LACROSSE SOLUTIONS

LA CROSSE BOILING WATER REACTOR
FINAL STATUS SURVEY RELEASE RECORD

SURVEY UNIT L1-SUB-TDS

PREPARED BY / DATE:	Mitchell Uz	8/28/19
	M. Uz, Survey Design Specialist	
REVIEWED BY / DATE:		8/28/19
	R. Yetter, Director, Radiological Site Closure	
REVIEWED BY / DATE:	P Hollenbeck	8/28/19
	P. Hollenbeck, Radiological Engineer	
APPROVED BY / DATE:	Scott Zoller	8/28/19
	S. Zoller, FSS Manager	

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
ASP	Alarm Set Point
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
MDCR	Minimal Detectable Count Rate
NaI	Sodium Iodide
$OpDCGL_S$	Soil Operational Derived Concentration Guideline Level
QAPP	Quality Assurance Project Plan
QC	Quality Control
RASS	Remedial Action Support Survey
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 L1-SUB-TDS, West Excavation (within open land survey unit L1-010-102), has been generated in accordance with LaCrosse*Solutions* procedure LC-FS-PR-009, *Final Status Survey Data Reporting* (Reference 1) and satisfies the requirements of Section 5.11 of the *La Crosse Boiling Water Reactor License Termination Plan* (LTP) (Reference 2).

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

This survey unit has a MARSSIM classification of 1. A survey plan was designed based upon use of the Sign Test as the nonparametric statistical test for compliance. Both the Type I (α) and Type II (β) decision error rates were set at 0.05. As a systematic sample population using a random start point, fourteen (14) soil samples were acquired from the survey unit. In addition, soil scanning was performed on 100% of the total surface area in the survey unit.

The analytical results for all soil samples taken in survey unit L1-SUB-TDS 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 0.0552 when applying the respective Operational Derived Concentration Guideline Levels ($OpDCGL_S$) for soil. Therefore, the null hypothesis is rejected and survey unit L1-SUB-TDS is acceptable for unrestricted release. The mean SOF when applying the respective Base Case DCGLs ($DCGL_S$) for soil is 0.0125. This SOF equates to a dose for the survey unit of 0.3115 mrem/yr.

2. SURVEY UNIT DESCRIPTION

L1-SUB-TDS is an impacted Class 1 excavation survey unit. The survey unit consists of the underlying soil post-removal of the Turbine Building/Turbine Building Offices and 1B Diesel Generator Building, as well as associated system lines. The surface area of the survey unit is 1,185.5 m^2.

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

This survey unit includes only the western portion of the original L1-SUB-TDS. The eastern portion of the original survey unit did not undergo FSS because of high background readings emanating from the Reactor Building and surrounding environs. The eastern portion of the survey unit (now identified as L1-SUB-TDS A) will undergo FSS under a separate sample plan. Additionally, the Reactor Plant Generator Plant Area (RPGPA) Sump Area, also within the east portion of the original survey unit, experienced groundwater intrusion due to rising Mississippi River levels and has caused it to become inaccessible. The backfilled RPGPA Sump Area (L1-SUB-TDS B) will undergo FSS via use of GeoProbe® technology using a separate sample plan.

3. CLASSIFICATION BASIS

Based on the Historical Site Assessment (HSA) (Reference 5), open land survey unit L1-010-102 had a past history of minor radiological surface contamination on the grounds and outside the truck bay and therefore was categorized as a Class 1 area. As survey unit L1-SUB-TDS consists of the underlying soils from L1-010-102, it is also deemed Class 1. The following summarizes the results of the characterization surveys for survey unit L1-010-102.

The initial site characterization surveys performed by Energy*Solutions* were conducted between October 9, 2014, and August 6, 2015. In 2014, a total of two (2) surface soil samples, and seven (7) subsurface soil samples (including one sub-slab soil sample taken beneath the Turbine Building Tunnel Area) were collected in the survey unit. In 2015, as part of a broader site characterization, five (5) locations were selected for angled coring to obtain soil from beneath the Turbine Building at the location of suspected broken drain lines. GeoProbe® technology was used to obtain the samples. At each of the 5 locations, samples were collected from the 10', 15' and 20' depths, for a total of fifteen (15) soil samples. A total of 2 surface soil samples and 22 subsurface soil samples were collected in the survey unit prior to FSS.

All samples were analyzed by the on-site gamma spectroscopy system. No ROC were detected at concentrations above Minimum Detectable Concentration (MDC) for the surface soil samples. For subsurface soil samples, Cs-137 was detected at concentrations above MDC in four (4) of the samples, at a maximum concentration of 0.130 pCi/g. Co-60 was not detected at concentrations above MDC for subsurface soil samples. A summary of the analyses for the surface soil and subsurface soil 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	2	
# >MDC	0	0
Mean (pCi/g)	0.049	0.050
Median (pCi/g)	0.049	0.050
Max (pCi/g)	0.054	0.051
Min (pCi/g)	0.044	0.050
Standard Deviation (pCi/g)	0.007	0.001
Subsurface Soil	**Co-60**	**Cs-137**
# of Samples	22	
# >MDC	0	4
Mean (pCi/g)	0.058	0.064
Median (pCi/g)	0.058	0.065
Max (pCi/g)	0.080	0.130
Min (pCi/g)	0.043	0.044
Standard Deviation (pCi/g)	0.010	0.017

Four (4) subsurface soil samples, and one (1) surface soil sample, from characterization were sent to Test America Laboratories for off-site analysis. The subsurface soil samples were analyzed for the full suite of initial ROC, while the surface soil 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 two (2) samples and Ni-63 was identified in one (1) sample at maximum concentrations of 24.7 pCi/g and 4.0 pCi/g; respectively. No ROC were identified with concentrations greater than MDC for surface soil samples.

In September of 2017, the Turbine Building foundation was removed in its entirety, including all broken drain lines and adjacent soil. As required by Section 5.3.3.4 of the LTP, in the western portion of the excavation, a total of eight (8) samples were collected from the region beneath the broken drain lines, turbine sump, turbine pit, and condenser pit. Although part of continuing characterization, these samples were collected as judgmental samples during the FSS. As per Section 5.1 of the LTP, all samples were analyzed by the on-site gamma spectroscopy system. Gamma spectroscopy results revealed eight (8) samples above MDC for Cs-137 with a maximum concentration of 0.188 pCi/g. Two (2) samples were above MDC for Co-60 with a maximum concentration of 0.257 pCi/g. No samples were identified with concentrations greater than MDC for any other ROC. A summary of the on-

site analytical results for the judgmental soil samples for continuing characterization is provided in Table 7-5.

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 soil. 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 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 are required to be documented in the release record for the survey unit.

Although four (4) of the samples were required to be sent off-site for Sr-90 analysis (per the FSS sample plan), as a conservative measure, all were sent off-site for Sr-90 analysis. Additionally, seven (7) of the eight (8) samples were sent off-site for HTD analyses for the full initial suite of ROC. An assessment of the results of continuing characterization confirmed that the IC dose is unchanged (dose fraction less than 10%). A summary of the off-site analytical results for the judgmental soil samples collected for Continuing Characterization is provided in Table 7-4.

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 L1-SUB-TDS was determined to be Class 1.

Between December 18, 2017, and December 21, 2017, a Remedial Action Support Survey (RASS) was performed in the survey unit after the excavation was complete and before FSS was performed. The purpose of the RASS was to ensure that residual radionuclide concentrations in the excavation were below the Operational DCGL for soil. 100% of the surface area of soil in the excavation was scanned using a Ludlum Model 2350-1 data logger paired with a Ludlum Model 44-10 detector. The alarm set point (ASP) was set using a gross background of 31,800 cpm and a minimum detectable count rate (MDCR) of 1,906 cpm for a total of 33,706 cpm. One (1) alarm was produced and verified during the RASS scan

survey. In accordance with the RASS sample plan, five (5) judgmental soil samples were collected in the excavation at areas where scan alarms occurred or where significant increases in count rate were noted. The five (5) samples were analyzed using the on-site gamma spectroscopy system. Gamma spectroscopy revealed Cs-137 concentrations ranging between 3.94E-02 pCi/g and 6.74E-01 pCi/g. Co-60 concentrations ranged between 4.30E-01 pCi/g and 5.52E-01 pCi/g. Areas that alarmed and where judgmental samples were collected were bounded and remediated to levels below the Operational DCGL. Remediation was deemed sufficient as no further alarms were produced upon rescan of the elevated areas.

4. DATA QUALITY OBJECTIVES

Final Status Survey planning and design hinges on coherence with the Data Quality Objective (DQO) process to ensure, through compliance with explicitly defined inputs and boundaries, that the primary objective of the survey is satisfied. The DQO process is described in the 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 L1-SUB-TDS 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).

LaCrosse*Solutions* TSD RS-TD-313196-001, *Radionuclides of Concern during LACBWR Decommissioning* (Reference 7) established the basis for an initial suite of potential ROC for decommissioning. LTP Chapter 2 provides detailed characterization data that describes the results of surveys taken of soil. Surface and subsurface soil samples were taken in each impacted open land survey units and analyzed for the presence of plant-derived

radionuclides. The results of surface and subsurface soil characterization in the impacted area surrounding LACBWR indicate that there is minimal residual radioactivity in soil.

Insignificant dose contributors were determined to be 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).

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 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. Energy*Solutions* TSD RS-TD-313196-004 and LTP Chapter 6, Sections 6.4 and 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	$DCGL_S$ (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.). The $OpDCGL_S$ 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 concentrations, therefore, the actual concentrations are used as the recorded FSS result for measurement and/or sample values even if less than the reported 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 L1-SUB-TDS 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

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

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

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

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

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

Equation 2

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

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

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

Table 5-2 – Action Levels for Survey Unit L1-SUB-TDS

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 L1-SUB-TDS, based on Cs-137 and Co-60 data for subsurface soil samples collected during characterization of L1-010-102, was calculated as follows:

Equation 3

$$\Delta/\sigma = 0.5/0.003 = 166.67$$

As the calculated relative shift (166.67) 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. The survey design specified fourteen (14) soil samples for non-parametric statistical testing.

As the survey unit was classified as Class 1, sample locations were selected based on a systematic triangular grid with a random starting point. The systematic locations of the soil samples were selected using Visual Sample Plan (VSP), in accordance with LC-FS-PR-002. Input parameters included use of aerial photographs, the GPS route of the boundary of the excavation, and seventy (70) 20' by 20' grids. The systematic coordinates generated with VSP were integrated with a GPS to identify sample locations in the field. Table 5-3 lists the systematic samples collected for FSS and the corresponding GPS coordinates, based on the Wisconsin State Plane North American Datum 1983 coordinate system.

Table 5-3 – Systematic Sample Locations

Sample ID	Northing	Easting
L1-SUB-TDS-FSGS-001-SB	570938.3660	1642047.7039
L1-SUB-TDS-FSGS-002-SB	570964.4550	1642002.5164
L1-SUB-TDS-FSGS-003-SB	570964.4550	1642032.6414
L1-SUB-TDS-FSGS-004-SB	570990.5441	1642002.5789
L1-SUB-TDS-FSGS-005-SB	571016.6331	1642002.5164
L1-SUB-TDS-FSGS-006-SB	571016.6331	1642032.6414
L1-SUB-TDS-FSGS-007-SB	571042.7221	1642017.5789
L1-SUB-TDS-FSGS-008-SB	571042.7221	1642047.7039
L1-SUB-TDS-FSGS-009-SB	571042.7221	1642077.8289
L1-SUB-TDS-FSGS-010-SB	571068.8112	1642032.6414
L1-SUB-TDS-FSGS-011-SB	571068.8112	1642062.7664
L1-SUB-TDS-FSGS-012-SB	571068.8112	1642092.8915
L1-SUB-TDS-FSGS-013-SB	571094.9002	1642047.7039
L1-SUB-TDS-FSGS-014-SB	571094.9002	1642077.8289

Although one (1) judgmental sample was required for survey design, ten (10) judgmental soil samples were collected at locations of higher scan readings and for continuing characterization as a conservative measure. In total, twenty-four (24) soil samples were collected for the FSS of survey unit L1-SUB-TDS. The coordinates for the judgmental samples are provided in Table 5-4.

Table 5-4 - Judgmental Sample Locations

Sample ID	Northing	Easting
L1-SUB-TDS-FJGS-001-SB	571044.994	1642039.042
L1-SUB-TDS-FJGS-002-SB	571082.009	1642064.649
L1-SUB-TDS-FJGS-003-SB	571090.293	1642057.744
L1-SUB-TDS-FJGS-004-SB	571051.946	1641998.938
L1-SUB-TDS-FJGS-005-SB	571026.280	1642027.408
L1-SUB-TDS-FJGS-006-SB	571035.204	1642046.196
L1-SUB-TDS-FJGS-007-SB	570944.621	1642068.758
L1-SUB-TDS-FJGS-008-SB	571042.305	1642073.367
L1-SUB-TDS-FJGS-009-SB	571064.010	1642003.777
L1-SUB-TDS-FJGS-010-SB	571075.804	1642049.975

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 for continuing characterization. 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. In addition, if any sample has a SOF of 10% of the Operational DCGL or more, it must be sent for HTD ROC analysis. 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 one (1) soil sample, L1-SUB-TDS-FSGS-010-SB, from the systematic sample population met the requirement that a minimum of 10% of the samples collected for the FSS of the survey unit be analyzed for HTD ROC. The selected sample was sent off-site (GEL Laboratories) for analysis of the HTD ROC as specified in LTP Chapter 5, Section 5.1. Seven (7) of the eight (8) judgmental samples collected for continuing characterization were sent off-site for full suite ROC analysis, as explained in Section 3 of this release record.

The implementation of quality control measures as referenced by LTP Chapter 5, Section 5.9 and LaCrosse*Solutions* LC-QA-PN-001, *Final Status Survey Quality Assurance Project Plan* (QAPP) (Reference 10) includes the collection of a soil sample for "split sample" analysis on 5% of the soil samples taken in a survey unit with the locations selected at

random. One (1) soil sample, L1-SUB-TDS-QSGS-004-SB, 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 1 survey units, surface scans will be performed on 100% of the surface area in the survey unit. For survey unit L1-SUB-TDS, 100% scan coverage equates to 1,185.5 m^2. To encapsulate the entire area of the survey unit, a 20' by 20' grid pattern was overlaid on a map of the survey unit. The survey unit spanned through portions of thirty-eight (38) of the sixty-three (63) total grids. A map of the scan grid locations is provided in Attachment 1.

For this Class 1 excavation 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 1	>Operational DCGL or >MDC_{scan} if MDC_{scan} is greater than Operational DCGL	>Operational DCGL

Table 5-6 provides a synopsis of the survey design for survey unit L1-SUB-TDS.

Table 5-6 - Synopsis of Survey Design

Feature	Design Criteria	Basis
Survey Unit Surface Area	1,185.5 m^2	GPS
Number of Systematic Samples (N)	14	• $\sigma = 0.003$ • 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	• 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 Areal Coverage	1,185.5 m^2 or 100% areal coverage	LTP Chapter 5, Table 5-15
Number of Judgmental Samples	1 10 (8 for continuing characterization)	Per Sample Plan Actual Number Obtained
HTD ROC Analysis	1 sample 8 (7 for continuing characterization)	LTP 5.1 & Signed Sample Plan Actual Number Obtained
QC	1 split sample selected at random 3	LTP Chapter 5, Section 5.9 Actual Number Obtained

6. SURVEY IMPLEMENTATION

For survey unit L1-SUB-TDS, 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 January 4, 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.

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 January 5, 2018.

FSS field activities were projected to take ten (10) 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 January 15, 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 thirty-eight (38) scan grids, constituting a total scan coverage of 1,185.5 m^2, or approximately 100% 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 L1-SUB-TDS, background ranged from 7,263 counts per minute (cpm) up to 8,899 cpm.

All designated scan areas as denoted on Figure 1in 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 of approximately 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.

Ten (10) judgmental soil samples were collected during implementation of FSS. These samples were collected to investigate locations where scanning revealed higher readings and for continuing characterization as required by the LTP Chapter 5, Section 5.3.3.4. The locations of the judgmental samples are presented in Figure 2 of Attachment 1.

The survey design specified that a minimum of one (1) sample (10%) was required for HTD ROC analysis. Sample L1-SUB-TDS-FSGS-010-SB was selected for HTD radionuclide analysis. Seven (7) additional samples from continuing characterization (L1-SUB-TDS-FJGS-003-SB, L1-SUB-TDS-FJGS-004-SB, L1-SUB-TDS-FJGS-005-SB, L1-SUB-TDS-FJGS-006-SB, L1-SUB-TDS-FJGS-007-SB, L1-SUB-TDS-FJGS-008-SB, and L1-SUB-TDS-FJGS-010-SB) were selected for HTD analysis of the initial full suite of radionuclides.

The survey design specified one (1) sample to be collected for QC split and duplicate analysis. The implementation of survey specific QC measures included the collection of three (3) samples (L1-SUB-TDS-QSGS-004-SB, L1-SUB-TDS-FJGS-008-SB SPLIT, and L1-SUB-TDS-FJGS-009-SB SPLIT) for split and duplicate sample analysis.

7. SURVEY RESULTS

All areas identified in the FSS plan were scanned for elevated radiation levels. No elevated measurement locations were identified by surface scan. Table 7-1 provides an overview of the scan results for all scan grids (identified as A1 through G9), the 1 m^2 scan areas around each sample location (identified as SP1 through SP14 and JSP2 through JSP10), and QC locations (identified with a Q). Complete scan results are provided in Attachment 2.

Table 7-1 – Synopsis of Scan Results

Scan Area	Highest Logged Reading (cpm)	Action Level (cpm)	# of Scan Alarms	Judgmental Samples	Investigation Samples
A1	8,757	33,706	0	0	0
A2	9,075	33,706	0	0	0
A3	8,879	33,706	0	1	0
A4	9,613	33,706	0	1	0
A5	9,230	33,706	0	0	0
A6	10,041	33,706	0	0	0
A7	9,130	33,706	0	0	0
B1	8,767	33,706	0	0	0
B2	9,005	33,706	0	0	0
B3	9,938	33,706	0	2	0
B4	9,160	33,706	0	0	0
B5	10,039	33,706	0	0	0
B6	10,422	33,706	0	0	0
B7	9,762	33,706	0	0	0
B8	8,514	33,706	0	0	0
C1	8,514	33,706	0	0	0
C2	13,403	33,706	0	1	0
C3	8,747	33,706	0	0	0
C4	11,957	33,706	0	0	0
C4	16,975	33,706	0	2	0
C5	10,934	33,706	0	1	0

Scan Area	Highest Logged Reading (cpm)	Action Level (cpm)	# of Scan Alarms	Judgmental Samples	Investigation Samples
C5QC	12,588	33,706	0	0	0
C6	12,495	33,706	0	0	0
C7	10,676	33,706	0	0	0
C8	8,914	33,706	0	0	0
C9	7,435	33,706	0	0	0
D1	9,244	33,706	0	0	0
D2	9,297	33,706	0	0	0
D3	9,148	33,706	0	1	0
D8	14,449	33,706	0	0	0
D8	10,462	33,706	0	0	0
D9	7,695	33,706	0	0	0
E1	9,676	33,706	0	0	0
E2	9,570	33,706	0	0	0
E3	10,641	33,706	0	0	0
E8	11,516	33,706	0	0	0
E9	8,950	33,706	0	0	0
F8	13,054	33,706	0	0	0
F9	11,309	33,706	0	0	0
G8	13,320	33,706	0	1	0
G9	14,024	33,706	0	0	0
JSP10	7,297	33,706	0	0	0
JSP2	13,088	33,706	0	0	0
JSP3	8,209	33,706	0	0	0
JSP4	9,009	33,706	0	0	0
JSP5	7,229	33,706	0	0	0
JSP6	9,185	33,706	0	0	0
JSP7	12,952	33,706	0	0	0
JSP8	8,995	33,706	0	0	0
JSP9	8,344	33,706	0	0	0
QC4	9,047	33,706	0	0	0
SP1	13,778	33,706	0	0	0
SP10	8,736	33,706	0	0	0
SP11	8,211	33,706	0	0	0

Scan Area	Highest Logged Reading (cpm)	Action Level (cpm)	# of Scan Alarms	Judgmental Samples	Investigation Samples
SP12	8,835	33,706	0	0	0
SP13	7,724	33,706	0	0	0
SP14	8,498	33,706	0	0	0
SP2	7,649	33,706	0	0	0
SP3	9,322	33,706	0	0	0
SP4	9,708	33,706	0	0	0
SP5	9,710	33,706	0	0	0
SP6	8,338	33,706	0	0	0
SP7	8,358	33,706	0	0	0
SP8	8,667	33,706	0	0	0
SP9	8,715	33,706	0	0	0

At the time of the FSS, the Action Level was based upon a fraction of the Base Case Cs-137 DCGL and a pre-established background count rate. The Action Level was calculated using a background of 31,800 cpm and an MDCR of 1,906 cpm for a total of 33,706 cpm. The MDCR value equates to Cs-137 concentration of 9.2 pCi/g, which is equivalent to approximately 20% of the Cs-137 Base case DCGL for soil. A pre-established gross background and ASP was used during FSS because of an anticipated elevated background due to the survey unit's proximity to the Reactor Building.

Retroactively fitting the scan data to Action Levels based on the Operational DCGL and the actual background data collected during the FSS, resulted in fourteen (14) scan measurements that would have alarmed, and in turn would have triggered the collection of investigational soil samples. As can be seen in Table 7-1 above, no investigational samples were collected. Because 100% of the soil in the survey unit was scanned and the maximum Sum-of-Fraction (SOF) of all applicable Radionuclides of Concern (ROC), either by direct measurement or by inference, is equal to 0.0552 when applying the respective Operational Derived Concentration Guideline Levels ($OpDCGL_S$) for soil, the probability of discovering an elevated soil sample is very low, even had investigational samples been collected.

The on-site laboratory analyzed the fourteen (14) soil samples taken for non-parametric statistical testing using the on-site gamma spectroscopy system. A summary of the gamma spectroscopy results for the fourteen (14) samples collected for non-parametric statistical testing is provided in Table 7-2. Gamma spectroscopy results revealed ten (10) samples above MDC for Cs-137 and one (1) sample above MDC for Co-60; 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 complete gamma spectroscopy reports are presented in Attachment 7. The basic statistics for the systematic sample population is 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)
L1-SUB-TDS-FSGS-001-SB	3.94E-02	4.28E-02	4.47E-02	5.51E-02	2.15E-02
L1-SUB-TDS-FSGS-002-SB	3.73E-02	1.88E-02	4.72E-02	2.20E-02	9.44E-03
L1-SUB-TDS-FSGS-003-SB	4.78E-02	**7.39E-02**	1.14E-01	7.00E-03	3.71E-02
L1-SUB-TDS-FSGS-004-SB	4.69E-02	5.89E-02	1.18E-01	1.04E-01	2.96E-02
L1-SUB-TDS-FSGS-005-SB	**1.13E-01**	**1.26E-01**	0.00E+00	1.45E-01	6.33E-02
L1-SUB-TDS-FSGS-006-SB	3.72E-02	1.39E-02	0.00E+00	3.72E-02	6.98E-03
L1-SUB-TDS-FSGS-007-SB	4.15E-02	**9.53E-02**	8.28E-02	1.89E-03	4.78E-02
L1-SUB-TDS-FSGS-008-SB	6.97E-02	**1.37E-01**	0.00E+00	0.00E+00	6.88E-02
L1-SUB-TDS-FSGS-009-SB	4.52E-02	**6.83E-02**	6.66E-02	3.99E-02	3.43E-02
L1-SUB-TDS-FSGS-010-SB	4.72E-02	**9.00E-02**	1.37E-01	1.00E-01	4.52E-02
L1-SUB-TDS-FSGS-011-SB	3.06E-02	**3.85E-02**	6.61E-02	1.83E-02	1.93E-02
L1-SUB-TDS-FSGS-012-SB	7.21E-02	**1.77E-01**	1.02E-01	1.55E-02	8.89E-02
L1-SUB-TDS-FSGS-013-SB	3.11E-02	**6.69E-02**	1.58E-01	1.65E-01	3.36E-02
L1-SUB-TDS-FSGS-014-SB	7.89E-02	**2.08E-01**	1.41E-01	3.19E-02	1.04E-01

Note: Bold values indicate concentrations greater than MDC.

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

ROC	Mean (pCi/g)	Median (pCi/g)	Max (pCi/g)	Min (pCi/g)	Std. Dev. (pCi/g)	BcDCGL (pCi/g)	Avg SOF per ROC	Avg Dose per ROC
Co-60	5.27E-02	4.61E-02	1.13E-01	3.06E-02	0.0230	1.06E+01	0.0050	0.1243
Cs-137	8.68E-02	7.11E-02	2.08E-01	1.39E-02	0.0574	4.83E+01	0.0018	0.0449
Eu-152	7.70E-02	7.47E-02	1.58E-01	0.00E+00	0.0540	2.36E+01	0.0033	0.0815
Eu-154	5.31E-02	3.46E-02	1.65E-01	0.00E+00	0.0539	2.19E+01	0.0024	0.0606
Sr-90	4.36E-02	3.57E-02	1.04E-01	6.98E-03	0.0288	5.47E+03	0.0000	0.0002

The off-site laboratory, GEL Laboratories, processed the eight (8) samples selected for HTD analysis. Continuing characterization samples L1-SUB-TDS-FJGS-003-SB, L1-SUB-TDS-FJGS-004-SB, L1-SUB-TDS-FJGS-005-SB, L1-SUB-TDS-FJGS-006-SB, L1-SUB-TDS-FJGS-007-SB, L1-SUB-TDS-FJGS-008-SB, L1-SUB-TDS-FJGS-010-SB, and FSS sample L1-SUB-TDS-FSGS-010-SB were selected. All off-site samples were analyzed for the initial suite of radionuclides, except for sample L1-SUB-TDS-FSGS-010-SB, which was only analyzed for Sr-90. All analyses met the required MDC.

Sr-90 was not detected in any of the samples sent for off-site analysis. Therefore, there was no need to re-evaluate the 95% UCL ratio of 0.502 established during continuing characterization. Gamma spectroscopy results revealed six (6) samples above MDC for Cs-137 with a maximum concentration of 0.189 pCi/g. Two (2) samples were above MDC for Co-60, and two (2) samples were above MDC for Tc-99 with maximum concentrations of 0.0816 pCi/g and 0.628 pCi/g, respectively. No samples were above MDC for any other ROC. The positive Tc-99 samples are part of the continuing characterization population. As stated in Section 3 of this release record, the IC dose is unchanged (dose fraction less than 10%). The results are provided in Table 7-4.

Table 7-4 - Off-Site Analysis Results

Sample ID	Am-241 (pCi/g)	Am-243 (pCi/g)	Cm-243/244 (pCi/g)	Np-237 (pCi/g)	Pu-238 (pCi/g)	Pu-239/240 (pCi/g)	Pu-241 (pCi/g)	Ni-59 (pCi/g)	Cs-137 (pCi/g)	Co-60 (pCi/g)
L1-SUB-TDS-FSGS-010-SB										
L1-SUB-TDS-FJGS-003-SB	4.10E-03	1.94E-02	2.20E-03	5.00E-04	-7.20E-03	-4.80E-03	-8.95E-02	-7.39E-01	**8.83E-02**	1.35E-02
L1-SUB-TDS-FJGS-004-SB	1.91E-02	2.60E-03	-4.50E-03	0.00E+00	1.83E-02	-1.70E-03	-1.09E+00	-1.24E-01	**1.03E-01**	**5.96E-02**
L1-SUB-TDS-FJGS-005-SB	1.15E-02	1.70E-02	-1.50E-03	5.00E-04	-4.20E-03	9.40E-03	-8.41E-01	-7.51E-01	**1.07E-01**	**8.16E-02**
L1-SUB-TDS-FJGS-006-SB	1.76E-02	9.10E-03	-9.50E-03	4.00E-04	-4.20E-03	-1.15E-02	-2.80E+00	-1.71E+00	**1.89E-01**	4.34E-02
L1-SUB-TDS-FJGS-007-SB	-1.70E-03	-2.83E-02	1.27E-02	5.00E-04	-2.60E-03	-1.05E-02	-2.05E+00	1.88E-01	3.78E-02	1.41E-02
L1-SUB-TDS-FJGS-008-SB	9.40E-03	1.47E-02	3.20E-03	1.90E-03	-2.10E-03	-4.30E-03	-1.34E+00	-2.60E+00	**7.19E-02**	-9.40E-03
L1-SUB-TDS-FJGS-010-SB	-3.40E-03	1.75E-02	5.20E-03	3.10E-03	-6.60E-03	-3.03E-03	-3.59E-01	-4.26E-01	**5.63E-02**	-3.20E-03

Sample ID	Eu-152 (pCi/g)	Eu-154 (pCi/g)	Eu-155 (pCi/g)	Nb-94 (pCi/g)	Sr-90 (pCi/g)	H-3 (pCi/g)	C-14 (pCi/g)	Tc-99 (pCi/g)	Fe-55 (pCi/g)	Ni-63 (pCi/g)
L1-SUB-TDS-FSGS-010-SB					2.06E-01					
L1-SUB-TDS-FJGS-003-SB	1.20E-03	-3.90E-03	8.40E-03	2.60E-03	6.23E-02	-2.02E-01	1.87E+00	-3.29E-01	1.36E+00	1.89E-01
L1-SUB-TDS-FJGS-004-SB	9.20E-03	-3.00E-04	-3.01E-02	6.01E-03	2.29E-02	-5.28E-01	-8.69E-01	**5.30E-01**	2.34E+00	1.98E-01
L1-SUB-TDS-FJGS-005-SB	4.80E-03	-6.60E-03	3.89E-02	-8.00E-03	-3.74E-02	2.93E-01	1.40E+00	2.89E-01	1.59E-01	1.09E+00
L1-SUB-TDS-FJGS-006-SB	4.90E-03	-4.90E-03	3.89E-02	5.40E-03	-6.57E-02	3.40E-01	-1.07E+00	**6.28E-01**	1.02E+00	7.96E-01
L1-SUB-TDS-FJGS-007-SB	-4.38E-02	-1.28E-02	-1.75E-02	-1.28E-02	1.39E-02	3.54E+00	-1.72E-02	1.58E-01	7.78E-01	-8.86E-01
L1-SUB-TDS-FJGS-008-SB	2.03E-03	1.95E-02	3.67E-02	-3.10E-03	1.13E-01	-1.18E+00	-8.32E-01	1.98E-01	3.00E+00	-1.60E-01
L1-SUB-TDS-FJGS-010-SB	1.62E-02	3.27E-02	1.32E-02	1.14E-02	-5.03E-02	-8.41E-01	-1.01E+00	4.23E-01	5.15E-01	-4.08E-01

Note: Bold values indicate concentrations greater than MDC.

The on-site laboratory analyzed the ten (10) judgmental soil samples using the on-site gamma spectroscopy system. A summary of the analytical results for the judgmental soil

samples is provided in Table 7-5. Gamma spectroscopy results revealed ten (10) samples above MDC for Cs-137 with max concentration 0.188 pCi/g. Two (2) samples above MDC for Co-60 with max concentration 0.257 pCi/g. 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 complete gamma spectroscopy reports 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)
L1-SUB-TDS-FJGS-001-SB	4.45E-02	**8.17E-02**	9.79E-03	2.71E-02	4.10E-02
L1-SUB-TDS-FJGS-002-SB	7.23E-02	**9.80E-02**	7.68E-02	1.40E-01	4.92E-02
L1-SUB-TDS-FJGS-003-SB	5.84E-02	**2.92E-02**	0.00E+00	6.38E-02	1.47E-02
L1-SUB-TDS-FJGS-004-SB	**2.57E-01**	**6.07E-02**	6.73E-02	1.40E-01	3.05E-02
L1-SUB-TDS-FJGS-005-SB	**5.37E-02**	**7.31E-02**	0.00E+00	1.55E-02	3.67E-02
L1-SUB-TDS-FJGS-006-SB	9.53E-02	**1.88E-01**	1.23E-01	0.00E+00	9.44E-02
L1-SUB-TDS-FJGS-007-SB	3.63E-02	**6.06E-02**	1.02E-02	1.96E-02	3.04E-02
L1-SUB-TDS-FJGS-008-SB	2.19E-02	**6.16E-02**	7.01E-03	1.40E-01	3.09E-02
L1-SUB-TDS-FJGS-009-SB	2.22E-02	**1.61E-01**	0.00E+00	6.48E-02	8.08E-02
L1-SUB-TDS-FJGS-010-SB	3.17E-02	**4.30E-02**	7.80E-02	4.34E-02	2.16E-02

Note: Bold values indicate concentrations greater than MDC.

The implementation of survey specific QC measures included the collection of three (3) samples (L1-SUB-TDS-QSGS-004-SB, L1-SUB-TDS-FJGS-008-SB SPLIT, L1-SUB-TDS-FJGS-009-SB 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 three (3) samples above MDC for Cs-137, with a maximum concentration 0.0695 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)
L1-SUB-TDS-QSGS-004-SB	6.51E-02	**4.39E-02**	8.04E-02	8.72E-03	2.20E-02
L1-SUB-TDS-FJGS-008-SB SPLIT	3.64E-02	**6.95E-02**	7.33E-02	6.54E-03	3.49E-02
L1-SUB-TDS-FJGS-009-SB SPLIT	7.75E-02	**6.20E-02**	3.35E-03	1.64E-02	3.11E-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

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

Where: C_n = concentration of radionuclide *n*

$DCGL_n$ = DCGL of radionuclide *n*.

