



**LA CROSSE BOILING WATER REACTOR
FINAL STATUS SURVEY RELEASE RECORD**

SURVEY UNIT L2-011-102






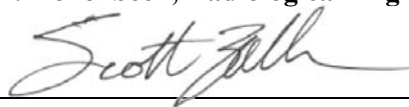
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LIST OF ACRONYMS AND ABBREVIATIONS

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
IC	Insignificant Contributors
LACBWR	La Crosse Boiling Water Reactor
LBGR	Lower Bound of the Gray Region
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
ROC	Radionuclides of Concern
SOF	Sum-of-Fraction
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 L2-011-102, an open land survey unit, has been generated in accordance with LaCrosseSolutions 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* (LTP) (Reference 2).

An FSS sample plan for this survey unit was developed in accordance with LaCrosseSolutions 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).

This survey unit has a MARSSIM classification of 2. 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 using a random start point, fourteen (14) soil samples were acquired from the survey unit. In addition, soil scanning was performed on 25% of the total surface area in the survey unit.

The analytical results for all soil samples taken in survey unit L2-011-102 indicate that the maximum Sum-of-Fraction (SOF), considering the concentration of all applicable Radionuclides of Concern (ROC) either by direct measurement or by inference, is equal to 0.0419 when applying the respective Operational Derived Concentration Guideline Levels (OpDCGLs) for soil. Therefore, the null hypothesis is rejected and survey unit L2-011-102 is acceptable for unrestricted release. The total mean SOF for all ROCs when applying the respective Base Case DCGLs (DCGLs) for soil is 0.0095. This SOF equates to a dose for the survey unit of 0.2368 mrem/yr.

2. SURVEY UNIT DESCRIPTION

L2-011-102 is an impacted Class 2 open land survey unit located south of the Radiologically Controlled Area. The surface area of the survey unit is 2,257.6 m².

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 L2-011-102.

3. CLASSIFICATION BASIS

Based on the Historical Site Assessment (HSA) (Reference 5), open land survey unit L2-011-102 has been identified as a Class 2 area. The following summarizes the results of the characterization surveys for survey unit L2-011-102.

The initial site characterization surveys performed by EnergySolutions were conducted between October 9, 2014, and August 6, 2015. A total of ten (10) surface soil samples, seven (7) subsurface soil samples, and six (6) asphalt samples were taken. All samples were analyzed by the on-site gamma spectroscopy system. Cs-137 was detected in six (6) surface samples above Minimum Detectable Concentration (MDC) at a maximum concentration of 0.200 pCi/g for the surface soil samples. No other ROC was identified for surface soil samples. For subsurface soil samples, Cs-137 was detected in two (2) samples above MDC at a maximum concentration of 0.052 pCi/g. No other ROC was identified for subsurface soil samples. Three (3) asphalt samples were detected above MDC for Cs-137 at a maximum concentration of 0.055 pCi/g. No other ROC was identified for 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.

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

Surface Soil	Co-60	Cs-137
# of Samples	10	
# >MDC	0	6
Mean (pCi/g)	0.064	0.065
Median (pCi/g)	0.064	0.054
Max (pCi/g)	0.081	0.200
Min (pCi/g)	0.052	0.030
Standard Deviation (pCi/g)	0.009	0.049
Subsurface Soil	Co-60	Cs-137
# of Samples	7	
# >MDC	0	2
Mean (pCi/g)	0.049	0.038
Median (pCi/g)	0.048	0.033
Max (pCi/g)	0.055	0.052
Min (pCi/g)	0.042	0.029
Standard Deviation (pCi/g)	0.004	0.009
Asphalt	Co-60	Cs-137
# of Samples	6	
# >MDC	0	3
Mean (pCi/g)	0.056	0.048
Median (pCi/g)	0.057	0.051
Max (pCi/g)	0.059	0.055
Min (pCi/g)	0.049	0.009
Standard Deviation (pCi/g)	0.003	0.008

Two (2) subsurface soil samples, one (1) surface soil sample, and one (1) asphalt sample, from characterization were sent to Test America Laboratories for off-site analysis. The subsurface and surface soil samples were analyzed for the full suite of initial ROC, while the asphalt sample was analyzed for Co-60, Nb-94, Cs-137, Eu-152, Eu-154, Eu-155, and Am-241. For subsurface samples, H-3 was identified in one (1) sample at a concentration of 31.370 pCi/g and C-14 was identified in one (1) sample at a concentration of 1.560 pCi/g. No other ROC was identified in any other samples.

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 TSD RS-TD-313196-004, *LACBWR Soil DCGL*, *Basement Concrete DCGL*, and *Buried Pipe DCGL*, Table 4 (Reference 6) for soils. If the IC dose calculated is less than the IC dose assigned for DCGL

adjustment, then no further action is required to 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 hard-to-detect (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 completion of a final Survey Unit Classification Worksheet, the correct final classification of survey unit L2-011-102 was determined to be Class 2.

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 is described in the LACBWR LTP in accordance with MARSSIM. 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 was to demonstrate that the level of residual radioactivity in survey unit L2-011-102 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).

LaCrosseSolutions 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.

Insignificant dose contributors 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 insignificant dose contributors and are 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.

LTP Chapter 6, Section 6.14.1 discusses the process used to derive the ROC for the decommissioning of LACBWR, including the elimination of insignificant dose contributors 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.

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 (calculation of surrogate DCGLs, investigations levels, etc.). 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. The DCGL_w can be multiplied by Area Factors, in Class 1 survey units, 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 for the end-state (basements, soils, buried pipe, above-ground structures, and groundwater). 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. EnergySolutions TSD RS-TD-313196-004 and LTP Chapter 6, 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 Chapter 6, Section 6.16.1 are reproduced in Table 4-2. The insignificant dose contributor 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 (calculation of surrogate DCGLs, investigation levels, etc.). 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 reported concentrations are 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 L2-011-102 as presented in 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

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

Where: $DCGL_{Sur}$ = Surrogate radionuclide DCGL
 $DCGL_{2,3,...n}$ = DCGL for radionuclides to be represented by the surrogate
 R_n = Ratio of concentration (or nuclide mixture fraction) of radionuclide “n” to surrogate radionuclide

Using the Operational DCGLs presented in Table 4-3 and the ratio from Table 5-1, the following surrogate calculation was performed:

Equation 2

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

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 L2-011-102 are based on the Operational DCGL and are presented in Table 5-2.

Table 5-2 - Action Levels for Survey Unit L2-011-102

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) (SOF of 0.5), divided by sigma (σ), which is the standard deviation of the data set used for survey design. The optimal value for Δ/σ should range between one (1) and three (3). The largest value the Δ/σ can have is three (3). If the Δ/σ exceeds three (3), then the value of three (3) will be used for Δ/σ . The Δ/σ for survey unit L2-011-102, based on Cs-137 and Co-60 data for subsurface soil samples collected during characterization of L2-011-102, was calculated as follows:

Equation 3

$$\Delta/\sigma = 0.5/0.002 = 250$$

As the calculated relative shift (250) was greater than three (3), then a value of three (3) was used as the adjusted Δ/σ . Both the Type I error, or α value, and the Type II error, or β value, was set at 0.05. The sample size from Table 5.5 of MARSSIM that equates to the Type I and Type II error of 0.05 for use with the Sign Test is an N value of 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 2, 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. Systematic sample locations #6, #9, #10, #11, #12, #13, and #14 were at areas covered by asphalt. At each of those locations, a surface asphalt sample and an underlying soil sample were collected. The surface asphalt samples are treated as the compliance samples, because they are the top layer and have the most significant dose consequence. The underlying soil samples, for the purposes of this FSS, are treated as judgmental samples. 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
L2-011-102-FSGS-001-SS	570845.9154	1641761.8532
L2-011-102-FSGS-002-SS	570884.6864	1641784.2377
L2-011-102-FSGS-003-SS	570884.6864	1641829.0066
L2-011-102-FSGS-004-SS	570884.6864	1641873.7755
L2-011-102-FSGS-005-SS	570884.6864	1641918.5444
L2-011-102-FSGS-007-SS	570884.6864	1642008.0823
L2-011-102-FSGS-008-SS	570884.6864	1642052.8512
L2-011-102-FSGA-006-AV	570884.6864	1641963.3133
L2-011-102-FSGA-009-AV	570923.4575	1641851.9311
L2-011-102-FSGA-010-AV	570923.4575	1641896.1600

Sample ID	Northing	Easting
L2-011-102-FSGA-011-AV	570923.4575	1641940.9289
L2-011-102-FSGA-012-AV	570962.2285	1641873.7755
L2-011-102-FSGA-013-AV	570962.2285	1641918.5444
L2-011-102-FSGA-014-AV	571000.9995	1641896.1600

In accordance with the sample plan, at least one (1) judgmental sample was required from the survey unit. The number of judgmental samples actually obtained was eight (8). In total, twenty-two (22) samples were collected for the FSS of survey unit L2-011-102. The coordinates for the judgmental samples are provided in Table 5-4.

Table 5-4 - Judgmental Sample Locations

Sample ID	Northing	Easting
L2-011-102-FSGS-006-SS	570884.6864	1641963.3133
L2-011-102-FSGS-009-SS	570923.4575	1641851.9311
L2-011-102-FSGS-010-SS	570923.4575	1641896.1600
L2-011-102-FSGS-011-SS	570923.4575	1641940.9289
L2-011-102-FSGS-012-SS	570962.2285	1641873.7755
L2-011-102-FSGS-013-SS	570962.2285	1641918.5444
L2-011-102-FSGS-014-SS	571000.9995	1641896.1600
L2-011-102-FJGS-015-SS	570866.7770	1641857.7120

The LACBWR LTP Chapter 5, 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 (including excavations where major sub-grade structures previously resided) will be analyzed for HTD ROC. Only the HTD radionuclide included as ROC (Sr-90) will be analyzed in the FSS confirmatory samples. 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 two (2) soil samples, L2-011-102-FSGS-004-SS and L2-011-102-FSGS-007-SS, met the requirement that a minimum of 10% of the samples collected for the FSS of survey unit L2-011-102 be analyzed for HTD ROC.

The implementation of quality control measures as referenced by LTP Chapter 5, Section 5.9 and LaCrosseSolutions 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 (3) soil sample, L2-011-102-QSGS-012-SS was designated for split sample QC analysis for the FSS of this survey unit.

LTP Chapter 5, Section 5.6.4.4 and Table 5-15 specifies that for Class 2 survey units, surface scans will be performed on 10% to 100% of the surface area in the survey unit. For survey unit L2-011-102, 25% scan coverage was selected, which equates to 564.4 m². To encapsulate 25% of the entire area of the survey unit, four (4) scan grids were established in the survey unit totaling 585 m² (more than the required minimum). A map of the scan grid locations is provided in Attachment 1.

For this Class 2 open land survey unit, the “Investigation Levels” for area scanning and soil sample measurement results are those levels specified in LTP Chapter 5, Table 5-16, and are reproduced below in Table 5-5.

Table 5-5 - Investigation Levels

Classification	Scan Investigation Levels	Direct Investigation Levels
Class 2	>Operational DCGL or >MDC _{scan} if MDC _{scan} is greater than Operational DCGL	>Operational DCGL

Table 5-6 provides a synopsis of the survey design for survey unit L2-011-102.

Table 5-6 - Synopsis of Survey Design

Feature	Design Criteria	Basis
Survey Unit Surface Area	2,257.6 m ²	GPS
Number of Systematic Samples (N)	14	<ul style="list-style-type: none"> • $\sigma = 0.002$ • UBGR = SOF of 1 • LBGR = SOF of 0.5 • Type I error = 0.05 • Type II error = 0.05 • $\Delta/\sigma = 3$ (adjusted) • MARSSIM Table 5.5

Feature	Design Criteria	Basis
DCGLs and Action Levels	<ul style="list-style-type: none"> 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 Chapter 5, Table 5-6
Scan and Direct Investigation Levels	>Operational DCGL	LTP Chapter 5, Table 5-16
Scan Area Coverage	585 m ² or ~25% area coverage	LTP Chapter 5, Table 5-15
Number of Judgmental Samples	1 8	Per Sample Plan Actual Number Obtained
HTD ROC Analysis	2 samples	LTP Chapter 5, Section 5.1 & Per Sample Plan
QC	1 split sample selected at random 5	LTP Chapter 5, Section 5.9 Actual Number Obtained

6. SURVEY IMPLEMENTATION

For survey unit L2-011-102, 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 December 11, 2018, 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 majority of soil in the survey unit was damp from melted snow, and several small patches of un-melted snow were still present in the area. Additionally, the survey unit was sparsely covered in dry grass and bushes. The snow and vegetation were deemed sparse enough as to not be a 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. A "Field Log" was used to document field activities and other information pertaining to the performance of the FSS. FSS field activities commenced on December 19, 2018.

FSS field activities were projected to take four (4) working days to complete. Daily briefings were conducted to discuss the expectations for job performance and to review safety aspects of the job. The survey required field activities were performed during normal working hours and concluded on December 21, 2018.

The fourteen (14) systematic soil sample locations were marked with flags based on GPS coordinates provided. Each soil sample consisted of approximately one (1) liter of soil. The 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 11), and in accordance with LC-FS-PR-004, *Sample Media Collection for Site Characterization and Final Status Survey* (Reference 12), LC-FS-PR-005, *Sample Media Preparation for Site Characterization and Final Status Survey* (Reference 13), and LC-FS-PR-001, *Sample Storage* (Reference 14).

A total of four (4) scan grids constituting a total scan coverage of 585 m², or approximately 25% of the surface area in the survey unit, were established. Background was assessed in the survey unit 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 L2-011-102, background ranged from 3,176 counts per minute (cpm) up to 6,945 cpm.

All designated scan areas and sample locations as denoted in Attachment 1 were scanned using a Ludlum 2350-1 paired with a Model 44-10 2"x 2" NaI detector operated in the rate-meter mode and using audio response. The probe was positioned no more than 3" from the ground and was moved at a scan speed not to exceed 0.5 meters per second. In accordance with RS-TD-313196-006, *Ludlum Model 44-10 Detector Sensitivity* (Reference 15), 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 survey design specified that a minimum of two (2) samples were required for HTD ROC analysis. In total, two (2) samples (L2-011-102-FSGS-004-SS and L2-011-102-FSGS-007-SS) were selected for HTD radionuclide analysis.

The survey design specified one (1) sample to be collected for QC split analysis. The implementation of survey specific QC measures included the collection of five (5) samples (L2-011-102-QSGS-001-SS, L2-011-102-QSGS-012-SS, L2-011-102-QSGA-012-AV, L2-011-102-FSGS-002-SS SPLIT, and L2-011-102-FSGS-007-SS SPLIT) for split and duplicate sample analysis.

7. SURVEY RESULTS

All areas identified in the FSS plan were scanned for elevated radiation levels; no alarms were produced. Table 7-1 provides an overview of the scan results for all four (4) scan grids and their associated lanes (identified as AL1-AL8, BL1-BL12, etc.), 15 sample locations (identified as SP001-SP015), 3 QC sample locations (identified as Q01SS, Q12AV, and Q12SS), and one scan of a grid as per QC measures (identified as QAL1-QAL4). 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	Judgmental Samples	Investigation Samples
AL1	4,873	5,831	0	0	0
AL2	5,059	5,831	0	0	0
AL3	5,082	5,831	0	0	0
AL4	5,056	5,831	0	0	0
AL5	5,087	5,831	0	0	0
AL6	5,207	5,831	0	0	0
AL7	5,050	5,831	0	0	0
AL8	4,980	5,831	0	0	0
BL1	4,784	5,831	0	0	0
BL2	4,808	5,831	0	0	0
BL3	4,961	5,831	0	0	0
BL4	4,811	5,831	0	0	0
BL5	4,849	5,831	0	0	0
BL6	4,840	5,831	0	0	0
BL7	4,873	5,831	0	0	0
BL8	5,171	5,831	0	0	0
BL9	5,158	5,831	0	0	0
BL10	5,033	5,831	0	0	0
BL11	4,999	5,831	0	0	0
BL12	4,965	5,831	0	0	0
CL1	4,043	5,831	0	0	0
CL2	4,028	5,831	0	0	0
CL3	3,919	5,831	0	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level ⁽¹⁾ (cpm)	# of Scan Alarms	Judgmental Samples	Investigation Samples
CL4	3,959	5,831	0	0	0
CL5	3,944	5,831	0	0	0
CL6	4,263	5,831	0	0	0
CL7	4,090	5,831	0	0	0
CL8	4,056	5,831	0	0	0
DL1	3,959	5,831	0	0	0
DL2	3,919	5,831	0	0	0
DL3	4,406	5,831	0	0	0
DL4	3,851	5,831	0	0	0
DL5	3,953	5,831	0	0	0
DL6	4,060	5,831	0	0	0
DL7	4,057	5,831	0	0	0
DL8	4,181	5,831	0	0	0
DL9	4,053	5,831	0	0	0
DL10	4,011	5,831	0	0	0
DL11	3,948	5,831	0	0	0
DL12	3,985	5,831	0	0	0
DL13	3,998	5,831	0	0	0
DL14	4,095	5,831	0	0	0
SP01	5,481	6,939	0	0	0
SP02	5,608	6,939	0	0	0
SP03	5,822	6,939	0	0	0
SP04	5,936	6,939	0	0	0
SP05	5,750	6,939	0	0	0
SP06	3,861	4,938	0	0	0
SP07	6,051	6,939	0	0	0
SP08	6,212	6,939	0	0	0
SP09	5,484	6,304	0	0	0
SP10	3,638	4,938	0	0	0
SP11	3,876	4,938	0	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level ⁽¹⁾ (cpm)	# of Scan Alarms	Judgmental Samples	Investigation Samples
SP12	5,172	6,304	0	0	0
SP13	4,036	4,938	0	0	0
SP14	3,582	4,938	0	0	0
SP15	5,877	6,936	0	0	0
Q01SS	6,060	8,107	0	0	0
Q12AV	5,083	8,107	0	0	0
Q12SS	5,381	8,107	0	0	0
QAL1	7,508	8,107	0	0	0
QAL2	7,457	8,107	0	0	0
QAL3	6,828	8,107	0	0	0
QAL4	7,180	8,107	0	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 and asphalt samples taken for non-parametric statistical testing using the on-site gamma spectroscopy system. A summary of the gamma spectroscopy results for the fourteen (14) samples collected for non-parametric statistical testing is provided in Table 7-2. Gamma spectroscopy results revealed one (1) sample above MDC for Cs-137 at a concentration of 0.0551 pCi/g. There were no samples above MDC for any other ROC. The concentration for Sr-90 was inferred based on the ratio specified in Table 5-1. The gamma spectroscopy reports for these samples 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 Soil 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)
L2-011-102-FSGS-001-SS	4.55E-02	3.52E-02	1.85E-02	1.28E-01	1.77E-02
L2-011-102-FSGS-002-SS	4.28E-02	5.26E-02	3.22E-02	1.61E-01	2.64E-02
L2-011-102-FSGS-003-SS	5.03E-03	6.58E-02	1.73E-01	1.49E-02	3.30E-02
L2-011-102-FSGS-004-SS	2.33E-02	9.35E-02	0.00E+00	1.29E-01	4.69E-02
L2-011-102-FSGS-005-SS	3.87E-02	8.73E-02	4.85E-03	7.05E-02	4.38E-02

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L2-011-102-FSGS-007-SS	1.46E-02	5.51E-02	0.00E+00	1.93E-02	2.77E-02
L2-011-102-FSGS-008-SS	7.08E-02	2.72E-02	9.58E-03	5.63E-03	1.37E-02
L2-011-102-FSGA-006-AV	0.00E+00	5.28E-02	0.00E+00	1.72E-01	2.65E-02
L2-011-102-FSGA-009-AV	2.16E-02	4.29E-02	1.30E-01	9.84E-02	2.15E-02
L2-011-102-FSGA-010-AV	3.44E-02	7.88E-02	4.78E-02	3.27E-02	3.96E-02
L2-011-102-FSGA-011-AV	1.01E-02	3.23E-02	1.42E-01	7.22E-03	1.62E-02
L2-011-102-FSGA-012-AV	6.97E-02	4.84E-02	1.26E-01	4.83E-02	2.43E-02
L2-011-102-FSGA-013-AV	2.65E-02	5.00E-02	3.08E-02	4.48E-02	2.51E-02
L2-011-102-FSGA-014-AV	3.01E-02	6.69E-02	2.59E-02	3.10E-02	3.36E-02

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	3.09E-02	2.83E-02	7.08E-02	0.00E+00	2.15E-02	1.06E+01	0.0029	0.0730
Cs-137	5.63E-02	5.27E-02	9.35E-02	2.72E-02	2.01E-02	4.83E+01	0.0012	0.0292
Eu-152	5.29E-02	2.84E-02	1.73E-01	0.00E+00	6.14E-02	2.36E+01	0.0022	0.0560
Eu-154	6.88E-02	4.66E-02	1.72E-01	5.63E-03	5.82E-02	2.19E+01	0.0031	0.0785
Sr-90	2.83E-02	2.65E-02	4.69E-02	1.37E-02	1.01E-02	5.47E+03	0.0000	0.0001

The off-site laboratory, GEL Laboratories, processed the two (2) samples (L2-011-102-FSGS-004-SS and L2-011-102-FSGS-007-SS) selected for HTD analysis. Both samples were analyzed for Sr-90. Both analyses met the required MDC. Laboratory results revealed that Sr-90 was not detected in either of the samples. 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
L2-011-102-FSGS-004-SS	Sr-90	5.39E-03	1.44E-01	2.82E-01	No
L2-011-102-FSGS-007-SS	Sr-90	-2.36E-02	1.77E-01	3.23E-01	No

Note: Bold values indicate concentrations greater than MDC.

The on-site laboratory analyzed the eight (8) judgmental soil samples using the on-site gamma spectroscopy system. A summary of the analytical results for the judgmental soil

samples are provided in Table 7-5. The gamma spectroscopy results revealed that no ROC was identified above the MDC for any of the judgmental samples. The concentration for Sr-90 was inferred based on the ratio specified in Table 5-1. The gamma spectroscopy report for these samples are presented in Attachment 7.

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

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L2-011-102-FSGS-006-SS	4.33E-02	6.66E-02	1.95E-02	0.00E+00	3.34E-02
L2-011-102-FSGS-009-SS	4.24E-02	3.37E-03	2.80E-02	4.47E-02	1.69E-03
L2-011-102-FSGS-010-SS	4.86E-02	7.67E-02	9.69E-02	1.23E-02	3.85E-02
L2-011-102-FSGS-011-SS	1.98E-02	5.18E-02	3.84E-02	2.83E-02	2.60E-02
L2-011-102-FSGS-012-SS	6.81E-02	7.92E-02	1.37E-01	1.07E-01	3.98E-02
L2-011-102-FSGS-013-SS	0.00E+00	8.43E-02	0.00E+00	5.41E-02	4.23E-02
L2-011-102-FSGS-014-SS	3.68E-02	5.70E-02	3.90E-02	2.16E-02	2.86E-02
L2-011-102-FJGS-015-SS	7.74E-02	1.28E-01	1.82E-01	1.46E-01	6.43E-02

Note: Bold values indicate concentrations greater than MDC.

The implementation of survey specific QC measures included the collection of five (5) samples (L2-011-102-QSGS-001-SS, L2-011-102-QSGS-012-SS, L2-011-102-QSGA-012-AV, L2-011-102-FSGS-002-SS SPLIT, and L2-011-102-FSGS-007-SS SPLIT) for split and duplicate sample analysis. The on-site laboratory analyzed the designated QC samples using the on-site gamma spectroscopy system. A summary of the analytical results for the QC samples is provided in Table 7-6. Gamma spectroscopy results revealed one (1) samples above MDC for Cs-137, with a maximum concentration 0.042 pCi/g, and no samples above MDC for any other ROC. 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 Soil Samples

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L2-011-102-QSGS-001-SS	4.74E-02	6.04E-02	7.29E-02	2.99E-02	3.03E-02
L2-011-102-QSGS-012-SS	3.25E-02	4.06E-02	3.58E-02	1.80E-02	2.04E-02
L2-011-102-QSGA-012-AV	3.43E-02	5.50E-02	1.57E-01	5.65E-02	2.76E-02

Sample ID	Co-60 (pCi/g)	Cs-137 (pCi/g)	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Sr-90 (pCi/g)
L2-011-102-FSGS-002-SS SPLIT	7.44E-03	2.68E-02	0.00E+00	0.00E+00	1.35E-02
L2-011-102-FSGS-007-SS SPLIT	9.77E-02	4.20E-02	1.10E-03	1.42E-02	2.11E-02

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

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

Where: C_n = concentration of radionuclide n

$DCGL_n$ = DCGL of radionuclide n .

The results of the unity rule calculation for the ROC in the systematic sample population for survey unit L2-011-102 are provided in Table 7-7.

Table 7-7 - Sum-of-Fractions for Individual Soil Samples (Systematic and QC)

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L2-011-102-FSGS-001-SS	0.0119	0.0020	0.0022	0.0162	0.0000	0.0323
L2-011-102-FSGS-002-SS	0.0112	0.0030	0.0038	0.0204	0.0000	0.0384
L2-011-102-FSGS-003-SS	0.0013	0.0038	0.0203	0.0019	0.0000	0.0273
L2-011-102-FSGS-004-SS	0.0061	0.0054	0.0000	0.0163	0.0000	0.0278
L2-011-102-FSGS-005-SS	0.0101	0.0050	0.0006	0.0089	0.0000	0.0247
L2-011-102-FSGS-007-SS	0.0038	0.0032	0.0000	0.0024	0.0000	0.0094
L2-011-102-FSGS-008-SS	0.0185	0.0016	0.0011	0.0007	0.0000	0.0219
L2-011-102-FSGA-006-AV	0.0000	0.0030	0.0000	0.0218	0.0000	0.0248
L2-011-102-FSGA-009-AV	0.0056	0.0025	0.0153	0.0125	0.0000	0.0359
L2-011-102-FSGA-010-AV	0.0090	0.0045	0.0056	0.0041	0.0000	0.0233
L2-011-102-FSGA-011-AV	0.0026	0.0019	0.0167	0.0009	0.0000	0.0221
L2-011-102-FSGA-012-AV	0.0182	0.0028	0.0148	0.0061	0.0000	0.0419
L2-011-102-FSGA-013-AV	0.0069	0.0029	0.0036	0.0057	0.0000	0.0191

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L2-011-102-FSGA-014-AV	0.0079	0.0038	0.0030	0.0039	0.0000	0.0187
L2-011-102-QSGS-001-SS	0.0124	0.0035	0.0086	0.0038	0.0000	0.0282
L2-011-102-QSGS-012-SS	0.0085	0.0023	0.0042	0.0023	0.0000	0.0173
L2-011-102-QSGA-012-AV	0.0090	0.0032	0.0184	0.0072	0.0000	0.0377
L2-011-102-FSGS-002-SS SPLIT	0.0019	0.0015	0.0000	0.0000	0.0000	0.0035
L2-011-102-FSGS-007-SS SPLIT	0.0255	0.0024	0.0001	0.0018	0.0000	0.0299

Systematic Measurements

Number of Systematic Measurements = 14

of Systematic Measurements with SOF ≥ 1 = 0

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

Max Individual Systematic Measurement SOF = 0.0419

Mean Systematic Measurement SOF = 0.0263

The results of the unity rule calculations for the ROC in the judgmental sample population for survey unit L2-011-102 are provided in Table 7-8.

Table 7-8 - Sum-of-Fractions for Individual Soil Samples (Judgmental)

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L2-011-102-FSGS-006-SS	0.0113	0.0038	0.0023	0.0000	0.0000	0.0174
L2-011-102-FSGS-009-SS	0.0111	0.0002	0.0033	0.0057	0.0000	0.0202
L2-011-102-FSGS-010-SS	0.0127	0.0044	0.0114	0.0016	0.0000	0.0301
L2-011-102-FSGS-011-SS	0.0052	0.0030	0.0045	0.0036	0.0000	0.0163
L2-011-102-FSGS-012-SS	0.0178	0.0046	0.0161	0.0136	0.0000	0.0520
L2-011-102-FSGS-013-SS	0.0000	0.0048	0.0000	0.0069	0.0000	0.0117
L2-011-102-FSGS-014-SS	0.0096	0.0033	0.0046	0.0027	0.0000	0.0202
L2-011-102-FJGS-015-SS	0.0202	0.0074	0.0214	0.0185	0.0000	0.0675

Judgmental Measurements

Number of Judgmental Measurements =	8
# of Judgmental Measurements with SOF \geq 1 =	0
# of Judgmental Measurements with SOF $>$ 0.1 (HTD Assessment) =	0
Max Individual Judgmental Measurement SOF =	0.0675
Mean Judgmental Measurement SOF =	0.0294

8. QUALITY CONTROL

The on-site laboratory processed five (5) split and duplicate samples (L2-011-102-QSGS-001-SS, L2-011-102-QSGS-012-SS, L2-011-102-QSGA-012-AV, L2-011-102-FSGS-002-SS SPLIT, and L2-011-102-FSGS-007-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). There was acceptable agreement between field split results. Refer to Attachment 4 for data and quality control analysis results.

9. INVESTIGATIONS AND RESULTS

No investigations were performed during the performance or analyses of the survey.

10. REMEDIATION AND RESULTS

Historically, no radiological remedial action as described by MARSSIM Section 5.4 was performed in this survey unit prior to or as a result of the FSS. Chapter 4 of the 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 2. The survey design had adequate power as indicated by the Retrospective Power Curve (see Attachment 6).

The analytical results indicated that all samples were less than a SOF of one (1) when compared to the OpDCGLs. Additionally, the maximum activity for each ROC did not exceed 10% of their respective OpDCGLs.

Although MARSSIM states that the Sign Test need not be performed in the instance that no measurements surpass the DCGL, the test was conducted to demonstrate coherence to the statistical principles of the DQO process. The Sign Test was performed on the data and compared to the original assumptions of the DQOs. The evaluation of the Sign Test results clearly demonstrates that the survey unit passes the unrestricted release criteria, thus, the null hypothesis is rejected. The results of the Sign Test are provided in Attachment 3.

The data assessment and 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 is 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 L2-011-102 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 OpDCGLs; 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 2.

The dose contribution from soil in survey unit L2-011-102 is 0.2368 mrem/yr TEDE, based on the average concentration of the ROC in samples used for non-parametric statistical sampling.