The results of the unity rule calculation for the ROC in the systematic sample population for survey unit L1-SUB-TDS 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	
L1-SUB-TDS-FSGS-001-SB	0.01029	0.00246	0.00525	0.00698	0.00001	0.02500
L1-SUB-TDS-FSGS-002-SB	0.00974	0.00108	0.00555	0.00279	0.00000	0.01916
L1-SUB-TDS-FSGS-003-SB	0.01248	0.00425	0.01340	0.00089	0.00002	0.03103
L1-SUB-TDS-FSGS-004-SB	0.01225	0.00339	0.01387	0.01318	0.00002	0.04269
L1-SUB-TDS-FSGS-005-SB	0.02950	0.00725	0.00000	0.01838	0.00003	0.05516
L1-SUB-TDS-FSGS-006-SB	0.00971	0.00080	0.00000	0.00471	0.00000	0.01523
L1-SUB-TDS-FSGS-007-SB	0.01084	0.00548	0.00973	0.00024	0.00002	0.02631
L1-SUB-TDS-FSGS-008-SB	0.01820	0.00788	0.00000	0.00000	0.00003	0.02611
L1-SUB-TDS-FSGS-009-SB	0.01180	0.00393	0.00783	0.00506	0.00002	0.02863
L1-SUB-TDS-FSGS-010-SB	0.01232	0.00518	0.01610	0.01267	0.00002	0.04630

Sample ID	Fraction of Operational DCGL					SOF
	Co-60	Cs-137	Eu-152	Eu-154	Sr-90	
L1-SUB-TDS-FSGS-011-SB	0.00799	0.00221	0.00777	0.00232	0.00001	0.02030
L1-SUB-TDS-FSGS-012-SB	0.01883	0.01018	0.01199	0.00196	0.00005	0.04300
L1-SUB-TDS-FSGS-013-SB	0.00812	0.00385	0.01857	0.02091	0.00002	0.05146
L1-SUB-TDS-FSGS-014-SB	0.02060	0.01196	0.01657	0.00404	0.00005	0.05323
L1-SUB-TDS-QSGS-004-SB	0.01700	0.00252	0.00945	0.00111	0.00001	0.03009
L1-SUB-TDS-FJGS-008-SB SPLIT	0.00950	0.00400	0.00861	0.00083	0.00002	0.02296
L1-SUB-TDS-FJGS-009-SB SPLIT	0.02023	0.00357	0.00039	0.00208	0.00002	0.02629

Systematic Measurements

Number of Systematic Measurements =	14
# of Systematic Measurements with SOF $\geq$ 1 =	0
# of Systematic Measurements with SOF > 0.1 (HTD Assessment) =	0
Max Individual Systematic Measurement SOF =	0.0552
Mean Systematic Measurement SOF =	0.0345

The results of the unity rule calculation for the ROC in the judgmental sample population for survey unit L1-SUB-TDS 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	
L1-SUB-TDS-FJGS-001-SB	0.01162	0.00470	0.00115	0.00343	0.0002	0.02092
L1-SUB-TDS-FJGS-002-SB	0.01888	0.00564	0.00902	0.01774	0.00002	0.05131
L1-SUB-TDS-FJGS-003-SB	0.01525	0.00168	0.00000	0.00809	0.00001	0.02502
L1-SUB-TDS-FJGS-004-SB	0.06710	0.00349	0.00791	0.01774	0.00002	0.09626
L1-SUB-TDS-FJGS-005-SB	0.01402	0.00420	0.00000	0.00196	0.00002	0.02021
L1-SUB-TDS-FJGS-006-SB	0.02488	0.01081	0.01445	0.0000	0.00005	0.05019
L1-SUB-TDS-FJGS-007-SB	0.00948	0.00348	0.00120	0.00248	0.00002	0.01666
L1-SUB-TDS-FJGS-008-SB	0.00572	0.00354	0.00082	0.01774	0.00002	0.02784
L1-SUB-TDS-FJGS-009-SB	0.00580	0.00926	0.00000	0.00821	0.00004	0.02331
L1-SUB-TDS-FJGS-010-SB	0.00828	0.00247	0.00917	0.00550	0.00001	0.02543

Judgmental Measurements

Number of Judgmental Measurements =	10
# of Judgmental Measurements with SOF ≥ 1 =	0
# of Judgmental Measurements with SOF > 0.1 (HTD Assessment) =	0
Max Individual Judgmental Measurement SOF =	0.0963
Mean Judgmental Measurement SOF =	0.0357

8. QUALITY CONTROL

The on-site laboratory processed three (3) split and duplicate samples (L1-SUB-TDS-QSGS-004-SB, L1-SUB-TDS-FJGS-008-SB SPLIT, and L1-SUB-TDS-FJGS-009-SB 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

The purpose of the excavation of the portion of survey unit L1-010-102 was to remove the Turbine Building/Turbine Building Offices and 1B Diesel Generator Building, as well as associated system lines. The purpose of the excavation was not to support removal of contaminated subsurface soil.

11. CHANGES FROM THE FINAL STATUS SURVEY PLAN

There were no addendums to the FSS plan.

12. DATA QUALITY ASSESSMENT (DQA)

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

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

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

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

The 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 are less than the Consultation Triggers for Residential Soil Concentration depicted in Table H.1 of NUREG 1757, Vol.1, Rev. 2 (MOU Table 1). The full table is included in Attachment 5 of this release record.

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

13. ANOMALIES

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

14. CONCLUSION

Survey unit L1-SUB-TDS has met the DQOs of the FSS plan. The ALARA criteria as specified in Chapter 4 of the LTP were achieved and remediation was not required.

All identified ROC were used for statistical testing to determine the adequacy of the survey unit for FSS. Evaluation of the data shows that none of the systematic ROC concentration values exceeds the $OpDCGL_S$; therefore, in accordance with LTP Section 5.11, the survey unit meets the release criteria.

The sample data passed the Sign Test. The null hypothesis was rejected. The Retrospective Power Curve showed that adequate power was achieved. The survey unit is properly classified as Class 1.

The dose contribution from soil in survey unit L1-SUB-TDS is 0.3115 mrem/yr TEDE, based on the average concentration of the ROC in samples used for non-parametric statistical sampling.

Survey unit L1-SUB-TDS 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 - L1-SUB-TDS Systematic Sample Locations Map

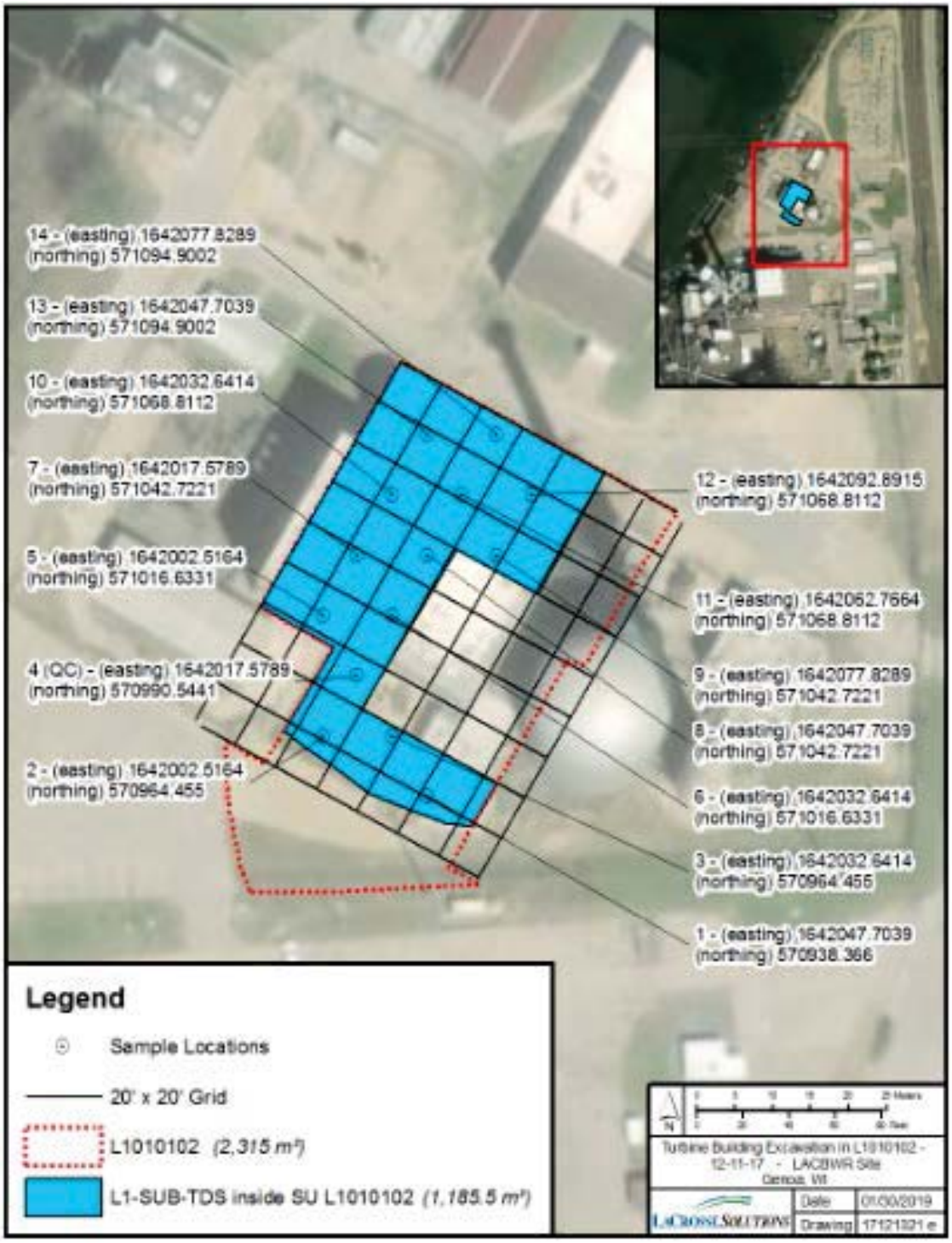
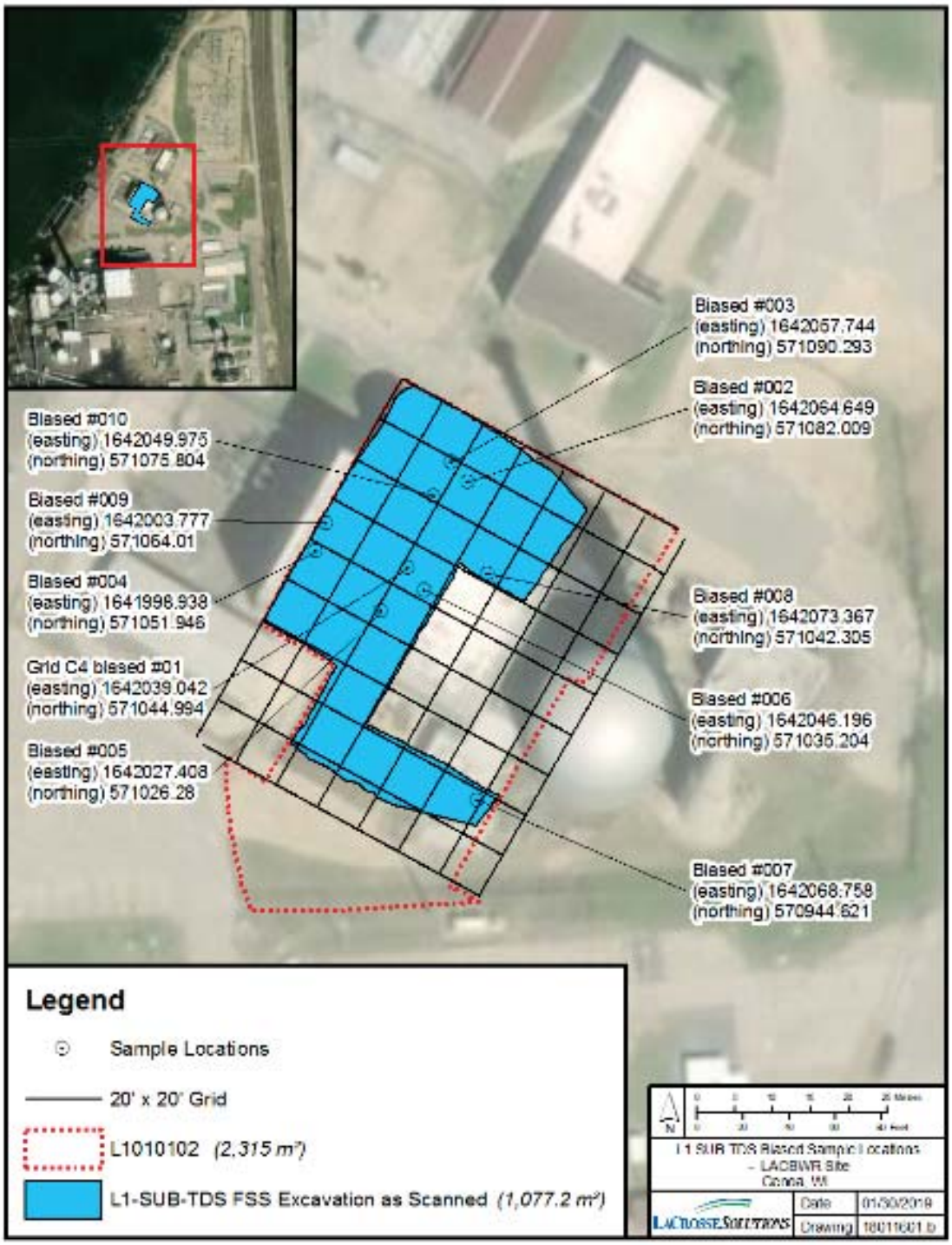


Figure 16-2 – L1-SUB-TDS Judgmental Sample Locations



ATTACHMENT 2
SCAN DATA

Table 16-1 - L1-SUB-TDS 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	318218	120636	A1	8,757	7,263	33,706	No
44-10	357776	325246	A2	9,075	8,082	33,706	No
44-10	318218	120636	A3	8,879	7,263	33,706	No
44-10	357776	325246	A4	9,613	7,812	33,706	No
44-10	318218	120636	A5	9,230	7,482	33,706	No
44-10	318218	120636	A6	10,041	7,482	33,706	No
44-10	318218	120636	A7	9,130	7,482	33,706	No
44-10	318218	120636	B1	8,767	7,263	33,706	No
44-10	357776	325246	B2	9,005	8,082	33,706	No
44-10	318218	120636	B3	9,938	7,263	33,706	No
44-10	357776	325246	B4	9,160	7,812	33,706	No
44-10	318218	120636	B5	10,039	7,482	33,706	No
44-10	318218	120636	B6	10,422	7,482	33,706	No
44-10	318218	120636	B7	9,762	7,482	33,706	No
44-10	357776	325246	B8	8,514	7,812	33,706	No
44-10	318218	120636	C1	8,514	7,263	33,706	No
44-10	357776	325246	C2	13,403	8,082	33,706	No
44-10	318218	120636	C3	8,747	7,263	33,706	No
44-10	357783	325261	C4	11,957	8,891	33,706	No
44-10	357776	325246	C4	16,975	7,812	33,706	No
44-10	357776	325246	C4	9,878	7,812	33,706	No
44-10	318218	120636	C5	10,934	7,482	33,706	No
44-10	162398	126195	C5QC	12,588	8,899	33,706	No
44-10	318218	120636	C6	12,495	7,482	33,706	No
44-10	318218	120636	C7	10,676	7,482	33,706	No
44-10	357776	325246	C8	8,914	7,812	33,706	No
44-10	318218	120636	C9	7,435	7,482	33,706	No
44-10	318218	120636	D1	9,244	7,263	33,706	No
44-10	357776	325246	D2	9,297	8,082	33,706	No
44-10	318218	120636	D3	9,148	7,263	33,706	No
44-10	357783	325261	D8	14,449	8,891	33,706	No
44-10	357776	325246	D8	10,462	7,812	33,706	No

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	318218	120636	D9	7,695	7,482	33,706	No
44-10	318218	120636	E1	9,676	7,263	33,706	No
44-10	357776	325246	E2	9,570	8,082	33,706	No
44-10	318218	120636	E3	10,641	7,263	33,706	No
44-10	357776	325246	E8	11,516	7,812	33,706	No
44-10	318218	120636	E9	8,950	7,482	33,706	No
44-10	318218	120636	F8	13,054	7,482	33,706	No
44-10	318218	120636	F9	11,309	7,482	33,706	No
44-10	318218	120636	G8	13,320	7,482	33,706	No
44-10	318218	120636	G9	14,024	7,482	33,706	No
44-10	357776	325246	JSP10	7,297	7,889	33,706	No
44-10	357776	325246	JSP10	7,263	7,889	33,706	No
44-10	357776	325246	JSP2	13,088	7,889	33,706	No
44-10	357776	325246	JSP2	8,948	7,889	33,706	No
44-10	357776	325246	JSP3	8,209	7,889	33,706	No
44-10	357776	325246	JSP3	7,755	7,889	33,706	No
44-10	357776	325246	JSP4	8,217	7,889	33,706	No
44-10	357776	325246	JSP4	9,009	7,889	33,706	No
44-10	357776	325246	JSP5	6,870	7,889	33,706	No
44-10	357776	325246	JSP5	7,229	7,889	33,706	No
44-10	357776	325246	JSP6	9,185	7,889	33,706	No
44-10	357776	325246	JSP6	8,796	7,889	33,706	No
44-10	357776	325246	JSP7	12,527	7,889	33,706	No
44-10	357776	325246	JSP7	12,952	7,889	33,706	No
44-10	357776	325246	JSP8	8,715	7,889	33,706	No
44-10	357776	325246	JSP8	8,995	7,889	33,706	No
44-10	357776	325246	JSP9	8,131	7,889	33,706	No
44-10	357776	325246	JSP9	8,344	7,889	33,706	No
44-10	318218	120636	QC4	9,047	8,201	33,706	No
44-10	357776	325246	SP1	13,778	7,988	33,706	No
44-10	318218	120636	SP10	8,736	7,748	33,706	No
44-10	318218	120636	SP11	8,211	7,748	33,706	No
44-10	318218	120636	SP12	8,835	7,748	33,706	No

Detector Type	Detector ID	M2350-1 ID	Location	Scan Logged Result (cpm)	Avg Background (cpm)	Action Level (cpm)	Scan Alarms
44-10	318218	120636	SP13	7,724	7,748	33,706	No
44-10	318218	120636	SP14	8,498	7,748	33,706	No
44-10	357776	325246	SP2	7,649	7,988	33,706	No
44-10	357776	325246	SP3	9,322	7,988	33,706	No
44-10	357776	325246	SP4	9,708	7,988	33,706	No
44-10	318218	120636	SP5	9,710	7,748	33,706	No
44-10	318218	120636	SP6	8,338	7,748	33,706	No
44-10	318218	120636	SP7	8,358	7,748	33,706	No
44-10	318218	120636	SP8	8,667	7,748	33,706	No
44-10	318218	120636	SP9	8,715	7,748	33,706	No

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

ATTACHMENT 3
SIGN TEST

Table 16-2 – L1-SUB-TDS Sign Test

#	SOF (Ws)	1-Ws	Sign
1	0.02500	0.98	+1
2	0.01916	0.98	+1
3	0.03103	0.97	+1
4	0.04269	0.96	+1
5	0.05516	0.94	+1
6	0.01523	0.98	+1
7	0.02631	0.97	+1
8	0.02611	0.97	+1
9	0.02863	0.97	+1
10	0.04630	0.95	+1
11	0.02030	0.98	+1
12	0.04300	0.96	+1
13	0.05146	0.95	+1
14	0.05323	0.95	+1

Number of positive differences (S+) 14

Critical Value 10

Survey Unit Meets the Acceptance Criteria

ATTACHMENT 4
QUALITY CONTROL ASSESSMENT

Table 16-3 – L1-SUB-TDS 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)
L1-SUB-TDS-FSGS-004-SB	K-40	4.59E+00	5.66E-01	8.11	0.6	1.66	L1-SUB-TDS-QSGS-004-SB	5.22E+00	6.27E-01	1.14	Y
L1-SUB-TDS-FJGS-008-SB	Cs-137	6.16E-02	2.70E-02	2.28	0.4	2.5	L1-SUB-TDS-FJGS-008-SB SPLIT	6.95E-02	2.93E-02	1.13	Y
L1-SUB-TDS-FJGS-009-SB	Cs-137	1.61E-01	3.15E-02	5.11	0.5	2	L1-SUB-TDS-FJGS-009-SB SPLIT	6.20E-02	2.88E-02	0.39	N

Comments/Corrective Actions: For L1-SUB-TDS-FSGS-004-SB and L1-SUB-TDS-QSGS-004-SB, K-40 was substituted as the radionuclide for split assessment because Cs-137 was only present in the comparison sample.

The split assessment for L1-SUB-TDS-FJGS-009-SB & L1-SUB-TDS-FJGS-009-SB SPLIT resulted in a failure. Because the values are well below the operational DCGL no further action is necessary.

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

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

ATTACHMENT 5
CONSULTATION TRIGGERS FOR RESIDENTIAL SOIL CONCENTRATION

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

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

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

ATTACHMENT 6
GRAPHICAL PRESENTATIONS

Figure 16-3 - Quantile Plot for Cs-137 Concentration

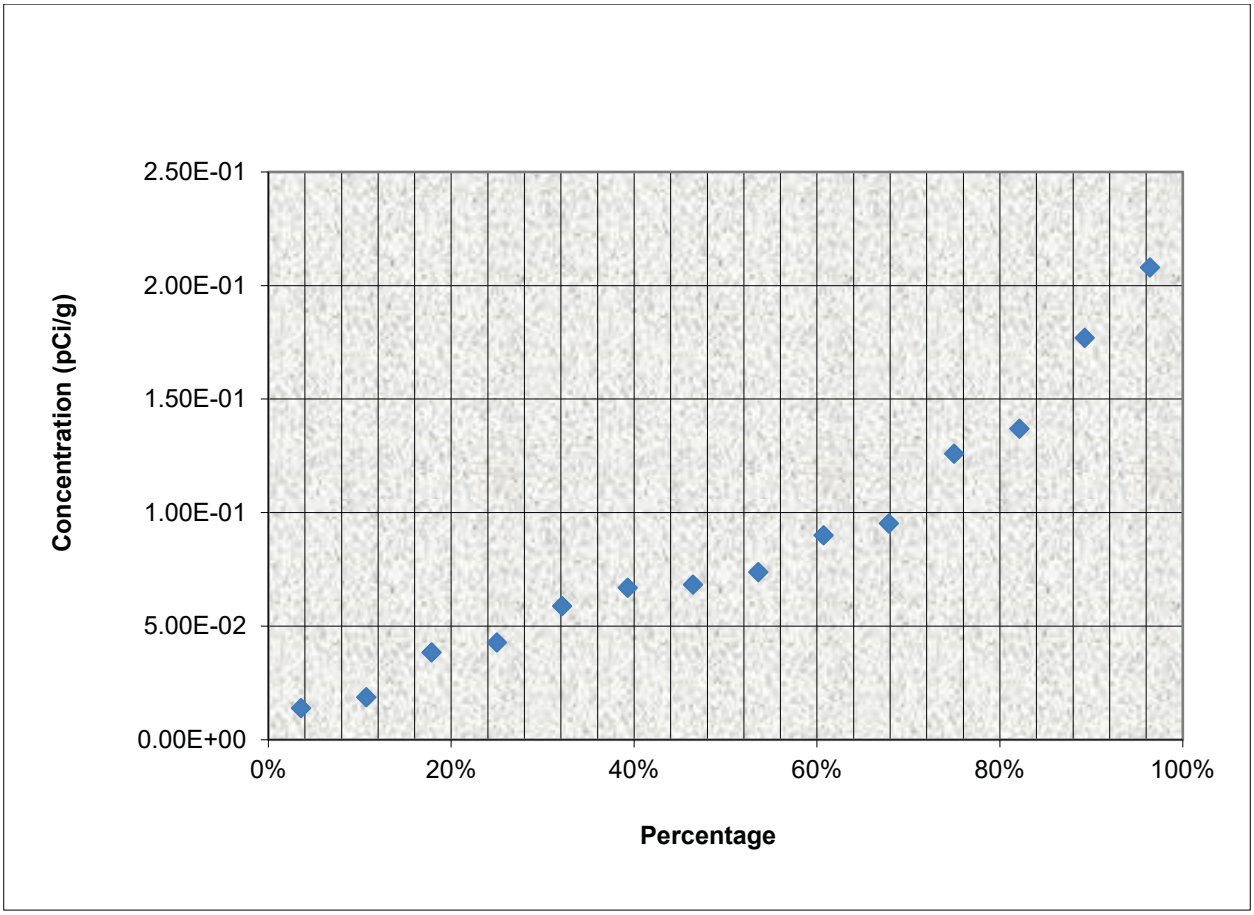


Figure 16-4 - Histogram for Cs-137 Concentration

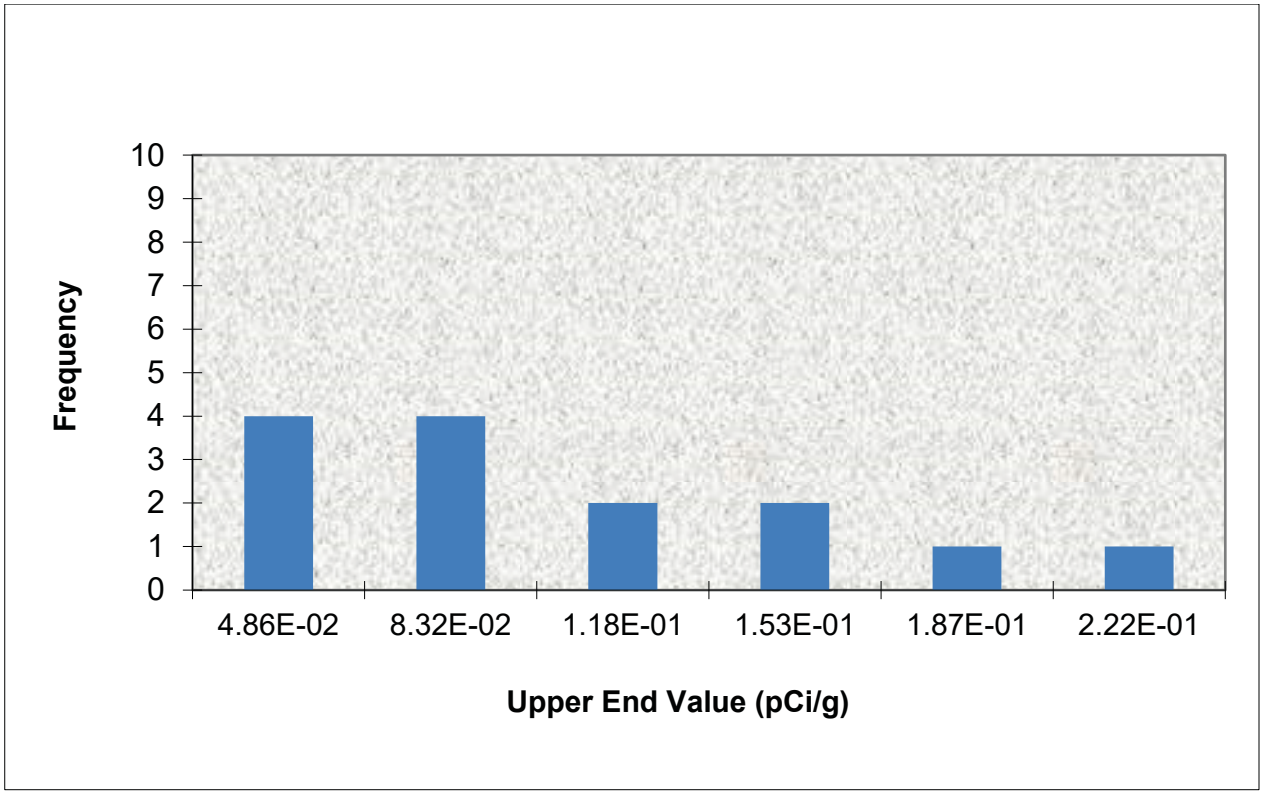
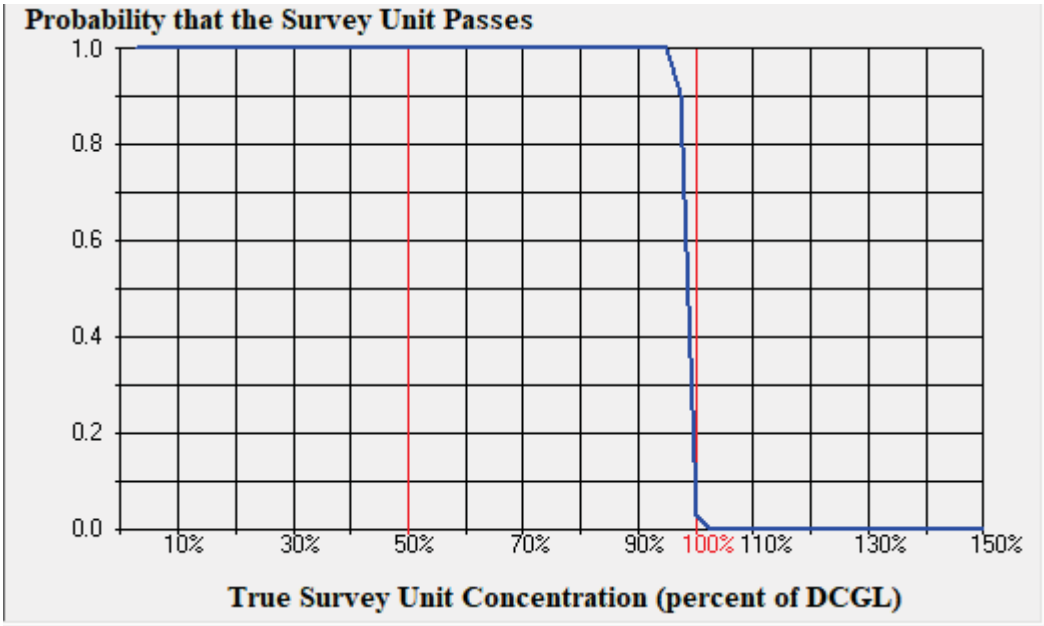


Figure 16-5 - Retrospective Power Curve for L1-SUB-TDS



ATTACHMENT 7
SAMPLE ANALYTICAL REPORTS

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-001-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-001-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.039E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/5/2018 1:18:00PM
Acquisition Started	: 1/8/2018 11:12:42AM
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	: 5316

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:31:56AM

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

Analysis Report for L1-SUB-TDS-FSGS-001-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	75.92	147 -	159	152.39	2.50E+02	61.67	1.23E+03	3.92
F	2	185.86	369 -	376	372.22	4.79E+01	27.29	4.74E+02	1.30
F	3	238.64	472 -	485	477.75	3.65E+02	48.60	6.57E+02	1.48
F	4	295.32	585 -	595	591.09	1.09E+02	29.54	3.00E+02	1.43
F	5	338.39	671 -	681	677.22	5.53E+01	25.01	3.10E+02	1.31
F	6	351.86	699 -	709	704.15	1.80E+02	32.61	2.12E+02	1.56
F	7	583.07	1158 -	1175	1166.48	1.29E+02	25.59	1.35E+02	1.64
F	8	609.13	1213 -	1226	1218.60	1.40E+02	27.34	1.20E+02	1.88
F	9	727.15	1449 -	1460	1454.60	2.63E+01	14.33	8.92E+01	1.99
F	10	910.65	1817 -	1829	1821.54	6.96E+01	19.12	7.23E+01	1.31
F	11	968.93	1933 -	1943	1938.08	3.05E+01	15.24	7.53E+01	1.50
F	12	1460.44	2914 -	2931	2921.00	5.94E+02	50.17	3.56E+01	2.32

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 7:31:56AM

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	75.92	2.50E+02	61.67			2.50E+02	6.17E+01
F	2	185.86	4.79E+01	27.29			4.79E+01	2.73E+01
F	3	238.64	3.65E+02	48.60			3.65E+02	4.86E+01
F	4	295.32	1.09E+02	29.54			1.09E+02	2.95E+01
F	5	338.39	5.53E+01	25.01			5.53E+01	2.50E+01
F	6	351.86	1.80E+02	32.61	8.36E+01	3.72E+01	9.69E+01	4.95E+01
F	7	583.07	1.29E+02	25.59			1.29E+02	2.56E+01
F	8	609.13	1.40E+02	27.34	4.12E+01	2.42E+01	9.85E+01	3.65E+01
F	9	727.15	2.63E+01	14.33			2.63E+01	1.43E+01
F	10	910.65	6.96E+01	19.12			6.96E+01	1.91E+01
F	11	968.93	3.05E+01	15.24			3.05E+01	1.52E+01
F	12	1460.44	5.94E+02	50.17	5.63E+01	1.71E+01	5.37E+02	5.30E+01

Analysis Report for L1-SUB-TDS-FSGS-001-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	5.64E+00	6.38E-01
BI-212	0.60	727.17	*	11.80	1.34E-01	7.36E-02
		785.42		2.00		
		1620.56		2.75		
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.81E-01	2.59E-02
BI-214	0.34	609.31	*	46.30	1.09E-01	4.09E-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	1.50E-01	4.13E-02
		351.92	*	37.20	8.06E-02	4.13E-02
RA-226	0.98	186.21	*	3.28	2.72E-01	1.56E-01
AC-228	0.57	209.28		4.40		
		338.32	*	11.40	1.45E-01	6.59E-02
		794.70		4.60		
		911.60	*	27.70	1.86E-01	5.16E-02
		964.60		5.20		
		969.11	*	16.60	1.43E-01	7.20E-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 L1-SUB-TDS-FSGS-001-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.985	5.64E+00	6.38E-01	
BI-212	0.605	1.34E-01	7.36E-02	
PB-212	0.560	1.81E-01	2.59E-02	
BI-214	0.347	1.09E-01	4.09E-02	
PB-214	0.721	1.15E-01	2.92E-02	
RA-226	0.980	2.72E-01	1.56E-01	
AC-228	0.576	1.64E-01	3.54E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-001-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:31:56AM
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	75.92	6.95197E-02	12.32		
F	7	583.07	3.58303E-02	9.92		

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	5.64E+00	4.97E-01	4.97E-01
+	AR-41	1293.64		99.16	1.54E+10	1.86E+10	1.86E+10
+	CO-60	1173.22		100.00	3.18E-02	4.75E-02	5.11E-02
		1332.49		100.00	3.94E-02		4.75E-02
+	KR-85	513.99		0.43	7.67E+00	8.22E+00	8.22E+00
+	Y-88	898.04		93.70	-5.98E-03	3.12E-02	4.31E-02
		1836.06		99.20	2.51E-03		3.12E-02
+	NB-94	702.63		100.00	2.17E-02	3.26E-02	3.26E-02
		871.10		100.00	-1.33E-03		3.83E-02
+	I-131	284.30		6.06	2.10E-01	4.29E-02	5.38E-01
		364.48		81.20	2.51E-03		4.29E-02
		636.97		7.27	1.09E-01		5.39E-01
+	CS-134	604.70		97.60	-1.35E-02	3.87E-02	4.20E-02
		795.84		85.40	-7.39E-02		3.87E-02
+	CS-137	661.65		85.12	4.28E-02	4.52E-02	4.52E-02
+	CE-144	80.12		1.36	-8.94E-01	2.28E-01	2.84E+00

Analysis Report for L1-SUB-TDS-FSGS-001-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CE-144	133.51		11.09	3.53E-02	2.28E-01	2.28E-01
+	EU-152	121.78		28.40	-6.25E-03	8.79E-02	8.79E-02
		344.28		26.60	-8.58E-02		1.11E-01
		1408.00		20.74	4.47E-02		1.70E-01
+	EU-154	123.07		40.40	-2.19E-02	6.15E-02	6.15E-02
		723.30		19.70	5.03E-02		1.80E-01
		1274.51		35.50	5.51E-02		1.28E-01
+	EU-155	86.54		32.80	-7.38E-02	9.71E-02	9.71E-02
		105.31		21.80	-4.71E-02		1.20E-01
+	BI-214	609.31	*	46.30	1.09E-01	7.15E-02	7.15E-02
		1120.29		15.10	3.10E-01		3.35E-01
		1238.11		5.94	2.94E-01		9.46E-01
		1377.67		4.11	-1.60E-01		8.13E-01
		1407.98		2.48	3.74E-01		1.42E+00
		1509.19		2.19	4.95E-01		1.36E+00
		1764.49		15.80	2.22E-01		2.57E-01
+	PB-214	77.11		10.70	4.19E-01	7.37E-02	3.83E-01
		295.21	*	19.20	1.50E-01		8.94E-02
		351.92	*	37.20	8.06E-02		7.37E-02
+	PA-228	89.95		22.00	1.78E+00	7.55E-01	1.30E+00
		93.35		35.00	1.47E-01		7.55E-01
		105.00		16.30	-6.86E-02		1.47E+00
		129.22		2.97	2.39E+00		7.87E+00
		338.32		5.30	4.60E+00		5.08E+00
		463.00		13.80	4.16E-01		2.02E+00
		911.23		16.70	3.89E+00		2.67E+00
+	AM-241	59.54		36.30	4.63E-02	1.79E-01	1.79E-01
+	CM-243	103.76		23.00	-3.88E-02	1.13E-01	1.13E-01
		228.18		10.60	-2.82E-02		2.33E-01
		277.60		14.00	-1.87E-02		1.89E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-002-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-002-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.960E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/5/2018 1:23:00PM
Acquisition Started	: 1/8/2018 12:17:03PM
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	: 5317

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:33:40AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FSGS-002-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.46	147 -	161	153.46	2.51E+02	61.53	1.30E+03	3.48
F	2	238.48	472 -	481	477.44	2.38E+02	42.78	5.71E+02	1.20
F	3	295.12	587 -	594	590.69	1.21E+02	29.53	2.12E+02	1.36
F	4	337.77	667 -	681	675.96	7.32E+01	27.22	2.85E+02	2.15
F	5	351.86	695 -	708	704.14	2.34E+02	35.43	2.81E+02	1.44
F	6	583.13	1161 -	1175	1166.61	7.06E+01	21.76	1.46E+02	1.68
F	7	609.19	1211 -	1225	1218.71	1.82E+02	30.70	1.50E+02	1.80
F	8	910.60	1815 -	1826	1821.44	6.32E+01	20.47	7.76E+01	2.12
F	9	968.65	1933 -	1944	1937.52	4.52E+01	17.45	8.78E+01	1.43
F	10	1120.26	2236 -	2246	2240.70	3.49E+01	15.75	5.31E+01	2.18
F	11	1407.69	2811 -	2820	2815.51	1.18E+01	7.13	1.26E+01	1.20
F	12	1460.51	2914 -	2928	2921.14	5.37E+02	47.49	3.71E+01	2.40
F	13	1763.58	3521 -	3533	3527.23	2.63E+01	11.31	6.50E+00	2.28

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 7:33:40AM

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	76.46	2.51E+02	61.53			2.51E+02	6.15E+01
F	2	238.48	2.38E+02	42.78			2.38E+02	4.28E+01
F	3	295.12	1.21E+02	29.53			1.21E+02	2.95E+01
F	4	337.77	7.32E+01	27.22			7.32E+01	2.72E+01
F	5	351.86	2.34E+02	35.43	8.36E+01	3.72E+01	1.50E+02	5.14E+01
F	6	583.13	7.06E+01	21.76			7.06E+01	2.18E+01
F	7	609.19	1.82E+02	30.70	4.12E+01	2.42E+01	1.41E+02	3.91E+01
F	8	910.60	6.32E+01	20.47			6.32E+01	2.05E+01
F	9	968.65	4.52E+01	17.45			4.52E+01	1.75E+01
F	10	1120.26	3.49E+01	15.75			3.49E+01	1.58E+01
F	11	1407.69	1.18E+01	7.13			1.18E+01	7.13E+00
F	12	1460.51	5.37E+02	47.49	5.63E+01	1.71E+01	4.81E+02	5.05E+01
F	13	1763.58	2.63E+01	11.31			2.63E+01	1.13E+01

Analysis Report for L1-SUB-TDS-FSGS-002-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	5.26E+00	6.25E-01
PB-212	0.97	77.11	*	17.50	3.61E-01	9.13E-02
		238.63	*	44.60	1.23E-01	2.30E-02
BI-214	0.79	609.31	*	46.30	1.63E-01	4.61E-02
		1120.29	*	15.10	2.14E-01	9.72E-02
		1238.11		5.94		
		1377.67		4.11		
		1407.98	*	2.48	5.36E-01	3.26E-01
		1509.19		2.19		
		1764.49	*	15.80	2.27E-01	9.89E-02
PB-214	0.98	77.11	*	10.70	5.90E-01	1.49E-01
		295.21	*	19.20	1.74E-01	4.33E-02
		351.92	*	37.20	1.30E-01	4.50E-02

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

INTERFERENCE CORRECTED REPORT

Analysis Report for L1-SUB-TDS-FSGS-002-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.991	5.26E+00	6.25E-01	
PB-212	0.979	1.31E-01	2.24E-02	
BI-214	0.799	1.86E-01	3.81E-02	
PB-214	0.988	1.63E-01	3.06E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-002-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:33:40AM
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	337.77	2.03296E-02	18.60	Tol.	AC-228 PA-228
F	6	583.13	1.96148E-02	15.41		
F	8	910.60	1.75502E-02	16.20	Tol.	PA-228
F	9	968.65	1.25639E-02	19.30	Tol.	AC-228

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.26E+00	5.16E-01	5.16E-01
+	AR-41	1293.64		99.16	-1.23E+10	2.34E+10	2.34E+10
+	CO-60	1173.22		100.00	-1.79E-02	4.70E-02	5.52E-02
		1332.49		100.00	3.73E-02		4.70E-02
+	KR-85	513.99		0.43	7.50E+00	8.62E+00	8.62E+00
+	Y-88	898.04		93.70	-2.04E-03	3.01E-02	4.28E-02
		1836.06		99.20	-1.64E-02		3.01E-02
+	NB-94	702.63		100.00	1.72E-02	3.40E-02	3.40E-02
		871.10		100.00	-3.50E-02		3.58E-02
+	I-131	284.30		6.06	3.47E-01	4.54E-02	5.94E-01
		364.48		81.20	5.20E-03		4.54E-02

Analysis Report for L1-SUB-TDS-FSGS-002-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	636.97		7.27	-3.59E-01	4.54E-02	5.67E-01
+	CS-134	604.70		97.60	8.97E-03	4.49E-02	4.87E-02
		795.84		85.40	-1.75E-02		4.49E-02
+	CS-137	661.65		85.12	1.88E-02	4.36E-02	4.36E-02
+	CE-144	80.12		1.36	-4.71E-01	2.29E-01	2.89E+00
		133.51		11.09	-9.21E-02		2.29E-01
+	EU-152	121.78		28.40	-8.75E-03	8.93E-02	8.93E-02
		344.28		26.60	-2.78E-02		1.14E-01
		1408.00		20.74	4.72E-02		1.83E-01
+	EU-154	123.07		40.40	-2.21E-03	6.32E-02	6.32E-02
		723.30		19.70	-9.52E-02		1.74E-01
		1274.51		35.50	2.20E-02		1.44E-01
+	EU-155	86.54		32.80	-1.19E-01	9.82E-02	9.82E-02
		105.31		21.80	4.15E-02		1.25E-01
+	BI-214	609.31	*	46.30	1.63E-01	7.95E-02	7.95E-02
		1120.29	*	15.10	2.14E-01		1.79E-01
		1238.11		5.94	4.32E-01		9.18E-01
		1377.67		4.11	-3.48E-01		7.73E-01
		1407.98	*	2.48	5.36E-01		7.08E-01
		1509.19		2.19	-1.30E+00		1.37E+00
		1764.49	*	15.80	2.27E-01		1.07E-01
+	PB-214	77.11	*	10.70	5.90E-01	7.28E-02	3.40E-01
		295.21	*	19.20	1.74E-01		7.28E-02
		351.92	*	37.20	1.30E-01		8.43E-02
+	PA-228	89.95		22.00	1.34E+00	8.11E-01	1.36E+00
		93.35		35.00	7.12E-01		8.11E-01
		105.00		16.30	3.78E-01		1.58E+00
		129.22		2.97	1.10E+00		8.19E+00
		338.32		5.30	2.75E-01		5.11E+00
		463.00		13.80	-4.63E-01		2.08E+00
		911.23		16.70	2.68E+00		2.85E+00
+	AM-241	59.54		36.30	-7.68E-02	1.82E-01	1.82E-01
+	CM-243	103.76		23.00	5.37E-02	1.20E-01	1.20E-01
		228.18		10.60	1.44E-01		2.45E-01
		277.60		14.00	3.72E-02		1.99E-01

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

Analysis Report for L1-SUB-TDS-FSGS-002-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-003-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-003-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.555E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/5/2018 10:40:00AM
Acquisition Started	: 1/8/2018 1:18:34PM
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	: 5318

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:34:27AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FSGS-003-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.90	147 -	161	154.34	1.08E+02	36.72	1.34E+03	0.98
F	2	185.84	368 -	379	372.18	5.35E+01	31.47	7.37E+02	1.20
F	3	238.48	471 -	485	477.43	2.65E+02	43.25	7.31E+02	1.40
F	4	294.99	585 -	595	590.44	7.89E+01	27.24	3.63E+02	1.20
F	5	337.96	671 -	680	676.35	6.27E+01	24.75	2.18E+02	1.51
F	6	351.87	699 -	708	704.17	1.85E+02	32.13	1.89E+02	1.39
F	7	582.97	1162 -	1172	1166.29	8.06E+01	21.51	7.96E+01	1.65
F	8	609.09	1214 -	1227	1218.52	1.44E+02	27.27	1.11E+02	1.75
F	9	661.41	1316 -	1331	1323.13	1.71E+02	29.15	1.31E+02	1.73
F	10	727.76	1451 -	1459	1455.81	1.82E+01	12.76	6.91E+01	1.13
F	11	910.96	1816 -	1829	1822.17	6.27E+01	19.66	7.96E+01	2.14
F	12	968.41	1933 -	1943	1937.05	2.26E+01	11.75	6.72E+01	0.72
F	13	1120.16	2235 -	2246	2240.51	3.41E+01	15.48	6.51E+01	1.68
F	14	1332.06	2659 -	2669	2664.26	2.18E+01	11.64	3.42E+01	1.34
F	15	1460.34	2914 -	2928	2920.80	5.20E+02	47.45	3.82E+01	2.38

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 7:34:27AM

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	76.90	1.08E+02	36.72			1.08E+02	3.67E+01
F	2	185.84	5.35E+01	31.47			5.35E+01	3.15E+01
F	3	238.48	2.65E+02	43.25			2.65E+02	4.32E+01
F	4	294.99	7.89E+01	27.24			7.89E+01	2.72E+01
F	5	337.96	6.27E+01	24.75			6.27E+01	2.48E+01
F	6	351.87	1.85E+02	32.13	8.36E+01	3.72E+01	1.02E+02	4.92E+01
F	7	582.97	8.06E+01	21.51			8.06E+01	2.15E+01
F	8	609.09	1.44E+02	27.27	4.12E+01	2.42E+01	1.03E+02	3.65E+01
F	9	661.41	1.71E+02	29.15	6.61E+01	2.54E+01	1.04E+02	3.87E+01
F	10	727.76	1.82E+01	12.76			1.82E+01	1.28E+01
F	11	910.96	6.27E+01	19.66			6.27E+01	1.97E+01
F	12	968.41	2.26E+01	11.75			2.26E+01	1.18E+01
F	13	1120.16	3.41E+01	15.48			3.41E+01	1.55E+01
F	14	1332.06	2.18E+01	11.64			2.18E+01	1.16E+01

Analysis Report for L1-SUB-TDS-FSGS-003-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	15	1460.34	5.20E+02	47.45	5.63E+01	1.71E+01	4.64E+02	5.04E+01

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

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.97	1460.75	*	10.67	5.29E+00	6.46E-01
CS-137	0.99	661.65	*	85.12	7.39E-02	2.76E-02
BI-212	0.56	727.17	*	11.80	1.01E-01	7.11E-02
		785.42		2.00		
		1620.56		2.75		
PB-212	0.99	77.11	*	17.50	1.59E-01	5.53E-02
		238.63	*	44.60	1.43E-01	2.45E-02
BI-214	0.58	609.31	*	46.30	1.24E-01	4.45E-02
		1120.29	*	15.10	2.18E-01	9.95E-02
		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	2.61E-01	9.05E-02
		295.21	*	19.20	1.18E-01	4.12E-02
		351.92	*	37.20	9.19E-02	4.47E-02
RA-226	0.97	186.21	*	3.28	3.30E-01	1.95E-01
AC-228	0.58	209.28		4.40		
		338.32	*	11.40	1.78E-01	7.09E-02
		794.70		4.60		
		911.60	*	27.70	1.82E-01	5.76E-02
		964.60		5.20		
		969.11	*	16.60	1.16E-01	6.03E-02

Analysis Report for L1-SUB-TDS-FSGS-003-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

* = 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	0.974	5.29E+00	6.46E-01	
CS-137	0.991	7.39E-02	2.76E-02	
BI-212	0.566	1.01E-01	7.11E-02	
PB-212	0.996	1.36E-01	2.26E-02	
BI-214	0.581	1.40E-01	4.06E-02	
PB-214	0.996	9.93E-02	2.89E-02	
RA-226	0.978	3.30E-01	1.95E-01	
AC-228	0.586	1.58E-01	3.59E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-003-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:34:27AM
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	582.97	2.23890E-02	13.34		
F	14	1332.06	6.05301E-03	26.70	Tol.	CO-60

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	5.29E+00	5.42E-01	5.42E-01
+	AR-41	1293.64		99.16	1.25E+10	1.12E+11	1.12E+11
+	CO-60	1173.22		100.00	1.37E-02	5.02E-02	5.49E-02
		1332.49		100.00	4.78E-02		5.02E-02
+	KR-85	513.99		0.43	6.05E+00	8.27E+00	8.27E+00
+	Y-88	898.04		93.70	3.60E-03	3.48E-02	4.58E-02
		1836.06		99.20	6.83E-03		3.48E-02
+	NB-94	702.63		100.00	-1.38E-02	3.45E-02	3.45E-02
		871.10		100.00	-3.00E-02		3.84E-02
+	I-131	284.30		6.06	1.95E-01	4.70E-02	6.06E-01
		364.48		81.20	3.78E-02		4.70E-02
		636.97		7.27	-1.79E-01		5.88E-01
+	CS-134	604.70		97.60	-6.38E-02	4.51E-02	4.51E-02
		795.84		85.40	3.15E-02		4.57E-02
+	CS-137	661.65	*	85.12	7.39E-02	4.98E-02	4.98E-02
+	CE-144	80.12		1.36	-1.32E+00	2.43E-01	2.94E+00

Analysis Report for L1-SUB-TDS-FSGS-003-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CE-144	133.51		11.09	1.95E-01	2.43E-01	2.43E-01
+	EU-152	121.78		28.40	-3.05E-02	9.28E-02	9.28E-02
		344.28		26.60	-8.84E-02		1.18E-01
		1408.00		20.74	1.14E-01		1.91E-01
+	EU-154	123.07		40.40	-4.14E-02	6.53E-02	6.53E-02
		723.30		19.70	4.29E-02		1.87E-01
		1274.51		35.50	7.00E-03		1.44E-01
+	EU-155	86.54		32.80	-4.50E-02	1.06E-01	1.06E-01
		105.31		21.80	-5.72E-02		1.22E-01
+	BI-214	609.31	*	46.30	1.24E-01	7.68E-02	7.68E-02
		1120.29	*	15.10	2.18E-01		2.07E-01
		1238.11		5.94	4.45E-01		1.08E+00
		1377.67		4.11	-3.28E-01		9.35E-01
		1407.98		2.48	9.50E-01		1.60E+00
		1509.19		2.19	-3.64E-01		1.59E+00
		1764.49		15.80	2.71E-02		2.87E-01
+	PB-214	77.11	*	10.70	2.61E-01	7.79E-02	3.57E-01
		295.21	*	19.20	1.18E-01		1.06E-01
		351.92	*	37.20	9.19E-02		7.79E-02
+	PA-228	89.95		22.00	2.53E+00	9.34E-01	1.64E+00
		93.35		35.00	7.38E-02		9.34E-01
		105.00		16.30	-2.39E-01		1.75E+00
		129.22		2.97	-1.31E+00		9.54E+00
		338.32		5.30	1.29E+00		6.07E+00
		463.00		13.80	1.08E+00		2.59E+00
		911.23		16.70	1.06E+00		3.22E+00
+	AM-241	59.54		36.30	-7.87E-02	1.89E-01	1.89E-01
+	CM-243	103.76		23.00	1.89E-02	1.16E-01	1.16E-01
		228.18		10.60	5.66E-02		2.57E-01
		277.60		14.00	7.34E-03		2.03E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-004-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.038E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/5/2018 10:10:17AM
Acquisition Started	: 1/8/2018 2:25:24PM
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	: 5319

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:35:12AM

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

Analysis Report for L1-SUB-TDS-FSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.46	147 -	161	153.46	2.02E+02	62.75	1.53E+03	3.08
F	2	185.76	368 -	377	372.03	8.38E+01	35.50	6.03E+02	1.46
M	3	238.52	472 -	492	477.51	3.45E+02	46.18	4.62E+02	1.65
m	4	241.76	472 -	492	484.00	1.02E+02	29.81	3.90E+02	1.65
F	5	294.95	583 -	596	590.35	1.44E+02	33.61	4.29E+02	1.59
F	6	338.39	674 -	682	677.20	4.85E+01	23.25	2.13E+02	1.45
F	7	351.74	698 -	712	703.90	2.00E+02	35.06	3.36E+02	1.70
F	8	582.98	1160 -	1175	1166.30	8.48E+01	22.65	1.37E+02	1.78
F	9	608.99	1211 -	1225	1218.31	1.56E+02	28.46	1.42E+02	1.65
F	10	742.56	1481 -	1489	1485.41	1.68E+01	12.75	5.64E+01	1.37
F	11	911.07	1817 -	1827	1822.38	6.49E+01	19.41	7.61E+01	1.52
F	12	1119.97	2236 -	2245	2240.13	2.02E+01	13.94	7.42E+01	1.41
F	13	1460.28	2912 -	2928	2920.67	4.93E+02	44.97	2.13E+01	2.46

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 7:35:12AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.46	2.02E+02	62.75			2.02E+02	6.28E+01
F	2	185.76	8.38E+01	35.50			8.38E+01	3.55E+01
M	3	238.52	3.45E+02	46.18			3.45E+02	4.62E+01
m	4	241.76	1.02E+02	29.81			1.02E+02	2.98E+01
F	5	294.95	1.44E+02	33.61			1.44E+02	3.36E+01
F	6	338.39	4.85E+01	23.25			4.85E+01	2.33E+01
F	7	351.74	2.00E+02	35.06	8.36E+01	3.72E+01	1.16E+02	5.11E+01
F	8	582.98	8.48E+01	22.65			8.48E+01	2.27E+01
F	9	608.99	1.56E+02	28.46	4.12E+01	2.42E+01	1.15E+02	3.74E+01
F	10	742.56	1.68E+01	12.75			1.68E+01	1.27E+01
F	11	911.07	6.49E+01	19.41			6.49E+01	1.94E+01
F	12	1119.97	2.02E+01	13.94			2.02E+01	1.39E+01
F	13	1460.28	4.93E+02	44.97	5.63E+01	1.71E+01	4.37E+02	4.81E+01

Analysis Report for L1-SUB-TDS-FSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.96	1460.75	*	10.67	4.59E+00	5.66E-01
PB-212	0.98	77.11	*	17.50	2.79E-01	8.82E-02
		238.63	*	44.60	1.71E-01	2.46E-02
BI-214	0.57	609.31	*	46.30	1.27E-01	4.21E-02
		1120.29	*	15.10	1.19E-01	8.23E-02
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.98	77.11	*	10.70	4.56E-01	1.44E-01
		295.21	*	19.20	1.99E-01	4.73E-02
		351.92	*	37.20	9.68E-02	4.28E-02
RA-226	0.96	186.21	*	3.28	4.76E-01	2.03E-01

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

INTERFERENCE CORRECTED REPORT

Analysis Report for L1-SUB-TDS-FSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.965	4.59E+00	5.66E-01	
PB-212	0.980	1.73E-01	2.37E-02	
BI-214	0.574	1.26E-01	3.75E-02	
PB-214	0.983	1.44E-01	3.11E-02	
RA-226	0.969	4.76E-01	2.03E-01	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:35:12AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m	4	241.76	2.82116E-02	14.68		
F	6	338.39	1.34679E-02	23.98	Tol.	AC-228 PA-228
F	8	582.98	2.35672E-02	13.35		
F	10	742.56	4.67071E-03	37.90		
F	11	911.07	1.80271E-02	14.95	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	4.59E+00	4.70E-01	4.70E-01
+	AR-41	1293.64		99.16	-1.34E+10	1.93E+11	1.93E+11
+	CO-60	1173.22		100.00	3.58E-02	4.46E-02	5.45E-02
		1332.49		100.00	4.69E-02		4.46E-02
+	KR-85	513.99		0.43	9.33E+00	7.89E+00	7.89E+00
+	Y-88	898.04		93.70	-4.83E-03	2.43E-02	4.15E-02

Analysis Report for L1-SUB-TDS-FSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	Y-88	1836.06		99.20	-1.47E-02	2.43E-02	2.43E-02
+	NB-94	702.63		100.00	-4.33E-03	3.05E-02	3.05E-02
		871.10		100.00	-5.76E-02		3.48E-02
+	I-131	284.30		6.06	-1.39E-01	4.23E-02	5.66E-01
		364.48		81.20	-1.45E-02		4.23E-02
		636.97		7.27	-2.10E-01		5.43E-01
+	CS-134	604.70		97.60	-3.22E-03	4.18E-02	4.30E-02
		795.84		85.40	-2.90E-02		4.18E-02
+	CS-137	661.65		85.12	5.89E-02	5.00E-02	5.00E-02
+	CE-144	80.12		1.36	-1.25E+00	2.29E-01	2.85E+00
		133.51		11.09	-8.45E-02		2.29E-01
+	EU-152	121.78		28.40	-6.60E-02	8.86E-02	8.86E-02
		344.28		26.60	-3.07E-02		1.09E-01
		1408.00		20.74	1.18E-01		1.98E-01
+	EU-154	123.07		40.40	-1.38E-02	6.26E-02	6.26E-02
		723.30		19.70	1.04E-01		1.71E-01
		1274.51		35.50	-2.67E-02		1.30E-01
+	EU-155	86.54		32.80	-8.40E-02	9.78E-02	9.78E-02
		105.31		21.80	-1.14E-02		1.17E-01
+	BI-214	609.31	*	46.30	1.27E-01	7.59E-02	7.59E-02
		1120.29	*	15.10	1.19E-01		1.94E-01
		1238.11		5.94	-1.37E-01		9.18E-01
		1377.67		4.11	3.05E-01		8.88E-01
		1407.98		2.48	9.86E-01		1.66E+00
		1509.19		2.19	8.05E-01		1.59E+00
		1764.49		15.80	2.73E-01		2.87E-01
+	PB-214	77.11	*	10.70	4.56E-01	8.52E-02	3.55E-01
		295.21	*	19.20	1.99E-01		1.14E-01
		351.92	*	37.20	9.68E-02		8.52E-02
+	PA-228	89.95		22.00	1.97E+00	9.45E-01	1.60E+00
		93.35		35.00	-1.08E-01		9.45E-01
		105.00		16.30	-1.91E-01		1.76E+00
		129.22		2.97	4.61E+00		9.60E+00
		338.32		5.30	4.83E+00		5.83E+00
		463.00		13.80	4.10E-01		2.41E+00
		911.23		16.70	3.35E+00		3.10E+00
+	AM-241	59.54		36.30	2.32E-02	1.80E-01	1.80E-01
+	CM-243	103.76		23.00	1.73E-02	1.12E-01	1.12E-01
		228.18		10.60	7.23E-02		2.29E-01
		277.60		14.00	-3.88E-02		1.94E-01

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

Analysis Report for L1-SUB-TDS-FSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Apex-Gamma

Analysis Report for L1-SUB-TDS-QSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-QSGS-004-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.806E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/5/2018 10:13:00AM
Acquisition Started	: 1/8/2018 3:26:44PM
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	: 5320

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:35:57AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-QSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	185.86	369 -	379	372.21	6.67E+01	30.85	5.99E+02	1.18
F	2	238.52	472 -	485	477.52	3.32E+02	46.67	6.38E+02	1.53
F	3	295.05	584 -	595	590.54	1.14E+02	31.37	3.21E+02	1.80
F	4	338.36	671 -	680	677.15	3.30E+01	19.10	2.48E+02	0.91
F	5	351.84	698 -	712	704.11	1.98E+02	34.39	3.30E+02	1.58
m	6	520.57	1015 -	1045	1041.51	2.27E+01	15.09	1.02E+02	1.52
F	7	582.91	1161 -	1170	1166.16	8.68E+01	23.90	1.02E+02	1.91
F	8	609.16	1213 -	1226	1218.66	1.67E+02	28.06	8.02E+01	1.71
F	9	661.36	1318 -	1329	1323.04	1.30E+02	25.66	9.23E+01	1.54
F	10	911.24	1818 -	1828	1822.72	5.57E+01	19.77	9.90E+01	1.64
F	11	1460.40	2913 -	2931	2920.92	5.26E+02	47.02	2.93E+01	2.51
F	12	1764.06	3522 -	3535	3528.18	3.96E+01	13.57	1.31E+01	2.24

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 7:35:57AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	185.86	6.67E+01	30.85			6.67E+01	3.09E+01
F	2	238.52	3.32E+02	46.67			3.32E+02	4.67E+01
F	3	295.05	1.14E+02	31.37			1.14E+02	3.14E+01
F	4	338.36	3.30E+01	19.10			3.30E+01	1.91E+01
F	5	351.84	1.98E+02	34.39	8.36E+01	3.72E+01	1.14E+02	5.07E+01
m	6	520.57	2.27E+01	15.09			2.27E+01	1.51E+01
F	7	582.91	8.68E+01	23.90			8.68E+01	2.39E+01
F	8	609.16	1.67E+02	28.06	4.12E+01	2.42E+01	1.26E+02	3.71E+01
F	9	661.36	1.30E+02	25.66	6.61E+01	2.54E+01	6.37E+01	3.61E+01
F	10	911.24	5.57E+01	19.77			5.57E+01	1.98E+01
F	11	1460.40	5.26E+02	47.02	5.63E+01	1.71E+01	4.70E+02	5.00E+01
F	12	1764.06	3.96E+01	13.57	1.52E+01	9.80E+00	2.44E+01	1.67E+01

Analysis Report for L1-SUB-TDS-QSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	5.22E+00	6.27E-01
CS-137	0.98	661.65	*	85.12	4.39E-02	2.50E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.75E-01	2.62E-02
BI-214	0.54	609.31	*	46.30	1.48E-01	4.43E-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	2.15E-01	1.48E-01
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.66E-01	4.65E-02
		351.92	*	37.20	1.00E-01	4.49E-02
RA-226	0.98	186.21	*	3.28	4.01E-01	1.87E-01
AC-228	0.30	209.28		4.40		
		338.32	*	11.40	9.14E-02	5.32E-02
		794.70		4.60		
		911.60	*	27.70	1.58E-01	5.63E-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 L1-SUB-TDS-QSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.981	5.22E+00	6.27E-01	
CS-137	0.987	4.39E-02	2.50E-02	
PB-212	0.559	1.75E-01	2.62E-02	
BI-214	0.545	1.54E-01	4.24E-02	
PB-214	0.720	1.32E-01	3.23E-02	
RA-226	0.980	4.01E-01	1.87E-01	
AC-228	0.302	1.23E-01	3.87E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-QSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:35:57AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m	6	520.57	6.30671E-03	33.23		
F	7	582.91	2.40991E-02	13.77		

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	5.22E+00	5.15E-01	5.15E-01
+	AR-41	1293.64		99.16	-2.12E+11	2.72E+11	2.72E+11
+	CO-60	1173.22		100.00	2.78E-02	4.97E-02	5.47E-02
		1332.49		100.00	6.51E-02		4.97E-02
+	KR-85	513.99		0.43	-6.07E-01	8.82E+00	8.82E+00
+	Y-88	898.04		93.70	-7.40E-04	3.06E-02	4.21E-02
		1836.06		99.20	-1.35E-03		3.06E-02
+	NB-94	702.63		100.00	8.37E-03	3.52E-02	3.64E-02
		871.10		100.00	5.07E-03		3.52E-02
+	I-131	284.30		6.06	-8.69E-02	4.67E-02	5.94E-01
		364.48		81.20	3.92E-02		4.67E-02
		636.97		7.27	3.82E-01		6.56E-01
+	CS-134	604.70		97.60	-3.16E-03	4.46E-02	4.67E-02
		795.84		85.40	-2.47E-03		4.46E-02
+	CS-137	661.65	*	85.12	4.39E-02	4.38E-02	4.38E-02
+	CE-144	80.12		1.36	1.07E+00	2.41E-01	3.03E+00

Analysis Report for L1-SUB-TDS-QSGS-004-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CE-144	133.51		11.09	-4.34E-03	2.41E-01	2.41E-01
+	EU-152	121.78		28.40	-3.35E-02	9.30E-02	9.30E-02
		344.28		26.60	-8.05E-02		1.16E-01
		1408.00		20.74	8.04E-02		1.96E-01
+	EU-154	123.07		40.40	-3.65E-03	6.55E-02	6.55E-02
		723.30		19.70	8.72E-03		1.90E-01
		1274.51		35.50	-7.79E-03		1.38E-01
+	EU-155	86.54		32.80	-4.64E-02	1.04E-01	1.04E-01
		105.31		21.80	-5.55E-02		1.27E-01
+	BI-214	609.31	*	46.30	1.48E-01	6.99E-02	6.99E-02
		1120.29		15.10	3.91E-01		3.61E-01
		1238.11		5.94	7.73E-01		9.58E-01
		1377.67		4.11	5.03E-01		9.95E-01
		1407.98		2.48	6.72E-01		1.63E+00
		1509.19		2.19	5.46E-02		1.47E+00
		1764.49	*	15.80	2.15E-01		2.42E-01
+	PB-214	77.11		10.70	6.93E-01	8.96E-02	4.11E-01
		295.21	*	19.20	1.66E-01		1.00E-01
		351.92	*	37.20	1.00E-01		8.96E-02
+	PA-228	89.95		22.00	1.34E+00	1.02E+00	1.74E+00
		93.35		35.00	-2.13E-01		1.02E+00
		105.00		16.30	-5.00E-01		1.96E+00
		129.22		2.97	-2.39E+00		1.02E+01
		338.32		5.30	1.07E+00		6.38E+00
		463.00		13.80	-1.04E-01		2.58E+00
		911.23		16.70	3.98E+00		3.60E+00
+	AM-241	59.54		36.30	9.49E-02	1.88E-01	1.88E-01
+	CM-243	103.76		23.00	-2.91E-03	1.21E-01	1.21E-01
		228.18		10.60	-4.57E-02		2.44E-01
		277.60		14.00	-1.52E-01		1.94E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-005-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-005-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.023E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 9:03:00AM
Acquisition Started	: 1/8/2018 4:55:16PM
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	: 5321

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:36:37AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FSGS-005-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.61	147 -	161	153.77	1.82E+02	59.33	1.49E+03	2.73
M	2	86.72	167 -	190	173.98	8.60E+01	35.73	7.14E+02	1.21
m	3	92.77	167 -	190	186.09	9.18E+01	37.09	7.30E+02	1.23
F	4	185.52	365 -	379	371.53	1.05E+02	39.06	8.81E+02	1.80
F	5	238.45	473 -	481	477.38	2.74E+02	45.19	5.31E+02	1.34
F	6	295.07	586 -	595	590.60	1.25E+02	30.56	2.74E+02	1.45
F	7	338.06	668 -	682	676.56	6.64E+01	24.55	3.60E+02	1.32
F	8	351.78	698 -	710	703.98	1.60E+02	34.26	3.08E+02	2.03
F	9	582.85	1157 -	1172	1166.03	1.02E+02	24.93	2.12E+02	1.45
F	10	609.16	1214 -	1226	1218.66	1.24E+02	26.93	1.56E+02	1.58
F	11	661.44	1316 -	1332	1323.19	2.57E+02	34.59	1.37E+02	1.77
F	12	910.96	1815 -	1829	1822.15	5.01E+01	19.20	1.09E+02	2.12
F	13	1120.03	2236 -	2245	2240.25	2.44E+01	14.22	5.42E+01	1.64
F	14	1172.92	2341 -	2352	2346.02	1.39E+02	27.57	1.14E+02	1.88
F	15	1332.26	2659 -	2672	2664.66	1.25E+02	24.53	4.88E+01	2.33
F	16	1460.43	2911 -	2928	2920.97	5.73E+02	49.21	3.69E+01	2.35