Survey unit L2-011-102 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 (LTP)*
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 (HSA)*
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 (QAPP)*
11. LC-FS-PR-012, *Chain of Custody Protocol*
12. LC-FS-PR-004, *Sample Media Collection for Site Characterization and Final Status Survey*
13. LC-FS-PR-005, *Sample Media Preparation for Site Characterization and Final Status Survey*
14. LC-FS-PR-001, *Sample Storage*
15. RS-TD-313196-006, *Ludlum Model 44-10 Detector Sensitivity*
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 – Figures and Maps

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

FIGURES AND MAPS

Figure 16-1 - Systematic and Co-Located Judgmental Sample Locations Map

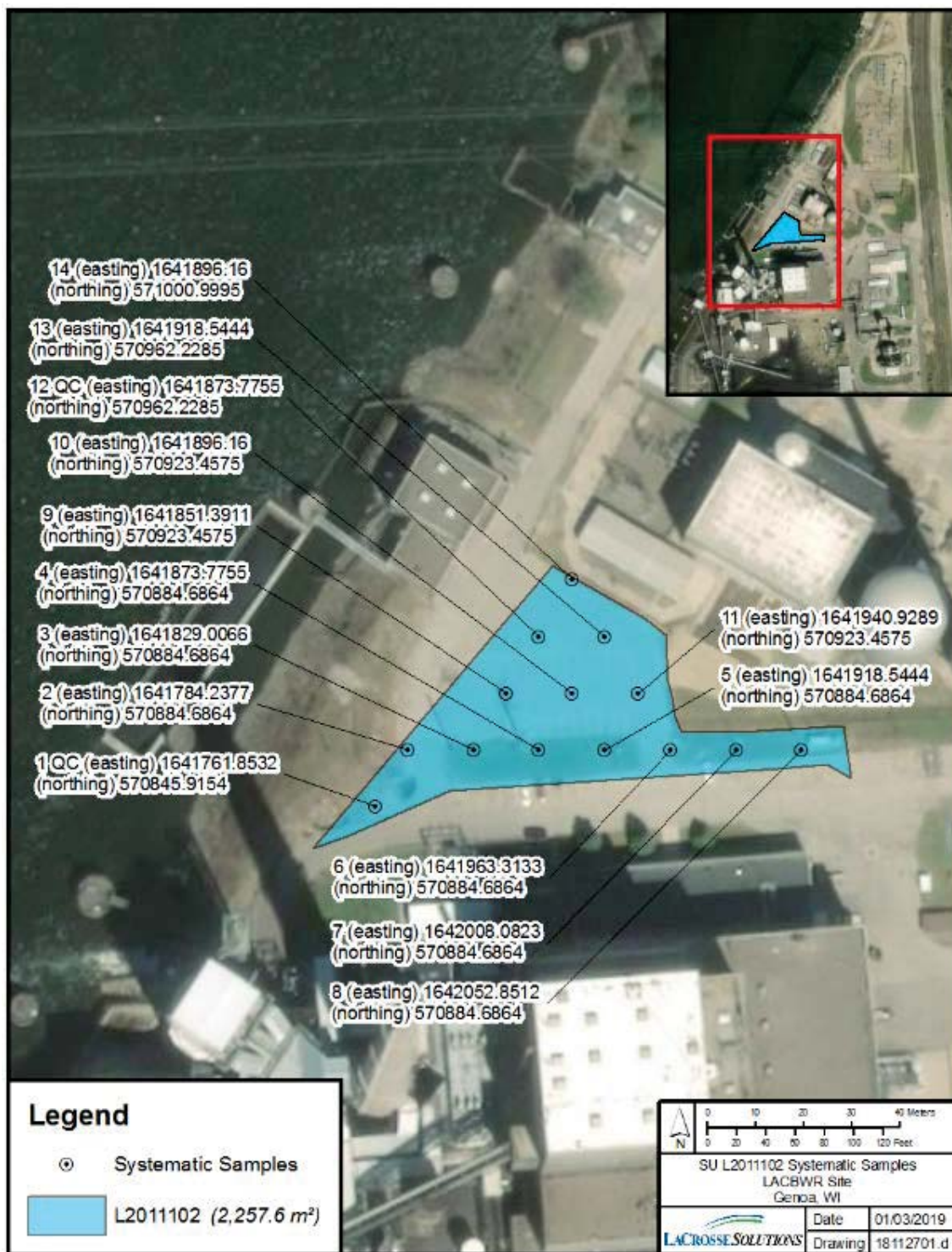
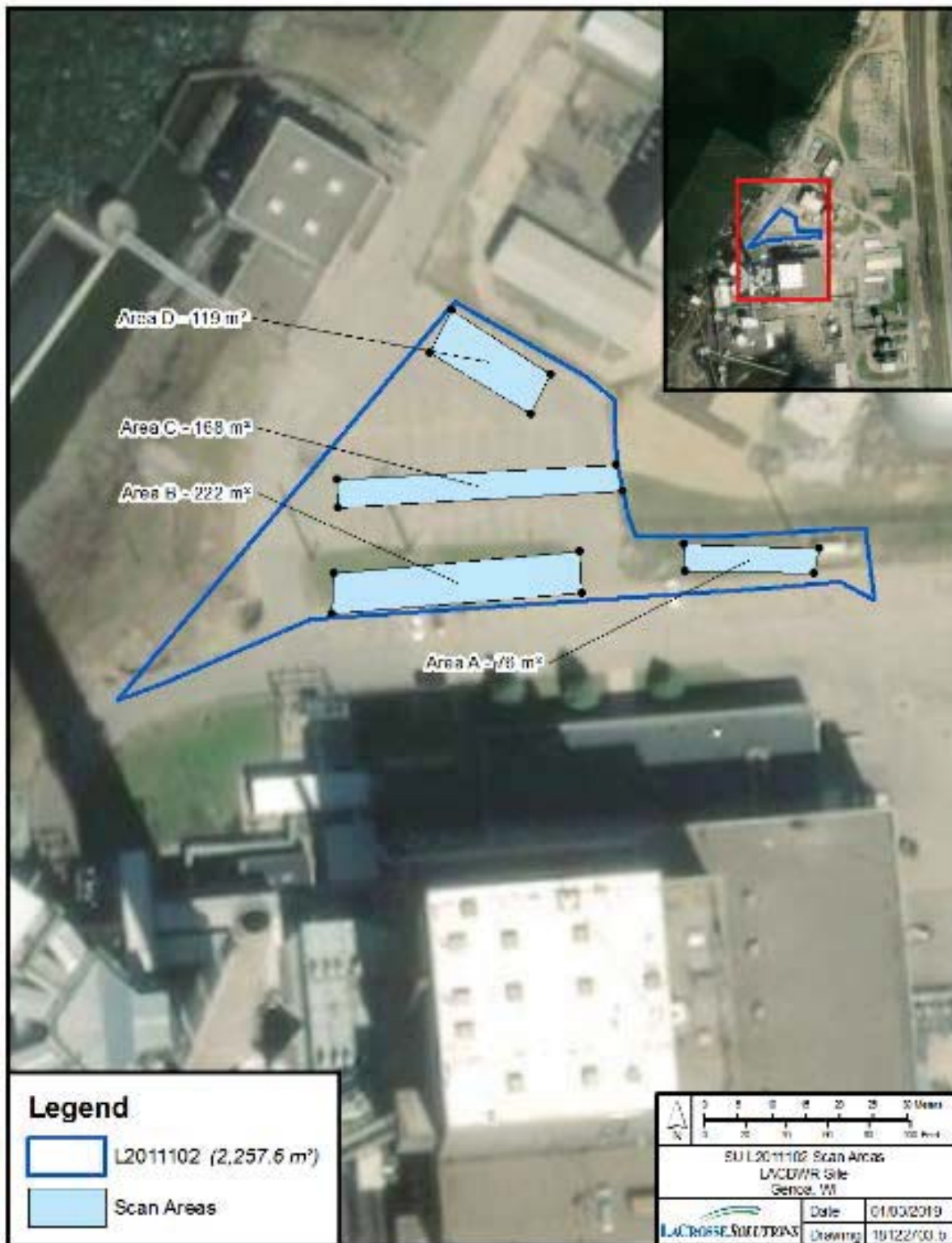


Figure 16-2 – Unique Judgmental Sample Location Map



Figure 16-3 - Scan Grid Locations Map



ATTACHMENT 2

SCAN DATA

Table 16-1 - L2-011-102 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	AL1	4873	4069	5831	0
44-10	226940	117014	AL2	5059	4069	5831	0
44-10	226940	117014	AL3	5082	4069	5831	0
44-18	226940	117014	AL4	5056	4069	5831	0
44-10	226940	117014	AL5	5087	4069	5831	0
44-10	226940	117014	AL6	5207	4069	5831	0
44-10	226940	117014	AL7	5050	4069	5831	0
44-10	226940	117014	AL8	4980	4069	5831	0
44-10	226940	117014	BL1	4784	4069	5831	0
44-10	226940	117014	BL2	4808	4069	5831	0
44-10	226940	117014	BL3	4961	4069	5831	0
44-10	226940	117014	BL4	4811	4069	5831	0
44-10	226940	117014	BL5	4849	4069	5831	0
44-10	226940	117014	BL6	4840	4069	5831	0
44-10	226940	117014	BL7	4873	4069	5831	0
44-10	226940	117014	BL8	5171	4069	5831	0
44-10	226940	117014	BL9	5158	4069	5831	0
44-10	226940	117014	BL10	5033	4069	5831	0
44-10	226940	117014	BL11	4999	4069	5831	0
44-10	226940	117014	BL12	4965	4069	5831	0
44-10	226940	117014	CL1	4043	4069	5831	0
44-10	226940	117014	CL2	4028	4069	5831	0
44-10	226940	117014	CL3	3919	4069	5831	0
44-10	226940	117014	CL4	3959	4069	5831	0
44-10	226940	117014	CL5	3944	4069	5831	0
44-10	226940	117014	CL6	4263	4069	5831	0
44-10	226940	117014	CL7	4090	4069	5831	0
44-10	226940	117014	CL8	4056	4069	5831	0
44-10	226940	117014	DL1	3959	4069	5831	0
44-10	226940	117014	DL2	3919	4069	5831	0
44-10	226940	117014	DL3	4406	4069	5831	0
44-10	226940	117014	DL4	3851	4069	5831	0

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-18	226940	117014	DL5	3953	4069	5831	0
44-10	226940	117014	DL6	4060	4069	5831	0
44-10	226940	117014	DL7	4057	4069	5831	0
44-10	226940	117014	DL8	4181	4069	5831	0
44-10	226940	117014	DL9	4053	4069	5831	0
44-10	226940	117014	DL10	4011	4069	5831	0
44-10	226940	117014	DL11	3948	4069	5831	0
44-10	226940	117014	DL12	3985	4069	5831	0
44-10	226940	117014	DL13	3998	4069	5831	0
44-10	226940	117014	DL14	4095	4069	5831	0
44-10	226940	117014	SP01	5481	5177	6939	0
44-10	226940	117014	SP01	5379	5177	6939	0
44-10	226940	117014	SP02	5608	5177	6939	0
44-10	226940	117014	SP02	5143	5177	6939	0
44-10	226940	117014	SP03	5441	5177	6939	0
44-10	226940	117014	SP03	5822	5177	6939	0
44-10	226940	117014	SP04	5487	5177	6939	0
44-10	226940	117014	SP04	5936	5177	6939	0
44-10	226940	117014	SP05	5750	5177	6939	0
44-10	226940	117014	SP05	5627	5177	6939	0
44-10	226940	117014	SP06	3861	3176	4938	0
44-10	226940	117014	SP06	3820	3176	4938	0
44-10	226940	117014	SP07	5882	5177	6939	0
44-10	226940	117014	SP07	6051	5177	6939	0
44-10	226940	117014	SP08	6169	5177	6939	0
44-10	226940	117014	SP08	6212	5177	6939	0
44-10	357776	325246	SP09	5439	4542	6304	0
44-10	357776	325246	SP09	5484	4542	6304	0
44-10	226940	117014	SP10	3334	3176	4938	0
44-10	226940	117014	SP10	3638	3176	4938	0
44-18	226940	117014	SP11	3678	3176	4938	0
44-10	226940	117014	SP11	3876	3176	4938	0
44-10	357776	325246	SP12	5172	4542	6304	0

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	357776	325246	SP12	4802	4542	6304	0
44-10	226940	117014	SP13	3461	3176	4938	0
44-10	226940	117014	SP13	4036	3176	4938	0
44-10	226940	117014	SP14	3582	3176	4938	0
44-10	226940	117014	SP14	3495	3176	4938	0
44-18	226940	117014	SP14	5877	5177	6939	0
44-10	226940	117014	SP15	5858	5177	6939	0
44-10	226940	117014	SP15	5877	5177	6936	0
44-10	357783	325261	Q01SS	6060	6345	8107	0
44-10	357783	325261	Q12AV	5083	6345	8107	0
44-10	357783	325261	Q12SS	5381	6345	8107	0
44-10	357783	325261	QAL1	7508	6345	8107	0
44-10	357783	325261	QAL2	7457	6345	8107	0
44-10	357783	325261	QAL3	6828	6345	8107	0
44-10	357783	325261	QAL4	7180	6345	8107	0

*Average Background established by taking the average of 5 1-minute static readings in each location.

ATTACHMENT 3

SIGN TEST

Table 16-2 - L2-011-102 Sign Test

#	SOF (Ws)	1-Ws	Sign
1	0.0323	0.97	+1
2	0.0384	0.96	+1
3	0.0273	0.97	+1
4	0.0278	0.97	+1
5	0.0247	0.98	+1
6	0.0094	0.99	+1
7	0.0219	0.98	+1
8	0.0248	0.98	+1
9	0.0359	0.96	+1
10	0.0233	0.98	+1
11	0.0221	0.98	+1
12	0.0419	0.96	+1
13	0.0191	0.98	+1
14	0.0187	0.98	+1

Number of positive differences (S+) 14

Critical Value 10

Survey Unit Meets
the Acceptance
Criteria

ATTACHMENT 4

QUALITY CONTROL ASSESSMENT

Table 16-3 - L2-011-102 QC Assessment

STANDARD						COMPARISON																		
Sample ID	Radionuclide	Activity Value	Standard Error	Resolution	Agreement Range (Low to High)	Sample ID	Activity Value	Standard Error	Comparison Ratio	Acceptable (Y/N)														
L2-011-102-FSGS-001-SS	K-40*	5.38E+00	6.87E-01	8	0.6 1.66	L2-011-102-QSGS-001-SS	5.46E+00	6.73E-01	1.01	Y														
L2-011-102-FSGA-012-AV	K-40*	4.63E+00	7.33E-01	6	0.5 2	L2-011-102-QSGA-012-AV	4.42E+00	6.97E-01	0.95	Y														
L2-011-102-FSGS-012-SS	K-40*	5.74E+00	7.11E-01	8	0.6 1.66	L2-011-102-QSGS-012-SS	5.72E+00	6.65E-01	1.00	Y														
L2-011-102-FSGS-002-SS	K-40*	5.72E+00	7.26E-01	8	0.6 1.66	L2-011-102-FSGS-002-SS SPLIT	6.28E+00	7.52E-01	1.10	Y														
L2-011-102-FSGS-007-SS	Cs-137	5.51E-02	4.06E-02	1	0.4 2.5	L2-011-102-FSGS-007-SS SPLIT	4.20E-02	3.49E-02	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.																		
						<table><tr><td>Resolution</td><td>Acceptable Ratio</td></tr><tr><td><4</td><td>0.4-2.5</td></tr><tr><td>4-7</td><td>0.5-2.0</td></tr><tr><td>8-15</td><td>0.6-1.66</td></tr><tr><td>16-50</td><td>0.75-1.33</td></tr><tr><td>51-200</td><td>0.80-1.25</td></tr><tr><td>>200</td><td>0.85-1.18</td></tr></table>					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
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 16-4 - Quantile Plot for Cs-137 Concentrations

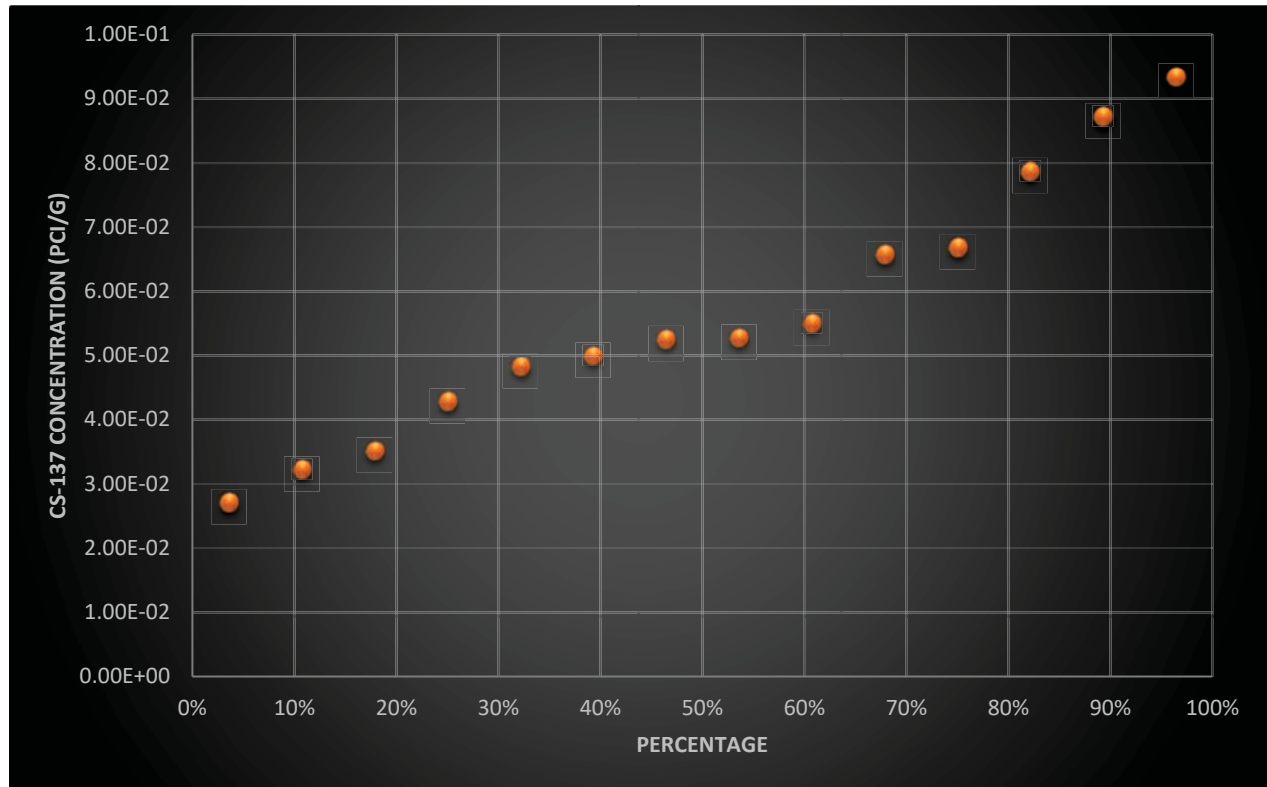


Figure 16-5 - Histogram for Cs-137 Concentrations

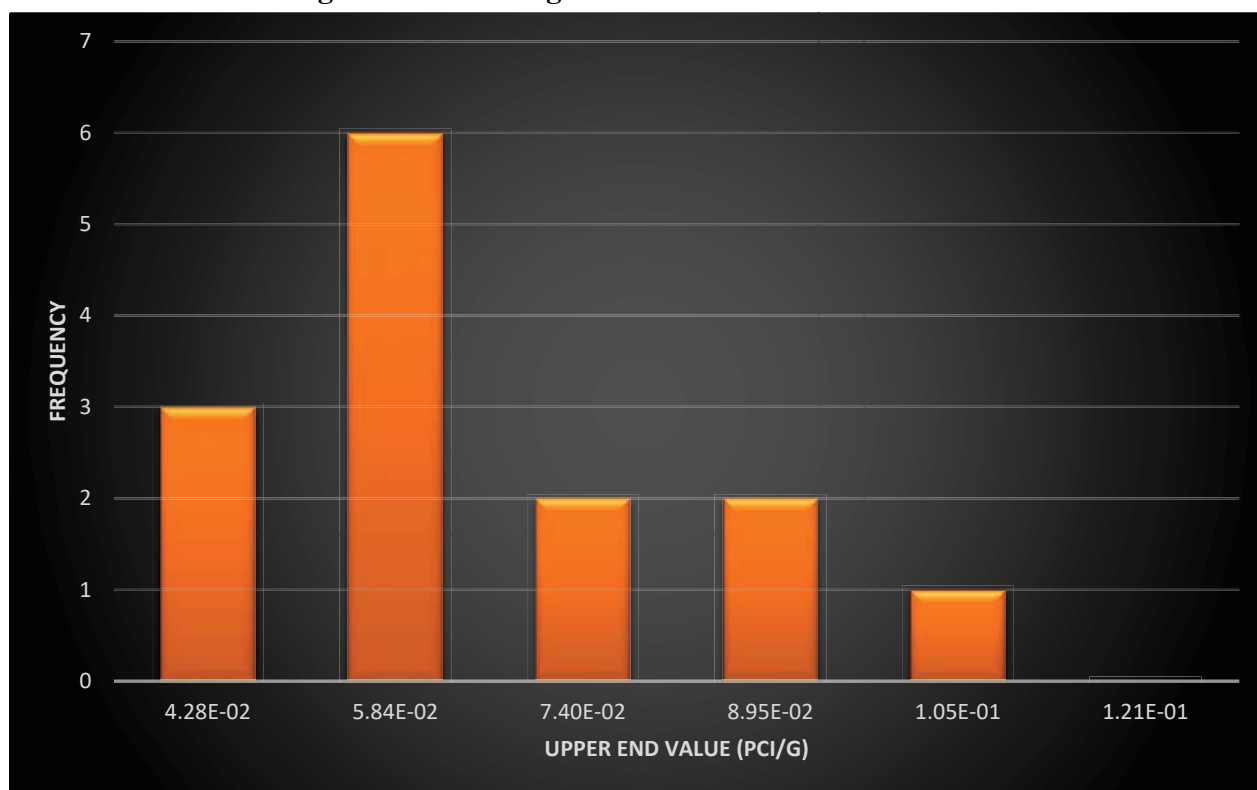
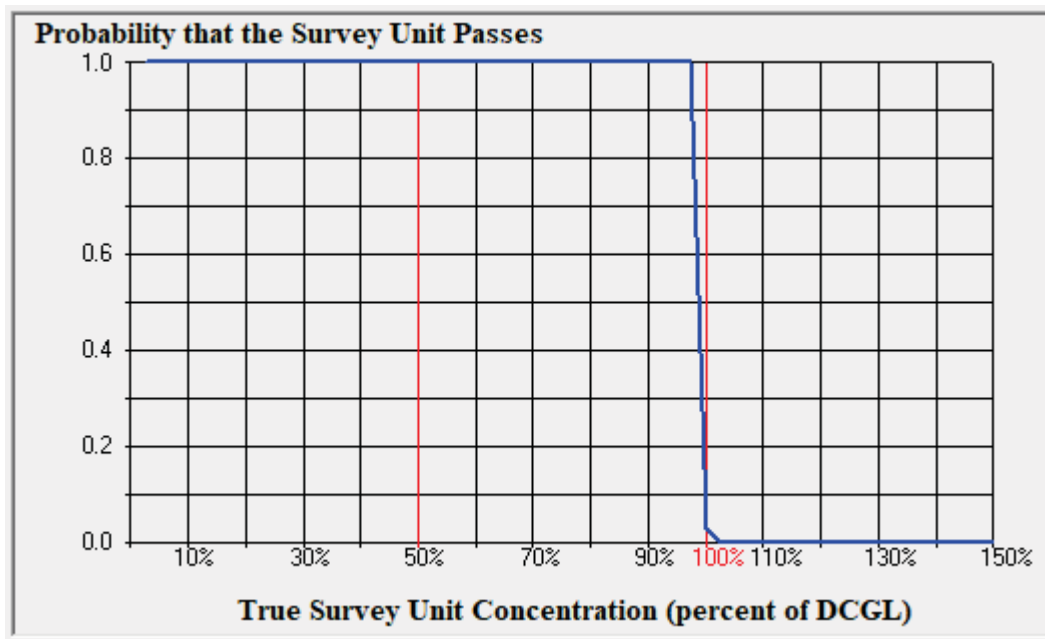


Figure 16-6 - Retrospective Power Curve for L2-011-102



ATTACHMENT 7

SAMPLE ANALYTICAL REPORTS

Analysis Report for L2-011-102-FSGS-001-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L2-011-102-FSGS-001-SS
Sample Description	: L2-011-102
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.313E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 12/20/2018 1:45:19PM
Acquisition Started	: 1/3/2019 2:34:50PM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.7 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	: 5382

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/23/2019 9:29:39AM

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

Analysis Report for L2-011-102-FSGS-001-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.69	147 -	161	153.93	1.41E+02	47.69	1.47E+03	1.67
F	2	93.19	185 -	192	186.92	4.22E+01	28.39	6.12E+02	0.82
F	3	238.43	471 -	481	477.34	2.59E+02	46.08	6.08E+02	1.57
F	4	294.99	584 -	595	590.43	1.43E+02	33.90	3.12E+02	1.91
F	5	338.30	673 -	683	677.03	7.41E+01	27.33	2.56E+02	1.94
F	6	351.83	698 -	709	704.10	2.27E+02	36.37	2.43E+02	1.77
F	7	583.15	1161 -	1173	1166.64	9.94E+01	25.24	1.44E+02	1.92
F	8	609.22	1213 -	1225	1218.77	1.76E+02	30.21	1.28E+02	1.83
F	9	911.27	1817 -	1832	1822.78	6.23E+01	20.31	8.59E+01	2.54
F	10	934.50	1865 -	1875	1869.24	1.76E+01	10.64	5.18E+01	0.87
F	11	969.25	1934 -	1946	1938.73	3.56E+01	15.16	8.76E+01	1.07
F	12	1120.28	2235 -	2247	2240.74	3.37E+01	15.14	6.86E+01	1.57
F	13	1460.64	2912 -	2929	2921.39	4.67E+02	44.01	3.13E+01	2.64
F	14	1764.62	3523 -	3535	3529.31	3.49E+01	12.55	6.00E+00	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 : 1/23/2019 9:29:39AM

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	76.69	1.41E+02	47.69			1.41E+02	4.77E+01
F	2	93.19	4.22E+01	28.39			4.22E+01	2.84E+01
F	3	238.43	2.59E+02	46.08			2.59E+02	4.61E+01
F	4	294.99	1.43E+02	33.90			1.43E+02	3.39E+01
F	5	338.30	7.41E+01	27.33			7.41E+01	2.73E+01
F	6	351.83	2.27E+02	36.37	8.36E+01	3.72E+01	1.44E+02	5.20E+01
F	7	583.15	9.94E+01	25.24			9.94E+01	2.52E+01
F	8	609.22	1.76E+02	30.21	4.12E+01	2.42E+01	1.35E+02	3.87E+01
F	9	911.27	6.23E+01	20.31			6.23E+01	2.03E+01
F	10	934.50	1.76E+01	10.64			1.76E+01	1.06E+01
F	11	969.25	3.56E+01	15.16			3.56E+01	1.52E+01
F	12	1120.28	3.37E+01	15.14			3.37E+01	1.51E+01
F	13	1460.64	4.67E+02	44.01	5.63E+01	1.71E+01	4.11E+02	4.72E+01
F	14	1764.62	3.49E+01	12.55	1.52E+01	9.80E+00	1.97E+01	1.59E+01

Analysis Report for L2-011-102-FSGS-001-SS
L2-011-102

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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.38E+00	6.87E-01
PB-212	0.98	77.11	*	17.50	2.40E-01	8.30E-02
		238.63	*	44.60	1.61E-01	2.98E-02
BI-214	0.78	609.31	*	46.30	1.86E-01	5.46E-02
		1120.29	*	15.10	2.47E-01	1.12E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49	*	15.80	2.05E-01	1.66E-01
PB-214	0.99	77.11	*	10.70	3.93E-01	1.36E-01
		295.21	*	19.20	2.46E-01	5.95E-02
		351.92	*	37.20	1.49E-01	5.46E-02
AC-228	0.62	209.28		4.40		
		338.32	*	11.40	2.43E-01	9.02E-02
		794.70		4.60		
		911.60	*	27.70	2.08E-01	6.84E-02
		964.60		5.20		
		969.11	*	16.60	2.09E-01	8.96E-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

Analysis Report for L2-011-102-FSGS-001-SS

L2-011-102

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.998	5.38E+00	6.87E-01	
PB-212	0.988	1.57E-01	2.81E-02	
BI-214	0.787	1.99E-01	4.71E-02	
PB-214	0.993	1.89E-01	3.87E-02	
AC-228	0.625	2.17E-01	4.66E-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 L2-011-102-FSGS-001-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/23/2019 9:29:39AM
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 2	93.19	1.17149E-02	33.65	Tol.	PA-228
F 7	583.15	2.76044E-02	12.70		
F 10	934.50	4.89142E-03	30.20		

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\Daityland_NPPLibrary\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.38E+00	6.15E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	4.55E-02	5.15E-02	6.62E-02
		1332.49	100.00	2.59E-02		5.15E-02
+	KR-85	513.99	0.43	7.06E+00	1.02E+01	1.02E+01
+	Y-88	898.04	93.70	-4.27E-02	3.98E-02	5.25E-02
		1836.06	99.20	-1.83E-02		3.98E-02
+	NB-94	702.63	100.00	-1.49E-02	3.71E-02	3.71E-02
		871.10	100.00	-2.57E-02		4.22E-02
+	I-131	284.30	6.06	6.72E-03	1.32E-01	1.77E+00
		364.48	81.20	-1.18E-01		1.32E-01
		636.97	7.27	2.93E-01		1.69E+00

Analysis Report for L2-011-102-FSGS-001-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-134	604.70	97.60	-9.32E-03	5.19E-02	5.71E-02
		795.84	85.40	-1.85E-02		5.19E-02
+	CS-137	661.65	85.12	3.52E-02	5.46E-02	5.46E-02
+	CE-144	80.12	1.36	-7.89E-01	2.79E-01	3.61E+00
		133.51	11.09	-1.78E-02		2.79E-01
+	EU-152	121.78	28.40	-1.27E-01	1.04E-01	1.04E-01
		344.28	26.60	1.85E-02		1.38E-01
		1408.00	20.74	3.39E-01		2.58E-01
+	EU-154	123.07	40.40	-3.57E-02	7.37E-02	7.37E-02
		723.30	19.70	1.18E-01		2.37E-01
		1274.51	35.50	1.28E-01		1.64E-01
+	EU-155	86.54	32.80	6.18E-02	1.25E-01	1.25E-01
		105.31	21.80	2.18E-01		1.52E-01
+	BI-214	609.31	* 46.30	1.86E-01	8.99E-02	8.99E-02
		1120.29	* 15.10	2.47E-01		2.51E-01
		1238.11	5.94	-7.60E-02		1.18E+00
		1377.67	4.11	4.05E-01		1.25E+00
		1407.98	2.48	2.83E+00		2.15E+00
		1509.19	2.19	6.74E-01		1.77E+00
		1764.49	* 15.80	2.05E-01		2.62E-01
+	PB-214	77.11	* 10.70	3.93E-01	9.54E-02	4.33E-01
		295.21	* 19.20	2.46E-01		1.17E-01
		351.92	* 37.20	1.49E-01		9.54E-02
+	PA-228	89.95	22.00	4.71E+02	4.10E+03	7.24E+03
		93.35	35.00	-4.36E+03		4.10E+03
		105.00	16.30	7.67E+03		8.29E+03
		129.22	2.97	2.94E+04		4.20E+04
		338.32	5.30	2.05E+04		2.76E+04
		463.00	13.80	2.13E+03		1.07E+04
		911.23	16.70	2.00E+04		1.44E+04
+	AM-241	59.54	36.30	9.97E-02	2.25E-01	2.25E-01
+	CM-243	103.76	23.00	8.35E-02	1.43E-01	1.43E-01
		228.18	10.60	7.42E-02		2.84E-01
		277.60	14.00	-1.98E-01		2.28E-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 L2-011-102-QSGS-001-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L2-011-102-QSGS-001-SS
Sample Description	: L2-011-102
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.817E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 12/20/2018 1:47:14PM
Acquisition Started	: 1/7/2019 9:44:21AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3611.0 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	: 5847

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 2/7/2019 9:11:30AM
Peak Analysis From Channel : 100
Peak Analysis To Channel : 4096