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 7:36:37AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.61	1.82E+02	59.33			1.82E+02	5.93E+01
M	2	86.72	8.60E+01	35.73			8.60E+01	3.57E+01
m	3	92.77	9.18E+01	37.09			9.18E+01	3.71E+01
F	4	185.52	1.05E+02	39.06			1.05E+02	3.91E+01
F	5	238.45	2.74E+02	45.19			2.74E+02	4.52E+01
F	6	295.07	1.25E+02	30.56			1.25E+02	3.06E+01
F	7	338.06	6.64E+01	24.55			6.64E+01	2.45E+01
F	8	351.78	1.60E+02	34.26	8.36E+01	3.72E+01	7.67E+01	5.06E+01
F	9	582.85	1.02E+02	24.93			1.02E+02	2.49E+01
F	10	609.16	1.24E+02	26.93	4.12E+01	2.42E+01	8.30E+01	3.62E+01
F	11	661.44	2.57E+02	34.59	6.61E+01	2.54E+01	1.90E+02	4.29E+01
F	12	910.96	5.01E+01	19.20			5.01E+01	1.92E+01
F	13	1120.03	2.44E+01	14.22			2.44E+01	1.42E+01

Analysis Report for L1-SUB-TDS-FSGS-005-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	14	1172.92	1.39E+02	27.57	4.55E+01	1.72E+01	9.32E+01	3.25E+01
F	15	1332.26	1.25E+02	24.53			1.25E+02	2.45E+01
F	16	1460.43	5.73E+02	49.21	5.63E+01	1.71E+01	5.17E+02	5.21E+01

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

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.51E+00	6.33E-01
CO-60	0.98	1173.22	*	100.00	8.76E-02	3.09E-02
		1332.49	*	100.00	1.31E-01	2.66E-02
CS-137	0.99	661.65	*	85.12	1.26E-01	2.91E-02
EU-155	0.32	86.54	*	32.80	5.36E-02	2.27E-02
		105.31		21.80		
PB-212	0.98	77.11	*	17.50	2.54E-01	8.42E-02
		238.63	*	44.60	1.38E-01	2.39E-02
BI-214	0.58	609.31	*	46.30	9.34E-02	4.11E-02
		1120.29	*	15.10	1.46E-01	8.52E-02
		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	4.15E-01	1.38E-01
		295.21	*	19.20	1.74E-01	4.36E-02
		351.92	*	37.20	6.48E-02	4.28E-02
RA-226	0.92	186.21	*	3.28	6.02E-01	2.27E-01

Analysis Report for L1-SUB-TDS-FSGS-005-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.984	5.51E+00	6.33E-01	
CO-60	0.989	1.13E-01	2.02E-02	
CS-137	0.993	1.26E-01	2.91E-02	
EU-155	0.328	5.36E-02	2.27E-02	
PB-212	0.986	1.41E-01	2.30E-02	
BI-214	0.582	1.03E-01	3.70E-02	
PB-214	0.991	1.22E-01	2.99E-02	
RA-226	0.926	6.02E-01	2.27E-01	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-005-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:36:37AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m	3	92.77	2.54877E-02	20.21	Tol.	PA-228
F	7	338.06	1.84406E-02	18.49	Tol.	AC-228 PA-228
F	9	582.85	2.83849E-02	12.20		
F	12	910.96	1.39164E-02	19.16	Tol.	AC-228 PA-228

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.51E+00	5.13E-01	5.13E-01
+	AR-41	1293.64		99.16	4.11E-01	1.10E+00	1.10E+00
+	CO-60	1173.22	*	100.00	8.76E-02	3.11E-02	5.31E-02
		1332.49	*	100.00	1.31E-01		3.11E-02
+	KR-85	513.99		0.43	9.11E+00	9.11E+00	9.11E+00
+	Y-88	898.04		93.70	2.49E-02	2.71E-02	4.73E-02
		1836.06		99.20	-4.70E-03		2.71E-02
+	NB-94	702.63		100.00	7.78E-03	3.49E-02	3.49E-02
		871.10		100.00	-4.78E-02		3.93E-02

Analysis Report for L1-SUB-TDS-FSGS-005-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	I-131	284.30		6.06	2.83E-03	3.46E-02	4.60E-01
		364.48		81.20	-1.57E-02		3.46E-02
		636.97		7.27	-1.39E-01		4.67E-01
+	CS-134	604.70		97.60	-4.34E-02	4.42E-02	4.49E-02
		795.84		85.40	-1.77E-02		4.42E-02
+	CS-137	661.65	*	85.12	1.26E-01	4.75E-02	4.75E-02
+	CE-144	80.12		1.36	-2.09E-01	2.30E-01	2.86E+00
		133.51		11.09	-1.21E-01		2.30E-01
+	EU-152	121.78		28.40	-4.45E-02	8.98E-02	8.98E-02
		344.28		26.60	-5.02E-02		1.16E-01
		1408.00		20.74	-6.49E-02		1.84E-01
+	EU-154	123.07		40.40	-6.13E-03	6.35E-02	6.35E-02
		723.30		19.70	1.45E-01		1.94E-01
		1274.51		35.50	-9.38E-02		1.25E-01
+	EU-155	86.54	*	32.80	5.36E-02	5.65E-02	5.65E-02
		105.31		21.80	-1.62E-02		1.22E-01
+	BI-214	609.31	*	46.30	9.34E-02	7.66E-02	7.66E-02
		1120.29	*	15.10	1.46E-01		1.70E-01
		1238.11		5.94	4.14E-01		9.58E-01
		1377.67		4.11	1.85E-02		8.83E-01
		1407.98		2.48	-5.43E-01		1.54E+00
		1509.19		2.19	7.37E-01		1.48E+00
		1764.49		15.80	2.36E-01		2.68E-01
+	PB-214	77.11	*	10.70	4.15E-01	8.27E-02	3.53E-01
		295.21	*	19.20	1.74E-01		8.48E-02
		351.92	*	37.20	6.48E-02		8.27E-02
+	PA-228	89.95		22.00	1.42E-01	1.11E-01	1.90E-01
		93.35		35.00	1.86E-03		1.11E-01
		105.00		16.30	-1.15E-02		2.14E-01
		129.22		2.97	-4.80E-01		1.12E+00
		338.32		5.30	3.74E-01		7.31E-01
		463.00		13.80	3.71E-02		3.11E-01
		911.23		16.70	1.13E-01		3.86E-01
+	AM-241	59.54		36.30	-1.45E-01	1.80E-01	1.80E-01
+	CM-243	103.76		23.00	8.88E-03	1.18E-01	1.18E-01
		228.18		10.60	-9.96E-02		2.40E-01
		277.60		14.00	2.43E-02		1.97E-01

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

Analysis Report for L1-SUB-TDS-FSGS-005-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-006-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-006-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.984E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 9:10:00AM
Acquisition Started	: 1/8/2018 6:01:35PM
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	: 5322

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:37:26AM

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

Analysis Report for L1-SUB-TDS-FSGS-006-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.76	147 -	158	154.08	1.26E+02	42.88	1.07E+03	1.41
F	2	185.83	369 -	376	372.15	4.63E+01	30.19	4.64E+02	1.28
F	3	238.60	469 -	485	477.68	3.30E+02	45.81	7.15E+02	1.56
F	4	295.26	586 -	598	590.97	5.79E+01	24.67	3.88E+02	1.20
F	5	338.22	670 -	685	676.87	1.05E+02	27.20	2.46E+02	1.87
F	6	582.98	1160 -	1172	1166.31	8.73E+01	23.71	1.58E+02	1.53
F	7	609.13	1213 -	1226	1218.59	1.25E+02	26.20	1.27E+02	1.74
F	8	910.89	1816 -	1827	1822.02	4.73E+01	17.52	9.11E+01	1.42
F	9	969.15	1932 -	1944	1938.52	3.87E+01	16.89	8.22E+01	1.84
F	10	1332.04	2659 -	2670	2664.22	2.74E+01	13.61	3.93E+01	2.03
F	11	1460.45	2913 -	2929	2921.01	5.41E+02	47.95	4.25E+01	2.39

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 7:37:26AM

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	76.76	1.26E+02	42.88			1.26E+02	4.29E+01
F	2	185.83	4.63E+01	30.19			4.63E+01	3.02E+01
F	3	238.60	3.30E+02	45.81			3.30E+02	4.58E+01
F	4	295.26	5.79E+01	24.67			5.79E+01	2.47E+01
F	5	338.22	1.05E+02	27.20			1.05E+02	2.72E+01
F	6	582.98	8.73E+01	23.71			8.73E+01	2.37E+01
F	7	609.13	1.25E+02	26.20	4.12E+01	2.42E+01	8.34E+01	3.57E+01
F	8	910.89	4.73E+01	17.52			4.73E+01	1.75E+01
F	9	969.15	3.87E+01	16.89			3.87E+01	1.69E+01
F	10	1332.04	2.74E+01	13.61			2.74E+01	1.36E+01
F	11	1460.45	5.41E+02	47.95	5.63E+01	1.71E+01	4.85E+02	5.09E+01

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

Analysis Report for L1-SUB-TDS-FSGS-006-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.29E+00	6.28E-01
PB-212	0.99	77.11	*	17.50	1.80E-01	6.20E-02
		238.63	*	44.60	1.70E-01	2.53E-02
BI-214	0.34	609.31	*	46.30	9.61E-02	4.15E-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		
RA-226	0.97	186.21	*	3.28	2.73E-01	1.79E-01
AC-228	0.60	209.28		4.40		
		338.32	*	11.40	2.87E-01	7.54E-02
		794.70		4.60		
		911.60	*	27.70	1.31E-01	4.90E-02
		964.60		5.20		
		969.11	*	16.60	1.90E-01	8.31E-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 L1-SUB-TDS-FSGS-006-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.986	5.29E+00	6.28E-01	
PB-212	0.995	1.72E-01	2.34E-02	
BI-214	0.347	9.61E-02	4.15E-02	
RA-226	0.977	2.73E-01	1.79E-01	
AC-228	0.601	1.80E-01	3.68E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-006-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:37:26AM
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	295.26	1.60892E-02	21.29	Tol.	PB-214
F	6	582.98	2.42427E-02	13.58		
F	10	1332.04	7.59996E-03	24.88		

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	5.29E+00	5.32E-01	5.32E-01
+	AR-41	1293.64		99.16	-1.65E+00	1.34E+00	1.34E+00
+	CO-60	1173.22		100.00	3.72E-02	4.80E-02	5.41E-02
		1332.49		100.00	1.39E-02		4.80E-02
+	KR-85	513.99		0.43	1.45E+01	8.60E+00	8.60E+00
+	Y-88	898.04		93.70	-2.41E-02	3.03E-02	3.92E-02
		1836.06		99.20	-7.56E-04		3.03E-02
+	NB-94	702.63		100.00	-1.28E-02	3.33E-02	3.33E-02
		871.10		100.00	-1.48E-02		3.46E-02
+	I-131	284.30		6.06	-1.25E-01	3.42E-02	4.51E-01
		364.48		81.20	7.07E-03		3.42E-02
		636.97		7.27	-1.37E-01		4.74E-01
+	CS-134	604.70		97.60	-8.47E-03	4.35E-02	4.39E-02
		795.84		85.40	-5.28E-02		4.35E-02
+	CS-137	661.65		85.12	1.39E-02	4.70E-02	4.70E-02

Analysis Report for L1-SUB-TDS-FSGS-006-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12		1.36	-1.92E+00	2.30E-01	2.81E+00
		133.51		11.09	1.52E-01		2.30E-01
+	EU-152	121.78		28.40	-3.76E-02	9.04E-02	9.04E-02
		344.28		26.60	-2.53E-01		1.12E-01
		1408.00		20.74	-6.24E-02		1.71E-01
+	EU-154	123.07		40.40	-3.06E-02	6.35E-02	6.35E-02
		723.30		19.70	4.36E-02		1.71E-01
		1274.51		35.50	3.72E-02		1.30E-01
+	EU-155	86.54		32.80	2.46E-02	1.01E-01	1.01E-01
		105.31		21.80	1.30E-01		1.25E-01
+	BI-214	609.31	*	46.30	9.61E-02	7.55E-02	7.55E-02
		1120.29		15.10	1.54E-01		3.43E-01
		1238.11		5.94	4.97E-01		9.75E-01
		1377.67		4.11	9.83E-01		1.01E+00
		1407.98		2.48	-5.22E-01		1.43E+00
		1509.19		2.19	-5.25E-02		1.42E+00
		1764.49		15.80	2.28E-01		2.99E-01
+	PB-214	77.11		10.70	3.73E-02	8.61E-02	3.82E-01
		295.21		19.20	9.62E-02		1.50E-01
		351.92		37.20	1.53E-01		8.61E-02
+	PA-228	89.95		22.00	2.47E-01	1.13E-01	1.96E-01
		93.35		35.00	-9.70E-02		1.13E-01
		105.00		16.30	2.27E-01		2.24E-01
		129.22		2.97	1.84E-01		1.15E+00
		338.32		5.30	-2.11E-02		7.17E-01
		463.00		13.80	-2.12E-01		2.79E-01
		911.23		16.70	3.77E-01		3.82E-01
+	AM-241	59.54		36.30	-6.64E-02	1.78E-01	1.78E-01
+	CM-243	103.76		23.00	6.72E-02	1.19E-01	1.19E-01
		228.18		10.60	8.82E-02		2.38E-01
		277.60		14.00	8.33E-02		1.95E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-007-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-007-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.050E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 9:15:00AM
Acquisition Started	: 1/8/2018 7:04:18PM
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	: 5323

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:38:06AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FSGS-007-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.56	147 -	161	153.67	2.28E+02	62.31	1.48E+03	3.01
F	2	185.99	367 -	378	372.47	9.01E+01	38.20	7.48E+02	1.67
F	3	238.49	469 -	482	477.46	2.68E+02	45.91	7.93E+02	1.48
F	4	294.84	584 -	596	590.13	8.01E+01	29.77	4.15E+02	1.64
F	5	338.21	673 -	685	676.85	8.34E+01	26.65	2.79E+02	1.70
F	6	351.62	697 -	709	703.68	1.50E+02	31.16	2.86E+02	1.51
F	7	509.89	1016 -	1025	1020.15	2.94E+01	18.01	2.06E+02	0.99
F	8	583.00	1157 -	1175	1166.35	9.17E+01	23.53	1.63E+02	2.01
F	9	609.05	1213 -	1223	1218.42	1.18E+02	25.54	1.16E+02	1.47
F	10	661.52	1318 -	1331	1323.35	2.14E+02	32.62	1.50E+02	1.67
F	11	911.05	1818 -	1829	1822.34	5.39E+01	19.02	7.76E+01	2.15
F	12	968.80	1933 -	1945	1937.82	3.67E+01	15.94	7.68E+01	1.56
F	13	1237.65	2470 -	2481	2475.45	2.53E+01	14.88	7.70E+01	1.72
F	14	1332.02	2658 -	2671	2664.17	5.32E+01	16.60	3.18E+01	2.41
F	15	1460.43	2912 -	2929	2920.98	5.61E+02	48.00	9.00E+00	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 : 1/15/2019 7:38:06AM

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	76.56	2.28E+02	62.31			2.28E+02	6.23E+01
F	2	185.99	9.01E+01	38.20			9.01E+01	3.82E+01
F	3	238.49	2.68E+02	45.91			2.68E+02	4.59E+01
F	4	294.84	8.01E+01	29.77			8.01E+01	2.98E+01
F	5	338.21	8.34E+01	26.65			8.34E+01	2.67E+01
F	6	351.62	1.50E+02	31.16	8.36E+01	3.72E+01	6.66E+01	4.85E+01
F	7	509.89	2.94E+01	18.01			2.94E+01	1.80E+01
F	8	583.00	9.17E+01	23.53			9.17E+01	2.35E+01
F	9	609.05	1.18E+02	25.54	4.12E+01	2.42E+01	7.67E+01	3.52E+01
F	10	661.52	2.14E+02	32.62	6.61E+01	2.54E+01	1.48E+02	4.13E+01
F	11	911.05	5.39E+01	19.02			5.39E+01	1.90E+01
F	12	968.80	3.67E+01	15.94			3.67E+01	1.59E+01
F	13	1237.65	2.53E+01	14.88			2.53E+01	1.49E+01
F	14	1332.02	5.32E+01	16.60			5.32E+01	1.66E+01

Analysis Report for L1-SUB-TDS-FSGS-007-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	15	1460.43	5.61E+02	48.00	5.63E+01	1.71E+01	5.04E+02	5.10E+01

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

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.23E+00	6.03E-01
CS-137	0.99	661.65	*	85.12	9.53E-02	2.71E-02
PB-212	0.98	77.11	*	17.50	3.09E-01	8.69E-02
		238.63	*	44.60	1.32E-01	2.35E-02
BI-214	0.43	609.31	*	46.30	8.41E-02	3.89E-02
		1120.29		15.10		
		1238.11	*	5.94	4.09E-01	2.41E-01
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.97	77.11	*	10.70	5.05E-01	1.42E-01
		295.21	*	19.20	1.09E-01	4.09E-02
		351.92	*	37.20	5.48E-02	4.00E-02
RA-226	0.99	186.21	*	3.28	5.06E-01	2.16E-01
AC-228	0.61	209.28		4.40		
		338.32	*	11.40	2.16E-01	6.98E-02
		794.70		4.60		
		911.60	*	27.70	1.42E-01	5.06E-02
		964.60		5.20		
		969.11	*	16.60	1.71E-01	7.46E-02

Analysis Report for L1-SUB-TDS-FSGS-007-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.984	5.23E+00	6.03E-01	
CS-137	0.997	9.53E-02	2.71E-02	
PB-212	0.984	1.40E-01	2.28E-02	
BI-214	0.430	9.23E-02	3.84E-02	
PB-214	0.978	8.89E-02	2.81E-02	
RA-226	0.992	5.06E-01	2.16E-01	
AC-228	0.610	1.68E-01	3.59E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-007-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:38:06AM
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	509.89	8.17684E-03	30.60		
F	8	583.00	2.54805E-02	12.82		
F	14	1332.02	1.47862E-02	15.59	Tol.	CO-60

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	5.23E+00	4.38E-01	4.38E-01
+	AR-41	1293.64		99.16	-7.40E-01	2.13E+00	2.13E+00
+	CO-60	1173.22		100.00	9.74E-03	4.87E-02	5.60E-02
		1332.49		100.00	4.15E-02		4.87E-02
+	KR-85	513.99		0.43	6.23E+00	8.24E+00	8.24E+00
+	Y-88	898.04		93.70	-2.45E-03	2.81E-02	4.13E-02
		1836.06		99.20	-2.66E-02		2.81E-02
+	NB-94	702.63		100.00	1.02E-03	3.44E-02	3.46E-02
		871.10		100.00	-9.43E-03		3.44E-02
+	I-131	284.30		6.06	-5.05E-01	3.34E-02	4.24E-01
		364.48		81.20	-7.26E-04		3.34E-02
		636.97		7.27	-9.35E-02		4.72E-01
+	CS-134	604.70		97.60	4.99E-02	4.15E-02	4.15E-02
		795.84		85.40	-4.03E-03		4.37E-02
+	CS-137	661.65	*	85.12	9.53E-02	4.60E-02	4.60E-02

Analysis Report for L1-SUB-TDS-FSGS-007-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12		1.36	7.36E-01	2.22E-01	2.80E+00
		133.51		11.09	1.23E-01		2.22E-01
+	EU-152	121.78		28.40	-2.40E-02	8.52E-02	8.52E-02
		344.28		26.60	-3.12E-02		1.14E-01
		1408.00		20.74	8.28E-02		1.66E-01
+	EU-154	123.07		40.40	-5.12E-04	6.04E-02	6.04E-02
		723.30		19.70	1.29E-01		1.80E-01
		1274.51		35.50	1.89E-03		1.30E-01
+	EU-155	86.54		32.80	-7.55E-03	9.63E-02	9.63E-02
		105.31		21.80	3.86E-03		1.21E-01
+	BI-214	609.31	*	46.30	8.41E-02	6.81E-02	6.81E-02
		1120.29		15.10	-2.33E-01		3.26E-01
		1238.11	*	5.94	4.09E-01		5.66E-01
		1377.67		4.11	-8.67E-02		7.33E-01
		1407.98		2.48	6.92E-01		1.39E+00
		1509.19		2.19	1.30E-01		1.30E+00
		1764.49		15.80	1.35E-01		2.51E-01
+	PB-214	77.11	*	10.70	5.05E-01	7.90E-02	3.45E-01
		295.21	*	19.20	1.09E-01		1.09E-01
		351.92	*	37.20	5.48E-02		7.90E-02
+	PA-228	89.95		22.00	2.14E-01	1.16E-01	1.95E-01
		93.35		35.00	6.13E-02		1.16E-01
		105.00		16.30	4.45E-02		2.24E-01
		129.22		2.97	-2.89E-01		1.12E+00
		338.32		5.30	6.27E-01		7.63E-01
		463.00		13.80	2.75E-02		3.19E-01
		911.23		16.70	2.50E-01		3.81E-01
+	AM-241	59.54		36.30	-1.09E-01	1.75E-01	1.75E-01
+	CM-243	103.76		23.00	5.37E-02	1.16E-01	1.16E-01
		228.18		10.60	-1.10E-01		2.30E-01
		277.60		14.00	-1.28E-01		1.81E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-008-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-008-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.017E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 9:23:00AM
Acquisition Started	: 1/8/2018 8:19:50PM
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	: 5324

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:38:49AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FSGS-008-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.29	147 -	159	153.13	2.15E+02	59.78	1.23E+03	3.04
F	2	238.51	472 -	485	477.50	3.62E+02	48.07	6.65E+02	1.46
F	3	269.81	532 -	544	540.09	4.12E+01	25.47	4.40E+02	1.31
F	4	295.00	584 -	596	590.45	9.38E+01	30.07	4.47E+02	1.45
F	5	338.19	672 -	680	676.82	6.09E+01	24.10	2.20E+02	1.29
F	6	351.74	695 -	710	703.90	1.89E+02	34.42	3.84E+02	1.59
F	7	583.00	1161 -	1173	1166.35	8.42E+01	22.68	1.62E+02	1.28
F	8	609.26	1213 -	1225	1218.86	1.22E+02	26.41	1.39E+02	1.75
F	9	661.42	1315 -	1328	1323.15	2.72E+02	35.82	1.18E+02	1.89
F	10	910.79	1816 -	1831	1821.82	6.70E+01	19.76	7.85E+01	2.11
F	11	968.72	1933 -	1943	1937.66	2.66E+01	15.26	8.52E+01	1.50
F	12	1332.06	2659 -	2672	2664.26	3.44E+01	15.23	5.18E+01	2.42
F	13	1460.46	2915 -	2929	2921.03	5.21E+02	46.68	2.26E+01	2.39

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 7:38:49AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.29	2.15E+02	59.78			2.15E+02	5.98E+01
F	2	238.51	3.62E+02	48.07			3.62E+02	4.81E+01
F	3	269.81	4.12E+01	25.47			4.12E+01	2.55E+01
F	4	295.00	9.38E+01	30.07			9.38E+01	3.01E+01
F	5	338.19	6.09E+01	24.10			6.09E+01	2.41E+01
F	6	351.74	1.89E+02	34.42	8.36E+01	3.72E+01	1.05E+02	5.07E+01
F	7	583.00	8.42E+01	22.68			8.42E+01	2.27E+01
F	8	609.26	1.22E+02	26.41	4.12E+01	2.42E+01	8.04E+01	3.58E+01
F	9	661.42	2.72E+02	35.82	6.61E+01	2.54E+01	2.06E+02	4.39E+01
F	10	910.79	6.70E+01	19.76			6.70E+01	1.98E+01
F	11	968.72	2.66E+01	15.26			2.66E+01	1.53E+01
F	12	1332.06	3.44E+01	15.23			3.44E+01	1.52E+01
F	13	1460.46	5.21E+02	46.68	5.63E+01	1.71E+01	4.64E+02	4.97E+01

Analysis Report for L1-SUB-TDS-FSGS-008-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	4.97E+00	6.00E-01
CS-137	0.99	661.65	*	85.12	1.37E-01	3.01E-02
PB-212	0.96	77.11	*	17.50	3.03E-01	8.65E-02
		238.63	*	44.60	1.84E-01	2.62E-02
BI-214	0.34	609.31	*	46.30	9.10E-02	4.09E-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	0.97	77.11	*	10.70	4.96E-01	1.41E-01
		295.21	*	19.20	1.32E-01	4.28E-02
		351.92	*	37.20	8.96E-02	4.33E-02
AC-228	0.58	209.28		4.40		
		338.32	*	11.40	1.63E-01	6.49E-02
		794.70		4.60		
		911.60	*	27.70	1.83E-01	5.44E-02
		964.60		5.20		
		969.11	*	16.60	1.28E-01	7.36E-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 L1-SUB-TDS-FSGS-008-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.986	4.97E+00	6.00E-01	
CS-137	0.991	1.37E-01	3.01E-02	
PB-212	0.969	1.88E-01	2.51E-02	
BI-214	0.349	9.10E-02	4.09E-02	
PB-214	0.978	1.14E-01	2.98E-02	
AC-228	0.586	1.63E-01	3.63E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-008-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:38:49AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	3	269.81	1.14359E-02	30.94		
F	7	583.00	2.33793E-02	13.47		
F	12	1332.06	9.54359E-03	22.16	Tol.	CO-60

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	4.97E+00	4.75E-01	4.75E-01
+	AR-41	1293.64		99.16	2.05E-01	3.31E+00	3.31E+00
+	CO-60	1173.22		100.00	3.46E-02	5.23E-02	5.85E-02
		1332.49		100.00	6.97E-02		5.23E-02
+	KR-85	513.99		0.43	7.10E+00	8.77E+00	8.77E+00
+	Y-88	898.04		93.70	3.45E-02	3.06E-02	4.32E-02
		1836.06		99.20	-3.39E-02		3.06E-02
+	NB-94	702.63		100.00	-1.83E-02	3.48E-02	3.48E-02
		871.10		100.00	-1.84E-02		4.13E-02
+	I-131	284.30		6.06	-2.68E-01	3.69E-02	4.74E-01
		364.48		81.20	-1.22E-03		3.69E-02
		636.97		7.27	2.37E-01		4.73E-01
+	CS-134	604.70		97.60	3.24E-03	4.34E-02	4.34E-02
		795.84		85.40	-3.24E-02		4.40E-02
+	CS-137	661.65	*	85.12	1.37E-01	4.50E-02	4.50E-02

Analysis Report for L1-SUB-TDS-FSGS-008-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12		1.36	-6.53E-01	2.34E-01	2.86E+00
		133.51		11.09	9.94E-02		2.34E-01
+	EU-152	121.78		28.40	-2.94E-02	8.87E-02	8.87E-02
		344.28		26.60	-5.46E-02		1.18E-01
		1408.00		20.74	-2.63E-02		1.64E-01
+	EU-154	123.07		40.40	-3.22E-02	6.21E-02	6.21E-02
		723.30		19.70	-4.74E-02		1.69E-01
		1274.51		35.50	-3.67E-02		1.31E-01
+	EU-155	86.54		32.80	-3.03E-02	9.91E-02	9.91E-02
		105.31		21.80	6.72E-03		1.23E-01
+	BI-214	609.31	*	46.30	9.10E-02	7.48E-02	7.48E-02
		1120.29		15.10	1.91E-01		3.39E-01
		1238.11		5.94	4.35E-01		1.01E+00
		1377.67		4.11	-1.71E-01		9.15E-01
		1407.98		2.48	-2.20E-01		1.37E+00
		1509.19		2.19	-5.08E-01		1.32E+00
		1764.49		15.80	2.61E-01		2.75E-01
+	PB-214	77.11	*	10.70	4.96E-01	9.09E-02	3.11E-01
		295.21	*	19.20	1.32E-01		1.16E-01
		351.92	*	37.20	8.96E-02		9.09E-02
+	PA-228	89.95		22.00	1.99E-01	1.22E-01	2.07E-01
		93.35		35.00	1.83E-03		1.22E-01
		105.00		16.30	-1.81E-02		2.37E-01
		129.22		2.97	-8.76E-01		1.22E+00
		338.32		5.30	8.68E-01		8.20E-01
		463.00		13.80	3.31E-02		3.35E-01
		911.23		16.70	1.23E-01		3.96E-01
+	AM-241	59.54		36.30	3.14E-02	1.89E-01	1.89E-01
+	CM-243	103.76		23.00	-9.38E-03	1.17E-01	1.17E-01
		228.18		10.60	-1.88E-01		2.49E-01
		277.60		14.00	-5.82E-03		2.00E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-009-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-009-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.896E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 9:32:00AM
Acquisition Started	: 1/8/2018 9:24:00PM
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	: 5325

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:39:32AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FSGS-009-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	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	152.76	2.21E+02	60.89	1.39E+03	3.36
F	2	185.54	367 -	377	371.58	5.44E+01	33.39	6.61E+02	1.43
F	3	238.55	470 -	485	477.57	3.05E+02	44.69	6.96E+02	1.46
F	4	295.17	587 -	594	590.78	1.13E+02	30.18	2.10E+02	1.73
F	5	338.13	673 -	682	676.68	4.65E+01	23.28	2.61E+02	1.30
F	6	351.71	695 -	707	703.85	1.72E+02	33.00	2.47E+02	1.79
F	7	582.98	1161 -	1172	1166.31	9.79E+01	25.38	1.42E+02	1.89
F	8	609.23	1214 -	1227	1218.78	1.16E+02	26.18	1.37E+02	1.89
F	9	661.40	1313 -	1329	1323.12	1.66E+02	29.40	1.37E+02	1.97
F	10	910.80	1816 -	1828	1821.85	6.20E+01	19.74	9.38E+01	1.73
F	11	968.55	1933 -	1943	1937.33	3.25E+01	16.14	6.96E+01	1.82
F	12	1120.16	2234 -	2247	2240.51	2.72E+01	14.38	6.58E+01	1.90
F	13	1331.92	2659 -	2670	2663.98	3.17E+01	13.54	4.36E+01	1.43
F	14	1460.45	2914 -	2930	2921.01	5.25E+02	46.28	1.90E+01	2.46

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 7:39:31AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.11	2.21E+02	60.89			2.21E+02	6.09E+01
F	2	185.54	5.44E+01	33.39			5.44E+01	3.34E+01
F	3	238.55	3.05E+02	44.69			3.05E+02	4.47E+01
F	4	295.17	1.13E+02	30.18			1.13E+02	3.02E+01
F	5	338.13	4.65E+01	23.28			4.65E+01	2.33E+01
F	6	351.71	1.72E+02	33.00	8.36E+01	3.72E+01	8.84E+01	4.97E+01
F	7	582.98	9.79E+01	25.38			9.79E+01	2.54E+01
F	8	609.23	1.16E+02	26.18	4.12E+01	2.42E+01	7.49E+01	3.57E+01
F	9	661.40	1.66E+02	29.40	6.61E+01	2.54E+01	1.00E+02	3.88E+01
F	10	910.80	6.20E+01	19.74			6.20E+01	1.97E+01
F	11	968.55	3.25E+01	16.14			3.25E+01	1.61E+01
F	12	1120.16	2.72E+01	14.38			2.72E+01	1.44E+01
F	13	1331.92	3.17E+01	13.54			3.17E+01	1.35E+01
F	14	1460.45	5.25E+02	46.28	5.63E+01	1.71E+01	4.69E+02	4.94E+01

Analysis Report for L1-SUB-TDS-FSGS-009-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	5.16E+00	6.14E-01
CS-137	0.99	661.65	*	85.12	6.83E-02	2.68E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.59E-01	2.47E-02
BI-214	0.58	609.31	*	46.30	8.72E-02	4.18E-02
		1120.29	*	15.10	1.68E-01	8.91E-02
		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	1.63E-01	4.43E-02
		351.92	*	37.20	7.71E-02	4.36E-02
RA-226	0.93	186.21	*	3.28	3.24E-01	1.99E-01
AC-228	0.58	209.28		4.40		
		338.32	*	11.40	1.28E-01	6.43E-02
		794.70		4.60		
		911.60	*	27.70	1.74E-01	5.58E-02
		964.60		5.20		
		969.11	*	16.60	1.60E-01	8.00E-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

Analysis Report for L1-SUB-TDS-FSGS-009-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.985	5.16E+00	6.14E-01	
CS-137	0.990	6.83E-02	2.68E-02	
PB-212	0.559	1.59E-01	2.47E-02	
BI-214	0.584	1.02E-01	3.78E-02	
PB-214	0.717	1.19E-01	3.11E-02	
RA-226	0.931	3.24E-01	1.99E-01	
AC-228	0.581	1.55E-01	3.73E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-009-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:39:31AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	1	76.11	6.14001E-02	13.77		
F	7	582.98	2.71848E-02	12.97		
F	13	1331.92	8.79682E-03	21.38	Tol.	CO-60

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	5.16E+00	4.85E-01	4.85E-01
+	AR-41	1293.64		99.16	1.76E+00	5.22E+00	5.22E+00
+	CO-60	1173.22		100.00	4.52E-02	5.29E-02	5.44E-02
		1332.49		100.00	3.27E-02		5.29E-02
+	KR-85	513.99		0.43	2.60E+00	8.00E+00	8.00E+00
+	Y-88	898.04		93.70	-2.46E-02	2.28E-02	3.98E-02
		1836.06		99.20	-2.96E-02		2.28E-02
+	NB-94	702.63		100.00	2.93E-02	3.32E-02	3.72E-02
		871.10		100.00	-2.25E-02		3.32E-02
+	I-131	284.30		6.06	5.24E-03	3.50E-02	4.74E-01
		364.48		81.20	8.29E-03		3.50E-02
		636.97		7.27	1.88E-01		4.77E-01
+	CS-134	604.70		97.60	-2.73E-02	4.35E-02	4.42E-02
		795.84		85.40	1.60E-02		4.35E-02
+	CS-137	661.65	*	85.12	6.83E-02	4.90E-02	4.90E-02

Analysis Report for L1-SUB-TDS-FSGS-009-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12		1.36	-3.84E-01	2.29E-01	2.88E+00
		133.51		11.09	1.85E-01		2.29E-01
+	EU-152	121.78		28.40	-3.15E-03	8.98E-02	8.98E-02
		344.28		26.60	-1.27E-02		1.13E-01
		1408.00		20.74	6.66E-02		1.78E-01
+	EU-154	123.07		40.40	-9.71E-03	6.31E-02	6.31E-02
		723.30		19.70	-4.64E-02		1.81E-01
		1274.51		35.50	3.99E-02		1.36E-01
+	EU-155	86.54		32.80	-2.85E-02	1.02E-01	1.02E-01
		105.31		21.80	8.58E-02		1.26E-01
+	BI-214	609.31	*	46.30	8.72E-02	7.77E-02	7.77E-02
		1120.29	*	15.10	1.68E-01		2.11E-01
		1238.11		5.94	2.63E-01		9.90E-01
		1377.67		4.11	-1.37E+00		9.41E-01
		1407.98		2.48	5.57E-01		1.49E+00
		1509.19		2.19	-7.49E-01		1.33E+00
		1764.49		15.80	2.05E-01		2.92E-01
+	PB-214	77.11		10.70	5.70E-01	7.28E-02	3.96E-01
		295.21	*	19.20	1.63E-01		7.28E-02
		351.92	*	37.20	7.71E-02		8.13E-02
+	PA-228	89.95		22.00	2.73E-01	1.29E-01	2.19E-01
		93.35		35.00	2.37E-02		1.29E-01
		105.00		16.30	1.31E-01		2.49E-01
		129.22		2.97	3.03E-01		1.26E+00
		338.32		5.30	5.79E-01		8.23E-01
		463.00		13.80	7.46E-02		3.40E-01
		911.23		16.70	4.37E-01		4.34E-01
+	AM-241	59.54		36.30	5.28E-02	1.86E-01	1.86E-01
+	CM-243	103.76		23.00	8.55E-02	1.21E-01	1.21E-01
		228.18		10.60	-7.02E-02		2.43E-01
		277.60		14.00	-2.91E-02		1.93E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-010-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-010-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.965E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 12:20:00PM
Acquisition Started	: 1/9/2018 7:31:09AM
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	: 5326

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:40:12AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FSGS-010-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.91	147 -	161	150.37	9.27E+01	38.89	8.76E+02	1.38
m	2	77.01	147 -	161	154.57	1.41E+02	42.70	9.35E+02	1.39
F	3	238.47	472 -	481	477.41	2.48E+02	44.62	6.47E+02	1.26
F	4	295.05	586 -	596	590.54	1.28E+02	33.14	4.00E+02	1.49
F	5	338.09	673 -	684	676.62	6.91E+01	25.31	2.99E+02	1.33
F	6	351.76	700 -	710	703.95	2.09E+02	36.09	2.90E+02	1.64
F	7	463.02	923 -	932	926.42	2.20E+01	9.59	1.46E+02	0.55
F	8	583.17	1162 -	1173	1166.67	1.12E+02	25.72	1.25E+02	1.76
F	9	609.09	1212 -	1224	1218.52	2.03E+02	32.17	1.40E+02	1.74
F	10	661.47	1316 -	1329	1323.25	1.99E+02	31.75	1.36E+02	1.77
F	11	910.77	1814 -	1829	1821.78	6.30E+01	19.13	9.63E+01	1.69
F	12	968.78	1933 -	1942	1937.78	2.85E+01	14.72	8.38E+01	1.16
F	13	1332.14	2659 -	2670	2664.42	3.36E+01	14.36	4.76E+01	1.60
F	14	1460.42	2912 -	2930	2920.95	5.71E+02	48.94	2.29E+01	2.37
F	15	1764.10	3524 -	3535	3528.27	2.63E+01	10.85	4.27E+00	2.14

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 7:40:12AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
M	1	74.91	9.27E+01	38.89			9.27E+01	3.89E+01
m	2	77.01	1.41E+02	42.70			1.41E+02	4.27E+01
F	3	238.47	2.48E+02	44.62			2.48E+02	4.46E+01
F	4	295.05	1.28E+02	33.14			1.28E+02	3.31E+01
F	5	338.09	6.91E+01	25.31			6.91E+01	2.53E+01
F	6	351.76	2.09E+02	36.09	8.36E+01	3.72E+01	1.25E+02	5.18E+01
F	7	463.02	2.20E+01	9.59			2.20E+01	9.59E+00
F	8	583.17	1.12E+02	25.72			1.12E+02	2.57E+01
F	9	609.09	2.03E+02	32.17	4.12E+01	2.42E+01	1.61E+02	4.03E+01
F	10	661.47	1.99E+02	31.75	6.61E+01	2.54E+01	1.33E+02	4.07E+01
F	11	910.77	6.30E+01	19.13			6.30E+01	1.91E+01
F	12	968.78	2.85E+01	14.72			2.85E+01	1.47E+01
F	13	1332.14	3.36E+01	14.36			3.36E+01	1.44E+01
F	14	1460.42	5.71E+02	48.94	5.63E+01	1.71E+01	5.15E+02	5.19E+01

Analysis Report for L1-SUB-TDS-FSGS-010-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	15	1764.10	2.63E+01	10.85	1.52E+01	9.80E+00	1.11E+01	1.46E+01

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

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.63E+00	6.47E-01
CS-137	0.99	661.65	*	85.12	9.00E-02	2.80E-02
PB-212	0.99	77.11	*	17.50	2.00E-01	6.18E-02
		238.63	*	44.60	1.28E-01	2.40E-02
BI-214	0.54	609.31	*	46.30	1.87E-01	4.77E-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	9.62E-02	1.27E-01
PB-214	0.99	77.11	*	10.70	3.28E-01	1.01E-01
		295.21	*	19.20	1.84E-01	4.84E-02
		351.92	*	37.20	1.08E-01	4.52E-02
AC-228	0.58	209.28		4.40		
		338.32	*	11.40	1.88E-01	6.97E-02
		794.70		4.60		
		911.60	*	27.70	1.75E-01	5.38E-02
		964.60		5.20		
		969.11	*	16.60	1.40E-01	7.25E-02

Analysis Report for L1-SUB-TDS-FSGS-010-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

* = 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	0.982	5.63E+00	6.47E-01	
CS-137	0.995	9.00E-02	2.80E-02	
PB-212	0.997	1.27E-01	2.25E-02	
BI-214	0.544	1.75E-01	4.46E-02	
PB-214	0.996	1.42E-01	3.16E-02	
AC-228	0.585	1.70E-01	3.67E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-010-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:40:12AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

Peak No.		Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
M	1	74.91	2.57600E-02	20.97		
F	7	463.02	6.11170E-03	21.80	Tol.	SB-125 PA-228
F	8	583.17	3.10089E-02	11.52		
F	13	1332.14	9.33407E-03	21.37	Tol.	CO-60

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	5.63E+00	4.95E-01	4.95E-01
+	AR-41	1293.64		99.16	2.68E+01	8.70E+01	8.70E+01
+	CO-60	1173.22		100.00	4.72E-02	5.18E-02	5.99E-02
		1332.49		100.00	2.50E-02		5.18E-02
+	KR-85	513.99		0.43	7.54E+00	8.76E+00	8.76E+00
+	Y-88	898.04		93.70	-1.96E-02	2.15E-02	4.13E-02
		1836.06		99.20	-3.35E-02		2.15E-02
+	NB-94	702.63		100.00	2.39E-03	3.47E-02	3.47E-02
		871.10		100.00	-1.21E-02		4.16E-02
+	I-131	284.30		6.06	2.50E-01	3.63E-02	5.12E-01
		364.48		81.20	-4.47E-03		3.63E-02

Analysis Report for L1-SUB-TDS-FSGS-010-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	636.97		7.27	-4.29E-02	3.63E-02	4.85E-01
+	CS-134	604.70		97.60	-3.16E-03	4.57E-02	4.90E-02
		795.84		85.40	-1.43E-02		4.57E-02
+	CS-137	661.65	*	85.12	9.00E-02	4.73E-02	4.73E-02
+	CE-144	80.12		1.36	-1.17E+00	2.37E-01	3.02E+00
		133.51		11.09	5.94E-02		2.37E-01
+	EU-152	121.78		28.40	-8.04E-03	9.49E-02	9.49E-02
		344.28		26.60	-1.76E-01		1.22E-01
		1408.00		20.74	1.37E-01		1.92E-01
+	EU-154	123.07		40.40	-9.54E-03	6.69E-02	6.69E-02
		723.30		19.70	5.03E-02		1.91E-01
		1274.51		35.50	1.00E-01		1.35E-01
+	EU-155	86.54		32.80	-8.37E-02	1.03E-01	1.03E-01
		105.31		21.80	-3.68E-02		1.26E-01
+	BI-214	609.31	*	46.30	1.87E-01	7.65E-02	7.65E-02
		1120.29		15.10	3.70E-01		3.85E-01
		1238.11		5.94	1.08E+00		1.04E+00
		1377.67		4.11	9.22E-02		9.34E-01
		1407.98		2.48	1.15E+00		1.61E+00
		1509.19		2.19	8.84E-01		1.59E+00
		1764.49	*	15.80	9.62E-02		2.12E-01
+	PB-214	77.11	*	10.70	3.28E-01	8.21E-02	2.39E-01
		295.21	*	19.20	1.84E-01		1.07E-01
		351.92	*	37.20	1.08E-01		8.21E-02
+	PA-228	89.95		22.00	2.46E-01	1.65E-01	2.79E-01
		93.35		35.00	3.66E-02		1.65E-01
		105.00		16.30	6.47E-02		3.14E-01
		129.22		2.97	1.20E+00		1.69E+00
		338.32		5.30	1.66E-01		1.08E+00
		463.00		13.80	-9.58E-02		4.34E-01
		911.23		16.70	3.65E-01		5.36E-01
+	AM-241	59.54		36.30	1.10E-01	1.96E-01	1.96E-01
+	CM-243	103.76		23.00	-7.30E-02	1.20E-01	1.20E-01
		228.18		10.60	5.77E-02		2.50E-01
		277.60		14.00	-3.37E-02		2.04E-01

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

Analysis Report for L1-SUB-TDS-FSGS-010-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-011-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-011-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.858E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 12:26:00PM
Acquisition Started	: 1/9/2018 9:07:41AM
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	: 5327

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:40:55AM

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

Analysis Report for L1-SUB-TDS-FSGS-011-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	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 -	161	153.81	2.68E+02	60.30	1.31E+03	2.86
M	2	238.48	471 -	491	477.43	3.15E+02	45.13	4.44E+02	1.52
m	3	241.92	471 -	491	484.30	7.49E+01	27.82	4.12E+02	1.53
F	4	295.02	585 -	595	590.49	7.71E+01	26.09	3.32E+02	1.12
F	5	351.89	698 -	710	704.21	1.68E+02	31.32	2.75E+02	1.33
F	6	583.05	1159 -	1173	1166.45	1.05E+02	24.45	1.44E+02	1.68
F	7	609.11	1213 -	1222	1218.56	1.08E+02	25.21	1.06E+02	1.61
F	8	661.34	1319 -	1327	1322.99	1.22E+02	25.91	9.61E+01	1.45
F	9	911.10	1817 -	1828	1822.43	6.38E+01	20.05	6.93E+01	2.24
F	10	968.72	1933 -	1943	1937.66	2.26E+01	13.13	6.12E+01	1.34
F	11	1460.47	2910 -	2928	2921.06	5.63E+02	48.05	1.90E+01	2.37

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 7:40:55AM

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	2.68E+02	60.30			2.68E+02	6.03E+01
M	2	238.48	3.15E+02	45.13			3.15E+02	4.51E+01
m	3	241.92	7.49E+01	27.82			7.49E+01	2.78E+01
F	4	295.02	7.71E+01	26.09			7.71E+01	2.61E+01
F	5	351.89	1.68E+02	31.32	8.36E+01	3.72E+01	8.40E+01	4.86E+01
F	6	583.05	1.05E+02	24.45			1.05E+02	2.44E+01
F	7	609.11	1.08E+02	25.21	4.12E+01	2.42E+01	6.67E+01	3.50E+01
F	8	661.34	1.22E+02	25.91	6.61E+01	2.54E+01	5.62E+01	3.63E+01
F	9	911.10	6.38E+01	20.05			6.38E+01	2.00E+01
F	10	968.72	2.26E+01	13.13			2.26E+01	1.31E+01
F	11	1460.47	5.63E+02	48.05	5.63E+01	1.71E+01	5.06E+02	5.10E+01

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

Analysis Report for L1-SUB-TDS-FSGS-011-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.59E+00	6.44E-01
CS-137	0.98	661.65	*	85.12	3.85E-02	2.49E-02
PB-212	0.98	77.11	*	17.50	3.87E-01	9.05E-02
		238.63	*	44.60	1.65E-01	2.51E-02
BI-214	0.34	609.31	*	46.30	7.79E-02	4.11E-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	0.99	77.11	*	10.70	6.33E-01	1.48E-01
		295.21	*	19.20	1.12E-01	3.82E-02
		351.92	*	37.20	7.36E-02	4.28E-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

Analysis Report for L1-SUB-TDS-FSGS-011-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.988	5.59E+00	6.44E-01	
CS-137	0.985	3.85E-02	2.49E-02	
PB-212	0.987	1.76E-01	2.42E-02	
BI-214	0.346	7.79E-02	4.11E-02	
PB-214	0.992	1.04E-01	2.80E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-011-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:40:55AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m	3	241.92	2.07953E-02	18.58		
F	6	583.05	2.90330E-02	11.70		
F	9	911.10	1.77138E-02	15.72	Tol.	AC-228 PA-228
F	10	968.72	6.28759E-03	29.01	Tol.	AC-228

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.59E+00	4.93E-01	4.93E-01
+	AR-41	1293.64		99.16	-3.58E+01	1.40E+02	1.40E+02
+	CO-60	1173.22		100.00	2.93E-02	4.63E-02	5.00E-02
		1332.49		100.00	3.06E-02		4.63E-02
+	KR-85	513.99		0.43	5.19E+00	8.65E+00	8.65E+00
+	Y-88	898.04		93.70	2.20E-02	2.82E-02	4.47E-02
		1836.06		99.20	-2.61E-02		2.82E-02
+	NB-94	702.63		100.00	7.85E-03	3.35E-02	3.35E-02
		871.10		100.00	-6.26E-03		3.98E-02

Analysis Report for L1-SUB-TDS-FSGS-011-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	I-131	284.30		6.06	7.25E-02	3.67E-02	4.81E-01
		364.48		81.20	1.65E-02		3.67E-02
		636.97		7.27	6.79E-02		4.81E-01
+	CS-134	604.70		97.60	6.11E-02	4.28E-02	4.28E-02
		795.84		85.40	-2.80E-02		4.39E-02
+	CS-137	661.65	*	85.12	3.85E-02	4.29E-02	4.29E-02
+	CE-144	80.12		1.36	-9.21E-01	2.28E-01	2.91E+00
		133.51		11.09	-4.80E-02		2.28E-01
+	EU-152	121.78		28.40	-3.42E-02	9.13E-02	9.13E-02
		344.28		26.60	6.61E-02		1.11E-01
		1408.00		20.74	1.18E-01		1.79E-01
+	EU-154	123.07		40.40	-3.21E-02	6.43E-02	6.43E-02
		723.30		19.70	1.54E-01		1.92E-01
		1274.51		35.50	1.83E-02		1.26E-01
+	EU-155	86.54		32.80	-8.99E-02	9.92E-02	9.92E-02
		105.31		21.80	1.05E-02		1.24E-01
+	BI-214	609.31	*	46.30	7.79E-02	7.05E-02	7.05E-02
		1120.29		15.10	9.38E-02		3.41E-01
		1238.11		5.94	8.33E-01		9.24E-01
		1377.67		4.11	-6.56E-01		8.77E-01
		1407.98		2.48	9.91E-01		1.50E+00
		1509.19		2.19	1.14E-01		1.15E+00
		1764.49		15.80	3.23E-01		2.87E-01
+	PB-214	77.11	*	10.70	6.33E-01	8.34E-02	3.44E-01
		295.21	*	19.20	1.12E-01		9.91E-02
		351.92	*	37.20	7.36E-02		8.34E-02
+	PA-228	89.95		22.00	2.33E-01	1.69E-01	2.84E-01
		93.35		35.00	9.14E-02		1.69E-01
		105.00		16.30	1.19E-01		3.23E-01
		129.22		2.97	3.04E-01		1.69E+00
		338.32		5.30	4.92E-01		1.06E+00
		463.00		13.80	1.16E-01		4.45E-01
		911.23		16.70	2.27E-02		5.83E-01
+	AM-241	59.54		36.30	1.15E-01	1.87E-01	1.87E-01
+	CM-243	103.76		23.00	3.22E-04	1.18E-01	1.18E-01
		228.18		10.60	3.89E-02		2.45E-01
		277.60		14.00	-1.09E-01		1.90E-01

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

Analysis Report for L1-SUB-TDS-FSGS-011-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-012-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-012-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.014E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 12:33:00PM
Acquisition Started	: 1/9/2018 10:11:11AM
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	: 5328

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:41:37AM

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

Analysis Report for L1-SUB-TDS-FSGS-012-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.58	147 -	156	153.71	2.31E+02	58.99	1.04E+03	4.32
M	2	238.58	472 -	488	477.64	3.55E+02	46.87	4.36E+02	1.45
m	3	241.49	472 -	488	483.45	1.07E+02	30.24	3.99E+02	1.45
F	4	295.40	587 -	595	591.24	6.63E+01	30.56	3.45E+02	1.66
F	5	338.06	669 -	682	676.56	7.59E+01	28.33	3.44E+02	1.86
F	6	351.79	695 -	710	704.01	2.11E+02	36.63	3.92E+02	1.83
F	7	582.75	1160 -	1174	1165.84	1.08E+02	24.35	1.04E+02	2.00
F	8	609.14	1212 -	1223	1218.62	1.46E+02	28.40	1.35E+02	1.74
F	9	661.46	1317 -	1330	1323.23	3.32E+02	39.69	1.76E+02	1.64
F	10	910.89	1818 -	1827	1822.02	7.36E+01	20.49	7.92E+01	1.42
F	11	968.83	1933 -	1943	1937.89	3.61E+01	15.76	7.13E+01	1.44
F	12	1332.08	2656 -	2671	2664.30	4.97E+01	17.08	5.60E+01	2.16
F	13	1460.45	2912 -	2930	2921.02	6.27E+02	50.68	4.50E+00	2.54

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 7:41:37AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.58	2.31E+02	58.99			2.31E+02	5.90E+01
M	2	238.58	3.55E+02	46.87			3.55E+02	4.69E+01
m	3	241.49	1.07E+02	30.24			1.07E+02	3.02E+01
F	4	295.40	6.63E+01	30.56			6.63E+01	3.06E+01
F	5	338.06	7.59E+01	28.33			7.59E+01	2.83E+01
F	6	351.79	2.11E+02	36.63	8.36E+01	3.72E+01	1.27E+02	5.22E+01
F	7	582.75	1.08E+02	24.35			1.08E+02	2.44E+01
F	8	609.14	1.46E+02	28.40	4.12E+01	2.42E+01	1.05E+02	3.73E+01
F	9	661.46	3.32E+02	39.69	6.61E+01	2.54E+01	2.66E+02	4.71E+01
F	10	910.89	7.36E+01	20.49			7.36E+01	2.05E+01
F	11	968.83	3.61E+01	15.76			3.61E+01	1.58E+01
F	12	1332.08	4.97E+01	17.08			4.97E+01	1.71E+01
F	13	1460.45	6.27E+02	50.68	5.63E+01	1.71E+01	5.70E+02	5.35E+01

Analysis Report for L1-SUB-TDS-FSGS-012-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	6.12E+00	6.68E-01
CS-137	0.99	661.65	*	85.12	1.77E-01	3.28E-02
PB-212	0.98	77.11	*	17.50	3.25E-01	8.54E-02
		238.63	*	44.60	1.80E-01	2.56E-02
BI-214	0.34	609.31	*	46.30	1.19E-01	4.29E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.99	77.11	*	10.70	5.31E-01	1.40E-01
		295.21	*	19.20	9.36E-02	4.34E-02
		351.92	*	37.20	1.08E-01	4.48E-02
AC-228	0.59	209.28		4.40		
		338.32	*	11.40	2.03E-01	7.66E-02
		794.70		4.60		
		911.60	*	27.70	2.01E-01	5.67E-02
		964.60		5.20		
		969.11	*	16.60	1.74E-01	7.63E-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 L1-SUB-TDS-FSGS-012-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.986	6.12E+00	6.68E-01	
CS-137	0.994	1.77E-01	3.28E-02	
PB-212	0.987	1.87E-01	2.46E-02	
BI-214	0.347	1.19E-01	4.29E-02	
PB-214	0.990	1.07E-01	3.05E-02	
AC-228	0.597	1.95E-01	3.91E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-012-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:41:37AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m	3	241.49	2.97708E-02	14.11		
F	7	582.75	3.01202E-02	11.23		
F	12	1332.08	1.37933E-02	17.20	Tol.	CO-60

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	6.12E+00	4.43E-01	4.43E-01
+	AR-41	1293.64		99.16	1.36E+02	2.10E+02	2.10E+02
+	CO-60	1173.22		100.00	7.21E-02	5.41E-02	6.29E-02
		1332.49		100.00	6.28E-02		5.41E-02
+	KR-85	513.99		0.43	1.30E+01	8.75E+00	8.75E+00
+	Y-88	898.04		93.70	2.88E-03	2.65E-02	4.39E-02
		1836.06		99.20	-1.20E-02		2.65E-02
+	NB-94	702.63		100.00	1.27E-02	3.47E-02	3.47E-02
		871.10		100.00	-2.17E-02		3.73E-02
+	I-131	284.30		6.06	-1.02E-01	3.64E-02	4.98E-01
		364.48		81.20	-1.25E-02		3.64E-02
		636.97		7.27	-1.89E-01		4.96E-01
+	CS-134	604.70		97.60	8.92E-02	3.98E-02	4.62E-02
		795.84		85.40	-5.27E-02		3.98E-02

Analysis Report for L1-SUB-TDS-FSGS-012-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	*	85.12	1.77E-01	4.94E-02	4.94E-02
+	CE-144	80.12		1.36	-5.64E+00	2.37E-01	2.95E+00
		133.51		11.09	1.69E-01		2.37E-01
+	EU-152	121.78		28.40	-2.09E-02	9.11E-02	9.11E-02
		344.28		26.60	-4.29E-03		1.25E-01
		1408.00		20.74	1.02E-01		1.96E-01
+	EU-154	123.07		40.40	-7.48E-03	6.41E-02	6.41E-02
		723.30		19.70	7.47E-03		1.96E-01
		1274.51		35.50	1.55E-02		1.37E-01
+	EU-155	86.54		32.80	-7.25E-02	1.04E-01	1.04E-01
		105.31		21.80	3.94E-02		1.28E-01
+	BI-214	609.31	*	46.30	1.19E-01	7.37E-02	7.37E-02
		1120.29		15.10	1.81E-02		3.16E-01
		1238.11		5.94	-4.33E-01		9.69E-01
		1377.67		4.11	-1.21E-01		8.90E-01
		1407.98		2.48	8.55E-01		1.64E+00
		1509.19		2.19	1.77E-01		1.47E+00
		1764.49		15.80	1.48E-01		2.85E-01
+	PB-214	77.11	*	10.70	5.31E-01	9.17E-02	2.65E-01
		295.21	*	19.20	9.36E-02		9.30E-02
		351.92	*	37.20	1.08E-01		9.17E-02
+	PA-228	89.95		22.00	4.89E-01	1.81E-01	3.09E-01
		93.35		35.00	3.58E-02		1.81E-01
		105.00		16.30	-8.30E-02		3.43E-01
		129.22		2.97	1.38E-01		1.76E+00
		338.32		5.30	1.08E-02		1.19E+00
		463.00		13.80	1.94E-01		4.95E-01
		911.23		16.70	8.38E-01		6.37E-01
+	AM-241	59.54		36.30	1.33E-01	1.90E-01	1.90E-01
+	CM-243	103.76		23.00	3.80E-02	1.22E-01	1.22E-01
		228.18		10.60	1.90E-02		2.53E-01
		277.60		14.00	1.47E-01		2.05E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-013-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-013-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.001E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 12:40:00PM
Acquisition Started	: 1/9/2018 11:12:17AM
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	: 5329

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:42:21AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FSGS-013-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.13	147 -	159	152.80	2.08E+02	61.35	1.30E+03	3.38
F	2	185.94	364 -	379	372.37	8.13E+01	35.28	9.70E+02	1.45
F	3	238.50	469 -	485	477.47	3.31E+02	45.95	7.01E+02	1.62
F	4	295.06	586 -	595	590.57	7.93E+01	27.43	3.26E+02	1.25
F	5	337.84	672 -	682	676.12	5.70E+01	24.39	2.88E+02	1.31
F	6	351.74	699 -	709	703.92	1.87E+02	33.42	2.33E+02	1.54
F	7	462.88	920 -	931	926.14	4.98E+01	21.38	1.50E+02	1.95
F	8	583.12	1161 -	1171	1166.59	9.19E+01	23.42	1.25E+02	1.45
F	9	609.18	1212 -	1225	1218.69	1.10E+02	25.15	1.55E+02	1.51
F	10	661.44	1314 -	1328	1323.20	1.65E+02	29.33	1.55E+02	1.68
F	11	785.75	1567 -	1578	1571.78	2.22E+01	13.58	6.67E+01	1.48
F	12	910.63	1816 -	1827	1821.51	4.07E+01	17.03	8.67E+01	1.58
F	13	968.57	1933 -	1942	1937.37	2.63E+01	16.29	8.63E+01	1.73
F	14	1460.40	2912 -	2928	2920.91	6.17E+02	50.85	2.99E+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 : 1/15/2019 7:42:21AM

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	76.13	2.08E+02	61.35			2.08E+02	6.14E+01
F	2	185.94	8.13E+01	35.28			8.13E+01	3.53E+01
F	3	238.50	3.31E+02	45.95			3.31E+02	4.59E+01
F	4	295.06	7.93E+01	27.43			7.93E+01	2.74E+01
F	5	337.84	5.70E+01	24.39			5.70E+01	2.44E+01
F	6	351.74	1.87E+02	33.42	8.36E+01	3.72E+01	1.03E+02	5.00E+01
F	7	462.88	4.98E+01	21.38			4.98E+01	2.14E+01
F	8	583.12	9.19E+01	23.42			9.19E+01	2.34E+01
F	9	609.18	1.10E+02	25.15	4.12E+01	2.42E+01	6.91E+01	3.49E+01
F	10	661.44	1.65E+02	29.33	6.61E+01	2.54E+01	9.92E+01	3.88E+01
F	11	785.75	2.22E+01	13.58			2.22E+01	1.36E+01
F	12	910.63	4.07E+01	17.03			4.07E+01	1.70E+01
F	13	968.57	2.63E+01	16.29			2.63E+01	1.63E+01
F	14	1460.40	6.17E+02	50.85	5.63E+01	1.71E+01	5.61E+02	5.37E+01

Analysis Report for L1-SUB-TDS-FSGS-013-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	6.10E+00	6.75E-01
CS-137	0.99	661.65	*	85.12	6.69E-02	2.64E-02
PB-212	0.95	77.11	*	17.50	2.99E-01	9.03E-02
		238.63	*	44.60	1.71E-01	2.53E-02
BI-214	0.34	609.31	*	46.30	7.95E-02	4.04E-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	0.97	77.11	*	10.70	4.89E-01	1.48E-01
		295.21	*	19.20	1.13E-01	3.96E-02
		351.92	*	37.20	8.92E-02	4.34E-02
RA-226	0.98	186.21	*	3.28	4.79E-01	2.09E-01
AC-228	0.56	209.28		4.40		
		338.32	*	11.40	1.55E-01	6.66E-02
		794.70		4.60		
		911.60	*	27.70	1.13E-01	4.74E-02
		964.60		5.20		
		969.11	*	16.60	1.28E-01	7.97E-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 L1-SUB-TDS-FSGS-013-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.980	6.10E+00	6.75E-01	
CS-137	0.993	6.69E-02	2.64E-02	
PB-212	0.955	1.75E-01	2.44E-02	
BI-214	0.348	7.95E-02	4.04E-02	
PB-214	0.972	1.06E-01	2.87E-02	
RA-226	0.988	4.79E-01	2.09E-01	
AC-228	0.560	1.27E-01	3.48E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-013-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:42:21AM
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	462.88	1.38293E-02	21.47	Tol.	PA-228
F	8	583.12	2.55278E-02	12.74		
F	11	785.75	6.17509E-03	30.55	Tol.	BI-212

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	6.10E+00	5.05E-01	5.05E-01
+	AR-41	1293.64		99.16	8.50E+01	2.92E+02	2.92E+02
+	CO-60	1173.22		100.00	2.95E-02	4.62E-02	5.86E-02
		1332.49		100.00	3.11E-02		4.62E-02
+	KR-85	513.99		0.43	9.30E+00	8.78E+00	8.78E+00
+	Y-88	898.04		93.70	1.14E-02	3.28E-02	4.21E-02
		1836.06		99.20	3.38E-03		3.28E-02
+	NB-94	702.63		100.00	-2.63E-02	3.40E-02	3.40E-02
		871.10		100.00	-4.92E-02		3.91E-02
+	I-131	284.30		6.06	-3.53E-01	3.62E-02	4.85E-01
		364.48		81.20	5.02E-03		3.62E-02
		636.97		7.27	-1.19E-01		4.76E-01

Analysis Report for L1-SUB-TDS-FSGS-013-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-134	604.70		97.60	1.38E-02	4.32E-02	4.42E-02
		795.84		85.40	2.41E-02		4.32E-02
+	CS-137	661.65	*	85.12	6.69E-02	4.92E-02	4.92E-02
+	CE-144	80.12		1.36	-1.30E+00	2.35E-01	2.92E+00
		133.51		11.09	1.03E-01		2.35E-01
+	EU-152	121.78		28.40	-3.89E-02	9.05E-02	9.05E-02
		344.28		26.60	-6.94E-02		1.18E-01
		1408.00		20.74	1.58E-01		1.99E-01
+	EU-154	123.07		40.40	-1.05E-02	6.38E-02	6.38E-02
		723.30		19.70	1.65E-01		1.92E-01
		1274.51		35.50	-8.51E-02		1.30E-01
+	EU-155	86.54		32.80	-1.39E-02	1.01E-01	1.01E-01
		105.31		21.80	-1.97E-02		1.24E-01
+	BI-214	609.31	*	46.30	7.95E-02	7.90E-02	7.90E-02
		1120.29		15.10	3.64E-01		3.39E-01
		1238.11		5.94	4.29E-01		9.48E-01
		1377.67		4.11	-5.95E-02		8.83E-01
		1407.98		2.48	1.32E+00		1.66E+00
		1509.19		2.19	9.00E-01		1.69E+00
		1764.49		15.80	4.56E-01		3.15E-01
+	PB-214	77.11	*	10.70	4.89E-01	7.79E-02	3.27E-01
		295.21	*	19.20	1.13E-01		9.42E-02
		351.92	*	37.20	8.92E-02		7.79E-02
+	PA-228	89.95		22.00	1.77E-01	1.79E-01	3.02E-01
		93.35		35.00	2.62E-02		1.79E-01
		105.00		16.30	3.86E-02		3.45E-01
		129.22		2.97	-3.96E-01		1.77E+00
		338.32		5.30	1.75E-01		1.17E+00
		463.00		13.80	4.29E-01		4.84E-01
		911.23		16.70	9.07E-01		5.63E-01
+	AM-241	59.54		36.30	1.38E-01	1.93E-01	1.93E-01
+	CM-243	103.76		23.00	-3.39E-02	1.19E-01	1.19E-01
		228.18		10.60	-2.28E-01		2.40E-01
		277.60		14.00	1.06E-01		1.98E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FSGS-014-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FSGS-014-SB
Sample Description	: L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.806E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/8/2018 12:45:00PM
Acquisition Started	: 1/9/2018 12:13:01PM
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	: 5330

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 7:43:02AM

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

Analysis Report for L1-SUB-TDS-FSGS-014-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.92	146 -	162	150.39	1.04E+02	37.19	8.68E+02	1.28
m	2	77.17	146 -	162	154.88	1.29E+02	38.80	7.36E+02	1.29
M	3	87.33	171 -	193	175.21	5.31E+01	35.39	8.04E+02	1.49
m	4	92.91	171 -	193	186.36	9.79E+01	39.11	7.79E+02	1.50
F	5	238.46	469 -	481	477.39	2.85E+02	46.43	7.51E+02	1.41
F	6	295.08	586 -	594	590.62	7.23E+01	27.90	3.24E+02	1.28
F	7	338.12	668 -	680	676.68	5.79E+01	24.42	3.12E+02	1.44
F	8	351.75	699 -	709	703.93	1.70E+02	33.18	2.56E+02	1.58
F	9	582.98	1158 -	1173	1166.31	1.03E+02	24.87	1.67E+02	1.73
F	10	609.16	1215 -	1223	1218.66	1.12E+02	25.62	1.08E+02	1.66
F	11	661.48	1315 -	1331	1323.27	3.67E+02	40.51	1.23E+02	1.92
F	12	910.81	1816 -	1828	1821.86	7.33E+01	20.90	8.51E+01	1.90
F	13	968.61	1931 -	1942	1937.44	2.51E+01	14.69	9.25E+01	1.44
F	14	1332.05	2658 -	2670	2664.24	4.50E+01	16.84	5.25E+01	2.09
F	15	1460.46	2911 -	2930	2921.03	5.29E+02	46.55	3.48E+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 : 1/15/2019 7:43:02AM

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	74.92	1.04E+02	37.19			1.04E+02	3.72E+01
m	2	77.17	1.29E+02	38.80			1.29E+02	3.88E+01
M	3	87.33	5.31E+01	35.39			5.31E+01	3.54E+01
m	4	92.91	9.79E+01	39.11			9.79E+01	3.91E+01
F	5	238.46	2.85E+02	46.43			2.85E+02	4.64E+01
F	6	295.08	7.23E+01	27.90			7.23E+01	2.79E+01
F	7	338.12	5.79E+01	24.42			5.79E+01	2.44E+01
F	8	351.75	1.70E+02	33.18	8.36E+01	3.72E+01	8.62E+01	4.99E+01
F	9	582.98	1.03E+02	24.87			1.03E+02	2.49E+01
F	10	609.16	1.12E+02	25.62	4.12E+01	2.42E+01	7.07E+01	3.53E+01
F	11	661.48	3.67E+02	40.51	6.61E+01	2.54E+01	3.01E+02	4.78E+01
F	12	910.81	7.33E+01	20.90			7.33E+01	2.09E+01
F	13	968.61	2.51E+01	14.69			2.51E+01	1.47E+01
F	14	1332.05	4.50E+01	16.84			4.50E+01	1.68E+01

Analysis Report for L1-SUB-TDS-FSGS-014-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	15	1460.46	5.29E+02	46.55	5.63E+01	1.71E+01	4.73E+02	4.96E+01