Analysis Report for L2-011-102-QSGS-001-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.63	147 -	162	153.81	2.35E+02	65.81	1.59E+03	3.76
F	2	92.76	183 -	190	186.05	6.12E+01	34.13	6.74E+02	1.06
F	3	186.10	369 -	380	372.69	7.16E+01	35.61	7.04E+02	1.66
F	4	238.47	469 -	481	477.42	2.73E+02	47.27	7.63E+02	1.53
F	5	295.21	586 -	595	590.87	1.24E+02	33.13	3.17E+02	1.74
F	6	338.21	672 -	685	676.86	7.87E+01	26.54	3.23E+02	1.54
F	7	351.85	700 -	712	704.13	2.27E+02	36.44	2.68E+02	1.89
F	8	477.29	948 -	959	954.95	5.03E+01	22.28	1.54E+02	2.08
F	9	582.89	1159 -	1172	1166.12	1.23E+02	26.97	1.37E+02	2.07
F	10	609.22	1213 -	1227	1218.78	1.75E+02	31.44	1.68E+02	2.11
F	11	911.02	1817 -	1829	1822.28	6.45E+01	19.45	6.69E+01	2.04
F	12	969.30	1934 -	1944	1938.83	3.06E+01	17.03	8.25E+01	2.06
F	13	1120.51	2236 -	2247	2241.20	4.03E+01	17.85	7.21E+01	2.44
F	14	1460.59	2913 -	2930	2921.30	4.98E+02	45.56	3.87E+01	2.70

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 : 2/7/2019 9:11:30AM

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	76.63	2.35E+02	65.81			2.35E+02	6.58E+01
F	2	92.76	6.12E+01	34.13			6.12E+01	3.41E+01
F	3	186.10	7.16E+01	35.61			7.16E+01	3.56E+01
F	4	238.47	2.73E+02	47.27			2.73E+02	4.73E+01
F	5	295.21	1.24E+02	33.13			1.24E+02	3.31E+01
F	6	338.21	7.87E+01	26.54			7.87E+01	2.65E+01
F	7	351.85	2.27E+02	36.44	8.36E+01	3.72E+01	1.43E+02	5.21E+01
F	8	477.29	5.03E+01	22.28			5.03E+01	2.23E+01
F	9	582.89	1.23E+02	26.97			1.23E+02	2.70E+01
F	10	609.22	1.75E+02	31.44	4.12E+01	2.42E+01	1.34E+02	3.97E+01
F	11	911.02	6.45E+01	19.45			6.45E+01	1.95E+01
F	12	969.30	3.06E+01	17.03			3.06E+01	1.70E+01
F	13	1120.51	4.03E+01	17.85			4.03E+01	1.79E+01
F	14	1460.59	4.98E+02	45.56	5.63E+01	1.71E+01	4.41E+02	4.87E+01

Analysis Report for L2-011-102-QSGS-001-SS

L2-011-102

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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.46E+00	6.73E-01
PB-212	0.98	77.11	*	17.50	3.79E-01	1.09E-01
		238.63	*	44.60	1.60E-01	2.88E-02
BI-214	0.58	609.31	*	46.30	1.75E-01	5.27E-02
		1120.29	*	15.10	2.79E-01	1.24E-01
		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	6.20E-01	1.78E-01
		295.21	*	19.20	2.01E-01	5.47E-02
		351.92	*	37.20	1.40E-01	5.15E-02
RA-226	0.99	186.21	*	3.28	4.79E-01	2.40E-01
AC-228	0.61	209.28		4.40		
		338.32	*	11.40	2.43E-01	8.27E-02
		794.70		4.60		
		911.60	*	27.70	2.03E-01	6.18E-02
		964.60		5.20		
		969.11	*	16.60	1.70E-01	9.48E-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

Analysis Report for L2-011-102-QSGS-001-SS

L2-011-102

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.996	5.46E+00	6.73E-01	
PB-212	0.987	1.67E-01	2.79E-02	
BI-214	0.583	1.91E-01	4.86E-02	
PB-214	0.994	1.76E-01	3.67E-02	
RA-226	0.998	4.79E-01	2.40E-01	
AC-228	0.610	2.07E-01	4.39E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-QSGS-001-SS

L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 2/7/2019 9:11:30AM

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	92.76	1.70047E-02	27.88	Tol.	PA-228
F 8	477.29	1.39693E-02	22.15	Sum	
F 9	582.89	3.42264E-02	10.95		

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_NPPLibrary\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	* 10.67	5.46E+00	5.95E-01	5.95E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	4.74E-02	5.04E-02	6.05E-02
		1332.49	100.00	4.24E-02		5.04E-02
+	KR-85	513.99	0.43	1.92E+01	1.03E+01	1.03E+01
+	Y-88	898.04	93.70	1.72E-02	3.63E-02	5.17E-02
		1836.06	99.20	-2.10E-02		3.63E-02
+	NB-94	702.63	100.00	-1.49E-03	3.98E-02	4.09E-02
		871.10	100.00	-3.87E-02		3.98E-02
+	I-131	284.30	6.06	8.03E-01	1.71E-01	2.37E+00
		364.48	81.20	-8.23E-02		1.71E-01
		636.97	7.27	1.32E-01		2.31E+00
+	CS-134	604.70	97.60	-1.88E-02	4.71E-02	5.57E-02
		795.84	85.40	-4.25E-02		4.71E-02

Analysis Report for L2-011-102-QSGS-001-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	85.12	6.04E-02	5.33E-02	5.33E-02
+	CE-144	80.12	1.36	-7.54E-01	2.80E-01	3.51E+00
		133.51	11.09	4.44E-02		2.80E-01
+	EU-152	121.78	28.40	-7.51E-02	1.02E-01	1.02E-01
		344.28	26.60	-2.01E-01		1.35E-01
		1408.00	20.74	7.29E-02		2.03E-01
+	EU-154	123.07	40.40	-4.33E-02	7.23E-02	7.23E-02
		723.30	19.70	2.99E-02		2.11E-01
		1274.51	35.50	-7.74E-03		1.55E-01
+	EU-155	86.54	32.80	-4.92E-03	1.15E-01	1.15E-01
		105.31	21.80	5.00E-02		1.45E-01
+	BI-214	609.31	* 46.30	1.75E-01	9.26E-02	9.26E-02
		1120.29	* 15.10	2.79E-01		2.37E-01
		1238.11	5.94	-3.46E-01		1.08E+00
		1377.67	4.11	-1.45E-01		1.06E+00
		1407.98	2.48	6.08E-01		1.69E+00
		1509.19	2.19	-4.30E-01		1.69E+00
		1764.49	15.80	4.11E-01		3.21E-01
+	PB-214	77.11	* 10.70	6.20E-01	9.32E-02	4.33E-01
		295.21	* 19.20	2.01E-01		1.05E-01
		351.92	* 37.20	1.40E-01		9.32E-02
+	PA-228	89.95	22.00	1.17E+05	6.98E+04	1.20E+05
		93.35	35.00	-1.52E+04		6.98E+04
		105.00	16.30	4.78E+04		1.41E+05
		129.22	2.97	3.55E+05		7.29E+05
		338.32	5.30	4.53E+05		4.64E+05
		463.00	13.80	2.35E+05		1.96E+05
		911.23	16.70	1.77E+05		2.44E+05
+	AM-241	59.54	36.30	1.15E-02	2.16E-01	2.16E-01
+	CM-243	103.76	23.00	7.39E-03	1.38E-01	1.38E-01
		228.18	10.60	-1.76E-01		2.71E-01
		277.60	14.00	4.41E-02		2.24E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L2-011-102-FSGS-002-SS
Sample Description	: L2-011-102
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.920E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 12/20/2018 1:53:42PM
Acquisition Started	: 1/4/2019 8:28:15AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3611.1 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	: 5522

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 2:29:19PM

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

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.18	147 -	161	152.91	3.90E+02	69.14	1.44E+03	4.30
F	2	186.24	366 -	380	372.97	1.37E+02	41.45	8.11E+02	2.06
F	3	238.61	469 -	485	477.70	4.11E+02	52.84	8.37E+02	1.99
F	4	295.17	586 -	594	590.80	1.90E+02	35.98	2.70E+02	1.60
F	5	338.58	672 -	683	677.59	4.87E+01	24.40	3.11E+02	1.46
F	6	351.87	696 -	710	704.17	3.40E+02	42.64	2.97E+02	1.95
F	7	477.81	948 -	963	956.01	8.35E+01	25.68	1.84E+02	2.60
F	8	583.17	1163 -	1171	1166.68	1.16E+02	25.59	9.94E+01	1.59
F	9	609.21	1211 -	1227	1218.76	2.37E+02	34.18	1.44E+02	2.20
F	10	768.34	1530 -	1541	1536.96	3.58E+01	17.22	7.51E+01	2.27
F	11	794.57	1586 -	1593	1589.41	1.91E+01	11.06	5.53E+01	0.65
F	12	911.09	1818 -	1829	1822.42	8.26E+01	21.39	6.61E+01	2.03
F	13	1120.12	2233 -	2246	2240.43	4.30E+01	19.01	1.02E+02	2.35
F	14	1460.63	2912 -	2929	2921.38	4.72E+02	44.24	3.63E+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 : 1/24/2019 2:29:19PM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.18	3.90E+02	69.14			3.90E+02	6.91E+01
F	2	186.24	1.37E+02	41.45			1.37E+02	4.15E+01
F	3	238.61	4.11E+02	52.84			4.11E+02	5.28E+01
F	4	295.17	1.90E+02	35.98			1.90E+02	3.60E+01
F	5	338.58	4.87E+01	24.40			4.87E+01	2.44E+01
F	6	351.87	3.40E+02	42.64	8.36E+01	3.72E+01	2.57E+02	5.66E+01
F	7	477.81	8.35E+01	25.68			8.35E+01	2.57E+01
F	8	583.17	1.16E+02	25.59			1.16E+02	2.56E+01
F	9	609.21	2.37E+02	34.18	4.12E+01	2.42E+01	1.96E+02	4.19E+01
F	10	768.34	3.58E+01	17.22			3.58E+01	1.72E+01
F	11	794.57	1.91E+01	11.06			1.91E+01	1.11E+01
F	12	911.09	8.26E+01	21.39			8.26E+01	2.14E+01
F	13	1120.12	4.30E+01	19.01			4.30E+01	1.90E+01
F	14	1460.63	4.72E+02	44.24	5.63E+01	1.71E+01	4.16E+02	4.74E+01

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102

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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.72E+00	7.26E-01
PB-212	0.96	77.11	*	17.50	7.07E-01	1.33E-01
		238.63	*	44.60	2.68E-01	3.71E-02
BI-214	0.58	609.31	*	46.30	2.84E-01	6.29E-02
		1120.29	*	15.10	3.32E-01	1.48E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.97	77.11	*	10.70	1.16E+00	2.18E-01
		295.21	*	19.20	3.43E-01	6.71E-02
		351.92	*	37.20	2.80E-01	6.32E-02
RA-226	1.00	186.21	*	3.28	1.02E+00	3.14E-01
AC-228	0.39	209.28		4.40		
		338.32	*	11.40	1.67E-01	8.43E-02
		794.70	*	4.60	3.56E-01	2.07E-01
		911.60	*	27.70	2.89E-01	7.59E-02
		964.60		5.20		
		969.11		16.60		

* = 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

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.998	5.72E+00	7.26E-01	
PB-212	0.962	2.85E-01	3.58E-02	
BI-214	0.584	2.92E-01	5.79E-02	
PB-214	0.978	3.26E-01	4.51E-02	
RA-226	1.000	1.02E+00	3.14E-01	
AC-228	0.390	2.43E-01	5.44E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-FSGS-002-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 2:29:19PM
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 7	477.81	2.31871E-02	15.38	Sum	
F 8	583.17	3.22331E-02	11.03		
F 10	768.34	9.94965E-03	24.03		

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\Daq\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	5.72E+00	6.59E-01	6.59E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	2.98E-02	5.86E-02	7.10E-02
		1332.49	100.00	4.28E-02		5.86E-02
+	KR-85	513.99	0.43	8.88E+00	1.08E+01	1.08E+01
+	Y-88	898.04	93.70	1.11E-02	4.31E-02	6.11E-02
		1836.06	99.20	-2.87E-02		4.31E-02
+	NB-94	702.63	100.00	-1.28E-02	4.20E-02	4.20E-02
		871.10	100.00	3.37E-03		5.12E-02
+	I-131	284.30	6.06	6.02E-01	1.53E-01	2.13E+00
		364.48	81.20	2.09E-02		1.53E-01
		636.97	7.27	-1.22E+00		1.97E+00
+	CS-134	604.70	97.60	-4.35E-03	6.20E-02	6.67E-02
		795.84	85.40	-3.88E-02		6.20E-02
+	CS-137	661.65	85.12	5.26E-02	5.82E-02	5.82E-02

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12	1.36	-1.97E+00	3.13E-01	4.01E+00
		133.51	11.09	3.13E-01		3.13E-01
+	EU-152	121.78	28.40	-6.83E-02	1.17E-01	1.17E-01
		344.28	26.60	3.22E-03		1.49E-01
		1408.00	20.74	2.27E-01		2.90E-01
+	EU-154	123.07	40.40	-6.97E-02	8.20E-02	8.20E-02
		723.30	19.70	1.61E-01		2.53E-01
		1274.51	35.50	-1.86E-03		1.79E-01
+	EU-155	86.54	32.80	-1.12E-02	1.33E-01	1.33E-01
		105.31	21.80	-1.99E-02		1.59E-01
+	BI-214	609.31	* 46.30	2.84E-01	1.01E-01	1.01E-01
		1120.29	* 15.10	3.32E-01		3.22E-01
		1238.11	5.94	9.32E-01		1.24E+00
		1377.67	4.11	8.83E-01		1.37E+00
		1407.98	2.48	1.89E+00		2.42E+00
		1509.19	2.19	-9.23E-01		2.00E+00
		1764.49	15.80	3.13E-01		3.69E-01
+	PB-214	77.11	* 10.70	1.16E+00	1.06E-01	4.53E-01
		295.21	* 19.20	3.43E-01		1.06E-01
		351.92	* 37.20	2.80E-01		1.08E-01
+	PA-228	89.95	22.00	1.77E+04	8.03E+03	1.37E+04
		93.35	35.00	8.71E+02		8.03E+03
		105.00	16.30	-3.79E+02		1.53E+04
		129.22	2.97	-1.01E+04		8.08E+04
		338.32	5.30	5.29E+04		5.17E+04
		463.00	13.80	5.56E+03		2.07E+04
		911.23	16.70	1.82E+04		2.80E+04
+	AM-241	59.54	36.30	8.12E-02	2.44E-01	2.44E-01
+	CM-243	103.76	23.00	8.55E-02	1.53E-01	1.53E-01
		228.18	10.60	8.83E-02		3.14E-01
		277.60	14.00	-1.13E-01		2.60E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Analysis Report for L2-011-102-FSGS-003-SS

L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L2-011-102-FSGS-003-SS
Sample Description	: L2-011-102
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.105E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 12/20/2018 2:00:37PM
Acquisition Started	: 1/4/2019 9:30:13AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.9 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	: 5524

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 2:30:52PM

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

Analysis Report for L2-011-102-FSGS-003-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.20	147 -	161	152.96	4.14E+02	72.57	1.64E+03	3.66
F	2	185.94	365 -	380	372.37	7.54E+01	34.80	1.13E+03	1.23
M	3	238.65	472 -	490	477.77	4.51E+02	52.92	6.10E+02	1.76
m	4	241.90	472 -	490	484.27	1.46E+02	33.66	4.90E+02	1.77
F	5	295.07	582 -	595	590.60	2.01E+02	37.76	4.94E+02	1.58
F	6	338.17	673 -	681	676.77	8.59E+01	28.80	2.48E+02	1.75
F	7	351.84	698 -	710	704.11	3.46E+02	43.68	3.13E+02	1.72
F	8	582.91	1157 -	1171	1166.17	1.24E+02	27.47	1.65E+02	2.02
F	9	609.24	1213 -	1227	1218.82	2.78E+02	36.66	1.38E+02	1.99
F	10	726.98	1451 -	1462	1454.25	2.94E+01	15.13	8.86E+01	1.44
F	11	911.16	1816 -	1829	1822.55	8.43E+01	21.77	7.65E+01	2.12
F	12	1120.31	2234 -	2247	2240.81	2.93E+01	13.02	8.01E+01	0.84
F	13	1460.61	2912 -	2931	2921.34	5.10E+02	46.38	4.46E+01	2.64
F	14	1764.44	3523 -	3536	3528.96	3.68E+01	14.64	2.70E+01	2.87

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 : 1/24/2019 2:30:52PM

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	76.20	4.14E+02	72.57			4.14E+02	7.26E+01
F	2	185.94	7.54E+01	34.80			7.54E+01	3.48E+01
M	3	238.65	4.51E+02	52.92			4.51E+02	5.29E+01
m	4	241.90	1.46E+02	33.66			1.46E+02	3.37E+01
F	5	295.07	2.01E+02	37.76			2.01E+02	3.78E+01
F	6	338.17	8.59E+01	28.80			8.59E+01	2.88E+01
F	7	351.84	3.46E+02	43.68	8.36E+01	3.72E+01	2.63E+02	5.74E+01
F	8	582.91	1.24E+02	27.47			1.24E+02	2.75E+01
F	9	609.24	2.78E+02	36.66	4.12E+01	2.42E+01	2.37E+02	4.39E+01
F	10	726.98	2.94E+01	15.13			2.94E+01	1.51E+01
F	11	911.16	8.43E+01	21.77			8.43E+01	2.18E+01
F	12	1120.31	2.93E+01	13.02			2.93E+01	1.30E+01
F	13	1460.61	5.10E+02	46.38	5.63E+01	1.71E+01	4.53E+02	4.94E+01
F	14	1764.44	3.68E+01	14.64	1.52E+01	9.80E+00	2.17E+01	1.76E+01

Analysis Report for L2-011-102-FSGS-003-SS

L2-011-102

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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	6.09E+00	7.46E-01
BI-212	0.60	727.17	*	11.80	1.93E-01	9.96E-02
		785.42		2.00		
		1620.56		2.75		
PB-212	0.96	77.11	*	17.50	7.33E-01	1.37E-01
		238.63	*	44.60	2.87E-01	3.68E-02
BI-214	0.78	609.31	*	46.30	3.36E-01	6.52E-02
		1120.29	*	15.10	2.21E-01	9.87E-02
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49	*	15.80	2.30E-01	1.88E-01
PB-214	0.97	77.11	*	10.70	1.20E+00	2.24E-01
		295.21	*	19.20	3.55E-01	6.89E-02
		351.92	*	37.20	2.80E-01	6.27E-02
RA-226	0.98	186.21	*	3.28	5.49E-01	2.55E-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

Analysis Report for L2-011-102-FSGS-003-SS

L2-011-102

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.997	6.09E+00	7.46E-01	
BI-212	0.601	1.93E-01	9.96E-02	
PB-212	0.964	3.03E-01	3.56E-02	
BI-214	0.787	2.96E-01	5.23E-02	
PB-214	0.978	3.30E-01	4.55E-02	
RA-226	0.988	5.49E-01	2.55E-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 L2-011-102-FSGS-003-SS

L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 2:30:52PM

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 4	241.90	4.05561E-02	11.53		
F 6	338.17	2.38487E-02	16.77	Tol.	AC-228 PA-228
F 8	582.91	3.44976E-02	11.06		
F 11	911.16	2.34295E-02	12.91	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	6.09E+00	6.74E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	-2.87E-02	5.62E-02	6.62E-02
		1332.49	100.00	5.03E-03		5.62E-02
+	KR-85	513.99	0.43	1.17E+01	1.08E+01	1.08E+01
+	Y-88	898.04	93.70	1.30E-03	3.99E-02	5.56E-02
		1836.06	99.20	-4.86E-02		3.99E-02

Analysis Report for L2-011-102-FSGS-003-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	NB-94	702.63	100.00	4.32E-02	4.36E-02	4.36E-02
		871.10	100.00	-7.68E-02		4.89E-02
+	I-131	284.30	6.06	-8.03E-01	1.58E-01	2.11E+00
		364.48	81.20	1.17E-01		1.58E-01
		636.97	7.27	7.64E-01		2.01E+00
+	CS-134	604.70	97.60	-4.28E-02	5.63E-02	6.65E-02
		795.84	85.40	-3.97E-02		5.63E-02
+	CS-137	661.65	85.12	6.58E-02	6.34E-02	6.34E-02
+	CE-144	80.12	1.36	-1.06E+00	3.14E-01	4.15E+00
		133.51	11.09	-4.31E-02		3.14E-01
+	EU-152	121.78	28.40	-5.82E-02	1.19E-01	1.19E-01
		344.28	26.60	-1.04E-01		1.59E-01
		1408.00	20.74	1.73E-01		2.50E-01
+	EU-154	123.07	40.40	1.49E-02	8.42E-02	8.42E-02
		723.30	19.70	-1.60E-01		2.38E-01
		1274.51	35.50	-4.69E-02		1.81E-01
+	EU-155	86.54	32.80	-1.38E-01	1.34E-01	1.34E-01
		105.31	21.80	-1.40E-01		1.61E-01
+	BI-214	609.31	* 46.30	3.36E-01	9.56E-02	9.56E-02
		1120.29	* 15.10	2.21E-01		2.81E-01
		1238.11	5.94	1.18E+00		1.24E+00
		1377.67	4.11	1.39E+00		1.34E+00
		1407.98	2.48	1.44E+00		2.09E+00
		1509.19	2.19	-2.34E-01		1.90E+00
		1764.49	* 15.80	2.30E-01		3.34E-01
+	PB-214	77.11	* 10.70	1.20E+00	1.05E-01	4.73E-01
		295.21	* 19.20	3.55E-01		1.56E-01
		351.92	* 37.20	2.80E-01		1.05E-01
+	PA-228	89.95	22.00	1.73E+04	8.75E+03	1.46E+04
		93.35	35.00	9.28E+03		8.75E+03
		105.00	16.30	-1.05E+04		1.60E+04
		129.22	2.97	2.52E+04		8.50E+04
		338.32	5.30	5.75E+04		5.54E+04
		463.00	13.80	-5.94E+03		2.04E+04
		911.23	16.70	1.96E+04		2.76E+04
+	AM-241	59.54	36.30	2.28E-02	2.48E-01	2.48E-01
+	CM-243	103.76	23.00	-1.31E-01	1.52E-01	1.52E-01
		228.18	10.60	-1.56E-01		3.16E-01
		277.60	14.00	-3.52E-02		2.62E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Analysis Report for L2-011-102-FSGS-003-SS
L2-011-102

Analysis Report for L2-011-102-FSGS-004-SS

L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-004-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 7.936E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 2:27:30PM
Acquisition Started : 1/4/2019 10:33:08AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.0 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 : 5526

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 2:32:12PM

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

Analysis Report for L2-011-102-FSGS-004-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	75.83	147 -	161	152.20	2.82E+02	65.17	1.22E+03	5.40
F	2	143.82	286 -	292	288.16	3.75E+01	26.33	4.32E+02	0.89
F	3	238.50	474 -	481	477.47	2.08E+02	39.84	4.01E+02	1.43
F	4	295.23	587 -	596	590.91	1.09E+02	30.32	3.01E+02	1.51
F	5	351.82	699 -	710	704.06	2.59E+02	37.37	2.34E+02	1.63
F	6	582.98	1161 -	1173	1166.30	5.40E+01	22.18	1.61E+02	1.95
F	7	609.21	1213 -	1223	1218.76	1.84E+02	30.80	1.13E+02	1.70
F	8	911.02	1817 -	1827	1822.27	2.81E+01	16.66	8.37E+01	1.93
F	9	1120.06	2234 -	2247	2240.30	3.70E+01	15.54	8.19E+01	1.43
F	10	1460.75	2913 -	2931	2921.62	3.41E+02	37.46	1.90E+01	2.65

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 : 1/24/2019 2:32:12PM

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	75.83	2.82E+02	65.17			2.82E+02	6.52E+01
F	2	143.82	3.75E+01	26.33			3.75E+01	2.63E+01
F	3	238.50	2.08E+02	39.84			2.08E+02	3.98E+01
F	4	295.23	1.09E+02	30.32			1.09E+02	3.03E+01
F	5	351.82	2.59E+02	37.37	8.36E+01	3.72E+01	1.75E+02	5.27E+01
F	6	582.98	5.40E+01	22.18			5.40E+01	2.22E+01
F	7	609.21	1.84E+02	30.80	4.12E+01	2.42E+01	1.43E+02	3.92E+01
F	8	911.02	2.81E+01	16.66			2.81E+01	1.67E+01
F	9	1120.06	3.70E+01	15.54			3.70E+01	1.55E+01
F	10	1460.75	3.41E+02	37.46	5.63E+01	1.71E+01	2.84E+02	4.12E+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 L2-011-102-FSGS-004-SS

L2-011-102

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	1.00	1460.75 *	10.67	3.91E+00	6.06E-01
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	1.35E-01	2.68E-02
BI-214	0.58	609.31 *	46.30	2.07E-01	5.80E-02
		1120.29 *	15.10	2.85E-01	1.20E-01
		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	1.96E-01	5.55E-02
		351.92 *	37.20	1.91E-01	5.82E-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	1.000	3.91E+00	6.06E-01	
PB-212	0.558	1.35E-01	2.68E-02	
BI-214	0.583	2.22E-01	5.23E-02	

Analysis Report for L2-011-102-FSGS-004-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.720	1.93E-01	4.01E-02	
<p>? = nuclide is part of an undetermined solution X = nuclide rejected by the interference analysis @ = nuclide contains energy lines not used in Weighted Mean Activity</p> <p>Errors quoted at 2.000sigma</p>				

Analysis Report for L2-011-102-FSGS-004-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 2:32:12PM
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	75.83	7.84207E-02	11.54		
F 2	143.82	1.04123E-02	35.12		
F 6	582.98	1.50137E-02	20.51		
F 8	911.02	7.81607E-03	29.60	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	3.91E+00	6.12E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	2.33E-02	4.89E-02	5.94E-02
		1332.49	100.00	-1.73E-02		4.89E-02
+	KR-85	513.99	0.43	9.09E+00	9.98E+00	9.98E+00
+	Y-88	898.04	93.70	1.15E-02	4.08E-02	5.31E-02
		1836.06	99.20	-2.25E-02		4.08E-02
+	NB-94	702.63	100.00	-4.83E-03	3.91E-02	3.91E-02
		871.10	100.00	-4.66E-03		4.38E-02
+	I-131	284.30	6.06	8.89E-02	1.44E-01	2.02E+00
		364.48	81.20	-4.87E-02		1.44E-01
		636.97	7.27	7.09E-01		2.00E+00

Analysis Report for L2-011-102-FSGS-004-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-134	604.70	97.60	1.30E-01	5.17E-02	6.05E-02
		795.84	85.40	-5.99E-02		5.17E-02
+	CS-137	661.65	85.12	9.35E-02	6.02E-02	6.02E-02
+	CE-144	80.12	1.36	-1.12E+00	2.81E-01	3.64E+00
		133.51	11.09	1.04E-01		2.81E-01
+	EU-152	121.78	28.40	-1.11E-01	1.05E-01	1.05E-01
		344.28	26.60	-1.37E-01		1.35E-01
		1408.00	20.74	-2.26E-02		2.20E-01
+	EU-154	123.07	40.40	-2.56E-02	7.46E-02	7.46E-02
		723.30	19.70	7.98E-02		2.17E-01
		1274.51	35.50	1.29E-01		1.48E-01
+	EU-155	86.54	32.80	-1.26E-01	1.22E-01	1.22E-01
		105.31	21.80	5.02E-02		1.47E-01
+	BI-214	609.31	* 46.30	2.07E-01	8.96E-02	8.96E-02
		1120.29	* 15.10	2.85E-01		2.91E-01
		1238.11	5.94	-7.69E-02		1.08E+00
		1377.67	4.11	1.48E-01		1.25E+00
		1407.98	2.48	-1.89E-01		1.84E+00
		1509.19	2.19	1.16E-01		2.00E+00
		1764.49	15.80	2.22E-01		3.33E-01
+	PB-214	77.11	10.70	6.07E-01	9.93E-02	4.83E-01
		295.21	* 19.20	1.96E-01		1.15E-01
		351.92	* 37.20	1.91E-01		9.93E-02
+	PA-228	89.95	22.00	2.10E+04	7.87E+03	1.35E+04
		93.35	35.00	6.88E+02		7.87E+03
		105.00	16.30	2.39E+03		1.48E+04
		129.22	2.97	4.78E+04		7.71E+04
		338.32	5.30	4.78E+03		4.98E+04
		463.00	13.80	-9.44E+03		1.94E+04
		911.23	16.70	2.95E+04		2.47E+04
+	AM-241	59.54	36.30	-4.94E-02	2.29E-01	2.29E-01
+	CM-243	103.76	23.00	1.26E-02	1.39E-01	1.39E-01
		228.18	10.60	-2.25E-01		2.86E-01
		277.60	14.00	-8.57E-02		2.43E-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

Analysis Report for L2-011-102-FSGS-005-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-005-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.147E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 2:35:25PM
Acquisition Started : 1/4/2019 11:34:50AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.1 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 : 5528

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 2:34:49PM

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

Analysis Report for L2-011-102-FSGS-005-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.21	146 -	159	152.97	2.37E+02	62.74	1.32E+03	3.43
F	2	238.69	472 -	485	477.86	3.73E+02	48.73	5.60E+02	1.90
F	3	295.03	585 -	595	590.51	1.02E+02	31.57	3.41E+02	1.69
F	4	338.16	671 -	682	676.75	5.68E+01	25.61	2.99E+02	1.60
F	5	351.86	700 -	712	704.14	2.47E+02	37.13	2.77E+02	1.70
F	6	583.00	1159 -	1172	1166.33	9.28E+01	23.91	1.33E+02	1.83
F	7	609.28	1213 -	1226	1218.89	1.81E+02	30.68	1.21E+02	2.11
F	8	911.08	1814 -	1830	1822.39	9.41E+01	22.42	7.14E+01	2.57
F	9	969.13	1932 -	1945	1938.49	3.20E+01	15.92	1.06E+02	1.53
F	10	1120.47	2236 -	2245	2241.12	2.06E+01	12.98	6.82E+01	1.12
F	11	1460.67	2913 -	2929	2921.44	4.25E+02	42.54	5.11E+01	2.56

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 : 1/24/2019 2:34:49PM

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	76.21	2.37E+02	62.74			2.37E+02	6.27E+01
F	2	238.69	3.73E+02	48.73			3.73E+02	4.87E+01
F	3	295.03	1.02E+02	31.57			1.02E+02	3.16E+01
F	4	338.16	5.68E+01	25.61			5.68E+01	2.56E+01
F	5	351.86	2.47E+02	37.13	8.36E+01	3.72E+01	1.63E+02	5.26E+01
F	6	583.00	9.28E+01	23.91			9.28E+01	2.39E+01
F	7	609.28	1.81E+02	30.68	4.12E+01	2.42E+01	1.40E+02	3.91E+01
F	8	911.08	9.41E+01	22.42			9.41E+01	2.24E+01
F	9	969.13	3.20E+01	15.92			3.20E+01	1.59E+01
F	10	1120.47	2.06E+01	12.98			2.06E+01	1.30E+01
F	11	1460.67	4.25E+02	42.54	5.63E+01	1.71E+01	3.68E+02	4.59E+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 L2-011-102-FSGS-005-SS
L2-011-102