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

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.26E+00	6.23E-01
CS-137	0.99	661.65	*	85.12	2.08E-01	3.48E-02
PB-212	0.99	77.11	*	17.50	1.84E-01	5.69E-02
		238.63	*	44.60	1.50E-01	2.56E-02
BI-214	0.34	609.31	*	46.30	8.30E-02	4.17E-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	3.01E-01	9.31E-02
		295.21	*	19.20	1.05E-01	4.10E-02
		351.92	*	37.20	7.59E-02	4.41E-02
AC-228	0.58	209.28		4.40		
		338.32	*	11.40	1.61E-01	6.82E-02
		794.70		4.60		
		911.60	*	27.70	2.07E-01	5.98E-02
		964.60		5.20		
		969.11	*	16.60	1.25E-01	7.34E-02

Analysis Report for L1-SUB-TDS-FSGS-014-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

* = 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	0.987	5.26E+00	6.23E-01	
CS-137	0.995	2.08E-01	3.48E-02	
PB-212	0.997	1.47E-01	2.35E-02	
BI-214	0.348	8.30E-02	4.17E-02	
PB-214	0.997	8.89E-02	2.88E-02	
AC-228	0.584	1.70E-01	3.83E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FSGS-014-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 7:43:02AM
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	74.92	2.89321E-02	17.85		
M	3	87.33	1.47604E-02	33.30	Tol.	EU-155
m	4	92.91	2.72038E-02	19.97	Tol.	PA-228
F	9	582.98	2.85228E-02	12.11		
F	14	1332.05	1.25099E-02	18.69		

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	5.26E+00	5.35E-01	5.35E-01
+	AR-41	1293.64		99.16	-1.31E+02	4.04E+02	4.04E+02
+	CO-60	1173.22		100.00	2.46E-02	5.62E-02	5.85E-02
		1332.49		100.00	7.89E-02		5.62E-02
+	KR-85	513.99		0.43	6.39E+00	8.83E+00	8.83E+00
+	Y-88	898.04		93.70	-2.40E-02	2.84E-02	4.05E-02
		1836.06		99.20	1.96E-03		2.84E-02
+	NB-94	702.63		100.00	1.28E-03	3.70E-02	3.70E-02
		871.10		100.00	-5.27E-02		3.70E-02

Analysis Report for L1-SUB-TDS-FSGS-014-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	I-131	284.30		6.06	2.63E-01	3.82E-02	5.20E-01
		364.48		81.20	-1.24E-02		3.82E-02
		636.97		7.27	-2.99E-02		4.82E-01
+	CS-134	604.70		97.60	7.47E-02	4.41E-02	4.56E-02
		795.84		85.40	3.81E-03		4.41E-02
+	CS-137	661.65	*	85.12	2.08E-01	4.82E-02	4.82E-02
+	CE-144	80.12		1.36	2.04E-01	2.30E-01	2.93E+00
		133.51		11.09	-2.13E-01		2.30E-01
+	EU-152	121.78		28.40	-1.59E-02	9.23E-02	9.23E-02
		344.28		26.60	-1.46E-01		1.17E-01
		1408.00		20.74	1.41E-01		1.90E-01
+	EU-154	123.07		40.40	-4.64E-03	6.48E-02	6.48E-02
		723.30		19.70	1.23E-01		1.82E-01
		1274.51		35.50	3.19E-02		1.31E-01
+	EU-155	86.54		32.80	7.62E-03	1.00E-01	1.00E-01
		105.31		21.80	-2.92E-02		1.28E-01
+	BI-214	609.31	*	46.30	8.30E-02	7.05E-02	7.05E-02
		1120.29		15.10	8.02E-02		3.53E-01
		1238.11		5.94	-5.02E-01		9.65E-01
		1377.67		4.11	-5.01E-01		9.30E-01
		1407.98		2.48	1.18E+00		1.59E+00
		1509.19		2.19	3.53E-01		1.62E+00
		1764.49		15.80	1.33E-01		2.51E-01
+	PB-214	77.11	*	10.70	3.01E-01	8.10E-02	2.16E-01
		295.21	*	19.20	1.05E-01		9.30E-02
		351.92	*	37.20	7.59E-02		8.10E-02
+	PA-228	89.95		22.00	1.24E-02	1.84E-01	3.14E-01
		93.35		35.00	-4.02E-02		1.84E-01
		105.00		16.30	-7.51E-02		3.65E-01
		129.22		2.97	-6.75E-02		1.84E+00
		338.32		5.30	1.05E+00		1.21E+00
		463.00		13.80	-4.36E-01		4.86E-01
		911.23		16.70	6.68E-01		6.52E-01
+	AM-241	59.54		36.30	3.08E-02	1.88E-01	1.88E-01
+	CM-243	103.76		23.00	7.23E-02	1.23E-01	1.23E-01
		228.18		10.60	-7.73E-02		2.53E-01
		277.60		14.00	-1.53E-01		2.00E-01

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

Analysis Report for L1-SUB-TDS-FSGS-014-SB

L1-SUB-TDS COMBINEDTB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-001-SB

BIASED SAMPLE

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-001-SB
Sample Description	: BIASED SAMPLE
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.576E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/10/2018 12:36:00PM
Acquisition Started	: 1/12/2018 6:49:51AM
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	: 5331

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:08:13AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FJGS-001-SB

BIASED SAMPLE

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.29	147 -	160	153.12	2.29E+02	59.67	1.21E+03	3.14
F	2	238.54	469 -	485	477.55	3.83E+02	48.08	6.97E+02	1.55
F	3	295.03	585 -	594	590.51	9.41E+01	28.58	2.48E+02	1.63
F	4	338.38	672 -	683	677.19	7.10E+01	26.94	2.97E+02	1.66
F	5	351.74	695 -	709	703.90	1.36E+02	30.66	3.69E+02	1.50
F	6	582.91	1163 -	1173	1166.16	9.36E+01	23.33	1.20E+02	1.47
F	7	609.24	1212 -	1224	1218.81	1.06E+02	24.67	1.24E+02	1.77
F	8	661.46	1316 -	1329	1323.23	1.82E+02	31.06	1.61E+02	1.71
F	9	910.85	1817 -	1827	1821.95	5.97E+01	19.43	7.15E+01	1.76
F	10	1460.50	2913 -	2930	2921.11	5.67E+02	49.37	5.39E+01	2.39

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

BACKGROUND SUBTRACT REPORT

Peak Analysis Performed on : 1/15/2019 8:08:13AM

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	76.29	2.29E+02	59.67			2.29E+02	5.97E+01
F	2	238.54	3.83E+02	48.08			3.83E+02	4.81E+01
F	3	295.03	9.41E+01	28.58			9.41E+01	2.86E+01
F	4	338.38	7.10E+01	26.94			7.10E+01	2.69E+01
F	5	351.74	1.36E+02	30.66	8.36E+01	3.72E+01	5.22E+01	4.82E+01
F	6	582.91	9.36E+01	23.33			9.36E+01	2.33E+01
F	7	609.24	1.06E+02	24.67	4.12E+01	2.42E+01	6.44E+01	3.46E+01
F	8	661.46	1.82E+02	31.06	6.61E+01	2.54E+01	1.16E+02	4.01E+01
F	9	910.85	5.97E+01	19.43			5.97E+01	1.94E+01
F	10	1460.50	5.67E+02	49.37	5.63E+01	1.71E+01	5.11E+02	5.23E+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 L1-SUB-TDS-FJGS-001-SB

BIASED SAMPLE

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	5.81E+00	6.76E-01
CS-137	0.99	661.65	*	85.12	8.17E-02	2.86E-02
PB-212	0.96	77.11	*	17.50	3.43E-01	9.20E-02
		238.63	*	44.60	2.06E-01	2.80E-02
BI-214	0.34	609.31	*	46.30	7.75E-02	4.18E-02
		1120.29		15.10		
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.97	77.11	*	10.70	5.61E-01	1.50E-01
		295.21	*	19.20	1.41E-01	4.32E-02
		351.92	*	37.20	4.71E-02	4.35E-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	0.990	5.81E+00	6.76E-01	
CS-137	0.994	8.17E-02	2.86E-02	

Analysis Report for L1-SUB-TDS-FJGS-001-SB

BIASED SAMPLE

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
PB-212	0.969	2.13E-01	2.68E-02	
BI-214	0.349	7.75E-02	4.18E-02	
PB-214	0.978	9.89E-02	3.01E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FJGS-001-SB
BIASED SAMPLE

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:08:13AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	4	338.38	1.97313E-02	18.96	Tol.	AC-228 PA-228
F	6	582.91	2.60076E-02	12.46		
F	9	910.85	1.65701E-02	16.29	Tol.	AC-228 PA-228

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.81E+00	5.78E-01	5.78E-01
+	AR-41	1293.64		99.16	-7.39E+04	5.15E+05	5.15E+05
+	CO-60	1173.22		100.00	1.86E-02	5.00E-02	5.50E-02
		1332.49		100.00	4.45E-02		5.00E-02
+	KR-85	513.99		0.43	6.32E+00	8.50E+00	8.50E+00
+	Y-88	898.04		93.70	7.33E-03	2.61E-02	4.13E-02
		1836.06		99.20	-1.57E-02		2.61E-02
+	NB-94	702.63		100.00	9.62E-03	3.64E-02	3.64E-02
		871.10		100.00	-5.04E-03		3.98E-02
+	I-131	284.30		6.06	-1.19E-01	3.92E-02	5.24E-01
		364.48		81.20	-1.58E-02		3.92E-02

Analysis Report for L1-SUB-TDS-FJGS-001-SB

BIASED SAMPLE

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	636.97		7.27	1.44E-01	3.92E-02	5.50E-01
+	CS-134	604.70		97.60	-1.62E-02	4.43E-02	4.43E-02
		795.84		85.40	-1.03E-02		4.59E-02
+	CS-137	661.65	*	85.12	8.17E-02	5.10E-02	5.10E-02
+	CE-144	80.12		1.36	-5.58E-01	2.36E-01	2.96E+00
		133.51		11.09	-1.04E-02		2.36E-01
+	EU-152	121.78		28.40	-4.30E-02	9.39E-02	9.39E-02
		344.28		26.60	9.79E-03		1.24E-01
		1408.00		20.74	1.36E-01		1.82E-01
+	EU-154	123.07		40.40	-6.72E-03	6.62E-02	6.62E-02
		723.30		19.70	2.71E-02		1.86E-01
		1274.51		35.50	-1.38E-01		1.43E-01
+	EU-155	86.54		32.80	-4.38E-02	1.04E-01	1.04E-01
		105.31		21.80	4.08E-02		1.30E-01
+	BI-214	609.31	*	46.30	7.75E-02	7.74E-02	7.74E-02
		1120.29		15.10	2.25E-01		3.57E-01
		1238.11		5.94	3.70E-01		9.66E-01
		1377.67		4.11	4.12E-01		9.91E-01
		1407.98		2.48	1.14E+00		1.52E+00
		1509.19		2.19	-1.57E-01		1.56E+00
		1764.49		15.80	1.44E-01		2.79E-01
+	PB-214	77.11	*	10.70	5.61E-01	8.61E-02	3.37E-01
		295.21	*	19.20	1.41E-01		8.61E-02
		351.92	*	37.20	4.71E-02		9.45E-02
+	PA-228	89.95		22.00	7.75E-01	3.48E-01	5.92E-01
		93.35		35.00	-6.82E-02		3.48E-01
		105.00		16.30	2.61E-01		6.68E-01
		129.22		2.97	3.05E-01		3.35E+00
		338.32		5.30	1.38E+00		2.27E+00
		463.00		13.80	2.47E-01		8.85E-01
		911.23		16.70	8.96E-01		1.13E+00
+	AM-241	59.54		36.30	4.89E-02	1.89E-01	1.89E-01
+	CM-243	103.76		23.00	7.23E-02	1.25E-01	1.25E-01
		228.18		10.60	2.17E-01		2.52E-01
		277.60		14.00	1.76E-01		2.06E-01

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

Analysis Report for L1-SUB-TDS-FJGS-001-SB

BIASED SAMPLE

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-002-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-002-SB
Sample Description	: L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.620E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/15/2018 9:15:00AM
Acquisition Started	: 1/15/2018 3:45:35PM
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	: 5332

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:08:57AM

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

Analysis Report for L1-SUB-TDS-FJGS-002-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	92.70	183 -	192	185.94	6.32E+01	34.02	8.22E+02	1.07
F	2	238.57	472 -	485	477.62	3.12E+02	45.52	6.06E+02	1.62
F	3	294.99	582 -	595	590.43	9.15E+01	29.57	4.10E+02	1.57
F	4	338.55	672 -	684	677.54	5.17E+01	25.13	3.12E+02	1.65
F	5	351.88	699 -	712	704.18	1.92E+02	33.27	2.52E+02	1.63
F	6	583.09	1161 -	1172	1166.52	8.80E+01	23.61	1.24E+02	1.74
F	7	609.01	1214 -	1224	1218.35	1.20E+02	25.94	1.02E+02	1.87
F	8	661.36	1317 -	1330	1323.04	2.06E+02	32.21	1.33E+02	1.88
F	9	910.94	1817 -	1828	1822.12	7.59E+01	20.42	5.48E+01	2.05
F	10	969.07	1933 -	1943	1938.36	2.00E+01	11.29	7.49E+01	0.65
F	11	1332.01	2658 -	2669	2664.16	3.51E+01	13.85	2.90E+01	1.93
F	12	1460.31	2911 -	2929	2920.73	5.35E+02	46.80	1.43E+01	2.42

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 8:08:57AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	92.70	6.32E+01	34.02			6.32E+01	3.40E+01
F	2	238.57	3.12E+02	45.52			3.12E+02	4.55E+01
F	3	294.99	9.15E+01	29.57			9.15E+01	2.96E+01
F	4	338.55	5.17E+01	25.13			5.17E+01	2.51E+01
F	5	351.88	1.92E+02	33.27	8.36E+01	3.72E+01	1.08E+02	4.99E+01
F	6	583.09	8.80E+01	23.61			8.80E+01	2.36E+01
F	7	609.01	1.20E+02	25.94	4.12E+01	2.42E+01	7.92E+01	3.55E+01
F	8	661.36	2.06E+02	32.21	6.61E+01	2.54E+01	1.40E+02	4.10E+01
F	9	910.94	7.59E+01	20.42			7.59E+01	2.04E+01
F	10	969.07	2.00E+01	11.29			2.00E+01	1.13E+01
F	11	1332.01	3.51E+01	13.85			3.51E+01	1.39E+01
F	12	1460.31	5.35E+02	46.80	5.63E+01	1.71E+01	4.79E+02	4.98E+01

Analysis Report for L1-SUB-TDS-FJGS-002-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.96	1460.75	*	10.67	5.42E+00	6.40E-01
CS-137	0.98	661.65	*	85.12	9.80E-02	2.93E-02
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.67E-01	2.59E-02
BI-214	0.34	609.31	*	46.30	9.48E-02	4.28E-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	1.36E-01	4.44E-02
		351.92	*	37.20	9.71E-02	4.51E-02
AC-228	0.60	209.28		4.40		
		338.32	*	11.40	1.46E-01	7.14E-02
		794.70		4.60		
		911.60	*	27.70	2.19E-01	5.96E-02
		964.60		5.20		
		969.11	*	16.60	1.02E-01	5.75E-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 L1-SUB-TDS-FJGS-002-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.969	5.42E+00	6.40E-01	
CS-137	0.987	9.80E-02	2.93E-02	
PB-212	0.560	1.67E-01	2.59E-02	
BI-214	0.342	9.48E-02	4.28E-02	
PB-214	0.719	1.17E-01	3.16E-02	
AC-228	0.604	1.55E-01	3.58E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FJGS-002-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:08:57AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	1	92.70	1.75445E-02	26.93	Tol.	PA-228
F	6	583.09	2.44396E-02	13.42		
F	11	1332.01	9.76036E-03	19.71		

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	5.42E+00	4.93E-01	4.93E-01
+	AR-41	1293.64		99.16	-6.50E-02	6.00E-01	6.00E-01
+	CO-60	1173.22		100.00	1.49E-02	5.34E-02	6.28E-02
		1332.49		100.00	7.23E-02		5.34E-02
+	KR-85	513.99		0.43	1.72E+00	8.95E+00	8.95E+00
+	Y-88	898.04		93.70	6.24E-03	3.06E-02	4.38E-02
		1836.06		99.20	-4.23E-02		3.06E-02
+	NB-94	702.63		100.00	-2.92E-03	3.68E-02	3.68E-02
		871.10		100.00	-3.45E-03		3.81E-02
+	I-131	284.30		6.06	6.86E-02	3.54E-02	4.83E-01
		364.48		81.20	1.44E-02		3.54E-02
		636.97		7.27	1.13E-01		4.78E-01
+	CS-134	604.70		97.60	-5.87E-02	4.19E-02	4.35E-02
		795.84		85.40	-3.19E-02		4.19E-02

Analysis Report for L1-SUB-TDS-FJGS-002-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	*	85.12	9.80E-02	4.88E-02	4.88E-02
+	CE-144	80.12		1.36	1.62E+00	2.45E-01	3.04E+00
		133.51		11.09	5.15E-02		2.45E-01
+	EU-152	121.78		28.40	-1.47E-02	9.40E-02	9.40E-02
		344.28		26.60	-9.87E-03		1.17E-01
		1408.00		20.74	7.68E-02		1.75E-01
+	EU-154	123.07		40.40	-4.26E-03	6.63E-02	6.63E-02
		723.30		19.70	1.40E-01		1.80E-01
		1274.51		35.50	-1.79E-02		1.28E-01
+	EU-155	86.54		32.80	-1.85E-02	1.04E-01	1.04E-01
		105.31		21.80	1.24E-02		1.32E-01
+	BI-214	609.31	*	46.30	9.48E-02	7.27E-02	7.27E-02
		1120.29		15.10	6.78E-02		3.50E-01
		1238.11		5.94	7.14E-01		9.65E-01
		1377.67		4.11	7.13E-01		9.48E-01
		1407.98		2.48	6.42E-01		1.46E+00
		1509.19		2.19	-1.69E-01		1.42E+00
		1764.49		15.80	1.41E-01		2.56E-01
+	PB-214	77.11		10.70	5.71E-01	8.49E-02	4.14E-01
		295.21	*	19.20	1.36E-01		1.20E-01
		351.92	*	37.20	9.71E-02		8.49E-02
+	PA-228	89.95		22.00	1.47E-02	1.10E-01	1.88E-01
		93.35		35.00	-8.91E-02		1.10E-01
		105.00		16.30	7.22E-02		2.21E-01
		129.22		2.97	2.11E-01		1.14E+00
		338.32		5.30	1.61E-01		7.02E-01
		463.00		13.80	7.61E-02		2.82E-01
		911.23		16.70	4.33E-01		3.81E-01
+	AM-241	59.54		36.30	1.14E-01	1.94E-01	1.94E-01
+	CM-243	103.76		23.00	5.08E-02	1.26E-01	1.26E-01
		228.18		10.60	1.70E-01		2.55E-01
		277.60		14.00	-8.41E-02		2.03E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-003-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-003-SB
Sample Description	: L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.008E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/15/2018 9:57:00AM
Acquisition Started	: 1/15/2018 5:07:36PM
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	: 5333

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:09:38AM

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

Analysis Report for L1-SUB-TDS-FJGS-003-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.44	147 -	161	153.42	2.62E+02	61.36	1.30E+03	3.41
M	2	238.54	473 -	489	477.56	2.87E+02	44.88	5.03E+02	1.65
m	3	241.78	473 -	489	484.04	8.73E+01	29.93	4.78E+02	1.66
F	4	295.01	587 -	596	590.48	1.30E+02	30.66	2.95E+02	1.34
F	5	338.00	673 -	680	676.43	6.71E+01	24.88	1.85E+02	1.47
F	6	351.72	697 -	711	703.86	1.86E+02	33.37	3.02E+02	1.64
F	7	582.93	1159 -	1170	1166.20	7.87E+01	22.26	1.11E+02	1.61
F	8	609.12	1214 -	1227	1218.57	1.53E+02	28.30	1.19E+02	1.84
F	9	661.48	1318 -	1328	1323.28	1.10E+02	25.46	1.10E+02	1.83
F	10	910.78	1816 -	1828	1821.80	5.92E+01	20.51	1.14E+02	1.82
F	11	968.52	1932 -	1942	1937.26	3.10E+01	15.76	1.01E+02	1.27
F	12	1119.51	2234 -	2244	2239.20	3.22E+01	16.63	6.94E+01	2.06
F	13	1331.80	2660 -	2670	2663.74	1.93E+01	11.72	4.63E+01	1.26
F	14	1460.46	2912 -	2928	2921.03	5.69E+02	49.00	4.36E+01	2.40

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 8:09:38AM

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	76.44	2.62E+02	61.36			2.62E+02	6.14E+01
M	2	238.54	2.87E+02	44.88			2.87E+02	4.49E+01
m	3	241.78	8.73E+01	29.93			8.73E+01	2.99E+01
F	4	295.01	1.30E+02	30.66			1.30E+02	3.07E+01
F	5	338.00	6.71E+01	24.88			6.71E+01	2.49E+01
F	6	351.72	1.86E+02	33.37	8.36E+01	3.72E+01	1.02E+02	5.00E+01
F	7	582.93	7.87E+01	22.26			7.87E+01	2.23E+01
F	8	609.12	1.53E+02	28.30	4.12E+01	2.42E+01	1.11E+02	3.72E+01
F	9	661.48	1.10E+02	25.46	6.61E+01	2.54E+01	4.36E+01	3.60E+01
F	10	910.78	5.92E+01	20.51			5.92E+01	2.05E+01
F	11	968.52	3.10E+01	15.76			3.10E+01	1.58E+01
F	12	1119.51	3.22E+01	16.63			3.22E+01	1.66E+01
F	13	1331.80	1.93E+01	11.72			1.93E+01	1.17E+01
F	14	1460.46	5.69E+02	49.00	5.63E+01	1.71E+01	5.13E+02	5.19E+01

Analysis Report for L1-SUB-TDS-FJGS-003-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	5.55E+00	6.40E-01
CS-137	0.99	661.65	*	85.12	2.92E-02	2.41E-02
PB-212	0.97	77.11	*	17.50	3.72E-01	9.02E-02
		238.63	*	44.60	1.47E-01	2.42E-02
BI-214	0.56	609.31	*	46.30	1.27E-01	4.31E-02
		1120.29	*	15.10	1.95E-01	1.01E-01
		1238.11		5.94		
		1377.67		4.11		
		1407.98		2.48		
		1509.19		2.19		
		1764.49		15.80		
PB-214	0.98	77.11	*	10.70	6.08E-01	1.48E-01
		295.21	*	19.20	1.85E-01	4.44E-02
		351.92	*	37.20	8.75E-02	4.30E-02
AC-228	0.57	209.28		4.40		
		338.32	*	11.40	1.81E-01	6.77E-02
		794.70		4.60		
		911.60	*	27.70	1.63E-01	5.68E-02
		964.60		5.20		
		969.11	*	16.60	1.50E-01	7.67E-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 L1-SUB-TDS-FJGS-003-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.986	5.55E+00	6.40E-01	
CS-137	0.995	2.92E-02	2.41E-02	
PB-212	0.979	1.56E-01	2.34E-02	
BI-214	0.566	1.38E-01	3.97E-02	
PB-214	0.983	1.44E-01	3.03E-02	
AC-228	0.576	1.65E-01	3.78E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FJGS-003-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:09:38AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

Peak No.		Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
m	3	241.78	2.42409E-02	17.15		
F	7	582.93	2.18550E-02	14.14		
F	13	1331.80	5.36119E-03	30.37	Tol.	CO-60

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	5.55E+00	5.31E-01	5.31E-01
+	AR-41	1293.64		99.16	-8.88E-02	7.49E-01	7.49E-01
+	CO-60	1173.22		100.00	5.84E-02	4.83E-02	5.32E-02
		1332.49		100.00	2.26E-02		4.83E-02
+	KR-85	513.99		0.43	-1.06E-01	8.28E+00	8.28E+00
+	Y-88	898.04		93.70	1.70E-02	3.09E-02	4.35E-02
		1836.06		99.20	8.29E-04		3.09E-02
+	NB-94	702.63		100.00	-1.19E-02	3.31E-02	3.31E-02
		871.10		100.00	-8.77E-03		3.80E-02
+	I-131	284.30		6.06	3.92E-01	3.26E-02	4.53E-01
		364.48		81.20	-3.56E-03		3.26E-02
		636.97		7.27	1.75E-01		4.77E-01
+	CS-134	604.70		97.60	-3.12E-02	4.45E-02	4.51E-02

Analysis Report for L1-SUB-TDS-FJGS-003-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CS-134	795.84		85.40	-9.39E-03	4.45E-02	4.45E-02
+	CS-137	661.65	*	85.12	2.92E-02	4.36E-02	4.36E-02
+	CE-144	80.12		1.36	-4.91E-01	2.30E-01	2.85E+00
		133.51		11.09	-4.84E-02		2.30E-01
+	EU-152	121.78		28.40	-6.31E-02	9.05E-02	9.05E-02
		344.28		26.60	-8.01E-02		1.12E-01
		1408.00		20.74	-2.30E-03		1.75E-01
+	EU-154	123.07		40.40	-2.36E-02	6.39E-02	6.39E-02
		723.30		19.70	2.61E-01		2.01E-01
		1274.51		35.50	6.38E-02		1.30E-01
+	EU-155	86.54		32.80	-3.87E-02	9.92E-02	9.92E-02
		105.31		21.80	3.39E-02		1.24E-01
+	BI-214	609.31	*	46.30	1.27E-01	7.38E-02	7.38E-02
		1120.29	*	15.10	1.95E-01		2.03E-01
		1238.11		5.94	4.18E-01		9.85E-01
		1377.67		4.11	3.57E-01		1.01E+00
		1407.98		2.48	-1.92E-02		1.46E+00
		1509.19		2.19	1.07E+00		1.53E+00
		1764.49		15.80	2.54E-01		2.75E-01
+	PB-214	77.11	*	10.70	6.08E-01	8.54E-02	3.37E-01
		295.21	*	19.20	1.85E-01		8.99E-02
		351.92	*	37.20	8.75E-02		8.54E-02
+	PA-228	89.95		22.00	2.49E-01	1.08E-01	1.86E-01
		93.35		35.00	-1.31E-02		1.08E-01
		105.00		16.30	1.06E-01		2.11E-01
		129.22		2.97	6.19E-02		1.10E+00
		338.32		5.30	1.07E+00		7.06E-01
		463.00		13.80	-1.41E-01		2.74E-01
		911.23		16.70	3.72E-01		3.77E-01
+	AM-241	59.54		36.30	1.00E-02	1.85E-01	1.85E-01
+	CM-243	103.76		23.00	2.31E-02	1.18E-01	1.18E-01
		228.18		10.60	-1.08E-01		2.41E-01
		277.60		14.00	-1.26E-01		1.90E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-004-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-004-SB
Sample Description	: L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.977E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/15/2018 10:07:00AM
Acquisition Started	: 1/15/2018 6:10:46PM
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	: 5334

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:10:20AM

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

Analysis Report for L1-SUB-TDS-FJGS-004-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	75.89	147 -	159	152.33	1.71E+02	59.20	1.32E+03	3.18
F	2	185.85	366 -	376	372.19	7.14E+01	35.45	7.33E+02	1.39
F	3	238.53	469 -	485	477.53	3.78E+02	49.55	7.56E+02	1.71
F	4	269.89	535 -	546	540.24	5.15E+01	27.02	4.08E+02	1.46
F	5	295.15	586 -	595	590.76	9.11E+01	29.32	3.56E+02	1.28
F	6	338.25	669 -	683	676.93	5.60E+01	27.05	4.22E+02	1.68
F	7	351.86	699 -	712	704.14	1.48E+02	33.86	4.05E+02	1.72
F	8	583.19	1160 -	1171	1166.72	8.18E+01	24.73	1.74E+02	1.76
F	9	609.26	1214 -	1224	1218.85	8.64E+01	24.34	1.46E+02	1.68
F	10	661.47	1315 -	1328	1323.25	1.56E+02	29.50	1.55E+02	1.88
F	11	911.16	1814 -	1832	1822.55	7.10E+01	22.63	1.60E+02	2.40
F	12	968.18	1932 -	1945	1936.58	2.93E+01	16.23	1.31E+02	1.32
F	13	1172.92	2339 -	2354	2346.02	2.98E+02	37.62	1.30E+02	2.19
F	14	1331.99	2657 -	2673	2664.12	2.49E+02	33.24	6.26E+01	2.27
F	15	1460.48	2913 -	2929	2921.07	5.48E+02	47.87	1.61E+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 : 1/15/2019 8:10:20AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	75.89	1.71E+02	59.20			1.71E+02	5.92E+01
F	2	185.85	7.14E+01	35.45			7.14E+01	3.54E+01
F	3	238.53	3.78E+02	49.55			3.78E+02	4.96E+01
F	4	269.89	5.15E+01	27.02			5.15E+01	2.70E+01
F	5	295.15	9.11E+01	29.32			9.11E+01	2.93E+01
F	6	338.25	5.60E+01	27.05			5.60E+01	2.71E+01
F	7	351.86	1.48E+02	33.86	8.36E+01	3.72E+01	6.40E+01	5.03E+01
F	8	583.19	8.18E+01	24.73			8.18E+01	2.47E+01
F	9	609.26	8.64E+01	24.34	4.12E+01	2.42E+01	4.52E+01	3.43E+01
F	10	661.47	1.56E+02	29.50	6.61E+01	2.54E+01	8.96E+01	3.89E+01
F	11	911.16	7.10E+01	22.63			7.10E+01	2.26E+01
F	12	968.18	2.93E+01	16.23			2.93E+01	1.62E+01
F	13	1172.92	2.98E+02	37.62	4.55E+01	1.72E+01	2.52E+02	4.14E+01
F	14	1331.99	2.49E+02	33.24			2.49E+02	3.32E+01

Analysis Report for L1-SUB-TDS-FJGS-004-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	15	1460.48	5.48E+02	47.87	5.63E+01	1.71E+01	4.92E+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

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.37E+00	6.30E-01
CO-60	0.97	1173.22	*	100.00	2.43E-01	4.15E-02
		1332.49	*	100.00	2.68E-01	3.83E-02
CS-137	0.99	661.65	*	85.12	6.07E-02	2.66E-02
PB-212	0.55	77.11		17.50		
		238.63	*	44.60	1.95E-01	2.75E-02
BI-214	0.34	609.31	*	46.30	5.22E-02	3.97E-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	1.31E-01	4.25E-02
		351.92	*	37.20	5.54E-02	4.37E-02
RA-226	0.97	186.21	*	3.28	4.22E-01	2.11E-01
AC-228	0.58	209.28		4.40		
		338.32	*	11.40	1.53E-01	7.41E-02
		794.70		4.60		
		911.60	*	27.70	1.97E-01	6.35E-02
		964.60		5.20		
		969.11	*	16.60	1.43E-01	7.97E-02

Analysis Report for L1-SUB-TDS-FJGS-004-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.988	5.37E+00	6.30E-01	
CO-60	0.974	2.57E-01	2.82E-02	
CS-137	0.995	6.07E-02	2.66E-02	
PB-212	0.559	1.95E-01	2.75E-02	
BI-214	0.349	5.22E-02	3.97E-02	
PB-214	0.721	9.40E-02	3.05E-02	
RA-226	0.979	4.22E-01	2.11E-01	
AC-228	0.588	1.69E-01	4.12E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FJGS-004-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:10:20AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	1	75.89	4.73627E-02	17.36		
F	4	269.89	1.42947E-02	26.25		
F	8	583.19	2.27092E-02	15.13		

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	5.37E+00	4.76E-01	4.76E-01
+	AR-41	1293.64		99.16	-4.86E-02	1.22E+00	1.22E+00
+	CO-60	1173.22	*	100.00	2.43E-01	3.88E-02	5.88E-02
		1332.49	*	100.00	2.68E-01		3.88E-02
+	KR-85	513.99		0.43	1.07E+01	9.32E+00	9.32E+00
+	Y-88	898.04		93.70	8.17E-03	3.27E-02	5.05E-02
		1836.06		99.20	1.57E-02		3.27E-02
+	NB-94	702.63		100.00	-4.32E-03	3.99E-02	3.99E-02
		871.10		100.00	-4.42E-02		4.54E-02
+	I-131	284.30		6.06	8.31E-02	3.91E-02	5.11E-01
		364.48		81.20	-8.13E-03		3.91E-02
		636.97		7.27	1.71E-03		5.44E-01
+	CS-134	604.70		97.60	-2.83E-02	4.45E-02	4.45E-02
		795.84		85.40	-4.65E-03		5.24E-02
+	CS-137	661.65	*	85.12	6.07E-02	4.86E-02	4.86E-02

Analysis Report for L1-SUB-TDS-FJGS-004-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CE-144	80.12		1.36	-6.04E-01	2.37E-01	2.95E+00
		133.51		11.09	-3.74E-02		2.37E-01
+	EU-152	121.78		28.40	-4.22E-02	9.49E-02	9.49E-02
		344.28		26.60	-5.72E-02		1.25E-01
		1408.00		20.74	6.73E-02		1.94E-01
+	EU-154	123.07		40.40	1.22E-02	6.73E-02	6.73E-02
		723.30		19.70	1.40E-01		2.16E-01
		1274.51		35.50	-6.95E-02		1.28E-01
+	EU-155	86.54		32.80	-2.05E-02	1.05E-01	1.05E-01
		105.31		21.80	1.53E-01		1.34E-01
+	BI-214	609.31	*	46.30	5.22E-02	7.55E-02	7.55E-02
		1120.29		15.10	-2.62E-02		3.85E-01
		1238.11		5.94	4.80E-01		9.48E-01
		1377.67		4.11	4.79E-01		9.33E-01
		1407.98		2.48	5.63E-01		1.62E+00
		1509.19		2.19	5.53E-01		1.42E+00
		1764.49		15.80	1.24E-01		2.61E-01
+	PB-214	77.11		10.70	5.11E-01	9.20E-02	3.95E-01
		295.21	*	19.20	1.31E-01		9.86E-02
		351.92	*	37.20	5.54E-02		9.20E-02
+	PA-228	89.95		22.00	2.61E-01	1.16E-01	1.98E-01
		93.35		35.00	-2.05E-02		1.16E-01
		105.00		16.30	1.92E-01		2.34E-01
		129.22		2.97	1.16E+00		1.19E+00
		338.32		5.30	3.94E-01		8.00E-01
		463.00		13.80	4.10E-02		3.21E-01
		911.23		16.70	1.91E-01		4.53E-01
+	AM-241	59.54		36.30	-1.05E-01	1.90E-01	1.90E-01
+	CM-243	103.76		23.00	1.17E-01	1.28E-01	1.28E-01
		228.18		10.60	1.66E-01		2.60E-01
		277.60		14.00	6.24E-02		2.12E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-005-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-005-SB
Sample Description	: L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.220E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/15/2018 10:20:00AM
Acquisition Started	: 1/15/2018 7:13:14PM
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	: 5335

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:11:00AM

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

Analysis Report for L1-SUB-TDS-FJGS-005-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	92.77	183 -	189	186.08	5.92E+01	34.95	6.13E+02	1.10
F	2	225.96	449 -	456	452.40	4.44E+01	26.59	3.33E+02	1.23
F	3	238.64	471 -	485	477.76	3.56E+02	47.07	5.77E+02	1.70
F	4	295.04	582 -	594	590.53	8.73E+01	28.15	3.48E+02	1.52
F	5	338.37	672 -	681	677.17	8.45E+01	26.78	2.11E+02	1.67
F	6	351.73	697 -	710	703.88	1.42E+02	31.03	3.43E+02	1.44
F	7	583.08	1161 -	1174	1166.50	9.59E+01	24.65	1.44E+02	1.92
F	8	609.15	1212 -	1227	1218.63	1.17E+02	24.52	1.12E+02	1.63
F	9	661.38	1314 -	1330	1323.08	1.66E+02	28.91	1.30E+02	1.82
F	10	910.91	1816 -	1829	1822.05	7.05E+01	20.93	8.47E+01	2.19
F	11	1172.79	2341 -	2352	2345.75	7.55E+01	21.79	8.67E+01	2.16
F	12	1332.03	2657 -	2671	2664.19	5.56E+01	17.32	4.84E+01	2.03
F	13	1460.38	2912 -	2929	2920.87	5.30E+02	46.88	2.70E+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 : 1/15/2019 8:11:00AM

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	92.77	5.92E+01	34.95			5.92E+01	3.49E+01
F	2	225.96	4.44E+01	26.59			4.44E+01	2.66E+01
F	3	238.64	3.56E+02	47.07			3.56E+02	4.71E+01
F	4	295.04	8.73E+01	28.15			8.73E+01	2.82E+01
F	5	338.37	8.45E+01	26.78			8.45E+01	2.68E+01
F	6	351.73	1.42E+02	31.03	8.36E+01	3.72E+01	5.88E+01	4.84E+01
F	7	583.08	9.59E+01	24.65			9.59E+01	2.46E+01
F	8	609.15	1.17E+02	24.52	4.12E+01	2.42E+01	7.54E+01	3.45E+01
F	9	661.38	1.66E+02	28.91	6.61E+01	2.54E+01	9.99E+01	3.85E+01
F	10	910.91	7.05E+01	20.93			7.05E+01	2.09E+01
F	11	1172.79	7.55E+01	21.79	4.55E+01	1.72E+01	3.00E+01	2.78E+01
F	12	1332.03	5.56E+01	17.32			5.56E+01	1.73E+01
F	13	1460.38	5.30E+02	46.88	5.63E+01	1.71E+01	4.74E+02	4.99E+01

Analysis Report for L1-SUB-TDS-FJGS-005-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.97	1460.75	*	10.67	5.60E+00	6.66E-01
CO-60	0.96	1173.22	*	100.00	3.13E-02	2.90E-02
		1332.49	*	100.00	6.48E-02	2.05E-02
CS-137	0.98	661.65	*	85.12	7.31E-02	2.85E-02
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.99E-01	2.83E-02
BI-214	0.34	609.31	*	46.30	9.41E-02	4.34E-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	1.35E-01	4.42E-02
		351.92	*	37.20	5.51E-02	4.55E-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 L1-SUB-TDS-FJGS-005-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.978	5.60E+00	6.66E-01	
CO-60	0.969	5.37E-02	1.67E-02	
CS-137	0.989	7.31E-02	2.85E-02	
PB-212	0.560	1.99E-01	2.83E-02	
BI-214	0.347	9.41E-02	4.34E-02	
PB-214	0.717	9.64E-02	3.17E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FJGS-005-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:11:00AM
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	92.77	1.64462E-02	29.51	Tol.	PA-228
F	2	225.96	1.23238E-02	29.97		
F	5	338.37	2.34738E-02	15.85	Tol.	AC-228 PA-228
F	7	583.08	2.66444E-02	12.85		
F	10	910.91	1.95808E-02	14.85	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	5.60E+00	5.44E-01	5.44E-01
+	AR-41	1293.64		99.16	-1.05E+00	1.55E+00	1.55E+00
+	CO-60	1173.22	*	100.00	3.13E-02	3.52E-02	5.47E-02
		1332.49	*	100.00	6.48E-02		3.52E-02
+	KR-85	513.99		0.43	4.08E+00	9.07E+00	9.07E+00
+	Y-88	898.04		93.70	1.61E-02	3.10E-02	4.94E-02
		1836.06		99.20	-2.06E-03		3.10E-02

Analysis Report for L1-SUB-TDS-FJGS-005-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	NB-94	702.63		100.00	2.12E-02	3.88E-02	4.15E-02
		871.10		100.00	-2.42E-02		3.88E-02
+	I-131	284.30		6.06	3.13E-02	3.75E-02	4.92E-01
		364.48		81.20	-2.01E-02		3.75E-02
		636.97		7.27	6.83E-02		5.28E-01
+	CS-134	604.70		97.60	1.44E-03	4.65E-02	4.65E-02
		795.84		85.40	-4.76E-02		4.73E-02
+	CS-137	661.65	*	85.12	7.31E-02	5.19E-02	5.19E-02
+	CE-144	80.12		1.36	1.28E+00	2.54E-01	3.11E+00
		133.51		11.09	2.12E-01		2.54E-01
+	EU-152	121.78		28.40	-1.55E-02	9.60E-02	9.60E-02
		344.28		26.60	-5.11E-02		1.22E-01
		1408.00		20.74	-2.28E-02		1.98E-01
+	EU-154	123.07		40.40	1.55E-02	6.77E-02	6.77E-02
		723.30		19.70	1.10E-01		1.95E-01
		1274.51		35.50	3.09E-02		1.39E-01
+	EU-155	86.54		32.80	-2.43E-02	1.11E-01	1.11E-01
		105.31		21.80	-2.89E-02		1.33E-01
+	BI-214	609.31	*	46.30	9.41E-02	8.12E-02	8.12E-02
		1120.29		15.10	2.89E-02		3.63E-01
		1238.11		5.94	8.19E-01		1.07E+00
		1377.67		4.11	4.63E-01		1.09E+00
		1407.98		2.48	-1.90E-01		1.65E+00
		1509.19		2.19	-1.22E-01		1.48E+00
		1764.49		15.80	8.65E-02		2.43E-01
+	PB-214	77.11		10.70	2.58E-01	9.51E-02	4.21E-01
		295.21	*	19.20	1.35E-01		1.13E-01
		351.92	*	37.20	5.51E-02		9.51E-02
+	PA-228	89.95		22.00	1.28E-01	1.27E-01	2.13E-01
		93.35		35.00	4.41E-02		1.27E-01
		105.00		16.30	-2.02E-01		2.38E-01
		129.22		2.97	-9.33E-02		1.26E+00
		338.32		5.30	6.16E-01		8.13E-01
		463.00		13.80	2.44E-01		3.30E-01
		911.23		16.70	5.36E-01		4.37E-01
+	AM-241	59.54		36.30	1.33E-01	2.00E-01	2.00E-01
+	CM-243	103.76		23.00	-2.13E-03	1.28E-01	1.28E-01
		228.18		10.60	-1.24E-01		2.59E-01
		277.60		14.00	-5.12E-02		2.12E-01

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

Analysis Report for L1-SUB-TDS-FJGS-005-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-006-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-006-SB
Sample Description	: L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.007E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/15/2018 12:13:00PM
Acquisition Started	: 1/16/2018 7:48:44AM
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	: 5336

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:11:41AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FJGS-006-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.62	147 -	161	153.79	1.97E+02	61.36	1.49E+03	3.00
F	2	185.86	368 -	377	372.22	7.39E+01	31.74	6.14E+02	1.10
F	3	238.46	472 -	485	477.39	3.22E+02	45.61	6.19E+02	1.50
F	4	295.11	582 -	595	590.68	9.88E+01	30.56	4.17E+02	1.61
F	5	338.10	672 -	680	676.63	6.39E+01	25.91	2.25E+02	1.54
F	6	351.88	697 -	708	704.19	1.59E+02	31.67	2.76E+02	1.44
F	7	583.05	1162 -	1172	1166.43	8.74E+01	24.80	1.39E+02	1.95
F	8	609.39	1216 -	1225	1219.12	1.12E+02	25.09	1.15E+02	1.56
F	9	661.44	1316 -	1329	1323.19	3.47E+02	40.23	1.36E+02	1.60
F	10	910.52	1815 -	1828	1821.28	7.10E+01	20.97	8.83E+01	2.08
F	11	968.63	1933 -	1943	1937.47	3.48E+01	17.05	7.51E+01	2.07
F	12	1120.01	2234 -	2246	2240.20	4.36E+01	17.10	5.54E+01	2.71
F	13	1332.27	2658 -	2673	2664.68	6.16E+01	17.97	4.22E+01	2.51
F	14	1460.44	2914 -	2928	2921.00	5.40E+02	47.24	1.85E+01	2.48

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 8:11:41AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.62	1.97E+02	61.36			1.97E+02	6.14E+01
F	2	185.86	7.39E+01	31.74			7.39E+01	3.17E+01
F	3	238.46	3.22E+02	45.61			3.22E+02	4.56E+01
F	4	295.11	9.88E+01	30.56			9.88E+01	3.06E+01
F	5	338.10	6.39E+01	25.91			6.39E+01	2.59E+01
F	6	351.88	1.59E+02	31.67	8.36E+01	3.72E+01	7.55E+01	4.89E+01
F	7	583.05	8.74E+01	24.80			8.74E+01	2.48E+01
F	8	609.39	1.12E+02	25.09	4.12E+01	2.42E+01	7.13E+01	3.49E+01
F	9	661.44	3.47E+02	40.23	6.61E+01	2.54E+01	2.81E+02	4.76E+01
F	10	910.52	7.10E+01	20.97			7.10E+01	2.10E+01
F	11	968.63	3.48E+01	17.05			3.48E+01	1.70E+01
F	12	1120.01	4.36E+01	17.10			4.36E+01	1.71E+01
F	13	1332.27	6.16E+01	17.97			6.16E+01	1.80E+01
F	14	1460.44	5.40E+02	47.24	5.63E+01	1.71E+01	4.83E+02	5.02E+01

Analysis Report for L1-SUB-TDS-FJGS-006-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	5.23E+00	6.16E-01
CS-137	0.99	661.65	*	85.12	1.88E-01	3.35E-02
PB-212	0.98	77.11	*	17.50	2.79E-01	8.86E-02
		238.63	*	44.60	1.65E-01	2.49E-02
BI-214	0.58	609.31	*	46.30	8.15E-02	4.02E-02
		1120.29	*	15.10	2.64E-01	1.05E-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	4.56E-01	1.45E-01
		295.21	*	19.20	1.40E-01	4.39E-02
		351.92	*	37.20	6.47E-02	4.20E-02
RA-226	0.98	186.21	*	3.28	4.33E-01	1.87E-01

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

INTERFERENCE CORRECTED REPORT

Analysis Report for L1-SUB-TDS-FJGS-006-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.985	5.23E+00	6.16E-01	
CS-137	0.993	1.88E-01	3.35E-02	
PB-212	0.986	1.69E-01	2.40E-02	
BI-214	0.582	1.05E-01	3.75E-02	
PB-214	0.993	1.04E-01	2.98E-02	
RA-226	0.980	4.33E-01	1.87E-01	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FJGS-006-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:11:41AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	5	338.10	1.77457E-02	20.28	Tol.	AC-228 PA-228
F	7	583.05	2.42805E-02	14.19		
F	10	910.52	1.97266E-02	14.77	Tol.	PA-228
F	11	968.63	9.67605E-03	24.47	Tol.	AC-228
F	13	1332.27	1.71118E-02	14.59	Tol.	CO-60

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	5.23E+00	4.74E-01	4.74E-01
+	AR-41	1293.64		99.16	3.19E+01	8.46E+01	8.46E+01
+	CO-60	1173.22		100.00	9.53E-02	5.73E-02	6.43E-02
		1332.49		100.00	9.12E-02		5.73E-02
+	KR-85	513.99		0.43	8.62E+00	8.43E+00	8.43E+00
+	Y-88	898.04		93.70	2.02E-02	3.54E-02	4.34E-02
		1836.06		99.20	1.17E-02		3.54E-02
+	NB-94	702.63		100.00	-1.13E-02	3.46E-02	3.46E-02
		871.10		100.00	-1.36E-02		4.20E-02
+	I-131	284.30		6.06	-1.80E-01	3.70E-02	4.81E-01

Analysis Report for L1-SUB-TDS-FJGS-006-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	364.48		81.20	5.16E-03	3.70E-02	3.70E-02
		636.97		7.27	8.60E-02		4.90E-01
+	CS-134	604.70		97.60	-1.02E-01	4.35E-02	4.35E-02
		795.84		85.40	-3.99E-03		4.54E-02
+	CS-137	661.65	*	85.12	1.88E-01	4.68E-02	4.68E-02
+	CE-144	80.12		1.36	-1.02E+00	2.37E-01	2.90E+00
		133.51		11.09	1.57E-01		2.37E-01
+	EU-152	121.78		28.40	-8.75E-02	8.99E-02	8.99E-02
		344.28		26.60	-8.80E-02		1.14E-01
		1408.00		20.74	1.23E-01		1.87E-01
+	EU-154	123.07		40.40	-6.93E-02	6.37E-02	6.37E-02
		723.30		19.70	-5.33E-02		1.77E-01
		1274.51		35.50	-9.14E-02		1.26E-01
+	EU-155	86.54		32.80	3.61E-03	1.02E-01	1.02E-01
		105.31		21.80	5.14E-02		1.30E-01
+	BI-214	609.31	*	46.30	8.15E-02	7.09E-02	7.09E-02
		1120.29	*	15.10	2.64E-01		1.87E-01
		1238.11		5.94	9.19E-01		9.67E-01
		1377.67		4.11	1.58E-02		9.77E-01
		1407.98		2.48	1.03E+00		1.56E+00
		1509.19		2.19	9.11E-01		1.30E+00
		1764.49		15.80	7.82E-02		2.45E-01
+	PB-214	77.11	*	10.70	4.56E-01	8.10E-02	3.59E-01
		295.21	*	19.20	1.40E-01		1.16E-01
		351.92	*	37.20	6.47E-02		8.10E-02
+	PA-228	89.95		22.00	1.77E-01	1.64E-01	2.77E-01
		93.35		35.00	4.98E-02		1.64E-01
		105.00		16.30	1.22E-01		3.26E-01
		129.22		2.97	3.26E-01		1.64E+00
		338.32		5.30	1.08E+00		1.07E+00
		463.00		13.80	3.26E-01		4.56E-01
		911.23		16.70	2.95E-01		5.39E-01
+	AM-241	59.54		36.30	2.19E-01	1.87E-01	1.87E-01
+	CM-243	103.76		23.00	-8.16E-03	1.24E-01	1.24E-01
		228.18		10.60	2.31E-01		2.50E-01
		277.60		14.00	-2.03E-01		1.95E-01

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

Analysis Report for L1-SUB-TDS-FJGS-006-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-007-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-007-SB
Sample Description	: L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.680E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/15/2018 12:20:00PM
Acquisition Started	: 1/16/2018 8:49:48AM
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	: 5337

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:12:21AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FJGS-007-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.25	148 -	162	153.05	2.13E+02	65.81	1.56E+03	4.44
M	2	87.27	172 -	193	175.08	6.09E+01	37.42	7.99E+02	1.77
m	3	92.79	172 -	193	186.11	1.41E+02	45.32	9.97E+02	1.78
F	4	238.50	472 -	484	477.48	3.08E+02	46.19	6.83E+02	1.46
F	5	295.06	587 -	594	590.57	9.24E+01	29.40	2.49E+02	1.52
F	6	338.15	672 -	684	676.73	9.91E+01	26.70	2.45E+02	1.58
F	7	351.68	698 -	710	703.80	1.57E+02	31.15	3.03E+02	1.32
M	8	502.23	1000 -	1029	1004.82	2.08E+01	2.28	1.05E+02	1.41
F	9	582.93	1157 -	1174	1166.20	1.12E+02	26.18	1.80E+02	2.09
F	10	609.24	1215 -	1225	1218.81	1.28E+02	26.74	1.18E+02	1.65
F	11	661.35	1315 -	1329	1323.02	1.53E+02	29.49	1.61E+02	1.96
F	12	910.72	1815 -	1828	1821.68	7.15E+01	20.60	9.88E+01	1.73
F	13	968.73	1933 -	1943	1937.69	3.36E+01	16.47	1.06E+02	1.31
F	14	1460.45	2911 -	2927	2921.01	5.70E+02	49.05	4.39E+01	2.32

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 8:12:21AM

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	76.25	2.13E+02	65.81			2.13E+02	6.58E+01
M	2	87.27	6.09E+01	37.42			6.09E+01	3.74E+01
m	3	92.79	1.41E+02	45.32			1.41E+02	4.53E+01
F	4	238.50	3.08E+02	46.19			3.08E+02	4.62E+01
F	5	295.06	9.24E+01	29.40			9.24E+01	2.94E+01
F	6	338.15	9.91E+01	26.70			9.91E+01	2.67E+01
F	7	351.68	1.57E+02	31.15	8.36E+01	3.72E+01	7.30E+01	4.85E+01
M	8	502.23	2.08E+01	2.28			2.08E+01	2.28E+00
F	9	582.93	1.12E+02	26.18			1.12E+02	2.62E+01
F	10	609.24	1.28E+02	26.74	4.12E+01	2.42E+01	8.73E+01	3.61E+01
F	11	661.35	1.53E+02	29.49	6.61E+01	2.54E+01	8.69E+01	3.89E+01
F	12	910.72	7.15E+01	20.60			7.15E+01	2.06E+01
F	13	968.73	3.36E+01	16.47			3.36E+01	1.65E+01
F	14	1460.45	5.70E+02	49.05	5.63E+01	1.71E+01	5.14E+02	5.20E+01

Analysis Report for L1-SUB-TDS-FJGS-007-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	5.79E+00	6.67E-01
CS-137	0.98	661.65	*	85.12	6.06E-02	2.73E-02
PB-212	0.96	77.11	*	17.50	3.16E-01	9.96E-02
		238.63	*	44.60	1.64E-01	2.60E-02
BI-214	0.34	609.31	*	46.30	1.04E-01	4.33E-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	0.97	77.11	*	10.70	5.16E-01	1.63E-01
		295.21	*	19.20	1.36E-01	4.39E-02
		351.92	*	37.20	6.51E-02	4.34E-02
AC-228	0.57	209.28		4.40		
		338.32	*	11.40	2.78E-01	7.62E-02
		794.70		4.60		
		911.60	*	27.70	2.05E-01	5.97E-02
		964.60		5.20		
		969.11	*	16.60	1.69E-01	8.35E-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

Analysis Report for L1-SUB-TDS-FJGS-007-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.986	5.79E+00	6.67E-01	
CS-137	0.986	6.06E-02	2.73E-02	
PB-212	0.966	1.70E-01	2.52E-02	
BI-214	0.349	1.04E-01	4.33E-02	
PB-214	0.976	1.05E-01	3.04E-02	
AC-228	0.579	2.18E-01	4.09E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FJGS-007-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:12:21AM
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	87.27	1.69144E-02	30.73	Tol.	EU-155
m	3	92.79	3.91758E-02	16.07	Tol.	PA-228
M	8	502.23	5.78048E-03	5.47		
F	9	582.93	3.11558E-02	11.67		

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.79E+00	5.56E-01	5.56E-01
+	AR-41	1293.64		99.16	-1.28E+01	1.39E+02	1.39E+02
+	CO-60	1173.22		100.00	3.63E-02	4.98E-02	6.04E-02
		1332.49		100.00	2.12E-02		4.98E-02
+	KR-85	513.99		0.43	-2.18E+00	8.79E+00	8.79E+00
+	Y-88	898.04		93.70	-6.33E-03	2.08E-02	4.35E-02
		1836.06		99.20	-3.41E-02		2.08E-02
+	NB-94	702.63		100.00	-7.53E-03	3.37E-02	3.37E-02
		871.10		100.00	-1.71E-02		3.80E-02
+	I-131	284.30		6.06	-1.32E-02	3.74E-02	5.05E-01

Analysis Report for L1-SUB-TDS-FJGS-007-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	I-131	364.48		81.20	-2.65E-02	3.74E-02	3.74E-02
		636.97		7.27	-1.77E-02		4.97E-01
+	CS-134	604.70		97.60	-8.83E-02	4.42E-02	4.46E-02
		795.84		85.40	-5.78E-02		4.42E-02
+	CS-137	661.65	*	85.12	6.06E-02	5.11E-02	5.11E-02
+	CE-144	80.12		1.36	-6.07E-01	2.39E-01	3.09E+00
		133.51		11.09	6.84E-02		2.39E-01
+	EU-152	121.78		28.40	-1.34E-01	9.20E-02	9.20E-02
		344.28		26.60	-2.52E-02		1.19E-01
		1408.00		20.74	1.02E-02		2.07E-01
+	EU-154	123.07		40.40	-4.87E-02	6.50E-02	6.50E-02
		723.30		19.70	-4.82E-02		1.98E-01
		1274.51		35.50	1.96E-02		1.45E-01
+	EU-155	86.54		32.80	-2.27E-02	1.06E-01	1.06E-01
		105.31		21.80	-3.21E-02		1.30E-01
+	BI-214	609.31	*	46.30	1.04E-01	7.45E-02	7.45E-02
		1120.29		15.10	1.76E-01		3.67E-01
		1238.11		5.94	-1.14E-01		9.77E-01
		1377.67		4.11	8.76E-01		9.99E-01
		1407.98		2.48	8.49E-02		1.73E+00
		1509.19		2.19	-5.51E-01		1.52E+00
		1764.49		15.80	-2.91E-02		2.66E-01
+	PB-214	77.11	*	10.70	5.16E-01	8.09E-02	3.86E-01
		295.21	*	19.20	1.36E-01		8.09E-02
		351.92	*	37.20	6.51E-02		8.73E-02
+	PA-228	89.95		22.00	-5.42E-02	1.80E-01	3.03E-01
		93.35		35.00	-9.04E-03		1.80E-01
		105.00		16.30	-3.53E-02		3.38E-01
		129.22		2.97	1.17E+00		1.74E+00
		338.32		5.30	1.30E+00		1.12E+00
		463.00		13.80	1.69E-02		4.59E-01
		911.23		16.70	6.59E-01		6.09E-01
+	AM-241	59.54		36.30	8.93E-02	1.96E-01	1.96E-01
+	CM-243	103.76		23.00	4.60E-02	1.24E-01	1.24E-01
		228.18		10.60	-1.66E-01		2.55E-01
		277.60		14.00	6.15E-02		2.11E-01

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

Analysis Report for L1-SUB-TDS-FJGS-007-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-008-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-008-SB
Sample Description	: L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 9.814E+02 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/15/2018 12:23:00PM
Acquisition Started	: 1/16/2018 9:54:39AM
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	: 5338

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:13:01AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FJGS-008-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	76.32	147 -	161	153.19	3.07E+02	63.37	1.32E+03	3.55
F	2	93.16	184 -	190	186.87	6.08E+01	33.69	5.68E+02	1.07
F	3	238.46	471 -	485	477.40	3.22E+02	46.32	7.26E+02	1.50
F	4	295.00	585 -	595	590.45	8.16E+01	25.06	3.07E+02	1.02
F	5	338.32	672 -	681	677.06	5.52E+01	22.57	2.02E+02	1.33
F	6	351.96	700 -	709	704.35	1.78E+02	31.79	1.81E+02	1.46
M	7	502.63	1001 -	1030	1005.62	1.94E+01	1.58	1.03E+02	1.41
F	8	582.87	1162 -	1173	1166.08	9.17E+01	23.08	1.30E+02	1.31
F	9	609.05	1211 -	1223	1218.43	1.27E+02	26.60	1.31E+02	1.75
F	10	661.38	1316 -	1327	1323.08	1.56E+02	29.62	1.28E+02	1.94
F	11	727.63	1452 -	1462	1455.55	2.56E+01	13.60	8.41E+01	0.99
F	12	910.83	1817 -	1827	1821.91	4.14E+01	17.08	6.85E+01	1.67
F	13	968.88	1933 -	1943	1937.98	2.34E+01	15.30	8.74E+01	1.62
F	14	1460.34	2913 -	2929	2920.79	5.35E+02	46.49	9.20E+00	2.54
F	15	1763.50	3523 -	3532	3527.07	1.95E+01	9.77	5.00E+00	2.03

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 8:13:01AM

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

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	1	76.32	3.07E+02	63.37			3.07E+02	6.34E+01
F	2	93.16	6.08E+01	33.69			6.08E+01	3.37E+01
F	3	238.46	3.22E+02	46.32			3.22E+02	4.63E+01
F	4	295.00	8.16E+01	25.06			8.16E+01	2.51E+01
F	5	338.32	5.52E+01	22.57			5.52E+01	2.26E+01
F	6	351.96	1.78E+02	31.79	8.36E+01	3.72E+01	9.44E+01	4.89E+01
M	7	502.63	1.94E+01	1.58			1.94E+01	1.58E+00
F	8	582.87	9.17E+01	23.08			9.17E+01	2.31E+01
F	9	609.05	1.27E+02	26.60	4.12E+01	2.42E+01	8.62E+01	3.60E+01
F	10	661.38	1.56E+02	29.62	6.61E+01	2.54E+01	8.95E+01	3.90E+01
F	11	727.63	2.56E+01	13.60			2.56E+01	1.36E+01
F	12	910.83	4.14E+01	17.08			4.14E+01	1.71E+01
F	13	968.88	2.34E+01	15.30			2.34E+01	1.53E+01
F	14	1460.34	5.35E+02	46.49	5.63E+01	1.71E+01	4.79E+02	4.95E+01

Analysis Report for L1-SUB-TDS-FJGS-008-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	15	1763.50	1.95E+01	9.77			1.95E+01	9.77E+00

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	0.97	1460.75	*	10.67	5.31E+00	6.24E-01
CS-137	0.98	661.65	*	85.12	6.16E-02	2.70E-02
BI-212	0.58	727.17	*	11.80	1.39E-01	7.40E-02
		785.42		2.00		
		1620.56		2.75		
PB-212	0.96	77.11	*	17.50	4.48E-01	9.69E-02
		238.63	*	44.60	1.69E-01	2.59E-02
BI-214	0.52	609.31	*	46.30	1.01E-01	4.26E-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	1.71E-01	8.65E-02
PB-214	0.98	77.11	*	10.70	7.32E-01	1.58E-01
		295.21	*	19.20	1.19E-01	3.70E-02
		351.92	*	37.20	8.31E-02	4.33E-02
AC-228	0.59	209.28		4.40		
		338.32	*	11.40	1.53E-01	6.30E-02
		794.70		4.60		
		911.60	*	27.70	1.17E-01	4.85E-02
		964.60		5.20		
		969.11	*	16.60	1.16E-01	7.64E-02

Analysis Report for L1-SUB-TDS-FJGS-008-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

* = 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	0.974	5.31E+00	6.24E-01	
CS-137	0.989	6.16E-02	2.70E-02	
BI-212	0.582	1.39E-01	7.40E-02	
PB-212	0.969	1.83E-01	2.50E-02	
BI-214	0.520	1.15E-01	3.82E-02	
PB-214	0.982	1.14E-01	2.77E-02	
AC-228	0.594	1.28E-01	3.43E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FJGS-008-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:13:01AM
Peak Locate From Channel : 100
Peak Locate To Channel : 4096

	Peak No.	Energy (keV)	Peak Size (CPS)	Peak CPS (%) Uncertainty	Peak Type	Tolerance Nuclide
F	2	93.16	1.68891E-02	27.70	Tol.	PA-228
M	7	502.63	5.38723E-03	4.07		
F	8	582.87	2.54663E-02	12.59		

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.31E+00	4.70E-01	4.70E-01
+	AR-41	1293.64		99.16	3.77E+00	1.82E+02	1.82E+02
+	CO-60	1173.22		100.00	2.19E-02	4.50E-02	5.44E-02
		1332.49		100.00	1.83E-02		4.50E-02
+	KR-85	513.99		0.43	1.87E-01	8.51E+00	8.51E+00
+	Y-88	898.04		93.70	1.51E-02	2.92E-02	4.43E-02
		1836.06		99.20	-9.45E-03		2.92E-02
+	NB-94	702.63		100.00	-2.07E-02	3.48E-02	3.48E-02
		871.10		100.00	2.79E-03		3.84E-02
+	I-131	284.30		6.06	1.48E-01	3.57E-02	5.01E-01
		364.48		81.20	1.03E-04		3.57E-02
		636.97		7.27	-8.58E-02		4.73E-01
+	CS-134	604.70		97.60	8.10E-02	4.44E-02	4.44E-02

Analysis Report for L1-SUB-TDS-FJGS-008-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CS-134	795.84		85.40	7.28E-03	4.44E-02	4.48E-02
+	CS-137	661.65	*	85.12	6.16E-02	4.64E-02	4.64E-02
+	CE-144	80.12		1.36	-4.63E-01	2.38E-01	2.98E+00
		133.51		11.09	6.22E-02		2.38E-01
+	EU-152	121.78		28.40	-1.52E-02	9.11E-02	9.11E-02
		344.28		26.60	-1.47E-01		1.12E-01
		1408.00		20.74	7.01E-03		1.61E-01
+	EU-154	123.07		40.40	-6.15E-02	6.35E-02	6.35E-02
		723.30		19.70	-1.84E-01		1.97E-01
		1274.51		35.50	1.40E-01		1.49E-01
+	EU-155	86.54		32.80	-2.64E-02	1.01E-01	1.01E-01
		105.31		21.80	-1.16E-02		1.25E-01
+	BI-214	609.31	*	46.30	1.01E-01	7.64E-02	7.64E-02
		1120.29		15.10	-1.91E-01		3.37E-01
		1238.11		5.94	1.82E-02		9.67E-01
		1377.67		4.11	7.34E-01		9.85E-01
		1407.98		2.48	5.86E-02		1.34E+00
		1509.19		2.19	-5.83E-01		1.83E+00
		1764.49	*	15.80	1.71E-01		9.26E-02
+	PB-214	77.11	*	10.70	7.32E-01	7.54E-02	3.50E-01
		295.21	*	19.20	1.19E-01		9.57E-02
		351.92	*	37.20	8.31E-02		7.54E-02
+	PA-228	89.95		22.00	1.55E-01	1.72E-01	2.91E-01
		93.35		35.00	-1.84E-02		1.72E-01
		105.00		16.30	-1.23E-02		3.34E-01
		129.22		2.97	-5.98E-01		1.75E+00
		338.32		5.30	4.72E-02		1.11E+00
		463.00		13.80	2.02E-01		4.51E-01
		911.23		16.70	1.44E-01		5.60E-01
+	AM-241	59.54		36.30	1.60E-01	1.93E-01	1.93E-01
+	CM-243	103.76		23.00	-3.52E-02	1.19E-01	1.19E-01
		228.18		10.60	-1.79E-02		2.42E-01
		277.60		14.00	-1.90E-01		1.97E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-009-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-009-SB
Sample Description	: L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.012E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/15/2018 12:29:00PM
Acquisition Started	: 1/16/2018 10:55:41AM
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	: 5339

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:13:41AM

Peak Analysis From Channel : 100

Peak Analysis To Channel : 4096

Analysis Report for L1-SUB-TDS-FJGS-009-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
M	1	74.50	143 -	161	149.54	1.16E+02	39.91	9.61E+02	1.50
m	2	77.09	143 -	161	154.72	1.48E+02	42.36	9.41E+02	1.50
F	3	186.01	369 -	377	372.52	5.62E+01	29.45	5.54E+02	0.95
F	4	238.53	473 -	485	477.53	3.16E+02	45.97	6.17E+02	1.53
F	5	295.09	583 -	598	590.62	8.06E+01	25.51	5.04E+02	1.00
F	6	337.94	667 -	684	676.32	1.04E+02	32.35	3.77E+02	2.82
F	7	351.79	697 -	712	704.01	1.67E+02	33.05	3.26E+02	1.89
F	8	582.93	1162 -	1175	1166.20	9.64E+01	23.87	1.39E+02	1.75
F	9	609.07	1213 -	1224	1218.48	1.03E+02	25.00	1.30E+02	1.68
F	10	661.43	1318 -	1330	1323.17	3.08E+02	37.62	1.01E+02	1.83
F	11	860.38	1716 -	1726	1721.01	2.95E+01	14.33	5.79E+01	1.50
F	12	910.81	1813 -	1828	1821.85	7.72E+01	20.56	6.42E+01	2.51
F	13	968.85	1932 -	1942	1937.92	2.26E+01	15.77	9.14E+01	1.86
F	14	1119.98	2235 -	2245	2240.15	2.84E+01	15.72	6.71E+01	1.90
F	15	1460.41	2912 -	2930	2920.93	5.52E+02	47.71	9.50E+00	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 : 1/15/2019 8:13:40AM

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	74.50	1.16E+02	39.91			1.16E+02	3.99E+01
m	2	77.09	1.48E+02	42.36			1.48E+02	4.24E+01
F	3	186.01	5.62E+01	29.45			5.62E+01	2.95E+01
F	4	238.53	3.16E+02	45.97			3.16E+02	4.60E+01
F	5	295.09	8.06E+01	25.51			8.06E+01	2.55E+01
F	6	337.94	1.04E+02	32.35			1.04E+02	3.24E+01
F	7	351.79	1.67E+02	33.05	8.36E+01	3.72E+01	8.31E+01	4.98E+01
F	8	582.93	9.64E+01	23.87			9.64E+01	2.39E+01
F	9	609.07	1.03E+02	25.00	4.12E+01	2.42E+01	6.21E+01	3.48E+01
F	10	661.43	3.08E+02	37.62	6.61E+01	2.54E+01	2.41E+02	4.54E+01
F	11	860.38	2.95E+01	14.33			2.95E+01	1.43E+01
F	12	910.81	7.72E+01	20.56			7.72E+01	2.06E+01
F	13	968.85	2.26E+01	15.77			2.26E+01	1.58E+01
F	14	1119.98	2.84E+01	15.72			2.84E+01	1.57E+01