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	6.53E+00	8.90E-01
PB-212	0.96	77.11	*	17.50	5.54E-01	1.51E-01
		238.63	*	44.60	3.13E-01	4.40E-02
BI-214	0.58	609.31	*	46.30	2.62E-01	7.47E-02
		1120.29	*	15.10	2.05E-01	1.29E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.97	77.11	*	10.70	9.05E-01	2.47E-01
		295.21	*	19.20	2.37E-01	7.44E-02
		351.92	*	37.20	2.29E-01	7.47E-02
AC-228	0.61	209.28		4.40		
		338.32	*	11.40	2.51E-01	1.14E-01
		794.70		4.60		
		911.60	*	27.70	4.25E-01	1.03E-01
		964.60		5.20		
		969.11	*	16.60	2.55E-01	1.27E-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 L2-011-102-FSGS-005-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.999	6.53E+00	8.90E-01	
PB-212	0.964	3.21E-01	4.23E-02	
BI-214	0.584	2.48E-01	6.47E-02	
PB-214	0.978	2.39E-01	5.16E-02	
AC-228	0.615	3.22E-01	6.54E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-FSGS-005-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 2:34:49PM
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 6	583.00	2.57889E-02	12.88		

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	6.53E+00	8.93E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	3.87E-02	7.36E-02	8.34E-02
		1332.49	100.00	1.32E-02		7.36E-02
+	KR-85	513.99	0.43	2.37E+01	1.37E+01	1.37E+01
+	Y-88	898.04	93.70	1.43E-02	5.98E-02	6.27E-02
		1836.06	99.20	1.44E-02		5.98E-02
+	NB-94	702.63	100.00	-1.17E-03	5.18E-02	5.18E-02
		871.10	100.00	-5.00E-02		5.91E-02
+	I-131	284.30	6.06	9.29E-01	1.96E-01	2.61E+00
		364.48	81.20	1.87E-02		1.96E-01
		636.97	7.27	1.35E+00		2.53E+00
+	CS-134	604.70	97.60	-1.98E-02	7.51E-02	7.77E-02
		795.84	85.40	-5.60E-02		7.51E-02
+	CS-137	661.65	85.12	8.73E-02	7.70E-02	7.70E-02
+	CE-144	80.12	1.36	-3.08E+00	3.72E-01	4.82E+00
		133.51	11.09	8.18E-02		3.72E-01

Analysis Report for L2-011-102-FSGS-005-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	EU-152	121.78	28.40	-1.21E-01	1.35E-01	1.35E-01
		344.28	26.60	-3.86E-01		1.85E-01
		1408.00	20.74	4.85E-03		2.91E-01
+	EU-154	123.07	40.40	-3.61E-03	9.56E-02	9.56E-02
		723.30	19.70	2.96E-01		3.03E-01
		1274.51	35.50	7.05E-02		2.08E-01
+	EU-155	86.54	32.80	-2.03E-02	1.64E-01	1.64E-01
		105.31	21.80	-1.24E-01		1.88E-01
+	BI-214	609.31	* 46.30	2.62E-01	1.21E-01	1.21E-01
		1120.29	* 15.10	2.05E-01		3.16E-01
		1238.11	5.94	4.12E-01		1.47E+00
		1377.67	4.11	-8.33E-01		1.48E+00
		1407.98	2.48	4.05E-02		2.43E+00
		1509.19	2.19	-1.22E+00		1.99E+00
		1764.49	15.80	3.83E-01		4.66E-01
+	PB-214	77.11	* 10.70	9.05E-01	1.35E-01	5.47E-01
		295.21	* 19.20	2.37E-01		1.61E-01
		351.92	* 37.20	2.29E-01		1.35E-01
+	PA-228	89.95	22.00	2.24E+04	1.09E+04	1.86E+04
		93.35	35.00	7.46E+03		1.09E+04
		105.00	16.30	-1.38E+04		1.95E+04
		129.22	2.97	-1.53E+04		1.03E+05
		338.32	5.30	7.07E+04		7.06E+04
		463.00	13.80	-1.34E+03		2.73E+04
		911.23	16.70	5.16E+04		3.72E+04
+	AM-241	59.54	36.30	-2.00E-02	2.94E-01	2.94E-01
+	CM-243	103.76	23.00	-8.40E-02	1.80E-01	1.80E-01
		228.18	10.60	1.58E-01		3.75E-01
		277.60	14.00	-2.74E-01		3.10E-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 L2-011-102-FSGA-006-AV
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGA-006-AV
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.965E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/21/2018 9:21:00AM
Acquisition Started : 1/8/2019 1:15:08PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.6 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 : 5530

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:04:18PM

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

Analysis Report for L2-011-102-FSGA-006-AV

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.69	469 -	485	477.85	2.00E+02	42.23	5.40E+02	2.95
F	2	295.14	582 -	598	590.72	9.67E+01	27.11	3.40E+02	1.63
F	3	351.86	700 -	711	704.15	1.50E+02	30.73	2.30E+02	1.61
F	4	422.71	842 -	851	845.82	2.15E+01	14.75	9.86E+01	1.34
F	5	510.16	1017 -	1028	1020.69	3.71E+01	19.27	1.83E+02	1.35
F	6	609.45	1213 -	1227	1219.22	1.16E+02	24.80	9.43E+01	2.10
F	7	911.33	1817 -	1829	1822.89	3.68E+01	15.42	5.85E+01	1.78
F	8	1460.80	2915 -	2930	2921.70	3.57E+02	38.50	2.15E+01	2.51

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 : 1/24/2019 3:04:18PM

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	238.69	2.00E+02	42.23			2.00E+02	4.22E+01
F	2	295.14	9.67E+01	27.11			9.67E+01	2.71E+01
F	3	351.86	1.50E+02	30.73	8.36E+01	3.72E+01	6.69E+01	4.83E+01
F	4	422.71	2.15E+01	14.75			2.15E+01	1.47E+01
F	5	510.16	3.71E+01	19.27			3.71E+01	1.93E+01
F	6	609.45	1.16E+02	24.80	4.12E+01	2.42E+01	7.46E+01	3.47E+01
F	7	911.33	3.68E+01	15.42			3.68E+01	1.54E+01
F	8	1460.80	3.57E+02	38.50	5.63E+01	1.71E+01	3.01E+02	4.21E+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 L2-011-102-FSGA-006-AV
L2-011-102

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	1.00	1460.75 *	10.67	4.71E+00	7.09E-01
PB-212	0.56	77.11	17.50		
		238.63 *	44.60	1.48E-01	3.22E-02
BI-214	0.34	609.31 *	46.30	1.23E-01	5.77E-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	1.99E-01	5.65E-02
		351.92 *	37.20	8.30E-02	6.00E-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	1.000	4.71E+00	7.09E-01	
PB-212	0.560	1.48E-01	3.22E-02	
BI-214	0.348	1.23E-01	5.77E-02	

Analysis Report for L2-011-102-FSGA-006-AV

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.721	1.44E-01	4.11E-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 L2-011-102-FSGA-006-AV
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:04:18PM
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	422.71	5.96778E-03		
F	5	510.16	1.02942E-02		
F	7	911.33	1.02148E-02	20.97	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	4.71E+00	6.94E-01
+	@ AR-41	1293.64		99.16	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	-1.34E-03	4.99E-02	6.30E-02
		1332.49	100.00	-1.90E-02		4.99E-02
+	KR-85	513.99	0.43	1.56E+01	1.15E+01	1.15E+01
+	Y-88	898.04	93.70	3.14E-02	4.31E-02	5.99E-02
		1836.06	99.20	-3.15E-03		4.31E-02
+	NB-94	702.63	100.00	6.10E-03	4.09E-02	4.09E-02
		871.10	100.00	-4.14E-02		4.58E-02
+	I-131	284.30	6.06	3.66E-01	2.00E-01	2.67E+00
		364.48	81.20	3.93E-02		2.00E-01
		636.97	7.27	-3.44E-01		2.83E+00
+	CS-134	604.70	97.60	4.47E-03	5.59E-02	5.85E-02

Analysis Report for L2-011-102-FSGA-006-AV

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CS-134	795.84	85.40	-3.61E-04	5.59E-02	5.59E-02
+	CS-137	661.65	85.12	5.28E-02	5.63E-02	5.63E-02
+	CE-144	80.12	1.36	1.96E+00	2.99E-01	3.81E+00
		133.51	11.09	-1.15E-03		2.99E-01
+	EU-152	121.78	28.40	-3.67E-02	1.15E-01	1.15E-01
		344.28	26.60	-2.57E-01		1.47E-01
		1408.00	20.74	-3.22E-02		2.33E-01
+	EU-154	123.07	40.40	-3.09E-02	8.12E-02	8.12E-02
		723.30	19.70	1.35E-02		2.31E-01
		1274.51	35.50	1.72E-01		1.70E-01
+	EU-155	86.54	32.80	-3.41E-02	1.31E-01	1.31E-01
		105.31	21.80	-4.05E-02		1.52E-01
+	BI-214	609.31	* 46.30	1.23E-01	1.03E-01	1.03E-01
		1120.29	15.10	2.83E-01		4.15E-01
		1238.11	5.94	5.24E-01		1.09E+00
		1377.67	4.11	-6.53E-01		1.26E+00
		1407.98	2.48	-2.69E-01		1.95E+00
		1509.19	2.19	-3.53E-01		1.67E+00
		1764.49	15.80	4.08E-01		3.88E-01
+	PB-214	77.11	10.70	3.26E-01	1.13E-01	4.93E-01
		295.21	* 19.20	1.99E-01		1.61E-01
		351.92	* 37.20	8.30E-02		1.13E-01
+	PA-228	89.95	22.00	8.49E+04	1.03E+05	1.73E+05
		93.35	35.00	7.04E+04		1.03E+05
		105.00	16.30	-3.99E+04		1.90E+05
		129.22	2.97	5.17E+04		1.02E+06
		338.32	5.30	6.55E+05		6.72E+05
		463.00	13.80	-4.78E+04		2.58E+05
		911.23	16.70	8.18E+04		3.29E+05
+	AM-241	59.54	36.30	-1.96E-01	2.36E-01	2.36E-01
+	CM-243	103.76	23.00	-1.22E-01	1.44E-01	1.44E-01
		228.18	10.60	-3.19E-01		2.86E-01
		277.60	14.00	-1.25E-01		2.45E-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

Analysis Report for L2-011-102-FSGS-006-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-006-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 8.136E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/21/2018 9:34:00AM
Acquisition Started : 1/8/2019 2:16:45PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.3 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 : 5532

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:05:51PM

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

Analysis Report for L2-011-102-FSGS-006-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.65	146 -	162	149.84	9.70E+01	35.99	6.64E+02	1.27
m	2	77.26	146 -	162	155.06	8.22E+01	34.47	6.64E+02	1.28
F	3	93.09	179 -	193	186.71	8.47E+01	35.95	9.78E+02	1.42
F	4	185.76	368 -	379	372.02	6.38E+01	30.28	5.73E+02	1.30
F	5	238.64	470 -	481	477.76	6.30E+01	30.88	5.87E+02	1.22
F	6	295.12	584 -	597	590.68	1.02E+02	29.24	3.33E+02	1.71
F	7	351.88	698 -	712	704.19	1.99E+02	34.23	2.28E+02	2.12
F	8	583.31	1162 -	1172	1166.97	4.80E+01	17.49	7.52E+01	1.47
F	9	609.26	1214 -	1225	1218.85	1.67E+02	29.67	1.12E+02	1.93
F	10	767.58	1533 -	1541	1535.44	1.61E+01	6.86	6.21E+01	0.62
F	11	911.08	1817 -	1828	1822.39	2.88E+01	14.43	5.13E+01	1.95
F	12	1332.62	2660 -	2672	2665.38	3.06E+01	13.31	2.09E+01	2.49
F	13	1460.95	2915 -	2929	2922.00	2.92E+02	35.02	1.85E+01	2.56
F	14	1765.30	3524 -	3536	3530.67	2.68E+01	11.54	6.31E+00	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 : 1/24/2019 3:05:51PM

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.
M	1	74.65	9.70E+01	35.99			9.70E+01	3.60E+01
m	2	77.26	8.22E+01	34.47			8.22E+01	3.45E+01
F	3	93.09	8.47E+01	35.95			8.47E+01	3.60E+01
F	4	185.76	6.38E+01	30.28			6.38E+01	3.03E+01
F	5	238.64	6.30E+01	30.88			6.30E+01	3.09E+01
F	6	295.12	1.02E+02	29.24			1.02E+02	2.92E+01
F	7	351.88	1.99E+02	34.23	8.36E+01	3.72E+01	1.15E+02	5.06E+01
F	8	583.31	4.80E+01	17.49			4.80E+01	1.75E+01
F	9	609.26	1.67E+02	29.67	4.12E+01	2.42E+01	1.26E+02	3.83E+01
F	10	767.58	1.61E+01	6.86			1.61E+01	6.86E+00
F	11	911.08	2.88E+01	14.43			2.88E+01	1.44E+01
F	12	1332.62	3.06E+01	13.31			3.06E+01	1.33E+01
F	13	1460.95	2.92E+02	35.02	5.63E+01	1.71E+01	2.36E+02	3.90E+01
F	14	1765.30	2.68E+01	11.54	1.52E+01	9.80E+00	1.16E+01	1.51E+01

Analysis Report for L2-011-102-FSGS-006-SS
L2-011-102

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_NPPI\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	3.16E+00	5.51E-01
PB-212	0.99	77.11	*	17.50	1.42E-01	6.02E-02
		238.63	*	44.60	4.00E-02	1.97E-02
BI-214	0.53	609.31	*	46.30	1.78E-01	5.51E-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	1.23E-01	1.61E-01
PB-214	0.99	77.11	*	10.70	2.32E-01	9.84E-02
		295.21	*	19.20	1.79E-01	5.21E-02
		351.92	*	37.20	1.22E-01	5.40E-02
RA-226	0.96	186.21	*	3.28	4.62E-01	2.21E-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 L2-011-102-FSGS-006-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.994	3.16E+00	5.51E-01	
PB-212	0.999	4.07E-02	1.88E-02	
BI-214	0.534	1.73E-01	5.21E-02	
PB-214	0.999	1.53E-01	3.53E-02	
RA-226	0.968	4.62E-01	2.21E-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 L2-011-102-FSGS-006-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:05:51PM
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 1	74.65	2.69437E-02	18.55		
F 3	93.09	2.35304E-02	21.22	Tol.	PA-228
F 8	583.31	1.33242E-02	18.23		
F 10	767.58	4.48293E-03	21.25		
F 11	911.08	7.99031E-03	25.08	Tol.	AC-228 PA-228
F 12	1332.62	8.50303E-03	21.74		

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	3.16E+00	5.87E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	1.63E-02	5.75E-02	5.88E-02
		1332.49	100.00	4.33E-02		5.75E-02
+	KR-85	513.99	0.43	9.79E+00	8.96E+00	8.96E+00

Analysis Report for L2-011-102-FSGS-006-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	Y-88	898.04	93.70	2.55E-02	3.95E-02	5.08E-02
		1836.06	99.20	-6.23E-02		3.95E-02
+	NB-94	702.63	100.00	3.44E-03	3.59E-02	3.59E-02
		871.10	100.00	6.65E-03		4.04E-02
+	I-131	284.30	6.06	1.13E+00	1.77E-01	2.31E+00
		364.48	81.20	5.75E-02		1.77E-01
		636.97	7.27	1.11E+00		2.46E+00
+	CS-134	604.70	97.60	-5.53E-02	4.39E-02	5.68E-02
		795.84	85.40	-4.24E-02		4.39E-02
+	CS-137	661.65	85.12	6.66E-02	5.19E-02	5.19E-02
+	CE-144	80.12	1.36	-1.02E+00	2.57E-01	3.46E+00
		133.51	11.09	-9.42E-02		2.57E-01
+	EU-152	121.78	28.40	1.95E-02	9.73E-02	9.73E-02
		344.28	26.60	6.02E-03		1.22E-01
		1408.00	20.74	1.57E-01		2.22E-01
+	EU-154	123.07	40.40	-1.53E-02	6.80E-02	6.80E-02
		723.30	19.70	-8.61E-03		2.17E-01
		1274.51	35.50	-1.12E-03		1.43E-01
+	EU-155	86.54	32.80	4.31E-03	1.13E-01	1.13E-01
		105.31	21.80	-3.98E-02		1.35E-01
+	BI-214	609.31	* 46.30	1.78E-01	8.84E-02	8.84E-02
		1120.29	15.10	-4.24E-02		3.80E-01
		1238.11	5.94	6.74E-01		1.01E+00
		1377.67	4.11	2.06E-01		1.00E+00
		1407.98	2.48	1.31E+00		1.85E+00
		1509.19	2.19	-1.27E+00		1.65E+00
		1764.49	* 15.80	1.23E-01		2.69E-01
+	PB-214	77.11	* 10.70	2.32E-01	9.91E-02	2.47E-01
		295.21	* 19.20	1.79E-01		1.29E-01
		351.92	* 37.20	1.22E-01		9.91E-02
+	PA-228	89.95	22.00	1.25E+04	9.02E+04	1.56E+05
		93.35	35.00	-1.59E+04		9.02E+04
		105.00	16.30	-5.78E+04		1.72E+05
		129.22	2.97	2.70E+05		8.90E+05
		338.32	5.30	-2.54E+05		5.47E+05
		463.00	13.80	-1.47E+04		2.27E+05
		911.23	16.70	3.33E+05		2.83E+05
+	AM-241	59.54	36.30	9.74E-02	2.10E-01	2.10E-01
+	CM-243	103.76	23.00	4.88E-02	1.28E-01	1.28E-01
		228.18	10.60	-1.49E-01		2.55E-01
		277.60	14.00	8.85E-02		2.15E-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 L2-011-102-FSGS-006-SS
L2-011-102

Analysis Report for L2-011-102-FSGS-007-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-007-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.058E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 2:42:45PM
Acquisition Started : 1/4/2019 12:38:29PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.2 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 : 5534

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:07:58PM

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

Analysis Report for L2-011-102-FSGS-007-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.11	147 -	161	152.78	3.92E+02	67.73	1.41E+03	3.84
F	2	238.60	470 -	485	477.67	4.01E+02	52.57	7.25E+02	2.02
F	3	295.07	587 -	594	590.59	1.79E+02	36.20	2.90E+02	1.59
F	4	327.82	651 -	664	656.07	5.81E+01	25.41	2.95E+02	1.77
F	5	338.35	672 -	685	677.14	8.97E+01	29.43	3.24E+02	2.13
F	6	351.86	696 -	710	704.14	3.27E+02	42.41	3.30E+02	1.95
F	7	583.25	1160 -	1172	1166.84	9.66E+01	25.23	1.65E+02	1.77
F	8	609.18	1210 -	1225	1218.69	2.33E+02	33.81	1.44E+02	2.01
F	9	661.51	1317 -	1330	1323.34	1.15E+02	25.90	1.10E+02	2.36
F	10	845.35	1686 -	1696	1690.95	2.78E+01	13.50	3.54E+01	2.03
F	11	911.09	1815 -	1828	1822.42	7.69E+01	21.47	8.42E+01	2.17
F	12	1120.35	2232 -	2247	2240.89	4.18E+01	17.08	7.61E+01	2.30
F	13	1460.76	2911 -	2931	2921.63	4.57E+02	43.43	3.68E+01	2.70
F	14	1764.42	3522 -	3535	3528.92	3.86E+01	13.10	3.53E+00	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 : 1/24/2019 3:07:58PM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.11	3.92E+02	67.73			3.92E+02	6.77E+01
F	2	238.60	4.01E+02	52.57			4.01E+02	5.26E+01
F	3	295.07	1.79E+02	36.20			1.79E+02	3.62E+01
F	4	327.82	5.81E+01	25.41			5.81E+01	2.54E+01
F	5	338.35	8.97E+01	29.43			8.97E+01	2.94E+01
F	6	351.86	3.27E+02	42.41	8.36E+01	3.72E+01	2.44E+02	5.64E+01
F	7	583.25	9.66E+01	25.23			9.66E+01	2.52E+01
F	8	609.18	2.33E+02	33.81	4.12E+01	2.42E+01	1.92E+02	4.16E+01
F	9	661.51	1.15E+02	25.90	6.61E+01	2.54E+01	4.93E+01	3.63E+01
F	10	845.35	2.78E+01	13.50			2.78E+01	1.35E+01
F	11	911.09	7.69E+01	21.47			7.69E+01	2.15E+01
F	12	1120.35	4.18E+01	17.08			4.18E+01	1.71E+01
F	13	1460.76	4.57E+02	43.43	5.63E+01	1.71E+01	4.01E+02	4.67E+01
F	14	1764.42	3.86E+01	13.10	1.52E+01	9.80E+00	2.34E+01	1.64E+01

Analysis Report for L2-011-102-FSGS-007-SS
L2-011-102

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_NPPLibrary\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.75	*	10.67	7.20E+00	9.30E-01
CS-137	0.99	661.65	*	85.12	5.51E-02	4.06E-02
PB-212	0.95	77.11	*	17.50	9.31E-01	1.72E-01
		238.63	*	44.60	3.42E-01	4.81E-02
BI-214	0.78	609.31	*	46.30	3.65E-01	8.16E-02
		1120.29	*	15.10	4.22E-01	1.73E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49	*	15.80	3.33E-01	2.34E-01
PB-214	0.97	77.11	*	10.70	1.52E+00	2.81E-01
		295.21	*	19.20	4.21E-01	8.79E-02
		351.92	*	37.20	3.48E-01	8.22E-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

Analysis Report for L2-011-102-FSGS-007-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	1.000	7.20E+00	9.30E-01	
CS-137	0.997	5.51E-02	4.06E-02	
PB-212	0.956	3.67E-01	4.64E-02	
BI-214	0.786	3.71E-01	7.04E-02	
PB-214	0.974	4.06E-01	5.88E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-FSGS-007-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:07:58PM
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	327.82	1.61490E-02	21.86		
F 5	338.35	2.49144E-02	16.40	Tol.	AC-228 PA-228
F 7	583.25	2.68359E-02	13.06		
F 10	845.35	7.72065E-03	24.28		
F 11	911.09	2.13484E-02	13.97	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\Daistryland_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	7.20E+00	8.79E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	1.46E-02	7.01E-02	8.32E-02
		1332.49	100.00	-4.34E-02		7.01E-02
+	KR-85	513.99	0.43	5.04E+00	1.42E+01	1.42E+01
+	Y-88	898.04	93.70	3.79E-02	5.64E-02	7.96E-02
		1836.06	99.20	-2.21E-02		5.64E-02

Analysis Report for L2-011-102-FSGS-007-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	NB-94	702.63	100.00	5.15E-02	5.75E-02	5.75E-02
		871.10	100.00	-3.18E-02		6.69E-02
+	I-131	284.30	6.06	-2.35E+00	1.98E-01	2.63E+00
		364.48	81.20	-1.38E-01		1.98E-01
		636.97	7.27	-3.70E-01		2.65E+00
+	CS-134	604.70	97.60	1.95E-02	6.92E-02	8.61E-02
		795.84	85.40	-9.35E-02		6.92E-02
+	CS-137	661.65	* 85.12	5.51E-02	7.47E-02	7.47E-02
+	CE-144	80.12	1.36	-1.11E+00	3.86E-01	5.36E+00
		133.51	11.09	1.37E-01		3.86E-01
+	EU-152	121.78	28.40	-1.50E-01	1.43E-01	1.43E-01
		344.28	26.60	-2.81E-02		2.06E-01
		1408.00	20.74	-6.74E-03		3.14E-01
+	EU-154	123.07	40.40	-1.03E-01	1.01E-01	1.01E-01
		723.30	19.70	8.61E-02		3.41E-01
		1274.51	35.50	1.93E-02		2.16E-01
+	EU-155	86.54	32.80	3.91E-03	1.78E-01	1.78E-01
		105.31	21.80	-1.05E-01		1.99E-01
+	BI-214	609.31	* 46.30	3.65E-01	1.31E-01	1.31E-01
		1120.29	* 15.10	4.22E-01		3.83E-01
		1238.11	5.94	8.50E-01		1.68E+00
		1377.67	4.11	-9.88E-01		1.52E+00
		1407.98	2.48	-5.62E-02		2.62E+00
		1509.19	2.19	1.79E+00		2.76E+00
		1764.49	* 15.80	3.33E-01		3.50E-01
+	PB-214	77.11	* 10.70	1.52E+00	1.39E-01	5.90E-01
		295.21	* 19.20	4.21E-01		1.39E-01
		351.92	* 37.20	3.48E-01		1.45E-01
+	PA-228	89.95	22.00	3.99E+04	1.17E+04	2.04E+04
		93.35	35.00	-2.10E+03		1.17E+04
		105.00	16.30	-9.39E+03		2.13E+04
		129.22	2.97	6.47E+04		1.13E+05
		338.32	5.30	4.67E+04		7.65E+04
		463.00	13.80	-5.26E+03		3.02E+04
		911.23	16.70	3.05E+04		3.98E+04
+	AM-241	59.54	36.30	1.76E-01	3.15E-01	3.15E-01
+	CM-243	103.76	23.00	4.79E-02	1.91E-01	1.91E-01
		228.18	10.60	1.80E-01		4.00E-01
		277.60	14.00	-1.69E-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

Analysis Report for L2-011-102-FSGS-007-SS
L2-011-102

Analysis Report for L2-011-102-FSGS-008-SS

L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-008-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.410E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 2:53:52PM
Acquisition Started : 1/4/2019 1:40:06PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.0 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 : 5536

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:09:36PM

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

Analysis Report for L2-011-102-FSGS-008-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.36	147 -	160	153.26	3.07E+02	67.02	1.49E+03	3.11
F	2	87.50	170 -	178	175.53	5.50E+01	15.87	9.70E+02	0.45
F	3	185.88	368 -	376	372.26	1.00E+02	37.60	5.50E+02	1.58
M	4	238.58	471 -	489	477.64	4.38E+02	52.63	5.58E+02	1.80
m	5	241.75	471 -	489	483.98	1.28E+02	33.52	5.14E+02	1.80
F	6	295.08	587 -	595	590.62	1.36E+02	33.13	3.19E+02	1.47
F	7	338.31	672 -	682	677.05	7.90E+01	26.93	2.67E+02	1.55
F	8	351.81	697 -	709	704.05	2.82E+02	40.13	3.02E+02	1.84
F	9	477.50	950 -	963	955.38	5.91E+01	21.79	1.94E+02	1.55
F	10	583.24	1159 -	1173	1166.83	1.34E+02	28.00	1.57E+02	2.02
F	11	609.32	1213 -	1228	1218.96	2.48E+02	34.53	1.34E+02	1.94
F	12	910.84	1814 -	1829	1821.92	9.89E+01	23.49	1.00E+02	2.14
F	13	1460.77	2912 -	2930	2921.66	6.69E+02	53.05	4.76E+01	2.58
F	14	1764.24	3523 -	3534	3528.55	3.02E+01	12.57	1.23E+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 : 1/24/2019 3:09:36PM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.36	3.07E+02	67.02			3.07E+02	6.70E+01
F	2	87.50	5.50E+01	15.87			5.50E+01	1.59E+01
F	3	185.88	1.00E+02	37.60			1.00E+02	3.76E+01
M	4	238.58	4.38E+02	52.63			4.38E+02	5.26E+01
m	5	241.75	1.28E+02	33.52			1.28E+02	3.35E+01
F	6	295.08	1.36E+02	33.13			1.36E+02	3.31E+01
F	7	338.31	7.90E+01	26.93			7.90E+01	2.69E+01
F	8	351.81	2.82E+02	40.13	8.36E+01	3.72E+01	1.98E+02	5.47E+01
F	9	477.50	5.91E+01	21.79			5.91E+01	2.18E+01
F	10	583.24	1.34E+02	28.00			1.34E+02	2.80E+01
F	11	609.32	2.48E+02	34.53	4.12E+01	2.42E+01	2.06E+02	4.22E+01
F	12	910.84	9.89E+01	23.49			9.89E+01	2.35E+01
F	13	1460.77	6.69E+02	53.05	5.63E+01	1.71E+01	6.12E+02	5.58E+01
F	14	1764.24	3.02E+01	12.57	1.52E+01	9.80E+00	1.50E+01	1.59E+01

Analysis Report for L2-011-102-FSGS-008-SS

L2-011-102

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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.75	*	10.67	1.04E+01	1.11E+00
PB-212	0.97	77.11	*	17.50	6.85E-01	1.56E-01
		238.63	*	44.60	3.52E-01	4.61E-02
BI-214	0.55	609.31	*	46.30	3.71E-01	7.85E-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	2.02E-01	2.15E-01
PB-214	0.98	77.11	*	10.70	1.12E+00	2.55E-01
		295.21	*	19.20	3.03E-01	7.54E-02
		351.92	*	37.20	2.67E-01	7.49E-02
RA-226	0.98	186.21	*	3.28	9.19E-01	3.49E-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 L2-011-102-FSGS-008-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	1.000	1.04E+01	1.11E+00	
PB-212	0.975	3.64E-01	4.43E-02	
BI-214	0.551	3.51E-01	7.38E-02	
PB-214	0.984	2.95E-01	5.21E-02	
RA-226	0.983	9.19E-01	3.49E-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 L2-011-102-FSGS-008-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:09:36PM
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	87.50	1.52736E-02	14.43	Tol.	EU-155
m 5	241.75	3.56409E-02	13.06		
F 7	338.31	2.19524E-02	17.04	Tol.	AC-228 PA-228
F 9	477.50	1.64180E-02	18.44	Sum	
F 10	583.24	3.71936E-02	10.45		
F 12	910.84	2.74739E-02	11.88	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	1.04E+01	8.57E-01	8.57E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26

Analysis Report for L2-011-102-FSGS-008-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CO-60	1173.22	100.00	-3.23E-02	8.14E-02	9.45E-02
		1332.49	100.00	7.08E-02		8.14E-02
+	KR-85	513.99	0.43	2.48E+01	1.42E+01	1.42E+01
+	Y-88	898.04	93.70	-4.56E-02	5.98E-02	7.38E-02
		1836.06	99.20	1.66E-03		5.98E-02
+	NB-94	702.63	100.00	-2.42E-03	5.44E-02	5.44E-02
		871.10	100.00	-1.12E-02		6.05E-02
+	I-131	284.30	6.06	-1.90E+00	1.95E-01	2.50E+00
		364.48	81.20	-8.27E-02		1.95E-01
		636.97	7.27	1.18E+00		2.69E+00
+	CS-134	604.70	97.60	-3.74E-02	6.81E-02	8.09E-02
		795.84	85.40	-6.91E-03		6.81E-02
+	CS-137	661.65	85.12	2.72E-02	7.89E-02	7.89E-02
+	CE-144	80.12	1.36	-6.50E-01	3.95E-01	5.00E+00
		133.51	11.09	2.93E-01		3.95E-01
+	EU-152	121.78	28.40	9.58E-03	1.46E-01	1.46E-01
		344.28	26.60	-3.74E-02		1.90E-01
		1408.00	20.74	2.55E-02		2.79E-01
+	EU-154	123.07	40.40	5.63E-03	1.04E-01	1.04E-01
		723.30	19.70	2.04E-01		3.17E-01
		1274.51	35.50	3.19E-02		2.38E-01
+	EU-155	86.54	32.80	-1.15E-01	1.68E-01	1.68E-01
		105.31	21.80	-8.21E-02		1.98E-01
+	BI-214	609.31	* 46.30	3.71E-01	1.21E-01	1.21E-01
		1120.29	15.10	4.84E-01		6.04E-01
		1238.11	5.94	1.64E+00		1.59E+00
		1377.67	4.11	1.10E+00		1.71E+00
		1407.98	2.48	2.13E-01		2.33E+00
		1509.19	2.19	6.51E-01		2.61E+00
		1764.49	* 15.80	2.02E-01		3.65E-01
+	PB-214	77.11	* 10.70	1.12E+00	1.31E-01	5.56E-01
		295.21	* 19.20	3.03E-01		1.42E-01
		351.92	* 37.20	2.67E-01		1.31E-01
+	PA-228	89.95	22.00	3.43E+04	1.19E+04	2.03E+04
		93.35	35.00	3.36E+03		1.19E+04
		105.00	16.30	-1.27E+04		2.17E+04
		129.22	2.97	7.60E+03		1.17E+05
		338.32	5.30	5.00E+04		7.55E+04
		463.00	13.80	2.29E+04		3.12E+04
		911.23	16.70	5.88E+04		4.14E+04
+	AM-241	59.54	36.30	1.80E-01	3.02E-01	3.02E-01
+	CM-243	103.76	23.00	-4.97E-02	1.88E-01	1.88E-01
		228.18	10.60	1.19E-02		3.94E-01
		277.60	14.00	-2.03E-02		3.15E-01

Analysis Report for L2-011-102-FSGS-008-SS

L2-011-102

-
- + = 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 L2-011-102-FSGA-009-AV
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGA-009-AV
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.538E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 3:10:00PM
Acquisition Started : 1/9/2019 7:32:36AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.2 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 : 5551

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:22:36PM

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

Analysis Report for L2-011-102-FSGA-009-AV

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	186.07	365 -	379	372.64	8.66E+01	35.35	7.07E+02	1.83
F	2	238.52	469 -	485	477.52	2.13E+02	40.12	5.48E+02	2.16
F	3	294.99	582 -	596	590.42	7.27E+01	25.85	3.42E+02	1.48
F	4	351.88	697 -	711	704.19	1.43E+02	30.51	2.48E+02	1.97
F	5	583.10	1160 -	1172	1166.54	5.11E+01	17.79	8.74E+01	1.48
F	6	609.33	1213 -	1225	1219.00	8.42E+01	22.36	9.37E+01	1.97
F	7	911.26	1816 -	1829	1822.77	2.59E+01	15.08	7.07E+01	2.08
F	8	969.10	1934 -	1943	1938.43	1.32E+01	2.69	3.58E+01	0.64
F	9	1460.75	2914 -	2930	2921.61	4.11E+02	41.05	1.99E+01	2.36

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 : 1/24/2019 3:22:36PM

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	186.07	8.66E+01	35.35			8.66E+01	3.54E+01
F	2	238.52	2.13E+02	40.12			2.13E+02	4.01E+01
F	3	294.99	7.27E+01	25.85			7.27E+01	2.58E+01
F	4	351.88	1.43E+02	30.51	8.36E+01	3.72E+01	5.94E+01	4.81E+01
F	5	583.10	5.11E+01	17.79			5.11E+01	1.78E+01
F	6	609.33	8.42E+01	22.36	4.12E+01	2.42E+01	4.30E+01	3.30E+01
F	7	911.26	2.59E+01	15.08			2.59E+01	1.51E+01
F	8	969.10	1.32E+01	2.69			1.32E+01	2.69E+00
F	9	1460.75	4.11E+02	41.05	5.63E+01	1.71E+01	3.55E+02	4.45E+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 L2-011-102-FSGA-009-AV

L2-011-102

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	1.00	1460.75 *	10.67	5.92E+00	8.11E-01
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	1.68E-01	3.28E-02
BI-214	0.35	609.31 *	46.30	7.58E-02	5.82E-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	1.59E-01	5.71E-02
		351.92 *	37.20	7.85E-02	6.37E-02
RA-226	0.99	186.21 *	3.28	7.81E-01	3.22E-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	1.000	5.92E+00	8.11E-01	
PB-212	0.559	1.68E-01	3.28E-02	

Analysis Report for L2-011-102-FSGA-009-AV

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BI-214	0.350	7.58E-02	5.82E-02	
PB-214	0.719	1.23E-01	4.25E-02	
RA-226	0.997	7.81E-01	3.22E-01	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-FSGA-009-AV
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:22:36PM
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	583.10	1.41948E-02	17.41		
F 7	911.26	7.20125E-03	29.08	Tol.	AC-228 PA-228
F 8	969.10	3.66161E-03	10.22	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\Daityland_NPPLibrary\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.92E+00	7.38E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	-1.96E-02	6.05E-02	6.83E-02
		1332.49	100.00	2.16E-02		6.05E-02
+	KR-85	513.99	0.43	1.28E+01	1.15E+01	1.15E+01
+	Y-88	898.04	93.70	1.48E-02	4.80E-02	6.09E-02
		1836.06	99.20	-2.37E-02		4.80E-02
+	NB-94	702.63	100.00	-2.31E-02	4.91E-02	4.91E-02
		871.10	100.00	3.02E-02		5.34E-02
+	I-131	284.30	6.06	-4.00E+00	2.51E-01	3.19E+00
		364.48	81.20	-1.80E-02		2.51E-01
		636.97	7.27	1.23E+00		3.35E+00

Analysis Report for L2-011-102-FSGA-009-AV

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-134	604.70	97.60	-3.00E-03	5.98E-02	5.98E-02
		795.84	85.40	-4.52E-02		6.30E-02
+	CS-137	661.65	85.12	4.29E-02	6.00E-02	6.00E-02
+	CE-144	80.12	1.36	4.77E-01	3.27E-01	3.91E+00
		133.51	11.09	1.70E-01		3.27E-01
+	EU-152	121.78	28.40	-3.89E-02	1.17E-01	1.17E-01
		344.28	26.60	1.30E-01		1.52E-01
		1408.00	20.74	9.22E-02		2.20E-01
+	EU-154	123.07	40.40	-1.18E-01	8.15E-02	8.15E-02
		723.30	19.70	-7.37E-02		2.29E-01
		1274.51	35.50	9.84E-02		1.73E-01
+	EU-155	86.54	32.80	-9.77E-02	1.28E-01	1.28E-01
		105.31	21.80	3.03E-02		1.65E-01
+	BI-214	609.31	* 46.30	7.58E-02	1.07E-01	1.07E-01
		1120.29	15.10	8.96E-02		4.86E-01
		1238.11	5.94	2.27E-01		1.39E+00
		1377.67	4.11	-7.33E-01		1.26E+00
		1407.98	2.48	7.69E-01		1.84E+00
		1509.19	2.19	1.75E+00		2.01E+00
		1764.49	15.80	2.16E-01		3.88E-01
+	PB-214	77.11	10.70	7.32E-01	1.25E-01	5.20E-01
		295.21	* 19.20	1.59E-01		1.66E-01
		351.92	* 37.20	7.85E-02		1.25E-01
+	PA-228	89.95	22.00	6.22E+05	3.30E+05	5.50E+05
		93.35	35.00	1.65E+04		3.30E+05
		105.00	16.30	1.86E+05		6.52E+05
		129.22	2.97	6.86E+04		3.41E+06
		338.32	5.30	1.46E+06		2.24E+06
		463.00	13.80	-6.56E+05		8.46E+05
		911.23	16.70	8.23E+05		1.05E+06
+	AM-241	59.54	36.30	-1.11E-02	2.49E-01	2.49E-01
+	CM-243	103.76	23.00	2.14E-03	1.57E-01	1.57E-01
		228.18	10.60	-6.71E-02		3.28E-01
		277.60	14.00	-1.01E-02		2.70E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Analysis Report for L2-011-102-FSGS-009-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-009-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 7.865E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 3:25:00PM
Acquisition Started : 1/9/2019 8:33:54AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.6 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 : 5549

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:21:08PM

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

Analysis Report for L2-011-102-FSGS-009-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	77.48	148 -	160	155.51	9.62E+01	37.89	1.09E+03	1.23
F	2	238.67	470 -	485	477.81	2.03E+02	40.75	6.20E+02	2.03
F	3	295.05	583 -	596	590.56	8.53E+01	29.31	3.37E+02	1.94
F	4	351.78	699 -	710	703.98	1.74E+02	32.96	2.60E+02	1.60
F	5	583.07	1162 -	1172	1166.49	4.82E+01	17.83	9.09E+01	1.36
F	6	609.24	1213 -	1227	1218.81	1.35E+02	26.88	1.07E+02	2.21
F	7	1120.21	2236 -	2246	2240.60	2.70E+01	13.91	4.71E+01	1.86
F	8	1250.61	2496 -	2505	2501.37	1.24E+01	9.92	4.57E+01	1.01
F	9	1460.73	2912 -	2931	2921.57	4.69E+02	43.83	2.95E+01	2.63

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 : 1/24/2019 3:21:08PM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	77.48	9.62E+01	37.89			9.62E+01	3.79E+01
F	2	238.67	2.03E+02	40.75			2.03E+02	4.08E+01
F	3	295.05	8.53E+01	29.31			8.53E+01	2.93E+01
F	4	351.78	1.74E+02	32.96	8.36E+01	3.72E+01	9.00E+01	4.97E+01
F	5	583.07	4.82E+01	17.83			4.82E+01	1.78E+01
F	6	609.24	1.35E+02	26.88	4.12E+01	2.42E+01	9.40E+01	3.62E+01
F	7	1120.21	2.70E+01	13.91			2.70E+01	1.39E+01
F	8	1250.61	1.24E+01	9.92			1.24E+01	9.92E+00
F	9	1460.73	4.69E+02	43.83	5.63E+01	1.71E+01	4.12E+02	4.71E+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 L2-011-102-FSGS-009-SS

L2-011-102

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	1.00	1460.75 *	10.67	5.71E+00	7.25E-01
PB-212	0.99	77.11 *	17.50	1.71E-01	6.82E-02
		238.63 *	44.60	1.33E-01	2.76E-02
BI-214	0.58	609.31 *	46.30	1.38E-01	5.35E-02
		1120.29 *	15.10	2.10E-01	1.09E-01
		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	2.79E-01	1.12E-01
		295.21 *	19.20	1.55E-01	5.38E-02
		351.92 *	37.20	9.88E-02	5.48E-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	1.000	5.71E+00	7.25E-01	
PB-212	0.994	1.28E-01	2.58E-02	
BI-214	0.584	1.52E-01	4.80E-02	

Analysis Report for L2-011-102-FSGS-009-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.993	1.21E-01	3.66E-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 L2-011-102-FSGS-009-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:21:08PM
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	583.07	1.34007E-02	18.47		
F 8	1250.61	3.45531E-03	39.86		

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	5.71E+00	6.51E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	4.24E-02	5.25E-02	6.31E-02
		1332.49	100.00	2.50E-02		5.25E-02
+	KR-85	513.99	0.43	7.80E+00	9.76E+00	9.76E+00
+	Y-88	898.04	93.70	2.41E-02	3.25E-02	5.76E-02
		1836.06	99.20	-4.65E-02		3.25E-02
+	NB-94	702.63	100.00	-1.67E-04	4.03E-02	4.03E-02
		871.10	100.00	-3.52E-02		4.57E-02
+	I-131	284.30	6.06	-2.82E-01	2.10E-01	2.74E+00
		364.48	81.20	-1.43E-01		2.10E-01
		636.97	7.27	2.14E+00		3.02E+00
+	CS-134	604.70	97.60	-3.92E-02	5.26E-02	5.31E-02
		795.84	85.40	-5.03E-03		5.26E-02
+	CS-137	661.65	85.12	3.37E-03	5.51E-02	5.51E-02
+	CE-144	80.12	1.36	-5.15E-01	2.80E-01	3.52E+00

Analysis Report for L2-011-102-FSGS-009-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CE-144	133.51	11.09	5.00E-02	2.80E-01	2.80E-01
+	EU-152	121.78	28.40	2.80E-02	1.03E-01	1.03E-01
		344.28	26.60	-5.20E-02		1.30E-01
		1408.00	20.74	-7.07E-03		2.09E-01
+	EU-154	123.07	40.40	4.47E-02	7.30E-02	7.30E-02
		723.30	19.70	-5.53E-02		2.05E-01
		1274.51	35.50	6.30E-03		1.70E-01
+	EU-155	86.54	32.80	-9.08E-02	1.15E-01	1.15E-01
		105.31	21.80	9.72E-03		1.44E-01
+	BI-214	609.31	* 46.30	1.38E-01	9.32E-02	9.32E-02
		1120.29	* 15.10	2.10E-01		2.14E-01
		1238.11	5.94	4.38E-01		1.19E+00
		1377.67	4.11	-2.92E-01		9.64E-01
		1407.98	2.48	-5.90E-02		1.75E+00
		1509.19	2.19	-2.57E-01		1.70E+00
		1764.49	15.80	1.81E-01		3.40E-01
+	PB-214	77.11	* 10.70	2.79E-01	1.03E-01	3.71E-01
		295.21	* 19.20	1.55E-01		1.34E-01
		351.92	* 37.20	9.88E-02		1.03E-01
+	PA-228	89.95	22.00	1.18E+05	2.99E+05	5.02E+05
		93.35	35.00	1.30E+04		2.99E+05
		105.00	16.30	-2.27E+05		5.78E+05
		129.22	2.97	1.10E+06		3.00E+06
		338.32	5.30	1.93E+06		1.91E+06
		463.00	13.80	3.90E+05		7.91E+05
		911.23	16.70	9.05E+05		9.39E+05
+	AM-241	59.54	36.30	-5.94E-02	2.14E-01	2.14E-01
+	CM-243	103.76	23.00	1.95E-02	1.37E-01	1.37E-01
		228.18	10.60	9.90E-02		2.72E-01
		277.60	14.00	-6.49E-02		2.13E-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 L2-011-102-FSGA-010-AV
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGA-010-AV
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.922E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/21/2018 8:21:00AM
Acquisition Started : 1/8/2019 7:32:43AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.0 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 : 5553

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:25:31PM

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

Analysis Report for L2-011-102-FSGA-010-AV

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	185.59	367 -	377	371.67	7.55E+01	32.53	5.58E+02	1.41
F	2	238.63	469 -	485	477.73	2.19E+02	41.11	6.17E+02	2.06
F	3	295.42	585 -	599	591.29	9.12E+01	31.71	3.30E+02	2.86
F	4	351.82	695 -	710	704.07	2.05E+02	35.50	2.83E+02	2.15
F	5	582.75	1162 -	1173	1165.83	4.48E+01	19.55	1.26E+02	1.85
F	6	609.27	1212 -	1224	1218.86	9.34E+01	22.81	8.42E+01	1.83
F	7	634.59	1266 -	1273	1269.51	1.72E+01	12.39	4.43E+01	1.46
F	8	1120.16	2235 -	2246	2240.50	2.38E+01	12.79	4.54E+01	1.56
F	9	1460.81	2915 -	2930	2921.74	3.47E+02	38.64	5.01E+01	2.44

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 : 1/24/2019 3:25:31PM

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	185.59	7.55E+01	32.53			7.55E+01	3.25E+01
F	2	238.63	2.19E+02	41.11			2.19E+02	4.11E+01
F	3	295.42	9.12E+01	31.71			9.12E+01	3.17E+01
F	4	351.82	2.05E+02	35.50	8.36E+01	3.72E+01	1.21E+02	5.14E+01
F	5	582.75	4.48E+01	19.55			4.48E+01	1.96E+01
F	6	609.27	9.34E+01	22.81	4.12E+01	2.42E+01	5.22E+01	3.33E+01
F	7	634.59	1.72E+01	12.39			1.72E+01	1.24E+01
F	8	1120.16	2.38E+01	12.79			2.38E+01	1.28E+01
F	9	1460.81	3.47E+02	38.64	5.63E+01	1.71E+01	2.91E+02	4.23E+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 L2-011-102-FSGA-010-AV
L2-011-102

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	4.58E+00	7.12E-01
PB-212	0.56	77.11	17.50		
		238.63 *	44.60	1.63E-01	3.18E-02
BI-214	0.58	609.31 *	46.30	8.69E-02	5.56E-02
		1120.29 *	15.10	2.10E-01	1.13E-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	1.89E-01	6.62E-02
		351.92 *	37.20	1.51E-01	6.46E-02
RA-226	0.94	186.21 *	3.28	6.43E-01	2.79E-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	0.999	4.58E+00	7.12E-01	
PB-212	0.560	1.63E-01	3.18E-02	

Analysis Report for L2-011-102-FSGA-010-AV

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BI-214	0.584	1.11E-01	4.99E-02	
PB-214	0.719	1.69E-01	4.62E-02	
RA-226	0.940	6.43E-01	2.79E-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 L2-011-102-FSGA-010-AV
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:25:31PM
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	582.75	1.24340E-02	21.84		
F 7	634.59	4.77561E-03	36.05		

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	4.58E+00	7.83E-01	7.83E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	3.44E-02	5.71E-02	7.29E-02
		1332.49	100.00	-2.60E-02		5.71E-02
+	KR-85	513.99	0.43	1.01E+01	1.09E+01	1.09E+01
+	Y-88	898.04	93.70	-2.94E-03	4.77E-02	6.12E-02
		1836.06	99.20	-1.99E-02		4.77E-02
+	NB-94	702.63	100.00	1.57E-02	4.40E-02	4.40E-02
		871.10	100.00	-6.09E-03		5.12E-02
+	I-131	284.30	6.06	4.14E-01	2.12E-01	2.79E+00
		364.48	81.20	5.69E-02		2.12E-01
		636.97	7.27	1.65E+00		3.08E+00
+	CS-134	604.70	97.60	6.38E-03	5.33E-02	5.33E-02
		795.84	85.40	-1.99E-03		5.84E-02
+	CS-137	661.65	85.12	7.88E-02	6.50E-02	6.50E-02
+	CE-144	80.12	1.36	2.68E+00	3.05E-01	3.94E+00

Analysis Report for L2-011-102-FSGA-010-AV

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CE-144	133.51	11.09	1.13E-01	3.05E-01	3.05E-01
+	EU-152	121.78	28.40	-5.31E-02	1.14E-01	1.14E-01
		344.28	26.60	4.78E-02		1.45E-01
		1408.00	20.74	9.86E-02		2.50E-01
+	EU-154	123.07	40.40	-4.21E-02	8.01E-02	8.01E-02
		723.30	19.70	1.08E-01		2.32E-01
		1274.51	35.50	3.27E-02		1.83E-01
+	EU-155	86.54	32.80	-1.33E-01	1.27E-01	1.27E-01
		105.31	21.80	-9.03E-02		1.56E-01
+	BI-214	609.31	* 46.30	8.69E-02	9.91E-02	9.91E-02
		1120.29	* 15.10	2.10E-01		2.46E-01
		1238.11	5.94	1.43E-02		1.11E+00
		1377.67	4.11	3.40E-01		1.22E+00
		1407.98	2.48	8.22E-01		2.08E+00
		1509.19	2.19	6.39E-01		1.85E+00
		1764.49	15.80	3.25E-01		4.09E-01
+	PB-214	77.11	10.70	4.17E-01	1.23E-01	5.11E-01
		295.21	* 19.20	1.89E-01		1.54E-01
		351.92	* 37.20	1.51E-01		1.23E-01
+	PA-228	89.95	22.00	-1.77E+03	8.82E+04	1.48E+05
		93.35	35.00	2.05E+04		8.82E+04
		105.00	16.30	-4.18E+04		1.69E+05
		129.22	2.97	-3.36E+05		8.73E+05
		338.32	5.30	1.06E+05		5.38E+05
		463.00	13.80	2.19E+04		2.30E+05
		911.23	16.70	1.15E+05		2.76E+05
+	AM-241	59.54	36.30	4.39E-02	2.45E-01	2.45E-01
+	CM-243	103.76	23.00	4.45E-03	1.50E-01	1.50E-01
		228.18	10.60	-5.20E-02		3.08E-01
		277.60	14.00	-7.37E-02		2.51E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Analysis Report for L2-011-102-FSGS-010-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-010-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 8.547E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/21/2018 8:29:25AM
Acquisition Started : 1/8/2019 8:33:54AM

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 : 5555

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:26:39PM

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

Analysis Report for L2-011-102-FSGS-010-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	92.38	182 -	190	185.31	4.66E+01	23.20	6.81E+02	0.56
F	2	238.42	474 -	481	477.31	1.34E+02	37.53	4.37E+02	1.66
F	3	295.37	584 -	599	591.19	1.11E+02	30.86	3.14E+02	2.38
F	4	352.00	697 -	712	704.43	1.81E+02	31.62	2.25E+02	1.74
F	5	510.17	1012 -	1029	1020.70	5.67E+01	23.32	2.38E+02	2.18
F	6	583.28	1159 -	1172	1166.91	6.07E+01	21.42	1.15E+02	2.28
F	7	609.30	1215 -	1227	1218.92	1.04E+02	23.55	8.68E+01	2.00
F	8	1332.30	2660 -	2669	2664.74	1.39E+01	9.43	3.39E+01	0.84
F	9	1460.84	2913 -	2929	2921.78	4.67E+02	44.26	3.37E+01	2.55

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 : 1/24/2019 3:26:39PM

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	92.38	4.66E+01	23.20			4.66E+01	2.32E+01
F	2	238.42	1.34E+02	37.53			1.34E+02	3.75E+01
F	3	295.37	1.11E+02	30.86			1.11E+02	3.09E+01
F	4	352.00	1.81E+02	31.62	8.36E+01	3.72E+01	9.77E+01	4.88E+01
F	5	510.17	5.67E+01	23.32			5.67E+01	2.33E+01
F	6	583.28	6.07E+01	21.42			6.07E+01	2.14E+01
F	7	609.30	1.04E+02	23.55	4.12E+01	2.42E+01	6.25E+01	3.38E+01
F	8	1332.30	1.39E+01	9.43			1.39E+01	9.43E+00
F	9	1460.84	4.67E+02	44.26	5.63E+01	1.71E+01	4.11E+02	4.75E+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 L2-011-102-FSGS-010-SS
L2-011-102

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	6.71E-01
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	8.08E-02	2.30E-02
BI-214	0.35	609.31 *	46.30	8.43E-02	4.58E-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	0.72	77.11	10.70		
		295.21 *	19.20	1.86E-01	5.25E-02
		351.92 *	37.20	9.88E-02	4.96E-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	0.999	5.24E+00	6.71E-01	
PB-212	0.555	8.08E-02	2.30E-02	
BI-214	0.350	8.43E-02	4.58E-02	

Analysis Report for L2-011-102-FSGS-010-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.720	1.40E-01	3.61E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-FSGS-010-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:26:39PM
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	92.38	1.29384E-02	24.90	Tol.	PA-228
F 5	510.17	1.57600E-02	20.55		
F 6	583.28	1.68658E-02	17.64		
F 8	1332.30	3.87029E-03	33.83		

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	6.01E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	4.86E-02	5.37E-02	6.63E-02
		1332.49	100.00	3.23E-02		5.37E-02
+	KR-85	513.99	0.43	-9.52E-01	9.17E+00	9.17E+00
+	Y-88	898.04	93.70	-1.59E-02	3.63E-02	4.88E-02
		1836.06	99.20	-2.11E-02		3.63E-02
+	NB-94	702.63	100.00	-7.43E-03	3.64E-02	3.64E-02
		871.10	100.00	-4.22E-02		4.02E-02
+	I-131	284.30	6.06	-7.29E-01	1.65E-01	2.32E+00
		364.48	81.20	-7.37E-04		1.65E-01
		636.97	7.27	1.26E+00		2.45E+00
+	CS-134	604.70	97.60	-6.83E-02	4.78E-02	4.78E-02

Analysis Report for L2-011-102-FSGS-010-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CS-134	795.84	85.40	-8.38E-03	4.78E-02	4.86E-02
+	CS-137	661.65	85.12	7.67E-02	5.49E-02	5.49E-02
+	CE-144	80.12	1.36	5.49E-01	2.60E-01	3.28E+00
		133.51	11.09	1.74E-01		2.60E-01
+	EU-152	121.78	28.40	-1.05E-01	9.57E-02	9.57E-02
		344.28	26.60	9.69E-02		1.23E-01
		1408.00	20.74	1.04E-01		1.85E-01
+	EU-154	123.07	40.40	1.23E-02	6.86E-02	6.86E-02
		723.30	19.70	1.08E-01		2.06E-01
		1274.51	35.50	-1.41E-02		1.55E-01
+	EU-155	86.54	32.80	-4.71E-02	1.11E-01	1.11E-01
		105.31	21.80	-1.04E-02		1.36E-01
+	BI-214	609.31	* 46.30	8.43E-02	8.14E-02	8.14E-02
		1120.29	15.10	-8.06E-02		3.81E-01
		1238.11	5.94	6.43E-01		1.04E+00
		1377.67	4.11	-9.02E-02		1.02E+00
		1407.98	2.48	8.68E-01		1.54E+00
		1509.19	2.19	-4.31E-01		1.63E+00
		1764.49	15.80	2.55E-01		3.28E-01
+	PB-214	77.11	10.70	3.57E-01	9.49E-02	4.29E-01
		295.21	* 19.20	1.86E-01		1.24E-01
		351.92	* 37.20	9.88E-02		9.49E-02
+	PA-228	89.95	22.00	4.22E+04	7.87E+04	1.32E+05
		93.35	35.00	4.16E+03		7.87E+04
		105.00	16.30	6.41E+04		1.51E+05
		129.22	2.97	1.82E+04		7.64E+05
		338.32	5.30	-1.08E+05		4.90E+05
		463.00	13.80	-2.72E+03		1.94E+05
		911.23	16.70	2.10E+05		2.37E+05
+	AM-241	59.54	36.30	-7.69E-02	2.06E-01	2.06E-01
+	CM-243	103.76	23.00	4.09E-02	1.31E-01	1.31E-01
		228.18	10.60	-8.83E-02		2.61E-01
		277.60	14.00	-4.42E-02		2.19E-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 L2-011-102-FSGA-011-AV

L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGA-011-AV
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.792E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/21/2018 8:48:00AM
Acquisition Started : 1/8/2019 11:00:14AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.0 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 : 5557

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:27:57PM

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

Analysis Report for L2-011-102-FSGA-011-AV

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.56	471 -	485	477.60	1.81E+02	38.00	5.71E+02	1.77
F	2	295.14	585 -	597	590.72	1.11E+02	27.88	2.97E+02	1.34
F	3	351.98	699 -	712	704.38	2.28E+02	35.92	2.35E+02	1.95
F	4	583.49	1161 -	1171	1167.31	3.77E+01	16.98	9.37E+01	1.41
F	5	609.25	1211 -	1224	1218.83	1.63E+02	28.81	1.05E+02	1.89
F	6	911.56	1818 -	1828	1823.36	2.88E+01	13.18	6.29E+01	0.94
F	7	1119.89	2235 -	2247	2239.95	4.32E+01	16.66	5.56E+01	2.32
F	8	1460.95	2913 -	2931	2922.01	3.52E+02	38.56	4.57E+01	2.70

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 : 1/24/2019 3:27:57PM

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	238.56	1.81E+02	38.00			1.81E+02	3.80E+01
F	2	295.14	1.11E+02	27.88			1.11E+02	2.79E+01
F	3	351.98	2.28E+02	35.92	8.36E+01	3.72E+01	1.45E+02	5.17E+01
F	4	583.49	3.77E+01	16.98			3.77E+01	1.70E+01
F	5	609.25	1.63E+02	28.81	4.12E+01	2.42E+01	1.21E+02	3.76E+01
F	6	911.56	2.88E+01	13.18			2.88E+01	1.32E+01
F	7	1119.89	4.32E+01	16.66			4.32E+01	1.67E+01
F	8	1460.95	3.52E+02	38.56	5.63E+01	1.71E+01	2.96E+02	4.22E+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 L2-011-102-FSGA-011-AV
L2-011-102

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	4.75E+00	7.27E-01
PB-212	0.56	77.11	17.50		
		238.63 *	44.60	1.37E-01	2.97E-02
BI-214	0.58	609.31 *	46.30	2.06E-01	6.48E-02
		1120.29 *	15.10	3.88E-01	1.51E-01
		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	2.34E-01	5.98E-02
		351.92 *	37.20	1.84E-01	6.64E-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	4.75E+00	7.27E-01	
PB-212	0.560	1.37E-01	2.97E-02	
BI-214	0.581	2.34E-01	5.96E-02	

Analysis Report for L2-011-102-FSGA-011-AV

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.721	2.12E-01	4.44E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-FSGA-011-AV
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:27:57PM
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	583.49	1.04764E-02	22.51		
F 6	911.56	7.99266E-03	22.90	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	4.75E+00	8.00E-01	8.00E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	-2.62E-02	6.36E-02	6.81E-02
		1332.49	100.00	1.01E-02		6.36E-02
+	KR-85	513.99	0.43	9.64E+00	1.12E+01	1.12E+01
+	Y-88	898.04	93.70	1.47E-02	5.01E-02	6.01E-02
		1836.06	99.20	-3.95E-02		5.01E-02
+	NB-94	702.63	100.00	-1.29E-02	4.61E-02	4.61E-02
		871.10	100.00	-2.16E-02		4.95E-02
+	I-131	284.30	6.06	-1.37E+00	2.14E-01	2.80E+00
		364.48	81.20	5.88E-02		2.14E-01
		636.97	7.27	3.16E+00		3.03E+00
+	CS-134	604.70	97.60	2.16E-03	5.16E-02	6.55E-02
		795.84	85.40	-4.00E-02		5.16E-02

Analysis Report for L2-011-102-FSGA-011-AV

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	85.12	3.23E-02	6.55E-02	6.55E-02
+	CE-144	80.12	1.36	-4.29E-01	3.17E-01	4.01E+00
		133.51	11.09	-1.33E-01		3.17E-01
+	EU-152	121.78	28.40	-2.17E-02	1.20E-01	1.20E-01
		344.28	26.60	-9.39E-02		1.55E-01
		1408.00	20.74	1.42E-01		2.66E-01
+	EU-154	123.07	40.40	7.22E-03	8.51E-02	8.51E-02
		723.30	19.70	-1.24E-02		2.48E-01
		1274.51	35.50	3.83E-03		1.77E-01
+	EU-155	86.54	32.80	-8.58E-02	1.35E-01	1.35E-01
		105.31	21.80	-1.38E-02		1.65E-01
+	BI-214	609.31	* 46.30	2.06E-01	1.06E-01	1.06E-01
		1120.29	* 15.10	3.88E-01		2.79E-01
		1238.11	5.94	5.03E-01		1.25E+00
		1377.67	4.11	1.26E-01		1.46E+00
		1407.98	2.48	1.19E+00		2.22E+00
		1509.19	2.19	1.07E+00		2.20E+00
		1764.49	15.80	3.90E-01		4.12E-01
+	PB-214	77.11	10.70	1.14E+00	1.18E-01	5.39E-01
		295.21	* 19.20	2.34E-01		1.43E-01
		351.92	* 37.20	1.84E-01		1.18E-01
+	PA-228	89.95	22.00	1.99E+05	1.01E+05	1.72E+05
		93.35	35.00	-3.70E+04		1.01E+05
		105.00	16.30	-1.95E+04		1.95E+05
		129.22	2.97	-8.76E+04		1.02E+06
		338.32	5.30	3.83E+05		6.55E+05
		463.00	13.80	1.90E+05		2.53E+05
		911.23	16.70	1.79E+05		3.25E+05
+	AM-241	59.54	36.30	-1.75E-01	2.42E-01	2.42E-01
+	CM-243	103.76	23.00	-4.20E-03	1.56E-01	1.56E-01
		228.18	10.60	-1.33E-01		3.13E-01
		277.60	14.00	-2.25E-01		2.56E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Analysis Report for L2-011-102-FSGS-011-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-011-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 8.502E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/21/2018 8:59:00AM
Acquisition Started : 1/8/2019 12:13:27PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.7 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 : 5559

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:30:26PM

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

Analysis Report for L2-011-102-FSGS-011-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.64	147 -	161	153.83	1.91E+02	56.71	1.18E+03	3.22
F	2	238.72	471 -	485	477.91	1.87E+02	40.44	5.88E+02	2.10
F	3	295.31	585 -	597	591.07	1.09E+02	31.29	3.36E+02	1.94
F	4	338.71	674 -	683	677.86	5.63E+01	23.38	1.77E+02	1.79
F	5	351.91	697 -	708	704.25	1.79E+02	32.66	2.55E+02	1.47
F	6	583.38	1162 -	1171	1167.09	4.45E+01	18.92	9.51E+01	1.71
F	7	609.34	1211 -	1226	1219.02	1.25E+02	25.57	9.87E+01	2.17
F	8	1120.27	2236 -	2250	2240.72	3.09E+01	14.20	6.30E+01	1.61
F	9	1460.95	2913 -	2930	2922.01	4.65E+02	43.34	4.50E+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 : 1/24/2019 3:30:26PM

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	76.64	1.91E+02	56.71			1.91E+02	5.67E+01
F	2	238.72	1.87E+02	40.44			1.87E+02	4.04E+01
F	3	295.31	1.09E+02	31.29			1.09E+02	3.13E+01
F	4	338.71	5.63E+01	23.38			5.63E+01	2.34E+01
F	5	351.91	1.79E+02	32.66	8.36E+01	3.72E+01	9.55E+01	4.95E+01
F	6	583.38	4.45E+01	18.92			4.45E+01	1.89E+01
F	7	609.34	1.25E+02	25.57	4.12E+01	2.42E+01	8.42E+01	3.52E+01
F	8	1120.27	3.09E+01	14.20			3.09E+01	1.42E+01
F	9	1460.95	4.65E+02	43.34	5.63E+01	1.71E+01	4.09E+02	4.66E+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 L2-011-102-FSGS-011-SS
L2-011-102

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	6.64E-01
PB-212	0.98	77.11 *	17.50	3.20E-01	9.71E-02
		238.63 *	44.60	1.13E-01	2.52E-02
BI-214	0.58	609.31 *	46.30	1.14E-01	4.81E-02
		1120.29 *	15.10	2.22E-01	1.03E-01
		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	5.24E-01	1.59E-01
		295.21 *	19.20	1.84E-01	5.34E-02
		351.92 *	37.20	9.71E-02	5.05E-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	5.24E+00	6.64E-01	
PB-212	0.989	1.21E-01	2.45E-02	
BI-214	0.585	1.34E-01	4.36E-02	

Analysis Report for L2-011-102-FSGS-011-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.994	1.48E-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 L2-011-102-FSGS-011-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:30:26PM
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	338.71	1.56377E-02	20.77	Tol.	AC-228 PA-228
F 6	583.38	1.23552E-02	21.27		

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\Daityland_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
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	1.98E-02	5.19E-02	6.08E-02
		1332.49	100.00	1.76E-02		5.19E-02
+	KR-85	513.99	0.43	9.69E+00	9.26E+00	9.26E+00
+	Y-88	898.04	93.70	-4.94E-03	4.31E-02	5.17E-02
		1836.06	99.20	-2.30E-02		4.31E-02
+	NB-94	702.63	100.00	7.93E-03	3.82E-02	3.82E-02
		871.10	100.00	-8.52E-03		4.17E-02
+	I-131	284.30	6.06	1.27E+00	1.78E-01	2.41E+00
		364.48	81.20	-1.57E-01		1.78E-01
		636.97	7.27	1.39E+00		2.41E+00
+	CS-134	604.70	97.60	1.29E-02	4.37E-02	4.90E-02
		795.84	85.40	6.06E-03		4.37E-02

Analysis Report for L2-011-102-FSGS-011-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	85.12	5.18E-02	5.25E-02	5.25E-02
+	CE-144	80.12	1.36	-1.80E+00	2.63E-01	3.27E+00
		133.51	11.09	3.75E-02		2.63E-01
+	EU-152	121.78	28.40	-1.07E-01	9.81E-02	9.81E-02
		344.28	26.60	-2.50E-02		1.24E-01
		1408.00	20.74	3.84E-02		2.17E-01
+	EU-154	123.07	40.40	-3.93E-02	6.90E-02	6.90E-02
		723.30	19.70	8.09E-02		2.01E-01
		1274.51	35.50	2.83E-02		1.54E-01
+	EU-155	86.54	32.80	-1.10E-01	1.11E-01	1.11E-01
		105.31	21.80	-8.46E-02		1.30E-01
+	BI-214	609.31	* 46.30	1.14E-01	8.56E-02	8.56E-02
		1120.29	* 15.10	2.22E-01		2.47E-01
		1238.11	5.94	6.47E-01		1.11E+00
		1377.67	4.11	6.90E-01		9.81E-01
		1407.98	2.48	3.21E-01		1.81E+00
		1509.19	2.19	-2.46E-01		1.70E+00
		1764.49	15.80	9.63E-02		2.86E-01
+	PB-214	77.11	* 10.70	5.24E-01	9.43E-02	3.79E-01
		295.21	* 19.20	1.84E-01		1.21E-01
		351.92	* 37.20	9.71E-02		9.43E-02
+	PA-228	89.95	22.00	1.17E+05	8.82E+04	1.48E+05
		93.35	35.00	4.74E+04		8.82E+04
		105.00	16.30	-6.96E+04		1.60E+05
		129.22	2.97	-1.82E+05		8.48E+05
		338.32	5.30	1.37E+05		5.42E+05
		463.00	13.80	-2.34E+04		2.15E+05
		911.23	16.70	1.77E+05		2.78E+05
+	AM-241	59.54	36.30	-1.38E-03	2.03E-01	2.03E-01
+	CM-243	103.76	23.00	-4.73E-02	1.25E-01	1.25E-01
		228.18	10.60	8.55E-02		2.61E-01
		277.60	14.00	2.16E-02		2.15E-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 L2-011-102-FSGA-012-AV
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGA-012-AV
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.461E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 2:22:00PM
Acquisition Started : 1/8/2019 3:34:52PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.4 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 : 5565

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:37:27PM

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

Analysis Report for L2-011-102-FSGA-012-AV

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.01	147 -	161	152.57	1.74E+02	53.98	1.05E+03	4.03
F	2	238.49	470 -	485	477.46	1.50E+02	35.19	5.64E+02	1.68
F	3	295.19	584 -	596	590.83	7.87E+01	26.88	3.15E+02	1.58
F	4	351.93	698 -	710	704.28	1.37E+02	29.59	1.88E+02	1.93
F	5	582.88	1161 -	1170	1166.11	4.95E+01	19.15	7.91E+01	1.82
F	6	609.14	1212 -	1226	1218.61	1.26E+02	25.50	1.08E+02	1.74
F	7	911.31	1818 -	1829	1822.85	3.49E+01	15.27	5.02E+01	1.76
F	8	1460.91	2912 -	2929	2921.94	3.31E+02	36.92	1.89E+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 : 1/24/2019 3:37:27PM

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	76.01	1.74E+02	53.98			1.74E+02	5.40E+01
F	2	238.49	1.50E+02	35.19			1.50E+02	3.52E+01
F	3	295.19	7.87E+01	26.88			7.87E+01	2.69E+01
F	4	351.93	1.37E+02	29.59	8.36E+01	3.72E+01	5.37E+01	4.75E+01
F	5	582.88	4.95E+01	19.15			4.95E+01	1.91E+01
F	6	609.14	1.26E+02	25.50	4.12E+01	2.42E+01	8.52E+01	3.52E+01
F	7	911.31	3.49E+01	15.27			3.49E+01	1.53E+01
F	8	1460.91	3.31E+02	36.92	5.63E+01	1.71E+01	2.74E+02	4.07E+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 L2-011-102-FSGA-012-AV
L2-011-102

NUCLIDE IDENTIFICATION REPORT

Nuclide Library Used : C:\Canberra\Apex\Root\Daairyland_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	4.63E+00	7.33E-01
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.20E-01	2.88E-02
BI-214	0.34	609.31	*	46.30	1.52E-01	6.32E-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	6.01E-02
		351.92	*	37.20	7.18E-02	6.37E-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	4.63E+00	7.33E-01	
PB-212	0.558	1.20E-01	2.88E-02	
BI-214	0.347	1.52E-01	6.32E-02	

Analysis Report for L2-011-102-FSGA-012-AV

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.721	1.26E-01	4.37E-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 L2-011-102-FSGA-012-AV
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:37:27PM
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	76.01	4.82080E-02	15.55		
F 5	582.88	1.37469E-02	19.35		
F 7	911.31	9.70828E-03	21.85	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	4.63E+00	7.51E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	6.97E-02	6.92E-02	7.13E-02
		1332.49	100.00	1.81E-02		6.92E-02
+	KR-85	513.99	0.43	1.87E+01	1.17E+01	1.17E+01
+	Y-88	898.04	93.70	-2.87E-02	5.30E-02	6.36E-02
		1836.06	99.20	7.76E-05		5.30E-02
+	NB-94	702.63	100.00	-4.32E-03	4.69E-02	4.69E-02
		871.10	100.00	-3.59E-02		4.85E-02
+	I-131	284.30	6.06	4.65E-01	2.37E-01	3.08E+00
		364.48	81.20	6.69E-02		2.37E-01
		636.97	7.27	5.19E-01		3.32E+00
+	CS-134	604.70	97.60	-1.17E-02	6.31E-02	6.31E-02

Analysis Report for L2-011-102-FSGA-012-AV

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CS-134	795.84	85.40	1.84E-02	6.31E-02	6.40E-02
+	CS-137	661.65	85.12	4.84E-02	6.39E-02	6.39E-02
+	CE-144	80.12	1.36	-3.93E-01	3.32E-01	4.11E+00
		133.51	11.09	-3.21E-02		3.32E-01
+	EU-152	121.78	28.40	-1.09E-01	1.20E-01	1.20E-01
		344.28	26.60	1.26E-01		1.54E-01
		1408.00	20.74	-8.88E-03		2.48E-01
+	EU-154	123.07	40.40	-3.62E-02	8.50E-02	8.50E-02
		723.30	19.70	6.04E-02		2.22E-01
		1274.51	35.50	4.83E-02		1.82E-01
+	EU-155	86.54	32.80	-5.94E-02	1.38E-01	1.38E-01
		105.31	21.80	2.26E-02		1.61E-01
+	BI-214	609.31	* 46.30	1.52E-01	1.14E-01	1.14E-01
		1120.29	15.10	1.47E-01		4.31E-01
		1238.11	5.94	9.23E-02		1.27E+00
		1377.67	4.11	5.07E-01		1.38E+00
		1407.98	2.48	-7.40E-02		2.07E+00
		1509.19	2.19	-2.29E+00		2.03E+00
		1764.49	15.80	3.10E-01		3.93E-01
+	PB-214	77.11	10.70	5.53E-01	1.18E-01	5.31E-01
		295.21	* 19.20	1.74E-01		1.54E-01
		351.92	* 37.20	7.18E-02		1.18E-01
+	PA-228	89.95	22.00	4.44E+05	2.08E+05	3.65E+05
		93.35	35.00	-5.52E+04		2.08E+05
		105.00	16.30	1.42E+05		3.90E+05
		129.22	2.97	-6.53E+05		2.14E+06
		338.32	5.30	1.43E+06		1.44E+06
		463.00	13.80	-1.40E+05		5.06E+05
		911.23	16.70	5.30E+05		6.60E+05
+	AM-241	59.54	36.30	5.75E-02	2.63E-01	2.63E-01
+	CM-243	103.76	23.00	1.25E-01	1.53E-01	1.53E-01
		228.18	10.60	1.72E-01		3.32E-01
		277.60	14.00	3.97E-02		2.60E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Analysis Report for L2-011-102-QSGA-012-AV
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-QSGA-012-AV
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.782E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 2:59:00PM
Acquisition Started : 1/9/2019 9:51:31AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3609.9 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 : 5561

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:32:09PM

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

Analysis Report for L2-011-102-QSGA-012-AV

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.57	147 -	157	153.68	1.50E+02	44.48	7.53E+02	1.98
F	2	238.37	469 -	482	477.22	1.33E+02	34.90	5.79E+02	1.40
F	3	295.16	584 -	595	590.77	8.62E+01	27.02	2.74E+02	1.52
F	4	338.27	674 -	684	676.98	3.11E+01	18.34	2.04E+02	1.07
F	5	351.79	700 -	712	704.02	1.38E+02	29.79	2.37E+02	1.87
F	6	582.99	1161 -	1174	1166.33	6.79E+01	19.86	7.76E+01	1.88
F	7	609.32	1211 -	1227	1218.98	1.14E+02	24.99	1.20E+02	1.99
F	8	911.17	1818 -	1828	1822.58	3.79E+01	15.61	4.31E+01	2.16
F	9	1460.70	2912 -	2929	2921.50	3.31E+02	36.82	1.37E+01	2.56

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 : 1/24/2019 3:32:09PM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.57	1.50E+02	44.48			1.50E+02	4.45E+01
F	2	238.37	1.33E+02	34.90			1.33E+02	3.49E+01
F	3	295.16	8.62E+01	27.02			8.62E+01	2.70E+01
F	4	338.27	3.11E+01	18.34			3.11E+01	1.83E+01
F	5	351.79	1.38E+02	29.79	8.36E+01	3.72E+01	5.47E+01	4.77E+01
F	6	582.99	6.79E+01	19.86			6.79E+01	1.99E+01
F	7	609.32	1.14E+02	24.99	4.12E+01	2.42E+01	7.31E+01	3.48E+01
F	8	911.17	3.79E+01	15.61			3.79E+01	1.56E+01
F	9	1460.70	3.31E+02	36.82	5.63E+01	1.71E+01	2.75E+02	4.06E+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 L2-011-102-QSGA-012-AV

L2-011-102

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	1.00	1460.75 *	10.67	4.42E+00	6.97E-01
PB-212	0.98	77.11 *	17.50	3.15E-01	9.57E-02
		238.63 *	44.60	1.01E-01	2.70E-02
BI-214	0.35	609.31 *	46.30	1.24E-01	5.95E-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	5.16E-01	1.56E-01
		295.21 *	19.20	1.82E-01	5.77E-02
		351.92 *	37.20	6.97E-02	6.08E-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	1.000	4.42E+00	6.97E-01	
PB-212	0.980	1.11E-01	2.61E-02	
BI-214	0.350	1.24E-01	5.95E-02	

Analysis Report for L2-011-102-QSGA-012-AV

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.991	1.42E-01	4.05E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-QSGA-012-AV

L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:32:09PM
 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	338.27	8.63273E-03	29.51	Tol.	AC-228 PA-228
F 6	582.99	1.88652E-02	14.62		
F 8	911.17	1.05171E-02	20.61	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	4.42E+00	6.96E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	3.43E-02	6.32E-02	6.79E-02
		1332.49	100.00	3.13E-02		6.32E-02
+	KR-85	513.99	0.43	9.68E+00	1.11E+01	1.11E+01
+	Y-88	898.04	93.70	3.68E-02	4.48E-02	6.19E-02
		1836.06	99.20	-9.71E-03		4.48E-02
+	NB-94	702.63	100.00	1.12E-02	4.47E-02	4.47E-02
		871.10	100.00	2.18E-02		5.10E-02
+	I-131	284.30	6.06	-4.37E-01	2.51E-01	3.13E+00
		364.48	81.20	2.91E-02		2.51E-01

Analysis Report for L2-011-102-QSGA-012-AV

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	636.97	7.27	-6.06E-01	2.51E-01	3.25E+00
+	CS-134	604.70	97.60	4.05E-03	5.74E-02	5.74E-02
		795.84	85.40	-3.22E-03		5.94E-02
+	CS-137	661.65	85.12	5.50E-02	5.88E-02	5.88E-02
+	CE-144	80.12	1.36	-3.79E+00	3.15E-01	3.90E+00
		133.51	11.09	2.39E-01		3.15E-01
+	EU-152	121.78	28.40	-1.55E-01	1.10E-01	1.10E-01
		344.28	26.60	-1.87E-01		1.45E-01
		1408.00	20.74	1.57E-01		2.55E-01
+	EU-154	123.07	40.40	-6.45E-02	7.85E-02	7.85E-02
		723.30	19.70	5.65E-02		2.38E-01
		1274.51	35.50	-2.78E-03		1.51E-01
+	EU-155	86.54	32.80	-5.31E-02	1.30E-01	1.30E-01
		105.31	21.80	5.51E-02		1.60E-01
+	BI-214	609.31	* 46.30	1.24E-01	1.14E-01	1.14E-01
		1120.29	15.10	6.12E-02		4.33E-01
		1238.11	5.94	3.03E-01		1.15E+00
		1377.67	4.11	4.28E-01		1.20E+00
		1407.98	2.48	1.31E+00		2.13E+00
		1509.19	2.19	9.06E-01		2.13E+00
		1764.49	15.80	2.67E-01		3.05E-01
+	PB-214	77.11	* 10.70	5.16E-01	1.19E-01	3.47E-01
		295.21	* 19.20	1.82E-01		1.34E-01
		351.92	* 37.20	6.97E-02		1.19E-01
+	PA-228	89.95	22.00	4.45E+05	3.40E+05	5.89E+05
		93.35	35.00	-6.12E+04		3.40E+05
		105.00	16.30	5.24E+05		6.83E+05
		129.22	2.97	3.46E+05		3.50E+06
		338.32	5.30	3.12E+05		2.29E+06
		463.00	13.80	4.07E+05		8.83E+05
		911.23	16.70	4.49E+05		1.15E+06
+	AM-241	59.54	36.30	1.15E-01	2.44E-01	2.44E-01
+	CM-243	103.76	23.00	1.19E-01	1.52E-01	1.52E-01
		228.18	10.60	2.82E-02		3.15E-01
		277.60	14.00	-7.21E-02		2.52E-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 L2-011-102-QSGA-012-AV
L2-011-102

Analysis Report for L2-011-102-FSGS-012-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L2-011-102-FSGS-012-SS
Sample Description	: L2-011-102
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 8.137E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 12/20/2018 2:45:00PM
Acquisition Started	: 1/9/2019 6:14:41AM
Procedure	: 500ml Marinelli
Operator	: Administrator
Detector Name	: HOTLAB
Geometry	: 500ml Marinelli
Live Time	: 3600.0 seconds
Real Time	: 3610.5 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	: 5567

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:41:20PM

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

Analysis Report for L2-011-102-FSGS-012-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.55	473 -	485	477.57	1.75E+02	36.39	4.16E+02	1.82
F	2	295.12	586 -	595	590.69	6.32E+01	24.96	2.12E+02	1.62
F	3	351.87	699 -	709	704.16	1.94E+02	33.54	1.89E+02	1.80
F	4	583.13	1160 -	1173	1166.60	5.47E+01	18.79	8.73E+01	1.92
F	5	609.23	1212 -	1223	1218.80	1.21E+02	26.10	1.02E+02	1.98
F	6	1460.75	2913 -	2930	2921.61	4.85E+02	44.31	1.33E+01	2.68

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 : 1/24/2019 3:41:20PM

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	238.55	1.75E+02	36.39			1.75E+02	3.64E+01
F	2	295.12	6.32E+01	24.96			6.32E+01	2.50E+01
F	3	351.87	1.94E+02	33.54	8.36E+01	3.72E+01	1.11E+02	5.01E+01
F	4	583.13	5.47E+01	18.79			5.47E+01	1.88E+01
F	5	609.23	1.21E+02	26.10	4.12E+01	2.42E+01	7.95E+01	3.56E+01
F	6	1460.75	4.85E+02	44.31	5.63E+01	1.71E+01	4.28E+02	4.75E+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 L2-011-102-FSGS-012-SS

L2-011-102

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	1.00	1460.75 *	10.67	5.74E+00	7.11E-01
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	1.11E-01	2.38E-02
BI-214	0.34	609.31 *	46.30	1.13E-01	5.08E-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	1.11E-01	4.42E-02
		351.92 *	37.20	1.17E-01	5.35E-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	1.000	5.74E+00	7.11E-01	
PB-212	0.559	1.11E-01	2.38E-02	
BI-214	0.349	1.13E-01	5.08E-02	

Analysis Report for L2-011-102-FSGS-012-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.721	1.14E-01	3.41E-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 L2-011-102-FSGS-012-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:41:20PM
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	583.13	1.51967E-02	17.17		

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\Daivland_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	5.74E+00	5.78E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	6.81E-02	5.11E-02	6.44E-02
		1332.49	100.00	3.49E-02		5.11E-02
+	KR-85	513.99	0.43	1.26E+01	9.36E+00	9.36E+00
+	Y-88	898.04	93.70	3.76E-02	4.33E-02	5.29E-02
		1836.06	99.20	-6.93E-03		4.33E-02
+	NB-94	702.63	100.00	1.38E-03	3.88E-02	3.88E-02
		871.10	100.00	1.05E-02		4.42E-02
+	I-131	284.30	6.06	3.24E+00	2.04E-01	2.83E+00
		364.48	81.20	4.44E-02		2.04E-01
		636.97	7.27	1.40E+00		2.92E+00
+	CS-134	604.70	97.60	9.77E-02	5.02E-02	5.24E-02
		795.84	85.40	-8.72E-03		5.02E-02
+	CS-137	661.65	85.12	7.92E-02	5.44E-02	5.44E-02
+	CE-144	80.12	1.36	2.65E-01	2.72E-01	3.27E+00
		133.51	11.09	2.17E-01		2.72E-01

Analysis Report for L2-011-102-FSGS-012-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	EU-152	121.78	28.40	-8.66E-02	9.85E-02	9.85E-02
		344.28	26.60	-4.96E-02		1.24E-01
		1408.00	20.74	1.37E-01		2.10E-01
+	EU-154	123.07	40.40	-2.15E-03	7.04E-02	7.04E-02
		723.30	19.70	1.07E-01		1.96E-01
		1274.51	35.50	-7.00E-02		1.53E-01
+	EU-155	86.54	32.80	-7.74E-02	1.12E-01	1.12E-01
		105.31	21.80	-3.38E-02		1.37E-01
+	BI-214	609.31	* 46.30	1.13E-01	8.65E-02	8.65E-02
		1120.29	15.10	3.26E-01		4.05E-01
		1238.11	5.94	8.03E-01		1.12E+00
		1377.67	4.11	4.15E-01		1.19E+00
		1407.98	2.48	1.14E+00		1.75E+00
		1509.19	2.19	6.97E-01		1.77E+00
		1764.49	15.80	1.87E-01		3.12E-01
+	PB-214	77.11	10.70	2.70E-01	9.23E-02	4.25E-01
		295.21	* 19.20	1.11E-01		9.42E-02
		351.92	* 37.20	1.17E-01		9.23E-02
+	PA-228	89.95	22.00	5.09E+05	2.73E+05	4.66E+05
		93.35	35.00	-6.17E+04		2.73E+05
		105.00	16.30	-7.47E+04		5.22E+05
		129.22	2.97	2.20E+05		2.72E+06
		338.32	5.30	-1.01E+05		1.75E+06
		463.00	13.80	-1.95E+05		6.88E+05
		911.23	16.70	-1.04E+05		8.15E+05
+	AM-241	59.54	36.30	7.62E-03	2.09E-01	2.09E-01
+	CM-243	103.76	23.00	-2.99E-02	1.30E-01	1.30E-01
		228.18	10.60	-2.29E-02		2.74E-01
		277.60	14.00	4.55E-02		2.24E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

Analysis Report for L2-011-102-QSGA-012-AV
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-QSGA-012-AV
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.782E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 2:59:00PM
Acquisition Started : 1/9/2019 9:51:31AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3609.9 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 : 5561

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:32:09PM

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

Analysis Report for L2-011-102-QSGA-012-AV

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.57	147 -	157	153.68	1.50E+02	44.48	7.53E+02	1.98
F	2	238.37	469 -	482	477.22	1.33E+02	34.90	5.79E+02	1.40
F	3	295.16	584 -	595	590.77	8.62E+01	27.02	2.74E+02	1.52
F	4	338.27	674 -	684	676.98	3.11E+01	18.34	2.04E+02	1.07
F	5	351.79	700 -	712	704.02	1.38E+02	29.79	2.37E+02	1.87
F	6	582.99	1161 -	1174	1166.33	6.79E+01	19.86	7.76E+01	1.88
F	7	609.32	1211 -	1227	1218.98	1.14E+02	24.99	1.20E+02	1.99
F	8	911.17	1818 -	1828	1822.58	3.79E+01	15.61	4.31E+01	2.16
F	9	1460.70	2912 -	2929	2921.50	3.31E+02	36.82	1.37E+01	2.56

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 : 1/24/2019 3:32:09PM

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	76.57	1.50E+02	44.48			1.50E+02	4.45E+01
F	2	238.37	1.33E+02	34.90			1.33E+02	3.49E+01
F	3	295.16	8.62E+01	27.02			8.62E+01	2.70E+01
F	4	338.27	3.11E+01	18.34			3.11E+01	1.83E+01
F	5	351.79	1.38E+02	29.79	8.36E+01	3.72E+01	5.47E+01	4.77E+01
F	6	582.99	6.79E+01	19.86			6.79E+01	1.99E+01
F	7	609.32	1.14E+02	24.99	4.12E+01	2.42E+01	7.31E+01	3.48E+01
F	8	911.17	3.79E+01	15.61			3.79E+01	1.56E+01
F	9	1460.70	3.31E+02	36.82	5.63E+01	1.71E+01	2.75E+02	4.06E+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 L2-011-102-QSGA-012-AV
L2-011-102

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	1.00	1460.75 *	10.67	4.42E+00	6.97E-01
PB-212	0.98	77.11 *	17.50	3.15E-01	9.57E-02
		238.63 *	44.60	1.01E-01	2.70E-02
BI-214	0.35	609.31 *	46.30	1.24E-01	5.95E-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	5.16E-01	1.56E-01
		295.21 *	19.20	1.82E-01	5.77E-02
		351.92 *	37.20	6.97E-02	6.08E-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	1.000	4.42E+00	6.97E-01	
PB-212	0.980	1.11E-01	2.61E-02	
BI-214	0.350	1.24E-01	5.95E-02	

Analysis Report for L2-011-102-QSGA-012-AV

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-214	0.991	1.42E-01	4.05E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-QSGA-012-AV
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:32:09PM
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	338.27	8.63273E-03	29.51	Tol.	AC-228 PA-228
F 6	582.99	1.88652E-02	14.62		
F 8	911.17	1.05171E-02	20.61	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	4.42E+00	6.96E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	3.43E-02	6.32E-02	6.79E-02
		1332.49	100.00	3.13E-02		6.32E-02
+	KR-85	513.99	0.43	9.68E+00	1.11E+01	1.11E+01
+	Y-88	898.04	93.70	3.68E-02	4.48E-02	6.19E-02
		1836.06	99.20	-9.71E-03		4.48E-02
+	NB-94	702.63	100.00	1.12E-02	4.47E-02	4.47E-02
		871.10	100.00	2.18E-02		5.10E-02
+	I-131	284.30	6.06	-4.37E-01	2.51E-01	3.13E+00
		364.48	81.20	2.91E-02		2.51E-01

Analysis Report for L2-011-102-QSGA-012-AV

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	636.97	7.27	-6.06E-01	2.51E-01	3.25E+00
+	CS-134	604.70	97.60	4.05E-03	5.74E-02	5.74E-02
		795.84	85.40	-3.22E-03		5.94E-02
+	CS-137	661.65	85.12	5.50E-02	5.88E-02	5.88E-02
+	CE-144	80.12	1.36	-3.79E+00	3.15E-01	3.90E+00
		133.51	11.09	2.39E-01		3.15E-01
+	EU-152	121.78	28.40	-1.55E-01	1.10E-01	1.10E-01
		344.28	26.60	-1.87E-01		1.45E-01
		1408.00	20.74	1.57E-01		2.55E-01
+	EU-154	123.07	40.40	-6.45E-02	7.85E-02	7.85E-02
		723.30	19.70	5.65E-02		2.38E-01
		1274.51	35.50	-2.78E-03		1.51E-01
+	EU-155	86.54	32.80	-5.31E-02	1.30E-01	1.30E-01
		105.31	21.80	5.51E-02		1.60E-01
+	BI-214	609.31	* 46.30	1.24E-01	1.14E-01	1.14E-01
		1120.29	15.10	6.12E-02		4.33E-01
		1238.11	5.94	3.03E-01		1.15E+00
		1377.67	4.11	4.28E-01		1.20E+00
		1407.98	2.48	1.31E+00		2.13E+00
		1509.19	2.19	9.06E-01		2.13E+00
		1764.49	15.80	2.67E-01		3.05E-01
+	PB-214	77.11	* 10.70	5.16E-01	1.19E-01	3.47E-01
		295.21	* 19.20	1.82E-01		1.34E-01
		351.92	* 37.20	6.97E-02		1.19E-01
+	PA-228	89.95	22.00	4.45E+05	3.40E+05	5.89E+05
		93.35	35.00	-6.12E+04		3.40E+05
		105.00	16.30	5.24E+05		6.83E+05
		129.22	2.97	3.46E+05		3.50E+06
		338.32	5.30	3.12E+05		2.29E+06
		463.00	13.80	4.07E+05		8.83E+05
		911.23	16.70	4.49E+05		1.15E+06
+	AM-241	59.54	36.30	1.15E-01	2.44E-01	2.44E-01
+	CM-243	103.76	23.00	1.19E-01	1.52E-01	1.52E-01
		228.18	10.60	2.82E-02		3.15E-01
		277.60	14.00	-7.21E-02		2.52E-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 L2-011-102-QSGA-012-AV
L2-011-102

Analysis Report for L2-011-102-QSGS-012-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-QSGS-012-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 9.469E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 3:02:00PM
Acquisition Started : 1/9/2019 10:52:21AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.4 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 : 5563

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:34:02PM

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

Analysis Report for L2-011-102-QSGS-012-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.33	472 -	481	477.14	1.06E+02	36.33	5.09E+02	1.58
F	2	295.20	585 -	596	590.85	7.87E+01	28.34	3.30E+02	1.65
F	3	338.48	674 -	685	677.39	4.04E+01	21.58	2.43E+02	1.49
F	4	351.83	699 -	712	704.10	1.96E+02	33.11	2.49E+02	1.56
F	5	583.40	1163 -	1174	1167.15	5.16E+01	19.87	1.08E+02	2.10
F	6	609.19	1210 -	1224	1218.71	1.32E+02	26.76	1.42E+02	1.64
F	7	910.96	1816 -	1829	1822.15	4.56E+01	16.76	6.08E+01	1.94
F	8	968.67	1933 -	1944	1937.55	2.62E+01	13.94	7.02E+01	1.32
F	9	1119.72	2233 -	2244	2239.63	3.92E+01	16.00	4.51E+01	2.43
F	10	1460.80	2913 -	2931	2921.71	5.54E+02	47.82	1.38E+01	2.45

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 : 1/24/2019 3:34:02PM

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	1.06E+02	36.33			1.06E+02	3.63E+01
F	2	295.20	7.87E+01	28.34			7.87E+01	2.83E+01
F	3	338.48	4.04E+01	21.58			4.04E+01	2.16E+01
F	4	351.83	1.96E+02	33.11	8.36E+01	3.72E+01	1.12E+02	4.98E+01
F	5	583.40	5.16E+01	19.87			5.16E+01	1.99E+01
F	6	609.19	1.32E+02	26.76	4.12E+01	2.42E+01	9.07E+01	3.61E+01
F	7	910.96	4.56E+01	16.76			4.56E+01	1.68E+01
F	8	968.67	2.62E+01	13.94			2.62E+01	1.39E+01
F	9	1119.72	3.92E+01	16.00			3.92E+01	1.60E+01
F	10	1460.80	5.54E+02	47.82	5.63E+01	1.71E+01	4.97E+02	5.08E+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 L2-011-102-QSGS-012-SS
L2-011-102

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	1.00	1460.75 *	10.67	5.72E+00	6.65E-01
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	5.74E-02	2.00E-02
BI-214	0.57	609.31 *	46.30	1.10E-01	4.43E-02
		1120.29 *	15.10	2.53E-01	1.04E-01
		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	1.19E-01	4.32E-02
		351.92 *	37.20	1.03E-01	4.57E-02
AC-228	0.59	209.28	4.40		
		338.32 *	11.40	1.16E-01	6.23E-02
		794.70	4.60		
		911.60 *	27.70	1.34E-01	4.94E-02
		964.60	5.20		
		969.11 *	16.60	1.35E-01	7.22E-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

Analysis Report for L2-011-102-QSGS-012-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	1.000	5.72E+00	6.65E-01	
PB-212	0.550	5.74E-02	2.00E-02	
BI-214	0.575	1.32E-01	4.08E-02	
PB-214	0.721	1.11E-01	3.14E-02	
AC-228	0.599	1.29E-01	3.41E-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 L2-011-102-QSGS-012-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:34:02PM
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	583.40	1.43349E-02	19.25		

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\Daivland_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	5.72E+00	4.99E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	2.87E-02	4.79E-02	5.47E-02
		1332.49	100.00	3.25E-02		4.79E-02
+	KR-85	513.99	0.43	1.10E+01	8.67E+00	8.67E+00
+	Y-88	898.04	93.70	8.51E-03	3.43E-02	4.90E-02
		1836.06	99.20	-1.11E-02		3.43E-02
+	NB-94	702.63	100.00	-2.18E-02	3.67E-02	3.67E-02
		871.10	100.00	-2.90E-02		4.10E-02
+	I-131	284.30	6.06	-8.90E-01	1.74E-01	2.37E+00
		364.48	81.20	-1.02E-01		1.74E-01
		636.97	7.27	-4.47E-02		2.50E+00
+	CS-134	604.70	97.60	3.30E-03	4.57E-02	4.57E-02
		795.84	85.40	-9.63E-03		4.60E-02
+	CS-137	661.65	85.12	4.06E-02	4.48E-02	4.48E-02
+	CE-144	80.12	1.36	-2.17E-01	2.37E-01	2.96E+00
		133.51	11.09	1.32E-02		2.37E-01

Analysis Report for L2-011-102-QSGS-012-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	EU-152	121.78	28.40	-2.00E-02	8.94E-02	8.94E-02
		344.28	26.60	-4.15E-02		1.12E-01
		1408.00	20.74	3.58E-02		1.74E-01
+	EU-154	123.07	40.40	1.80E-02	6.32E-02	6.32E-02
		723.30	19.70	1.09E-01		1.88E-01
		1274.51	35.50	9.63E-02		1.34E-01
+	EU-155	86.54	32.80	1.57E-02	1.02E-01	1.02E-01
		105.31	21.80	4.03E-02		1.25E-01
+	BI-214	609.31	* 46.30	1.10E-01	8.25E-02	8.25E-02
		1120.29	* 15.10	2.53E-01		1.77E-01
		1238.11	5.94	4.51E-01		1.02E+00
		1377.67	4.11	-5.68E-02		8.81E-01
		1407.98	2.48	2.98E-01		1.45E+00
		1509.19	2.19	-5.98E-01		1.39E+00
		1764.49	15.80	1.41E-01		2.79E-01
+	PB-214	77.11	10.70	2.71E-01	8.62E-02	3.85E-01
		295.21	* 19.20	1.19E-01		1.05E-01
		351.92	* 37.20	1.03E-01		8.62E-02
+	PA-228	89.95	22.00	3.52E+05	2.81E+05	4.81E+05
		93.35	35.00	-6.11E+04		2.81E+05
		105.00	16.30	1.59E+05		5.45E+05
		129.22	2.97	4.09E+05		2.82E+06
		338.32	5.30	6.08E+05		1.78E+06
		463.00	13.80	1.44E+04		7.20E+05
		911.23	16.70	1.01E+06		9.31E+05
+	AM-241	59.54	36.30	-8.59E-02	1.82E-01	1.82E-01
+	CM-243	103.76	23.00	-3.33E-02	1.17E-01	1.17E-01
		228.18	10.60	5.92E-02		2.40E-01
		277.60	14.00	-6.58E-02		1.87E-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 L2-011-102-FSGA-013-AV
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGA-013-AV
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 7.302E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/21/2018 8:01:00AM
Acquisition Started : 1/7/2019 1:23:24PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.1 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 : 5569

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:42:13PM

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

Analysis Report for L2-011-102-FSGA-013-AV

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.56	474 -	485	477.61	1.45E+02	33.24	4.60E+02	1.31
F	2	351.75	698 -	708	703.92	1.83E+02	32.76	1.81E+02	1.82
F	3	609.36	1212 -	1225	1219.05	1.29E+02	25.86	8.38E+01	2.13
F	4	911.07	1817 -	1827	1822.38	4.01E+01	15.74	4.88E+01	1.65
F	5	1120.04	2236 -	2247	2240.27	2.42E+01	13.37	4.90E+01	1.98
F	6	1332.39	2660 -	2669	2664.91	1.11E+01	8.04	2.94E+01	0.76
F	7	1460.72	2912 -	2930	2921.56	3.68E+02	38.73	9.50E+00	2.79

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 : 1/24/2019 3:42:13PM

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	238.56	1.45E+02	33.24			1.45E+02	3.32E+01
F	2	351.75	1.83E+02	32.76	8.36E+01	3.72E+01	9.96E+01	4.96E+01
F	3	609.36	1.29E+02	25.86	4.12E+01	2.42E+01	8.77E+01	3.54E+01
F	4	911.07	4.01E+01	15.74			4.01E+01	1.57E+01
F	5	1120.04	2.42E+01	13.37			2.42E+01	1.34E+01
F	6	1332.39	1.11E+01	8.04			1.11E+01	8.04E+00
F	7	1460.72	3.68E+02	38.73	5.63E+01	1.71E+01	3.11E+02	4.23E+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 L2-011-102-FSGA-013-AV
L2-011-102

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	1.00	1460.75	*	10.67	4.65E+00	6.83E-01
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.02E-01	2.41E-02
BI-214	0.58	609.31	*	46.30	1.38E-01	5.64E-02
		1120.29	*	15.10	2.03E-01	1.12E-01
		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	1.000	4.65E+00	6.83E-01	
PB-212	0.560	1.02E-01	2.41E-02	
BI-214	0.583	1.51E-01	5.04E-02	

Analysis Report for L2-011-102-FSGA-013-AV

L2-011-102

- ? = 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 L2-011-102-FSGA-013-AV
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:42:13PM
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	351.75	2.76548E-02	24.90	Tol.	PB-214
F 4	911.07	1.11420E-02	19.63	Tol.	AC-228 PA-228
F 6	1332.39	3.08100E-03	36.23		

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_NPPLibrary\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	6.33E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	2.65E-02	6.00E-02	6.88E-02
		1332.49	100.00	1.71E-02		6.00E-02
+	KR-85	513.99	0.43	8.70E+00	1.04E+01	1.04E+01
+	Y-88	898.04	93.70	-4.43E-02	4.23E-02	5.13E-02
		1836.06	99.20	5.35E-03		4.23E-02
+	NB-94	702.63	100.00	-1.56E-02	4.43E-02	4.43E-02
		871.10	100.00	6.88E-03		4.50E-02
+	I-131	284.30	6.06	-9.13E-01	1.87E-01	2.33E+00
		364.48	81.20	-1.36E-02		1.87E-01
		636.97	7.27	-8.32E-01		2.25E+00

Analysis Report for L2-011-102-FSGA-013-AV

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-134	604.70	97.60	1.01E-02	5.61E-02	5.61E-02
		795.84	85.40	3.49E-02		5.90E-02
+	CS-137	661.65	85.12	5.00E-02	5.58E-02	5.58E-02
+	CE-144	80.12	1.36	2.92E+00	2.88E-01	3.66E+00
		133.51	11.09	-9.47E-02		2.88E-01
+	EU-152	121.78	28.40	3.08E-02	1.13E-01	1.13E-01
		344.28	26.60	-8.26E-02		1.38E-01
		1408.00	20.74	-5.22E-02		2.16E-01
+	EU-154	123.07	40.40	4.48E-02	7.98E-02	7.98E-02
		723.30	19.70	3.59E-02		2.13E-01
		1274.51	35.50	-1.15E-01		1.54E-01
+	EU-155	86.54	32.80	-6.07E-02	1.24E-01	1.24E-01
		105.31	21.80	6.70E-03		1.52E-01
+	BI-214	609.31	* 46.30	1.38E-01	9.46E-02	9.46E-02
		1120.29	* 15.10	2.03E-01		2.42E-01
		1238.11	5.94	7.75E-01		1.18E+00
		1377.67	4.11	-4.01E-01		1.26E+00
		1407.98	2.48	-4.35E-01		1.81E+00
		1509.19	2.19	2.17E+00		2.08E+00
		1764.49	15.80	3.03E-01		3.84E-01
+	PB-214	77.11	10.70	3.28E-01	1.16E-01	4.75E-01
		295.21	19.20	8.06E-02		1.90E-01
		351.92	37.20	2.02E-01		1.16E-01
+	PA-228	89.95	22.00	1.05E+05	4.76E+04	8.13E+04
		93.35	35.00	1.19E+04		4.76E+04
		105.00	16.30	-2.21E+04		9.25E+04
		129.22	2.97	-8.12E+04		4.77E+05
		338.32	5.30	1.91E+05		3.15E+05
		463.00	13.80	8.00E+04		1.25E+05
		911.23	16.70	9.17E+04		1.53E+05
+	AM-241	59.54	36.30	3.77E-02	2.40E-01	2.40E-01
+	CM-243	103.76	23.00	7.06E-02	1.44E-01	1.44E-01
		228.18	10.60	3.37E-02		2.92E-01
		277.60	14.00	1.26E-01		2.28E-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 L2-011-102-FSGS-013-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L2-011-102-FSGS-013-SS
Sample Description	: L2-011-102
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 7.917E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 12/21/2018 8:07:13AM
Acquisition Started	: 1/8/2019 6:13:54AM
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	: 5571

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:43:11PM

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

Analysis Report for L2-011-102-FSGS-013-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	238.41	471 -	482	477.30	1.32E+02	36.39	6.11E+02	1.42
F	2	295.18	585 -	595	590.81	9.30E+01	29.97	2.86E+02	1.87
F	3	338.49	673 -	681	677.42	3.41E+01	19.69	1.76E+02	1.22
F	4	351.95	699 -	711	704.33	1.93E+02	33.54	2.26E+02	1.78
F	5	583.08	1158 -	1171	1166.51	5.25E+01	19.61	1.33E+02	1.63
F	6	609.24	1211 -	1226	1218.82	1.40E+02	27.38	1.52E+02	1.73
F	7	911.55	1818 -	1828	1823.34	2.93E+01	15.52	6.65E+01	1.79
F	8	968.72	1933 -	1943	1937.66	1.60E+01	10.62	5.64E+01	0.85
F	9	1120.31	2234 -	2245	2240.81	2.98E+01	15.13	6.57E+01	1.83
F	10	1460.70	2912 -	2930	2921.52	4.53E+02	42.95	1.90E+01	2.43

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 : 1/24/2019 3:43:11PM

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	238.41	1.32E+02	36.39			1.32E+02	3.64E+01
F	2	295.18	9.30E+01	29.97			9.30E+01	3.00E+01
F	3	338.49	3.41E+01	19.69			3.41E+01	1.97E+01
F	4	351.95	1.93E+02	33.54	8.36E+01	3.72E+01	1.09E+02	5.01E+01
F	5	583.08	5.25E+01	19.61			5.25E+01	1.96E+01
F	6	609.24	1.40E+02	27.38	4.12E+01	2.42E+01	9.84E+01	3.66E+01
F	7	911.55	2.93E+01	15.52			2.93E+01	1.55E+01
F	8	968.72	1.60E+01	10.62			1.60E+01	1.06E+01
F	9	1120.31	2.98E+01	15.13			2.98E+01	1.51E+01
F	10	1460.70	4.53E+02	42.95	5.63E+01	1.71E+01	3.96E+02	4.62E+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 L2-011-102-FSGS-013-SS
L2-011-102

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	1.00	1460.75 *	10.67	5.45E+00	7.05E-01
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	8.61E-02	2.41E-02
BI-214	0.58	609.31 *	46.30	1.43E-01	5.38E-02
		1120.29 *	15.10	2.30E-01	1.17E-01
		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	1.68E-01	5.48E-02
		351.92 *	37.20	1.19E-01	5.50E-02
AC-228	0.62	209.28	4.40		
		338.32 *	11.40	1.17E-01	6.79E-02
		794.70	4.60		
		911.60 *	27.70	1.03E-01	5.45E-02
		964.60	5.20		
		969.11 *	16.60	9.87E-02	6.57E-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

Analysis Report for L2-011-102-FSGS-013-SS

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	1.000	5.45E+00	7.05E-01	
PB-212	0.555	8.61E-02	2.41E-02	
BI-214	0.585	1.58E-01	4.89E-02	
PB-214	0.721	1.44E-01	3.88E-02	
AC-228	0.626	1.06E-01	3.57E-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 L2-011-102-FSGS-013-SS

L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:43:11PM
 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	583.08	1.45939E-02	18.66		

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\Daistryland_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	5.45E+00	6.13E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	-7.48E-03	5.61E-02	6.16E-02
		1332.49	100.00	-1.35E-02		5.61E-02
+	KR-85	513.99	0.43	2.78E+00	9.84E+00	9.84E+00
+	Y-88	898.04	93.70	7.10E-04	3.19E-02	5.91E-02
		1836.06	99.20	7.61E-03		3.19E-02
+	NB-94	702.63	100.00	-2.38E-02	4.13E-02	4.21E-02
		871.10	100.00	-4.63E-02		4.13E-02
+	I-131	284.30	6.06	-6.48E-01	1.86E-01	2.44E+00
		364.48	81.20	7.14E-03		1.86E-01
		636.97	7.27	-1.37E+00		2.35E+00
+	CS-134	604.70	97.60	2.96E-03	5.27E-02	5.74E-02
		795.84	85.40	-3.71E-02		5.27E-02
+	CS-137	661.65	85.12	8.43E-02	5.65E-02	5.65E-02
+	CE-144	80.12	1.36	4.63E+00	2.83E-01	3.60E+00
		133.51	11.09	-3.02E-02		2.83E-01

Analysis Report for L2-011-102-FSGS-013-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	EU-152	121.78	28.40	-1.56E-02	1.02E-01	1.02E-01
		344.28	26.60	-1.00E-01		1.30E-01
		1408.00	20.74	-3.10E-02		2.21E-01
+	EU-154	123.07	40.40	-2.00E-02	7.23E-02	7.23E-02
		723.30	19.70	1.22E-01		2.43E-01
		1274.51	35.50	5.41E-02		1.48E-01
+	EU-155	86.54	32.80	-9.50E-02	1.20E-01	1.20E-01
		105.31	21.80	4.29E-02		1.45E-01
+	BI-214	609.31	* 46.30	1.43E-01	1.02E-01	1.02E-01
		1120.29	* 15.10	2.30E-01		2.51E-01
		1238.11	5.94	4.74E-01		1.21E+00
		1377.67	4.11	6.24E-01		1.18E+00
		1407.98	2.48	-2.59E-01		1.84E+00
		1509.19	2.19	5.17E-01		1.88E+00
		1764.49	15.80	1.72E-01		3.12E-01
+	PB-214	77.11	10.70	3.00E-01	9.99E-02	4.59E-01
		295.21	* 19.20	1.68E-01		1.14E-01
		351.92	* 37.20	1.19E-01		9.99E-02
+	PA-228	89.95	22.00	8.81E+04	8.12E+04	1.36E+05
		93.35	35.00	7.27E+04		8.12E+04
		105.00	16.30	6.29E+04		1.51E+05
		129.22	2.97	-3.98E+05		7.79E+05
		338.32	5.30	-1.68E+05		4.83E+05
		463.00	13.80	1.49E+05		2.11E+05
		911.23	16.70	2.21E+05		2.53E+05
+	AM-241	59.54	36.30	1.57E-02	2.23E-01	2.23E-01
+	CM-243	103.76	23.00	-1.15E-02	1.38E-01	1.38E-01
		228.18	10.60	-6.44E-02		2.79E-01
		277.60	14.00	1.01E-01		2.36E-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 L2-011-102-FSGA-014-AV
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGA-014-AV
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 6.860E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/21/2018 7:30:00AM
Acquisition Started : 1/7/2019 11:05:13AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.3 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 : 5573

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:45:17PM

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

Analysis Report for L2-011-102-FSGA-014-AV

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	186.16	366 -	377	372.82	6.35E+01	31.87	5.41E+02	1.60
F	2	238.33	469 -	482	477.14	1.07E+02	33.86	6.44E+02	1.37
F	3	295.06	586 -	597	590.58	8.33E+01	28.87	3.20E+02	1.73
F	4	351.84	698 -	709	704.11	1.44E+02	30.84	2.54E+02	1.63
F	5	609.18	1212 -	1226	1218.70	1.32E+02	26.71	1.06E+02	2.22
F	6	1460.70	2912 -	2929	2921.51	2.94E+02	35.11	3.13E+01	2.50

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 : 1/24/2019 3:45:17PM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	186.16	6.35E+01	31.87			6.35E+01	3.19E+01
F	2	238.33	1.07E+02	33.86			1.07E+02	3.39E+01
F	3	295.06	8.33E+01	28.87			8.33E+01	2.89E+01
F	4	351.84	1.44E+02	30.84	8.36E+01	3.72E+01	6.00E+01	4.83E+01
F	5	609.18	1.32E+02	26.71	4.12E+01	2.42E+01	9.11E+01	3.61E+01
F	6	1460.70	2.94E+02	35.11	5.63E+01	1.71E+01	2.37E+02	3.91E+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 L2-011-102-FSGA-014-AV

L2-011-102

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	1.00	1460.75 *	10.67	3.77E+00	6.55E-01
PB-212	0.55	77.11	17.50		
		238.63 *	44.60	8.07E-02	2.58E-02
BI-214	0.34	609.31 *	46.30	1.53E-01	6.11E-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	6.08E-02
		351.92 *	37.20	7.56E-02	6.10E-02
RA-226	1.00	186.21 *	3.28	5.46E-01	2.76E-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	1.000	3.77E+00	6.55E-01	
PB-212	0.551	8.07E-02	2.58E-02	

Analysis Report for L2-011-102-FSGA-014-AV

L2-011-102

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
BI-214	0.348	1.53E-01	6.11E-02	
PB-214	0.720	1.25E-01	4.30E-02	
RA-226	1.000	5.46E-01	2.76E-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 L2-011-102-FSGA-014-AV
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:45:17PM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
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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_NPPLibrary\HOTLAB.NLB

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	3.77E+00	7.45E-01	7.45E-01
+	@ AR-41	1293.64		99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22		100.00	2.75E-02	5.96E-02	6.57E-02
		1332.49		100.00	3.01E-02		5.96E-02
+	KR-85	513.99		0.43	1.77E+01	1.13E+01	1.13E+01
+	Y-88	898.04		93.70	-5.77E-02	3.67E-02	5.34E-02
		1836.06		99.20	-3.44E-02		3.67E-02
+	NB-94	702.63		100.00	8.04E-03	4.54E-02	4.54E-02
		871.10		100.00	-2.80E-02		4.68E-02
+	I-131	284.30		6.06	-3.85E-01	1.80E-01	2.53E+00
		364.48		81.20	-4.48E-02		1.80E-01
		636.97		7.27	1.72E+00		2.65E+00
+	CS-134	604.70		97.60	-2.92E-03	5.55E-02	6.09E-02
		795.84		85.40	-1.72E-03		5.55E-02
+	CS-137	661.65		85.12	6.69E-02	6.26E-02	6.26E-02
+	CE-144	80.12		1.36	2.16E+00	3.06E-01	3.80E+00
		133.51		11.09	-7.77E-02		3.06E-01
+	EU-152	121.78		28.40	-7.72E-02	1.16E-01	1.16E-01

Analysis Report for L2-011-102-FSGA-014-AV

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	EU-152	344.28	26.60	2.59E-02	1.16E-01	1.52E-01
		1408.00	20.74	-1.55E-01		2.24E-01
+	EU-154	123.07	40.40	3.10E-02	8.20E-02	8.20E-02
		723.30	19.70	6.74E-02		2.34E-01
		1274.51	35.50	1.02E-01		1.69E-01
+	EU-155	86.54	32.80	-1.21E-01	1.29E-01	1.29E-01
		105.31	21.80	-7.59E-02		1.60E-01
+	BI-214	609.31	*	46.30	1.06E-01	1.06E-01
		1120.29	15.10	4.41E-01		4.49E-01
		1238.11	5.94	7.22E-01		1.27E+00
		1377.67	4.11	4.24E-01		1.19E+00
		1407.98	2.48	-1.29E+00		1.87E+00
		1509.19	2.19	2.17E+00		2.31E+00
		1764.49	15.80	1.54E-01		3.99E-01
+	PB-214	77.11	10.70	3.06E-01	1.17E-01	4.98E-01
		295.21	*	1.74E-01		1.43E-01
		351.92	*	7.56E-02		1.17E-01
+	PA-228	89.95	22.00	1.16E+05	4.91E+04	8.25E+04
		93.35	35.00	2.09E+04		4.91E+04
		105.00	16.30	-5.21E+04		9.26E+04
		129.22	2.97	1.99E+05		4.78E+05
		338.32	5.30	-1.16E+05		3.05E+05
		463.00	13.80	3.78E+04		1.18E+05
		911.23	16.70	9.51E+04		1.42E+05
+	AM-241	59.54	36.30	5.26E-02	2.43E-01	2.43E-01
+	CM-243	103.76	23.00	3.03E-02	1.53E-01	1.53E-01
		228.18	10.60	-2.97E-03		3.17E-01
		277.60	14.00	-7.77E-02		2.61E-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 L2-011-102-FSGS-014-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-014-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 7.884E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/21/2018 7:45:00AM
Acquisition Started : 1/7/2019 12:19:58PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.5 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 : 5575

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:46:40PM

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

Analysis Report for L2-011-102-FSGS-014-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	77.17	148 -	161	154.88	8.36E+01	38.39	1.28E+03	1.20
F	2	185.86	369 -	378	372.22	8.98E+01	33.60	4.97E+02	1.64
F	3	238.48	472 -	481	477.43	1.84E+02	39.83	5.24E+02	1.43
F	4	295.25	586 -	596	590.96	9.40E+01	29.25	2.97E+02	1.62
F	5	337.72	672 -	680	675.87	2.76E+01	19.32	1.93E+02	1.17
F	6	351.79	695 -	712	704.01	1.93E+02	33.98	3.02E+02	2.03
F	7	583.13	1163 -	1171	1166.60	5.60E+01	18.15	7.62E+01	1.11
F	8	609.30	1214 -	1226	1218.93	1.42E+02	27.21	8.83E+01	2.24
F	9	911.20	1817 -	1829	1822.63	4.19E+01	16.31	6.60E+01	1.72
F	10	968.74	1933 -	1943	1937.71	3.27E+01	15.30	5.49E+01	1.81
F	11	1120.51	2236 -	2246	2241.20	2.92E+01	14.68	6.11E+01	1.57
F	12	1460.66	2914 -	2929	2921.43	5.20E+02	46.67	3.88E+01	2.68
F	13	1763.56	3523 -	3532	3527.20	2.17E+01	10.20	7.81E+00	2.01

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 : 1/24/2019 3:46:40PM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	77.17	8.36E+01	38.39			8.36E+01	3.84E+01
F	2	185.86	8.98E+01	33.60			8.98E+01	3.36E+01
F	3	238.48	1.84E+02	39.83			1.84E+02	3.98E+01
F	4	295.25	9.40E+01	29.25			9.40E+01	2.93E+01
F	5	337.72	2.76E+01	19.32			2.76E+01	1.93E+01
F	6	351.79	1.93E+02	33.98	8.36E+01	3.72E+01	1.09E+02	5.04E+01
F	7	583.13	5.60E+01	18.15			5.60E+01	1.81E+01
F	8	609.30	1.42E+02	27.21	4.12E+01	2.42E+01	1.01E+02	3.64E+01
F	9	911.20	4.19E+01	16.31			4.19E+01	1.63E+01
F	10	968.74	3.27E+01	15.30			3.27E+01	1.53E+01
F	11	1120.51	2.92E+01	14.68			2.92E+01	1.47E+01
F	12	1460.66	5.20E+02	46.67	5.63E+01	1.71E+01	4.64E+02	4.97E+01
F	13	1763.56	2.17E+01	10.20			2.17E+01	1.02E+01

Analysis Report for L2-011-102-FSGS-014-SS
L2-011-102

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

Nuclide Name	Id Confidence	Energy (keV)	Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75 *	10.67	6.42E+00	7.74E-01
PB-212	0.99	77.11 *	17.50	1.49E-01	6.92E-02
		238.63 *	44.60	1.20E-01	2.68E-02
BI-214	0.76	609.31 *	46.30	1.47E-01	5.38E-02
		1120.29 *	15.10	2.26E-01	1.14E-01
		1238.11	5.94		
		1377.67	4.11		
		1407.98	2.48		
		1509.19	2.19		
		1764.49 *	15.80	2.37E-01	1.12E-01
PB-214	0.99	77.11 *	10.70	2.44E-01	1.13E-01
		295.21 *	19.20	1.71E-01	5.37E-02
		351.92 *	37.20	1.19E-01	5.55E-02
RA-226	0.98	186.21 *	3.28	6.72E-01	2.54E-01
AC-228	0.60	209.28	4.40		
		338.32 *	11.40	9.49E-02	6.67E-02
		794.70	4.60		
		911.60 *	27.70	1.47E-01	5.77E-02
		964.60	5.20		
		969.11 *	16.60	2.03E-01	9.52E-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

Analysis Report for L2-011-102-FSGS-014-SS

L2-011-102

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.999	6.42E+00	7.74E-01	
PB-212	0.997	1.13E-01	2.51E-02	
BI-214	0.763	1.74E-01	4.47E-02	
PB-214	0.998	1.37E-01	3.68E-02	
RA-226	0.980	6.72E-01	2.54E-01	
AC-228	0.608	1.38E-01	3.97E-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 L2-011-102-FSGS-014-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:46:40PM
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 7	583.13	1.55648E-02	16.19		

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	6.42E+00	6.59E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	3.68E-02	5.31E-02	6.37E-02
		1332.49	100.00	1.11E-02		5.31E-02
+	KR-85	513.99	0.43	1.07E+01	9.98E+00	9.98E+00
+	Y-88	898.04	93.70	1.53E-02	4.17E-02	5.78E-02
		1836.06	99.20	-2.95E-03		4.17E-02
+	NB-94	702.63	100.00	1.20E-02	4.25E-02	4.25E-02
		871.10	100.00	-3.62E-02		4.71E-02
+	I-131	284.30	6.06	-1.30E-01	1.70E-01	2.34E+00
		364.48	81.20	-1.69E-01		1.70E-01
		636.97	7.27	-7.02E-01		2.35E+00
+	CS-134	604.70	97.60	-5.03E-02	4.98E-02	5.54E-02
		795.84	85.40	-7.50E-02		4.98E-02
+	CS-137	661.65	85.12	5.70E-02	5.76E-02	5.76E-02
+	CE-144	80.12	1.36	9.69E-02	2.78E-01	3.60E+00
		133.51	11.09	-4.71E-03		2.78E-01

Analysis Report for L2-011-102-FSGS-014-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	EU-152	121.78	28.40	3.90E-02	1.07E-01	1.07E-01
		344.28	26.60	-2.31E-02		1.35E-01
		1408.00	20.74	1.11E-01		2.19E-01
+	EU-154	123.07	40.40	2.16E-02	7.52E-02	7.52E-02
		723.30	19.70	1.08E-02		2.22E-01
		1274.51	35.50	-1.09E-01		1.57E-01
+	EU-155	86.54	32.80	-7.67E-02	1.25E-01	1.25E-01
		105.31	21.80	-1.87E-01		1.44E-01
+	BI-214	609.31	* 46.30	1.47E-01	8.79E-02	8.79E-02
		1120.29	* 15.10	2.26E-01		2.40E-01
		1238.11	5.94	6.77E-01		1.15E+00
		1377.67	4.11	-8.26E-02		1.18E+00
		1407.98	2.48	9.25E-01		1.83E+00
		1509.19	2.19	1.37E+00		2.09E+00
		1764.49	* 15.80	2.37E-01		1.38E-01
+	PB-214	77.11	* 10.70	2.44E-01	1.12E-01	4.12E-01
		295.21	* 19.20	1.71E-01		1.17E-01
		351.92	* 37.20	1.19E-01		1.12E-01
+	PA-228	89.95	22.00	-1.66E+04	4.83E+04	7.99E+04
		93.35	35.00	4.38E+04		4.83E+04
		105.00	16.30	-7.77E+04		8.64E+04
		129.22	2.97	-7.26E+03		4.50E+05
		338.32	5.30	3.79E+04		2.87E+05
		463.00	13.80	2.95E+04		1.20E+05
		911.23	16.70	1.67E+05		1.55E+05
+	AM-241	59.54	36.30	3.08E-02	2.22E-01	2.22E-01
+	CM-243	103.76	23.00	-2.16E-01	1.37E-01	1.37E-01
		228.18	10.60	-9.35E-02		2.83E-01
		277.60	14.00	-2.54E-02		2.35E-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 L2-011-102-FJGS-015-SS
L2-011-102

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FJGS-015-SS
Sample Description : L2-011-102
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 5.826E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 2:21:56PM
Acquisition Started : 1/7/2019 8:28:01AM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.2 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 : 5577

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/24/2019 3:48:50PM

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

Analysis Report for L2-011-102-FJGS-015-SS

L2-011-102

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.20	147 -	160	152.94	3.03E+02	64.19	1.32E+03	3.38
M	2	87.60	173 -	191	175.74	6.96E+01	35.02	6.55E+02	1.21
m	3	92.90	173 -	191	186.33	7.28E+01	33.95	6.33E+02	1.22
F	4	186.17	365 -	380	372.83	1.33E+02	44.26	7.99E+02	2.76
M	5	238.54	474 -	491	477.56	3.28E+02	44.81	3.67E+02	1.66
m	6	241.45	474 -	491	483.38	1.30E+02	31.37	3.88E+02	1.66
F	7	295.14	585 -	596	590.74	1.45E+02	34.44	3.62E+02	1.82
F	8	338.04	673 -	680	676.51	5.60E+01	23.52	1.88E+02	1.32
F	9	351.73	695 -	709	703.88	2.93E+02	39.17	2.47E+02	1.85
F	10	583.13	1160 -	1173	1166.61	1.36E+02	27.77	1.30E+02	2.12
F	11	609.25	1214 -	1227	1218.84	2.01E+02	31.20	1.03E+02	2.00
F	12	910.76	1817 -	1828	1821.76	6.84E+01	19.92	7.55E+01	1.64
F	13	968.26	1933 -	1943	1936.74	2.43E+01	13.79	7.87E+01	1.12
F	14	1119.95	2232 -	2245	2240.08	4.15E+01	15.70	4.20E+01	2.20
F	15	1460.57	2913 -	2930	2921.25	3.43E+02	37.66	2.04E+01	2.74
F	16	1763.73	3521 -	3535	3527.54	4.51E+01	14.29	4.12E+00	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 : 1/24/2019 3:48:50PM

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	76.20	3.03E+02	64.19			3.03E+02	6.42E+01
M	2	87.60	6.96E+01	35.02			6.96E+01	3.50E+01
m	3	92.90	7.28E+01	33.95			7.28E+01	3.39E+01
F	4	186.17	1.33E+02	44.26			1.33E+02	4.43E+01
M	5	238.54	3.28E+02	44.81			3.28E+02	4.48E+01
m	6	241.45	1.30E+02	31.37			1.30E+02	3.14E+01
F	7	295.14	1.45E+02	34.44			1.45E+02	3.44E+01
F	8	338.04	5.60E+01	23.52			5.60E+01	2.35E+01
F	9	351.73	2.93E+02	39.17	8.36E+01	3.72E+01	2.10E+02	5.40E+01
F	10	583.13	1.36E+02	27.77			1.36E+02	2.78E+01
F	11	609.25	2.01E+02	31.20	4.12E+01	2.42E+01	1.60E+02	3.95E+01
F	12	910.76	6.84E+01	19.92			6.84E+01	1.99E+01
F	13	968.26	2.43E+01	13.79			2.43E+01	1.38E+01

Analysis Report for L2-011-102-FJGS-015-SS

L2-011-102

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	14	1119.95	4.15E+01	15.70			4.15E+01	1.57E+01
F	15	1460.57	3.43E+02	37.66	5.63E+01	1.71E+01	2.87E+02	4.14E+01
F	16	1763.73	4.51E+01	14.29	1.52E+01	9.80E+00	3.00E+01	1.73E+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\Daityland_NPPLibrary\HOTLAB.NLB

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	5.36E+00	8.29E-01
PB-212	0.96	77.11	*	17.50	7.47E-01	1.65E-01
		238.63	*	44.60	2.90E-01	4.24E-02
BI-214	0.76	609.31	*	46.30	3.17E-01	8.00E-02
		1120.29	*	15.10	4.35E-01	1.66E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49	*	15.80	4.43E-01	2.58E-01
PB-214	0.97	77.11	*	10.70	1.22E+00	2.71E-01
		295.21	*	19.20	3.56E-01	8.63E-02
		351.92	*	37.20	3.11E-01	8.15E-02
RA-226	1.00	186.21	*	3.28	1.35E+00	4.54E-01
AC-228	0.56	209.28		4.40		
		338.32	*	11.40	2.61E-01	1.10E-01
		794.70		4.60		
		911.60	*	27.70	3.25E-01	9.58E-02
		964.60		5.20		
		969.11	*	16.60	2.04E-01	1.16E-01

Analysis Report for L2-011-102-FJGS-015-SS

L2-011-102

* = 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	5.36E+00	8.29E-01	
PB-212	0.962	3.05E-01	4.11E-02	
BI-214	0.769	3.47E-01	6.94E-02	
PB-214	0.976	3.50E-01	5.80E-02	
RA-226	1.000	1.35E+00	4.54E-01	
AC-228	0.561	2.71E-01	6.14E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-FJGS-015-SS
L2-011-102

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/24/2019 3:48:50PM
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 2	87.60	1.93278E-02	25.17		
m 3	92.90	2.02138E-02	23.33	Tol.	PA-228
m 6	241.45	3.61621E-02	12.05		
F 10	583.13	3.77060E-02	10.23		

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_NPPLibrary\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	* 10.67	5.36E+00	8.32E-01	8.32E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	7.74E-02	7.41E-02	8.44E-02
		1332.49	100.00	3.66E-02		7.41E-02
+	KR-85	513.99	0.43	1.67E+01	1.48E+01	1.48E+01
+	Y-88	898.04	93.70	1.30E-02	5.98E-02	7.67E-02
		1836.06	99.20	-1.69E-02		5.98E-02
+	NB-94	702.63	100.00	9.59E-03	5.96E-02	5.96E-02
		871.10	100.00	-2.39E-03		6.05E-02

Analysis Report for L2-011-102-FJGS-015-SS

L2-011-102

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	I-131	284.30	6.06	-1.98E+00	2.63E-01	3.46E+00
		364.48	81.20	-2.27E-02		2.63E-01
		636.97	7.27	2.32E+00		3.47E+00
+	CS-134	604.70	97.60	-9.67E-02	7.37E-02	8.47E-02
		795.84	85.40	1.57E-02		7.37E-02
+	CS-137	661.65	85.12	1.28E-01	8.20E-02	8.20E-02
+	CE-144	80.12	1.36	-8.05E-01	3.91E-01	5.36E+00
		133.51	11.09	1.83E-01		3.91E-01
+	EU-152	121.78	28.40	-6.35E-02	1.47E-01	1.47E-01
		344.28	26.60	-7.88E-02		1.98E-01
		1408.00	20.74	1.82E-01		3.10E-01
+	EU-154	123.07	40.40	-1.78E-02	1.04E-01	1.04E-01
		723.30	19.70	2.53E-01		3.11E-01
		1274.51	35.50	1.46E-01		2.18E-01
+	EU-155	86.54	32.80	-3.66E-02	1.77E-01	1.77E-01
		105.31	21.80	3.36E-02		2.10E-01
+	BI-214	609.31	* 46.30	3.17E-01	1.24E-01	1.24E-01
		1120.29	* 15.10	4.35E-01		2.91E-01
		1238.11	5.94	2.45E-02		1.52E+00
		1377.67	4.11	8.12E-01		1.76E+00
		1407.98	2.48	1.52E+00		2.59E+00
		1509.19	2.19	-1.56E-01		2.80E+00
		1764.49	* 15.80	4.43E-01		3.69E-01
+	PB-214	77.11	* 10.70	1.22E+00	1.41E-01	5.78E-01
		295.21	* 19.20	3.56E-01		1.79E-01
		351.92	* 37.20	3.11E-01		1.41E-01
+	PA-228	89.95	22.00	-2.22E+04	9.92E+04	1.72E+05
		93.35	35.00	-5.05E+03		9.92E+04
		105.00	16.30	-2.40E+03		1.91E+05
		129.22	2.97	1.94E+05		9.69E+05
		338.32	5.30	4.35E+05		6.49E+05
		463.00	13.80	2.26E+05		2.64E+05
		911.23	16.70	5.47E+05		3.48E+05
+	AM-241	59.54	36.30	2.18E-01	3.14E-01	3.14E-01
+	CM-243	103.76	23.00	5.81E-02	1.99E-01	1.99E-01
		228.18	10.60	-1.16E-01		4.05E-01
		277.60	14.00	-1.56E-01		3.30E-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 L2-011-102-FJGS-015-SS
L2-011-102

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102 / SPLIT

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-002-SS
Sample Description : L2-011-102 / SPLIT
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 7.964E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 1:53:00PM
Acquisition Started : 1/15/2019 2:49:41PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3610.6 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 : 5366

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 3:49:55PM

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

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102 / SPLIT

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.34	147 -	161	153.23	2.69E+02	65.09	1.56E+03	3.14
F	2	93.01	182 -	191	186.55	1.02E+02	40.83	8.75E+02	1.46
F	3	238.52	469 -	481	477.52	3.11E+02	49.93	7.62E+02	1.69
F	4	294.98	582 -	597	590.42	1.24E+02	35.97	5.33E+02	2.10
F	5	351.97	699 -	712	704.38	2.30E+02	37.80	2.98E+02	2.07
F	6	477.44	948 -	960	955.25	4.37E+01	20.40	1.70E+02	1.67
F	7	583.27	1162 -	1174	1166.89	1.12E+02	25.52	1.09E+02	2.12
F	8	609.31	1212 -	1226	1218.96	1.98E+02	32.68	1.56E+02	2.32
F	9	911.24	1815 -	1830	1822.71	5.04E+01	20.15	1.20E+02	2.45
F	10	969.20	1934 -	1944	1938.63	3.08E+01	15.53	8.67E+01	1.35
F	11	1460.97	2912 -	2933	2922.05	5.15E+02	45.63	1.51E+01	2.89
F	12	1764.69	3524 -	3535	3529.45	3.14E+01	12.12	9.18E+00	2.60

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 : 1/15/2019 3:49:55PM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.34	2.69E+02	65.09			2.69E+02	6.51E+01
F	2	93.01	1.02E+02	40.83			1.02E+02	4.08E+01
F	3	238.52	3.11E+02	49.93			3.11E+02	4.99E+01
F	4	294.98	1.24E+02	35.97			1.24E+02	3.60E+01
F	5	351.97	2.30E+02	37.80	8.36E+01	3.72E+01	1.47E+02	5.30E+01
F	6	477.44	4.37E+01	20.40			4.37E+01	2.04E+01
F	7	583.27	1.12E+02	25.52			1.12E+02	2.55E+01
F	8	609.31	1.98E+02	32.68	4.12E+01	2.42E+01	1.56E+02	4.07E+01
F	9	911.24	5.04E+01	20.15			5.04E+01	2.02E+01
F	10	969.20	3.08E+01	15.53			3.08E+01	1.55E+01
F	11	1460.97	5.15E+02	45.63	5.63E+01	1.71E+01	4.59E+02	4.87E+01
F	12	1764.69	3.14E+01	12.12	1.52E+01	9.80E+00	1.62E+01	1.56E+01

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102 / SPLIT

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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	6.28E+00	7.52E-01
PB-212	0.97	77.11	*	17.50	4.84E-01	1.21E-01
		238.63	*	44.60	2.01E-01	3.40E-02
BI-214	0.55	609.31	*	46.30	2.26E-01	6.02E-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	1.76E-01	1.69E-01
PB-214	0.98	77.11	*	10.70	7.92E-01	1.98E-01
		295.21	*	19.20	2.22E-01	6.55E-02
		351.92	*	37.20	1.59E-01	5.81E-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

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102 / SPLIT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.992	6.28E+00	7.52E-01	
PB-212	0.973	2.13E-01	3.28E-02	
BI-214	0.551	2.20E-01	5.67E-02	
PB-214	0.982	1.99E-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 L2-011-102-FSGS-002-SS
L2-011-102 / SPLIT

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 3:49:55PM
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	93.01	2.83662E-02	19.99	Tol.	PA-228
F 6	477.44	1.21387E-02	23.34	Sum	
F 7	583.27	3.09823E-02	11.44		
F 9	911.24	1.39967E-02	20.00	Tol.	AC-228 PA-228
F 10	969.20	8.54718E-03	25.23	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_NPPLibrary\HOTLAB.NLB

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	* 10.67	6.28E+00	6.00E-01	6.00E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	-2.05E-02	5.82E-02	6.33E-02
		1332.49	100.00	7.44E-03		5.82E-02
+	KR-85	513.99	0.43	1.45E+01	1.09E+01	1.09E+01
+	Y-88	898.04	93.70	1.50E-02	4.50E-02	5.92E-02
		1836.06	99.20	-4.09E-02		4.50E-02
+	NB-94	702.63	100.00	-1.78E-02	4.33E-02	4.33E-02
		871.10	100.00	-3.60E-02		4.41E-02

Analysis Report for L2-011-102-FSGS-002-SS

L2-011-102 / SPLIT

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	I-131	284.30	6.06	3.04E-01	3.82E-01	5.26E+00
		364.48	81.20	-7.42E-02		3.82E-01
		636.97	7.27	-6.35E-01		5.09E+00
+	CS-134	604.70	97.60	-6.71E-03	5.54E-02	6.35E-02
		795.84	85.40	-9.47E-03		5.54E-02
+	CS-137	661.65	85.12	2.68E-02	5.72E-02	5.72E-02
+	CE-144	80.12	1.36	-8.41E-01	3.03E-01	4.04E+00
		133.51	11.09	-9.21E-02		3.03E-01
+	EU-152	121.78	28.40	-7.29E-02	1.13E-01	1.13E-01
		344.28	26.60	-3.59E-02		1.51E-01
		1408.00	20.74	-4.13E-03		2.50E-01
+	EU-154	123.07	40.40	-2.80E-02	7.94E-02	7.94E-02
		723.30	19.70	-1.10E-01		2.26E-01
		1274.51	35.50	-1.35E-01		1.66E-01
+	EU-155	86.54	32.80	5.13E-02	1.32E-01	1.32E-01
		105.31	21.80	-2.06E-02		1.55E-01
+	BI-214	609.31	* 46.30	2.26E-01	1.00E-01	1.00E-01
		1120.29	15.10	2.39E-01		4.54E-01
		1238.11	5.94	5.70E-02		1.19E+00
		1377.67	4.11	7.91E-01		1.47E+00
		1407.98	2.48	-3.44E-02		2.09E+00
		1509.19	2.19	6.16E-01		2.07E+00
		1764.49	* 15.80	1.76E-01		2.83E-01
+	PB-214	77.11	* 10.70	7.92E-01	1.06E-01	4.68E-01
		295.21	* 19.20	2.22E-01		1.75E-01
		351.92	* 37.20	1.59E-01		1.06E-01
+	PA-228	89.95	22.00	-4.30E+06	4.04E+07	6.84E+07
		93.35	35.00	1.17E+07		4.04E+07
		105.00	16.30	-2.52E+06		7.42E+07
		129.22	2.97	7.81E+07		3.83E+08
		338.32	5.30	1.21E+08		2.65E+08
		463.00	13.80	5.02E+06		1.01E+08
		911.23	16.70	1.82E+08		1.32E+08
+	AM-241	59.54	36.30	7.08E-02	2.34E-01	2.34E-01
+	CM-243	103.76	23.00	7.17E-02	1.49E-01	1.49E-01
		228.18	10.60	-8.04E-02		3.04E-01
		277.60	14.00	3.99E-02		2.55E-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 L2-011-102-FSGS-002-SS

L2-011-102 / SPLIT

Analysis Report for L2-011-102-FSGS-007-SS
L2-011-102 / SPLIT

GAMMA SPECTRUM ANALYSIS

Sample Identification : L2-011-102-FSGS-007-SS
Sample Description : L2-011-102 / SPLIT
Sample Type : 500 ml Marinelli
Unit :
Sample Point :

Sample Size : 7.023E+02 grams
Facility : Dairyland_NPP

Sample Taken On : 12/20/2018 2:42:00PM
Acquisition Started : 1/15/2019 4:12:11PM

Procedure : 500ml Marinelli
Operator : Administrator
Detector Name : HOTLAB
Geometry : 500ml Marinelli
Live Time : 3600.0 seconds
Real Time : 3611.2 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 : 5378

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/23/2019 9:08:13AM

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

Analysis Report for L2-011-102-FSGS-007-SS

L2-011-102 / SPLIT

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.68	146 -	160	149.92	1.54E+02	43.19	8.98E+02	1.56
m	2	77.10	146 -	160	154.75	1.70E+02	45.46	1.01E+03	1.57
F	3	238.71	473 -	485	477.90	4.09E+02	52.44	6.32E+02	2.12
F	4	295.36	586 -	595	591.18	1.16E+02	32.61	3.08E+02	1.81
F	5	338.28	672 -	685	676.99	1.11E+02	31.17	3.10E+02	2.47
F	6	351.84	695 -	711	704.12	2.30E+02	36.79	3.48E+02	1.86
F	7	583.21	1162 -	1175	1166.76	1.06E+02	26.10	1.75E+02	1.76
F	8	609.17	1212 -	1224	1218.67	1.76E+02	30.58	1.14E+02	2.14
F	9	661.47	1318 -	1330	1323.25	1.10E+02	25.70	1.29E+02	1.93
F	10	910.87	1816 -	1828	1821.99	7.09E+01	20.39	5.77E+01	2.24
F	11	969.04	1933 -	1946	1938.31	5.22E+01	19.07	8.43E+01	2.22
F	12	1120.44	2236 -	2246	2241.07	3.77E+01	17.26	7.59E+01	1.91
F	13	1460.91	2912 -	2929	2921.94	4.98E+02	46.28	5.31E+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 : 1/23/2019 9:08:13AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	1	74.68	1.54E+02	43.19			1.54E+02	4.32E+01
m	2	77.10	1.70E+02	45.46			1.70E+02	4.55E+01
F	3	238.71	4.09E+02	52.44			4.09E+02	5.24E+01
F	4	295.36	1.16E+02	32.61			1.16E+02	3.26E+01
F	5	338.28	1.11E+02	31.17			1.11E+02	3.12E+01
F	6	351.84	2.30E+02	36.79	8.36E+01	3.72E+01	1.47E+02	5.23E+01
F	7	583.21	1.06E+02	26.10			1.06E+02	2.61E+01
F	8	609.17	1.76E+02	30.58	4.12E+01	2.42E+01	1.35E+02	3.90E+01
F	9	661.47	1.10E+02	25.70	6.61E+01	2.54E+01	4.36E+01	3.61E+01
F	10	910.87	7.09E+01	20.39			7.09E+01	2.04E+01
F	11	969.04	5.22E+01	19.07			5.22E+01	1.91E+01
F	12	1120.44	3.77E+01	17.26			3.77E+01	1.73E+01
F	13	1460.91	4.98E+02	46.28	5.63E+01	1.71E+01	4.42E+02	4.93E+01

Analysis Report for L2-011-102-FSGS-007-SS

L2-011-102 / SPLIT

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

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.99	1460.75	*	10.67	6.85E+00	8.55E-01
CS-137	0.99	661.65	*	85.12	4.20E-02	3.49E-02
PB-212	0.99	77.11	*	17.50	3.40E-01	9.38E-02
		238.63	*	44.60	3.01E-01	4.15E-02
BI-214	0.58	609.31	*	46.30	2.21E-01	6.51E-02
		1120.29	*	15.10	3.28E-01	1.51E-01
		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	5.56E-01	1.53E-01
		295.21	*	19.20	2.36E-01	6.75E-02
		351.92	*	37.20	1.80E-01	6.50E-02
AC-228	0.60	209.28		4.40		
		338.32	*	11.40	4.30E-01	1.23E-01
		794.70		4.60		
		911.60	*	27.70	2.80E-01	8.14E-02
		964.60		5.20		
		969.11	*	16.60	3.64E-01	1.34E-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

Analysis Report for L2-011-102-FSGS-007-SS

L2-011-102 / SPLIT

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.996	6.85E+00	8.55E-01	
CS-137	0.995	4.20E-02	3.49E-02	
PB-212	0.999	2.87E-01	3.83E-02	
BI-214	0.583	2.38E-01	5.98E-02	
PB-214	0.998	1.97E-01	4.51E-02	
AC-228	0.600	3.34E-01	6.05E-02	

? = nuclide is part of an undetermined solution

X = nuclide rejected by the interference analysis

@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 2.000sigma

Analysis Report for L2-011-102-FSGS-007-SS

L2-011-102 / SPLIT

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/23/2019 9:08:13AM
 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 1	74.68	4.28231E-02	14.01		
F 7	583.21	2.93380E-02	12.36		

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	6.85E+00	7.92E-01
+	@ AR-41	1293.64	99.16	1.00E+26	1.00E+26	1.00E+26
+	CO-60	1173.22	100.00	9.77E-02	6.39E-02	7.73E-02
		1332.49	100.00	4.97E-02		6.39E-02
+	KR-85	513.99	0.43	1.41E+01	1.21E+01	1.21E+01
+	Y-88	898.04	93.70	3.75E-02	4.96E-02	6.78E-02
		1836.06	99.20	-3.25E-02		4.96E-02
+	NB-94	702.63	100.00	1.55E-02	4.89E-02	4.89E-02
		871.10	100.00	-5.05E-02		5.43E-02
+	I-131	284.30	6.06	-4.77E+00	4.35E-01	6.00E+00
		364.48	81.20	-6.32E-02		4.35E-01
		636.97	7.27	-9.61E-01		5.93E+00
+	CS-134	604.70	97.60	-4.55E-03	6.72E-02	6.72E-02
		795.84	85.40	-1.20E-02		6.98E-02
+	CS-137	661.65	*	85.12	4.20E-02	6.59E-02

Analysis Report for L2-011-102-FSGS-007-SS

L2-011-102 / SPLIT

	Nuclide Name	Energy (keV)	Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12	1.36	-1.80E-01	3.48E-01	4.66E+00
		133.51	11.09	1.61E-02		3.48E-01
+	EU-152	121.78	28.40	-7.19E-03	1.33E-01	1.33E-01
		344.28	26.60	1.10E-03		1.78E-01
		1408.00	20.74	-1.14E-01		2.55E-01
+	EU-154	123.07	40.40	1.42E-02	9.43E-02	9.43E-02
		723.30	19.70	1.83E-01		2.79E-01
		1274.51	35.50	1.32E-01		2.01E-01
+	EU-155	86.54	32.80	-1.77E-02	1.49E-01	1.49E-01
		105.31	21.80	-3.56E-02		1.75E-01
+	BI-214	609.31	* 46.30	2.21E-01	1.04E-01	1.04E-01
		1120.29	* 15.10	3.28E-01		2.96E-01
		1238.11	5.94	2.53E-01		1.41E+00
		1377.67	4.11	3.67E-01		1.26E+00
		1407.98	2.48	-9.52E-01		2.13E+00
		1509.19	2.19	1.12E+00		2.19E+00
		1764.49	15.80	1.53E-01		3.94E-01
+	PB-214	77.11	* 10.70	5.56E-01	1.30E-01	3.52E-01
		295.21	* 19.20	2.36E-01		1.30E-01
		351.92	* 37.20	1.80E-01		1.30E-01
+	PA-228	89.95	22.00	3.83E+07	4.59E+07	7.79E+07
		93.35	35.00	1.56E+07		4.59E+07
		105.00	16.30	-9.48E+06		8.60E+07
		129.22	2.97	3.33E+08		4.65E+08
		338.32	5.30	4.60E+08		3.11E+08
		463.00	13.80	-6.94E+06		1.20E+08
		911.23	16.70	1.28E+08		1.51E+08
+	AM-241	59.54	36.30	-6.42E-02	2.66E-01	2.66E-01
+	CM-243	103.76	23.00	8.28E-02	1.69E-01	1.69E-01
		228.18	10.60	1.76E-01		3.61E-01
		277.60	14.00	-7.48E-02		2.86E-01

+ = Nuclide identified during the nuclide identification

* = Energy line found in the spectrum

> = MDA value not calculated

@ = Half-life too short to be able to perform the decay correction

? = CAUTION: MDA value is inconsistent with Currie MDA at 95% confidence level

ATTACHMENT 8

GEL LABORATORIES ANALYTICAL REPORTS



March 01, 2019

Mr. Jason Q. Spaide
LaCrosseSolutions
S4601 State Hwy 35
Genoa, Wisconsin 54632

Re: LACBWR Site Restoration Project
Work Order: 472096

Dear Mr. Spaide:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on February 25, 2019. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

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,

Kaitlyn Stone for
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: 472096 GEL Work Order: 472096

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



GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: March 1, 2019

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632

Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L2-011-102-FSGS-004-SS
Sample ID: 472096001
Matrix: Soil
Collect Date: 20-DEC-18 14:27
Receive Date: 25-FEB-19
Collector: Client

Project: ENRG07001
Client ID: ENRG070

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	0.00539	+/-0.144	0.282	0.400	pCi/g			JXK3	02/28/19	1123	1852197	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	MPK1	02/25/19	1428	1852193

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"			86.5	(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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Report Date: March 1, 2019

Company : LaCrosseSolutions
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Genoa, Wisconsin 54632

Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L2-011-102-FSGS-007-SS
Sample ID: 472096002
Matrix: Soil
Collect Date: 20-DEC-18 14:42
Receive Date: 25-FEB-19
Collector: Client

Project: ENRG07001
Client ID: ENRG070

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	-0.0236	+/-0.177	0.323	0.400	pCi/g			JXK3	02/28/19	1419	1852197	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	MPK1	02/25/19	1428	1852193

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"			84.3	(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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Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632

Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L2-011-103-FSGS-003-SS
Sample ID: 472096003
Matrix: Soil
Collect Date: 13-DEC-18 13:50
Receive Date: 25-FEB-19
Collector: Client

Project: ENRG07001
Client ID: ENRG070

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	-0.0479	+/-0.217	0.399	0.400	pCi/g			JXK3	03/01/19	0551	1852197	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	MPK1	02/25/19	1428	1852193

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"			71.4	(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: March 1, 2019

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632

Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L2-011-103-FSGS-009-SS
Sample ID: 472096004
Matrix: Soil
Collect Date: 13-DEC-18 15:04
Receive Date: 25-FEB-19
Collector: Client

Project: ENRG07001
Client ID: ENRG070

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	0.205	+/-0.176	0.280	0.400	pCi/g			JXK3	02/28/19	1419	1852197	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	MPK1	02/25/19	1428	1852193

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"			88.6	(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

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: March 1, 2019

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LaCrosseSolutions
S4601 State Hwy 35
Genoa, Wisconsin

Contact: Mr. Jason Q. Spaide

Workorder: 472096

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Gas Flow											
Batch	1852197										
QC1204226374	472096003	DUP									
Strontium-90		U	-0.0479	U	-0.0614	pCi/g	N/A		N/A	JXK3	03/01/19 05:51
		Uncertainty	+/-0.217		+/-0.155						
QC1204226375	LCS										
Strontium-90		14.9			14.8	pCi/g	98.8	(75%-125%)			02/28/19 11:23
		Uncertainty			+/-0.883						
QC1204226373	MB										
Strontium-90			U	-0.0839	pCi/g						02/28/19 11:23
		Uncertainty		+/-0.139							

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 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
- UJ Gamma Spectroscopy--Uncertain identification

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 472096

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
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 (ENRG)
SDG #: 472096**

Product: Dry Weight

Preparation Method: Dry Soil Prep

Preparation Procedure: GL-RAD-A-021 REV# 23

Preparation Batch: 1852193

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
472096001	L2-011-102-FSGS-004-SS
472096002	L2-011-102-FSGS-007-SS
472096003	L2-011-103-FSGS-003-SS
472096004	L2-011-103-FSGS-009-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: GFPC, Sr90, Solid

Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified

Analytical Procedure: GL-RAD-A-004 REV# 21

Analytical Batch: 1852197

Preparation Method: Dry Soil Prep

Preparation Procedure: GL-RAD-A-021 REV# 23

Preparation Batch: 1852193

The following samples were analyzed using the above methods and analytical procedure(s).

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
472096001	L2-011-102-FSGS-004-SS
472096002	L2-011-102-FSGS-007-SS
472096003	L2-011-103-FSGS-003-SS
472096004	L2-011-103-FSGS-009-SS
1204226373	Method Blank (MB)
1204226374	472096003(L2-011-103-FSGS-003-SS) Sample Duplicate (DUP)
1204226375	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 1204226374 (L2-011-103-FSGS-003-SSDUP), 472096003 (L2-011-103-FSGS-003-SS) and 472096004 (L2-011-103-FSGS-009-SS) were recounted due to high MDCs. The recounts are reported. Sample 472096002 (L2-011-102-FSGS-007-SS) was recounted due to a suspected false positive. The recount is 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.



Laboratory

EK

SAMPLE RECEIPT & REVIEW FORM

Client: ENRG		SDG/AVCOC/Work Order:	
Received By: GA		Date Received: 2/25/19	
Carrier and Tracking Number		Click Applicable: <input checked="" type="checkbox"/> FedEx Express <input type="checkbox"/> FedEx Ground <input type="checkbox"/> UPS <input type="checkbox"/> Field Services <input type="checkbox"/> Courier <input type="checkbox"/> Other	
		7745 3548 9369	
Suspected Hazard Information		Yes	No
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample Receipt Criteria		Yes	No
1 Shipping containers received intact and sealed?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
2 Chain of custody documents included with shipment?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
4 Daily check performed and passed on IR temperature gun?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
5 Sample containers intact and sealed?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
6 Samples requiring chemical preservation at proper pH?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
7 Do any samples require Volatile Analysis?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
8 Samples received within holding time?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
9 Sample ID's on COC match ID's on bottles?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Date & time on COC match date & time on bottles?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
11 Number of containers received match number indicated on COC?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
12 Are sample containers identifiable as GEL provided?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
13 COC form is properly signed in relinquished/received sections?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Comments (Use Continuation Form if needed):			

Phi (or PMA) review: Initials

KS

Date

2/26/19

Page

1 of 1

GL-CHL-SR-001 Rev E

Subject: Re: Expedited Sample Analysis
From: Edie Kent <emk@gel.com>
Date: 2/25/2019, 10:35 AM
To: "Jason Q. Spaide" <jqspaide@energysolutions.com>
CC: "Scott G. Zoller" <sgzoller@energysolutions.com>

Jason:

We can provide a 7 day TAT. We will be able to report by next Monday.

Edie

On 2/25/2019 10:21 AM, Jason Q. Spaide wrote:

Edie-

Good Morning. You should be seeing 4 soil samples arrive today which we would like analyzed for Sr-90. Would it be possible to expedite these samples? If so what is the fastest we could have them turned?

Thank you,

Jason Q Spaide
LACBWR D&D Manager
LaCrosseSolutions
S4601 State Hwy 35
Genoa, WI 54632
jqspaide@energysolutions.com

Cell: (314) 440-3915
Work Cell: (608) 386-8359
Office: (608) 689-4210

--

Edith M. Kent
Project Manager



2040 Savage Road, Charleston, SC 29407 | PO Box 30712, Charleston, SC 29417
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E-Mail: emk@gel.com | Website: www.gel.com

Analytical Testing | Environmental | Engineering | Surveying



Subject: RE: Expedited Sample Analysis
From: "Jason Q. Spaide" <jqspaide@energysolutions.com>
Date: 2/25/2019, 11:36 AM
To: Edie Kent <emk@gel.com>
CC: "Scott G. Zoller" <sgzoller@energysolutions.com>

Edie-

Thank You. Please proceed with the expedited TAT.

Regards,

Jason Q Spaide
LACBWR D&D Manager
LaCrosseSolutions
S4601 State Hwy 35
Genoa, WI 54632
jqspaide@energysolutions.com

Cell: (314) 440-3915
Work Cell: (608) 386-8359
Office: (608) 689-4210

From: Edie Kent [mailto:emk@gel.com]
Sent: Monday, February 25, 2019 9:35 AM
To: Jason Q. Spaide
Cc: Scott G. Zoller
Subject: Re: Expedited Sample Analysis

Jason:

We can provide a 7 day TAT. We will be able to report by next Monday.

Edie

On 2/25/2019 10:21 AM, Jason Q. Spaide wrote:

Edie-

Good Morning. You should be seeing 4 soil samples arrive today which we would like analyzed for Sr-90. Would it be possible to expedite these samples? If so what is the fastest we could have them turned?

Thank you,

Jason Q Spaide
LACBWR D&D Manager
LaCrosseSolutions
S4601 State Hwy 35
Genoa, WI 54632

jqspaide@energysolutions.com

Cell: (314) 440-3915
Work Cell: (608) 386-8359
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--

Edith M. Kent
Project Manager

[REDACTED]

2040 Savage Road, Charleston, SC 29407 | PO Box 30712, Charleston, SC 29417
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Analytical Testing | Environmental | Engineering | Surveying

[REDACTED]

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<http://www.gellaboratories.com>

List of current GEL Certifications as of 01 March 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 NELAP	03046 (AI33904)
Louisiana SDWA	LA024
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122019-1
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	9904
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-19-14
Utah NELAP	SC000122018-27
Vermont	VT87156
Virginia NELAP	460202
Washington	C780