Analysis Report for L1-SUB-TDS-FJGS-009-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	Original Area	Orig. Area Uncertainty	Ambient Background	Backgr. Uncert.	Subtracted Area	Subtracted Uncert.
F	15	1460.41	5.52E+02	47.71	5.63E+01	1.71E+01	4.95E+02	5.07E+01

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

NUCLIDE IDENTIFICATION REPORT

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

IDENTIFIED NUCLIDES

Nuclide Name	Id Confidence	Energy (keV)		Yield(%)	Activity (pCi/grams)	Activity Uncertainty
K-40	0.98	1460.75	*	10.67	5.34E+00	6.21E-01
CS-137	0.99	661.65	*	85.12	1.61E-01	3.15E-02
PB-212	0.99	77.11	*	17.50	2.06E-01	6.05E-02
		238.63	*	44.60	1.61E-01	2.49E-02
BI-214	0.57	609.31	*	46.30	7.07E-02	3.98E-02
		1120.29	*	15.10	1.72E-01	9.53E-02
		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	3.38E-01	9.89E-02
		295.21	*	19.20	1.14E-01	3.65E-02
		351.92	*	37.20	7.10E-02	4.26E-02
RA-226	0.99	186.21	*	3.28	3.28E-01	1.73E-01
AC-228	0.58	209.28		4.40		
		338.32	*	11.40	2.79E-01	8.79E-02
		794.70		4.60		
		911.60	*	27.70	2.12E-01	5.71E-02
		964.60		5.20		
		969.11	*	16.60	1.09E-01	7.63E-02

Analysis Report for L1-SUB-TDS-FJGS-009-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

* = 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	0.982	5.34E+00	6.21E-01	
CS-137	0.992	1.61E-01	3.15E-02	
PB-212	0.999	1.59E-01	2.31E-02	
BI-214	0.578	8.57E-02	3.67E-02	
PB-214	0.998	9.44E-02	2.68E-02	
RA-226	0.993	3.28E-01	1.73E-01	
AC-228	0.588	1.97E-01	4.06E-02	

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

Errors quoted at 2.000sigma

Analysis Report for L1-SUB-TDS-FJGS-009-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:13:40AM
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	74.50	3.21630E-02	17.23		
F	8	582.93	2.67895E-02	12.38		
F	11	860.38	8.20120E-03	24.26		

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.34E+00	4.57E-01	4.57E-01
+	AR-41	1293.64		99.16	8.31E+00	2.84E+02	2.84E+02
+	CO-60	1173.22		100.00	2.22E-02	4.87E-02	5.55E-02
		1332.49		100.00	1.39E-02		4.87E-02
+	KR-85	513.99		0.43	5.65E+00	8.50E+00	8.50E+00
+	Y-88	898.04		93.70	-1.48E-02	2.75E-02	3.92E-02
		1836.06		99.20	-3.31E-03		2.75E-02
+	NB-94	702.63		100.00	-1.09E-02	3.41E-02	3.41E-02
		871.10		100.00	1.19E-03		3.76E-02
+	I-131	284.30		6.06	5.11E-02	3.68E-02	4.82E-01
		364.48		81.20	1.82E-03		3.68E-02
		636.97		7.27	2.52E-01		4.85E-01
+	CS-134	604.70		97.60	-4.87E-03	4.05E-02	4.05E-02
		795.84		85.40	-4.28E-02		4.28E-02

Analysis Report for L1-SUB-TDS-FJGS-009-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	CS-137	661.65	*	85.12	1.61E-01	4.37E-02	4.37E-02
+	CE-144	80.12		1.36	-1.34E+00	2.31E-01	2.89E+00
		133.51		11.09	2.23E-02		2.31E-01
+	EU-152	121.78		28.40	-5.25E-02	8.83E-02	8.83E-02
		344.28		26.60	-2.50E-02		1.19E-01
		1408.00		20.74	-1.12E-01		1.37E-01
+	EU-154	123.07		40.40	-6.70E-02	6.19E-02	6.19E-02
		723.30		19.70	-2.02E-02		1.69E-01
		1274.51		35.50	6.48E-02		1.28E-01
+	EU-155	86.54		32.80	-5.71E-02	9.93E-02	9.93E-02
		105.31		21.80	-1.62E-02		1.23E-01
+	BI-214	609.31	*	46.30	7.07E-02	7.34E-02	7.34E-02
		1120.29	*	15.10	1.72E-01		1.96E-01
		1238.11		5.94	3.05E-01		9.91E-01
		1377.67		4.11	1.80E-01		8.64E-01
		1407.98		2.48	-9.34E-01		1.14E+00
		1509.19		2.19	-4.22E-01		1.47E+00
		1764.49		15.80	2.48E-01		2.71E-01
+	PB-214	77.11	*	10.70	3.38E-01	8.74E-02	2.36E-01
		295.21	*	19.20	1.14E-01		1.32E-01
		351.92	*	37.20	7.10E-02		8.74E-02
+	PA-228	89.95		22.00	2.95E-01	1.77E-01	2.97E-01
		93.35		35.00	9.27E-02		1.77E-01
		105.00		16.30	-1.49E-01		3.37E-01
		129.22		2.97	1.45E+00		1.78E+00
		338.32		5.30	8.34E-01		1.18E+00
		463.00		13.80	-2.72E-01		4.69E-01
		911.23		16.70	6.56E-01		5.70E-01
+	AM-241	59.54		36.30	1.36E-01	1.86E-01	1.86E-01
+	CM-243	103.76		23.00	-1.02E-02	1.17E-01	1.17E-01
		228.18		10.60	-6.02E-02		2.40E-01
		277.60		14.00	1.42E-02		2.01E-01

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

Apex-Gamma

Analysis Report for L1-SUB-TDS-FJGS-010-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

GAMMA SPECTRUM ANALYSIS

Sample Identification	: L1-SUB-TDS-FJGS-010-SB
Sample Description	: L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL
Sample Type	: 500 ml Marinelli
Unit	:
Sample Point	:
Sample Size	: 1.023E+03 grams
Facility	: Dairyland_NPP
Sample Taken On	: 1/15/2018 12:35:00PM
Acquisition Started	: 1/16/2018 11:56:53AM
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	: 5340

PEAK ANALYSIS REPORT

Peak Analysis Performed on : 1/15/2019 8:14:23AM

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

Analysis Report for L1-SUB-TDS-FJGS-010-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Peak No.	Energy (keV)	ROI start	ROI end	Peak Centroid	Net Peak Area	Net Area Uncertainty	Continuum Counts	FWHM (keV)
F	1	75.66	147 -	160	151.86	2.19E+02	59.47	1.29E+03	3.74
F	2	92.53	183 -	192	185.60	6.60E+01	37.92	8.60E+02	1.38
F	3	185.71	364 -	378	371.92	6.40E+01	34.36	9.10E+02	1.46
F	4	238.56	469 -	485	477.60	3.49E+02	47.85	7.66E+02	1.65
F	5	295.21	586 -	594	590.86	9.38E+01	27.26	2.50E+02	1.22
F	6	337.95	668 -	680	676.34	4.68E+01	24.70	2.99E+02	1.68
F	7	351.90	697 -	710	704.22	1.88E+02	33.26	2.79E+02	1.55
F	8	582.93	1159 -	1172	1166.21	9.99E+01	23.40	1.05E+02	1.71
F	9	609.07	1212 -	1222	1218.48	1.16E+02	25.89	1.10E+02	1.74
F	10	661.49	1318 -	1332	1323.30	1.31E+02	25.65	1.06E+02	1.62
F	11	727.43	1451 -	1462	1455.16	2.33E+01	14.10	8.54E+01	1.35
F	12	911.08	1818 -	1828	1822.40	5.01E+01	18.48	8.42E+01	1.66
F	13	968.71	1933 -	1944	1937.63	3.01E+01	16.53	9.36E+01	1.80
F	14	1460.43	2911 -	2929	2920.97	5.55E+02	48.20	2.85E+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 : 1/15/2019 8:14:23AM

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	75.66	2.19E+02	59.47			2.19E+02	5.95E+01
F	2	92.53	6.60E+01	37.92			6.60E+01	3.79E+01
F	3	185.71	6.40E+01	34.36			6.40E+01	3.44E+01
F	4	238.56	3.49E+02	47.85			3.49E+02	4.78E+01
F	5	295.21	9.38E+01	27.26			9.38E+01	2.73E+01
F	6	337.95	4.68E+01	24.70			4.68E+01	2.47E+01
F	7	351.90	1.88E+02	33.26	8.36E+01	3.72E+01	1.04E+02	4.99E+01
F	8	582.93	9.99E+01	23.40			9.99E+01	2.34E+01
F	9	609.07	1.16E+02	25.89	4.12E+01	2.42E+01	7.50E+01	3.55E+01
F	10	661.49	1.31E+02	25.65	6.61E+01	2.54E+01	6.52E+01	3.61E+01
F	11	727.43	2.33E+01	14.10			2.33E+01	1.41E+01
F	12	911.08	5.01E+01	18.48			5.01E+01	1.85E+01
F	13	968.71	3.01E+01	16.53			3.01E+01	1.65E+01
F	14	1460.43	5.55E+02	48.20	5.63E+01	1.71E+01	4.99E+02	5.12E+01

Analysis Report for L1-SUB-TDS-FJGS-010-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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	0.98	1460.75	*	10.67	5.31E+00	6.19E-01
CS-137	0.99	661.65	*	85.12	4.30E-02	2.39E-02
BI-212	0.59	727.17	*	11.80	1.21E-01	7.35E-02
		785.42		2.00		
		1620.56		2.75		
PB-212	0.56	77.11		17.50		
		238.63	*	44.60	1.76E-01	2.58E-02
BI-214	0.34	609.31	*	46.30	8.44E-02	4.02E-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		
PB-214	0.72	77.11		10.70		
		295.21	*	19.20	1.31E-01	3.86E-02
		351.92	*	37.20	8.80E-02	4.24E-02
RA-226	0.96	186.21	*	3.28	3.68E-01	1.99E-01
AC-228	0.60	209.28		4.40		
		338.32	*	11.40	1.24E-01	6.59E-02
		794.70		4.60		
		911.60	*	27.70	1.36E-01	5.04E-02
		964.60		5.20		
		969.11	*	16.60	1.44E-01	7.92E-02

Analysis Report for L1-SUB-TDS-FJGS-010-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

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

INTERFERENCE CORRECTED REPORT

Nuclide Name	Nuclide Id Confidence	Wt mean Activity (pCi/grams)	Wt mean Activity Uncertainty	Comments
K-40	0.984	5.31E+00	6.19E-01	
CS-137	0.996	4.30E-02	2.39E-02	
BI-212	0.598	1.21E-01	7.35E-02	
PB-212	0.560	1.76E-01	2.58E-02	
BI-214	0.345	8.44E-02	4.02E-02	
PB-214	0.721	1.12E-01	2.85E-02	
RA-226	0.961	3.68E-01	1.99E-01	
AC-228	0.606	1.34E-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 L1-SUB-TDS-FJGS-010-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

UNIDENTIFIED PEAKS

Peak Locate Performed on : 1/15/2019 8:14:23AM
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	75.66	6.09165E-02	13.56		
F	2	92.53	1.83196E-02	28.75	Tol.	PA-228
F	8	582.93	2.77364E-02	11.72		

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

NUCLIDE MDA REPORT

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

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
+	K-40	1460.75	*	10.67	5.31E+00	4.96E-01	4.96E-01
+	AR-41	1293.64		99.16	1.23E+02	3.70E+02	3.70E+02
+	CO-60	1173.22		100.00	1.32E-02	4.68E-02	5.24E-02
		1332.49		100.00	3.17E-02		4.68E-02
+	KR-85	513.99		0.43	5.65E+00	7.78E+00	7.78E+00
+	Y-88	898.04		93.70	-3.39E-02	2.53E-02	4.10E-02
		1836.06		99.20	1.05E-03		2.53E-02
+	NB-94	702.63		100.00	4.58E-03	3.38E-02	3.38E-02
		871.10		100.00	1.38E-02		3.73E-02
+	I-131	284.30		6.06	1.91E-01	3.52E-02	4.73E-01
		364.48		81.20	-4.21E-03		3.52E-02
		636.97		7.27	7.61E-02		4.73E-01
+	CS-134	604.70		97.60	7.29E-02	4.20E-02	4.20E-02

Analysis Report for L1-SUB-TDS-FJGS-010-SB

L1-SUB-TDS COMBINED TB SLAB, PIT & SUMPS, DIESEL SLAB SOIL

	Nuclide Name	Energy (keV)		Yield(%)	Activity (pCi/grams)	Nuclide MDA (pCi/grams)	Line MDA (pCi/grams)
	CS-134	795.84		85.40	-4.76E-03	4.20E-02	4.28E-02
+	CS-137	661.65	*	85.12	4.30E-02	4.43E-02	4.43E-02
+	CE-144	80.12		1.36	-4.84E-01	2.24E-01	2.83E+00
		133.51		11.09	-5.17E-02		2.24E-01
+	EU-152	121.78		28.40	-5.63E-02	8.69E-02	8.69E-02
		344.28		26.60	-1.59E-02		1.05E-01
		1408.00		20.74	7.80E-02		1.69E-01
+	EU-154	123.07		40.40	-1.09E-02	6.16E-02	6.16E-02
		723.30		19.70	-2.76E-02		1.76E-01
		1274.51		35.50	4.34E-02		1.24E-01
+	EU-155	86.54		32.80	1.30E-03	1.02E-01	1.02E-01
		105.31		21.80	-4.68E-02		1.18E-01
+	BI-214	609.31	*	46.30	8.44E-02	6.92E-02	6.92E-02
		1120.29		15.10	7.80E-02		3.13E-01
		1238.11		5.94	1.07E+00		9.77E-01
		1377.67		4.11	4.23E-01		1.09E+00
		1407.98		2.48	6.52E-01		1.41E+00
		1509.19		2.19	3.95E-01		1.31E+00
		1764.49		15.80	1.64E-01		2.71E-01
+	PB-214	77.11		10.70	1.65E-01	7.87E-02	3.80E-01
		295.21	*	19.20	1.31E-01		7.87E-02
		351.92	*	37.20	8.80E-02		8.16E-02
+	PA-228	89.95		22.00	2.76E-02	1.80E-01	3.13E-01
		93.35		35.00	-3.29E-02		1.80E-01
		105.00		16.30	-2.10E-01		3.33E-01
		129.22		2.97	1.77E+00		1.82E+00
		338.32		5.30	9.35E-01		1.13E+00
		463.00		13.80	2.37E-01		4.80E-01
		911.23		16.70	9.92E-01		6.11E-01
+	AM-241	59.54		36.30	-8.95E-02	1.76E-01	1.76E-01
+	CM-243	103.76		23.00	-8.51E-03	1.12E-01	1.12E-01
		228.18		10.60	1.62E-01		2.33E-01
		277.60		14.00	-6.96E-02		1.90E-01

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

ATTACHMENT 8
GEL LABORATORIES ANALYTICAL REPORTS

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

February 26, 2018

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

Re: LACBWR Site Restoration Project
Work Order: 442612

Dear Mr. Spaide:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on January 30, 2018. 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: 442612 GEL Work Order: 442612

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: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FSGS-010-SB
Sample ID: 442612001
Matrix: Soil
Collect Date: 08-JAN-18 12:20
Receive Date: 30-JAN-18
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	0.206	+/-0.172	0.271	0.400	pCi/g			KSD1	02/14/18	1410	1736879	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	01/30/18	1256	1735459

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			90.7	(25%-125%)

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-003-SB
Project: ENRG07001
Sample ID: 442612002
Client ID: ENRG070
Matrix: Soil
Collect Date: 15-JAN-18 09:57
Receive Date: 30-JAN-18
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	U	0.00405	+/-0.0225	0.0431	0.400	pCi/g			JXR5	02/08/18	1341	1735499	1
Americium-243	U	0.0194	+/-0.0868	0.170	0.400	pCi/g							
Curium-243/244	U	0.00215	+/-0.0225	0.047	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	U	0.000501	+/-0.00354	0.00672	0.010	pCi/g			JXR5	02/17/18	1552	1735500	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	U	-0.00713	+/-0.0215	0.0605	0.400	pCi/g			JXR5	02/13/18	1214	1738612	3
Plutonium-239/240	U	-0.00475	+/-0.021	0.0548	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	U	-0.895	+/-2.01	3.46	5.00	pCi/g			JXR5	02/15/18	0629	1738613	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	U	-0.739	+/-1.51	2.55	5.00	pCi/g			TXJ1	02/16/18	0849	1736387	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137		0.0883	+/-0.0335	0.0245	1.00	pCi/g			RXF2	02/01/18	1033	1735521	6
Cobalt-60	U	0.0135	+/-0.0161	0.0365		pCi/g							
Europium-152	U	0.00115	+/-0.0301	0.0613		pCi/g							
Europium-154	U	-0.00388	+/-0.0407	0.0816		pCi/g							
Europium-155	U	0.00836	+/-0.0364	0.0708		pCi/g							
Niobium-94	U	0.00262	+/-0.013	0.0255		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0623	+/-0.122	0.219	0.400	pCi/g			KSD1	02/14/18	1410	1736879	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	U	-0.202	+/-4.32	7.61	10.0	pCi/g			MXH8	02/09/18	1651	1736372	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	U	1.87	+/-2.37	3.99	5.00	pCi/g			BXM4	02/08/18	1230	1736377	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	U	-0.329	+/-0.284	0.495	2.00	pCi/g			CXS7	02/24/18	0720	1741806	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	1.36	+/-3.24	4.64	10.0	pCi/g			TXJ1	02/21/18	0830	1736325	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-003-SB
Sample ID: 442612002
Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	U	0.189	+/-1.56	2.69	5.00	pCi/g			TXJ1	02/16/18	1518	1736338	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	01/30/18	1256	1735459

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			104	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			30	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			86.6	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			79.8	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			79.8	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			105	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			97.7	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			94	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			74.8	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			79	(25%-125%)

Notes:

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

Certificate of Analysis

Report Date: February 26, 2018

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-003-SB	Project:	ENRG07001
Sample ID:	442612002	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-004-SB
Project: ENRG07001
Sample ID: 442612003
Client ID: ENRG070
Matrix: Soil
Collect Date: 15-JAN-18 10:07
Receive Date: 30-JAN-18
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	U	0.0191	+/-0.0327	0.0286	0.400	pCi/g			JXR5	02/08/18	1341	1735499	1
Americium-243	U	0.00256	+/-0.0268	0.0559	0.400	pCi/g							
Curium-243/244	U	-0.00453	+/-0.020	0.0522	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	U	-4.00E-10	+/-0.00326	0.00644	0.010	pCi/g			JXR5	02/17/18	1609	1735500	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	U	0.0183	+/-0.0401	0.0712	0.400	pCi/g			JXR5	02/14/18	1048	1738612	3
Plutonium-239/240	U	-0.00165	+/-0.0163	0.037	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	U	-1.09	+/-1.67	2.88	5.00	pCi/g			JXR5	02/15/18	0833	1738613	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	U	-0.124	+/-1.18	2.14	5.00	pCi/g			TXJ1	02/16/18	0907	1736387	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137		0.103	+/-0.0413	0.0324	1.00	pCi/g			RXF2	02/01/18	1033	1735521	6
Cobalt-60		0.0596	+/-0.0478	0.0315		pCi/g							
Europium-152	U	0.0092	+/-0.0353	0.0713		pCi/g							
Europium-154	U	-0.000326	+/-0.052	0.104		pCi/g							
Europium-155	U	-0.0301	+/-0.0435	0.0843		pCi/g							
Niobium-94	U	0.00601	+/-0.0172	0.0335		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0229	+/-0.178	0.334	0.400	pCi/g			KSD1	02/14/18	1410	1736879	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	U	-0.528	+/-4.12	7.28	10.0	pCi/g			MXH8	02/09/18	1737	1736372	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	U	-0.869	+/-2.03	3.52	5.00	pCi/g			BXM4	02/08/18	1311	1736377	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99		0.530	+/-0.310	0.513	2.00	pCi/g			CXS7	02/24/18	0921	1741806	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	2.34	+/-3.47	4.92	10.0	pCi/g			TXJ1	02/21/18	0917	1736325	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-004-SB
Sample ID: 442612003
Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	U	0.198	+/-1.84	3.18	5.00	pCi/g			TXJ1	02/16/18	1539	1736338	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	01/30/18	1256	1735459

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			78.6	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			78	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			90.6	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			96.4	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			96.4	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			102	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			93.4	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			74.2	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			69.4	(25%-125%)

Notes:

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

Certificate of Analysis

Report Date: February 26, 2018

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-004-SB	Project:	ENRG07001
Sample ID:	442612003	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-005-SB
Project: ENRG07001
Sample ID: 442612004
Client ID: ENRG070
Matrix: Soil
Collect Date: 15-JAN-18 10:20
Receive Date: 30-JAN-18
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	U	0.0115	+/-0.0263	0.0418	0.400	pCi/g			JXR5	02/08/18	1341	1735499	1
Americium-243	U	0.017	+/-0.0408	0.0739	0.400	pCi/g							
Curium-243/244	U	-0.00149	+/-0.0224	0.0522	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	U	0.000487	+/-0.00287	0.00539	0.010	pCi/g			JXR5	02/17/18	1609	1735500	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	U	-0.00419	+/-0.0185	0.0483	0.400	pCi/g			JXR5	02/13/18	1214	1738612	3
Plutonium-239/240	U	0.00942	+/-0.0363	0.0704	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	U	-0.841	+/-1.91	3.29	5.00	pCi/g			JXR5	02/15/18	1037	1738613	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	U	-0.751	+/-1.41	2.37	5.00	pCi/g			TXJ1	02/16/18	1008	1736387	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137		0.107	+/-0.0375	0.0307	1.00	pCi/g			RXF2	02/01/18	1033	1735521	6
Cobalt-60		0.0816	+/-0.0295	0.0336		pCi/g							
Europium-152	U	0.00482	+/-0.0394	0.0803		pCi/g							
Europium-154	U	-0.00657	+/-0.0706	0.119		pCi/g							
Europium-155	U	0.0389	+/-0.044	0.0925		pCi/g							
Niobium-94	U	-0.008	+/-0.0191	0.0339		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0374	+/-0.155	0.306	0.400	pCi/g			KSD1	02/14/18	1632	1736879	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	U	0.293	+/-4.16	7.29	10.0	pCi/g			MXH8	02/09/18	1823	1736372	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	U	1.40	+/-2.37	4.01	5.00	pCi/g			BXM4	02/08/18	1352	1736377	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	U	0.289	+/-0.305	0.512	2.00	pCi/g			CXS7	02/24/18	1122	1741806	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	0.159	+/-3.36	4.85	10.0	pCi/g			TXJ1	02/21/18	1004	1736325	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-005-SB
Sample ID: 442612004
Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	U	1.09	+/-1.67	2.83	5.00	pCi/g			TXJ1	02/16/18	1601	1736338	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	01/30/18	1256	1735459

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			97.7	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			94.6	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			102	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			85.7	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			85.7	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			98.8	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			86	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			93.6	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			77	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			71	(25%-125%)

Notes:

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

Certificate of Analysis

Report Date: February 26, 2018

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-005-SB	Project:	ENRG07001
Sample ID:	442612004	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-006-SB
Project: ENRG07001
Sample ID: 442612005
Client ID: ENRG070
Matrix: Soil
Collect Date: 15-JAN-18 12:13
Receive Date: 30-JAN-18
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	U	0.0176	+/-0.0345	0.0479	0.400	pCi/g			JXR5	02/08/18	1341	1735499	1
Americium-243	U	0.00905	+/-0.038	0.0745	0.400	pCi/g							
Curium-243/244	U	-0.00947	+/-0.0219	0.065	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	U	0.000427	+/-0.00414	0.00846	0.010	pCi/g			JXR5	02/22/18	1352	1735500	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	U	-0.0042	+/-0.029	0.0707	0.400	pCi/g			JXR5	02/13/18	1214	1738612	3
Plutonium-239/240	U	-0.0115	+/-0.0217	0.067	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	U	-2.8	+/-1.96	3.42	5.00	pCi/g			JXR5	02/15/18	1242	1738613	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	U	-1.71	+/-1.24	2.03	5.00	pCi/g			TXJ1	02/16/18	1010	1736387	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137		0.189	+/-0.0465	0.0243	1.00	pCi/g			RXF2	02/01/18	1034	1735521	6
Cobalt-60	U	0.0434	+/-0.0259	0.0546		pCi/g							
Europium-152	U	0.00471	+/-0.0393	0.0712		pCi/g							
Europium-154	U	-0.00487	+/-0.0422	0.0829		pCi/g							
Europium-155	U	0.0389	+/-0.0374	0.0786		pCi/g							
Niobium-94	U	0.00539	+/-0.0129	0.0259		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0657	+/-0.125	0.262	0.400	pCi/g			KSD1	02/14/18	1410	1736879	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	U	0.340	+/-4.43	7.76	10.0	pCi/g			MXH8	02/09/18	1910	1736372	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	U	-1.07	+/-2.24	3.91	5.00	pCi/g			BXM4	02/08/18	1434	1736377	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99		0.628	+/-0.302	0.496	2.00	pCi/g			CXS7	02/24/18	1323	1741806	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	1.02	+/-3.37	4.83	10.0	pCi/g			TXJ1	02/21/18	1052	1736325	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-006-SB
Sample ID: 442612005
Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	U	0.796	+/-1.57	2.68	5.00	pCi/g			TXJ1	02/16/18	1622	1736338	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	01/30/18	1256	1735459

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			75	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			89.5	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			95.7	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			80.8	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			80.8	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			104	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			93	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			93.2	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			77.3	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			81.3	(25%-125%)

Notes:

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

Certificate of Analysis

Report Date: February 26, 2018

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-006-SB	Project:	ENRG07001
Sample ID:	442612005	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-007-SB
Project: ENRG07001
Sample ID: 442612006
Client ID: ENRG070
Matrix: Soil
Collect Date: 15-JAN-18 12:20
Receive Date: 30-JAN-18
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	U	-0.00172	+/-0.0148	0.0343	0.400	pCi/g			JXR5	02/17/18	1134	1735499	1
Americium-243	U	-0.0283	+/-0.0351	0.0984	0.400	pCi/g							
Curium-243/244	U	0.0127	+/-0.0288	0.0495	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	U	0.000528	+/-0.00373	0.00707	0.010	pCi/g			JXR5	02/17/18	1609	1735500	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	U	-0.00262	+/-0.0226	0.0523	0.400	pCi/g			JXR5	02/13/18	1214	1738612	3
Plutonium-239/240	U	-0.0105	+/-0.0242	0.0718	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	U	-2.05	+/-2.38	4.13	5.00	pCi/g			JXR5	02/15/18	1446	1738613	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	U	0.188	+/-1.11	2.09	5.00	pCi/g			TXJ1	02/16/18	1021	1736387	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137	U	0.0378	+/-0.0262	0.0562	1.00	pCi/g			RXF2	02/01/18	1034	1735521	6
Cobalt-60	U	0.0141	+/-0.0284	0.0509		pCi/g							
Europium-152	U	-0.0438	+/-0.0662	0.0922		pCi/g							
Europium-154	U	-0.0128	+/-0.0643	0.120		pCi/g							
Europium-155	U	-0.0175	+/-0.0423	0.0807		pCi/g							
Niobium-94	U	-0.0128	+/-0.0222	0.0387		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.0139	+/-0.117	0.229	0.400	pCi/g			KSD1	02/14/18	1410	1736879	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	U	3.54	+/-5.41	9.20	10.0	pCi/g			MXH8	02/10/18	1041	1736372	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	U	-0.0172	+/-2.09	3.60	5.00	pCi/g			BXM4	02/08/18	1515	1736377	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	U	0.158	+/-0.320	0.542	2.00	pCi/g			CXS7	02/24/18	1525	1741806	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	0.778	+/-3.54	5.09	10.0	pCi/g			TXJ1	02/21/18	1139	1736325	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-007-SB
Sample ID: 442612006
Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	U	-0.886	+/-1.71	3.03	5.00	pCi/g			TXJ1	02/16/18	1644	1736338	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	01/30/18	1256	1735459

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			96.1	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			63.5	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			84.2	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			67.2	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			67.2	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			105	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			88.4	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			91.2	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			75.6	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			73.4	(25%-125%)

Notes:

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

Certificate of Analysis

Report Date: February 26, 2018

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-007-SB	Project:	ENRG07001
Sample ID:	442612006	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-008-SB
Project: ENRG07001
Sample ID: 442612007
Client ID: ENRG070
Matrix: Soil
Collect Date: 15-JAN-18 12:23
Receive Date: 30-JAN-18
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	U	0.0094	+/-0.0216	0.0343	0.400	pCi/g			JXR5	02/21/18	0920	1735499	1
Americium-243	U	0.0147	+/-0.0316	0.0558	0.400	pCi/g							
Curium-243/244	U	0.00318	+/-0.0177	0.0338	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	U	0.00191	+/-0.00296	0.00458	0.010	pCi/g			JXR5	02/17/18	1609	1735500	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	U	-0.00214	+/-0.0211	0.0479	0.400	pCi/g			JXR5	02/14/18	1048	1738612	3
Plutonium-239/240	U	-0.00428	+/-0.0214	0.0549	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	U	-1.34	+/-2.47	4.26	5.00	pCi/g			JXR5	02/15/18	1650	1738613	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	U	-2.6	+/-1.50	2.21	5.00	pCi/g			TXJ1	02/16/18	1134	1736387	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137		0.0719	+/-0.0329	0.0211	1.00	pCi/g			RXF2	02/01/18	1035	1735521	6
Cobalt-60	U	-0.00941	+/-0.0133	0.0185		pCi/g							
Europium-152	U	0.00203	+/-0.036	0.0654		pCi/g							
Europium-154	U	0.0195	+/-0.0362	0.0752		pCi/g							
Europium-155	U	0.0367	+/-0.0382	0.0812		pCi/g							
Niobium-94	U	-0.00305	+/-0.0108	0.0206		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	0.113	+/-0.183	0.319	0.400	pCi/g			KSD1	02/14/18	1410	1736879	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	U	-1.18	+/-4.10	7.31	10.0	pCi/g			MXH8	02/09/18	2043	1736372	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	U	-0.832	+/-2.19	3.80	5.00	pCi/g			BXM4	02/08/18	1556	1736377	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	U	0.198	+/-0.314	0.529	2.00	pCi/g			CXS7	02/24/18	1726	1741806	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	3.00	+/-3.42	4.82	10.0	pCi/g			TXJ1	02/21/18	1226	1736325	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-008-SB
Sample ID: 442612007
Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	U	-0.16	+/-1.80	3.14	5.00	pCi/g			TXJ1	02/16/18	1705	1736338	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	01/30/18	1256	1735459

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			89	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			89.5	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			96	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			66	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			66	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			104	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			81.4	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			94.8	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			77.7	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			66.3	(25%-125%)

Notes:

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

Certificate of Analysis

Report Date: February 26, 2018

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-008-SB	Project:	ENRG07001
Sample ID:	442612007	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-010-SB
Project: ENRG07001
Sample ID: 442612008
Client ID: ENRG070
Matrix: Soil
Collect Date: 15-JAN-18 12:35
Receive Date: 30-JAN-18
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"													
Americium-241	U	-0.00335	+/-0.0148	0.0386	0.400	pCi/g			JXR5	02/17/18	1134	1735499	1
Americium-243	U	0.0175	+/-0.0345	0.0584	0.400	pCi/g							
Curium-243/244	U	0.00523	+/-0.0196	0.033	0.400	pCi/g							
Alphaspec Np, Solid "Dry Weight Corrected"													
Neptunium-237	U	0.00307	+/-0.00434	0.0068	0.010	pCi/g			JXR5	02/21/18	1337	1735500	2
Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"													
Plutonium-238	U	-0.00662	+/-0.0153	0.0454	0.400	pCi/g			JXR5	02/13/18	1214	1738612	3
Plutonium-239/240	U	-0.00303	+/-0.0209	0.051	0.400	pCi/g							
Liquid Scint Pu241, Solid "Dry Weight Corrected"													
Plutonium-241	U	-0.359	+/-1.57	2.70	5.00	pCi/g			JXR5	02/15/18	1854	1738613	4
Rad Gamma Spec Analysis													
Gamma Ni59, Solid "Dry Weight Corrected"													
Nickel-59	U	-0.426	+/-1.16	2.03	5.00	pCi/g			TXJ1	02/16/18	1135	1736387	5
Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155 "Dry Weight Corrected"													
Cesium-137		0.0563	+/-0.0312	0.0348	1.00	pCi/g			RXF2	02/01/18	1036	1735521	6
Cobalt-60	U	-0.00318	+/-0.014	0.0269		pCi/g							
Europium-152	U	0.0162	+/-0.0474	0.0848		pCi/g							
Europium-154	U	0.0327	+/-0.0471	0.104		pCi/g							
Europium-155	U	0.0132	+/-0.0435	0.0827		pCi/g							
Niobium-94	U	0.0114	+/-0.0178	0.0367		pCi/g							
Rad Gas Flow Proportional Counting													
GFPC, Sr90, Solid "Dry Weight Corrected"													
Strontium-90	U	-0.0503	+/-0.132	0.277	0.400	pCi/g			KSD1	02/14/18	1411	1736879	7
Rad Liquid Scintillation Analysis													
LSC, Tritium Distillation, Solid "As Received"													
Tritium	U	-0.841	+/-4.53	8.04	10.0	pCi/g			MXH8	02/09/18	2129	1736372	8
Liquid Scint C14, Solid "As Received"													
Carbon-14	U	-1.01	+/-2.22	3.87	5.00	pCi/g			BXM4	02/08/18	1638	1736377	9
Liquid Scint Tc99, Solid "As Received"													
Technetium-99	U	0.423	+/-0.312	0.519	2.00	pCi/g			CXS7	02/24/18	1927	1741806	10
Liquid Scint Fe55, Solid "Dry Weight Corrected"													
Iron-55	U	0.515	+/-3.29	4.69	10.0	pCi/g			TXJ1	02/21/18	1313	1736325	11
Liquid Scint Ni63, Solid "Dry Weight Corrected"													

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

Certificate of Analysis

Report Date: February 26, 2018

Company : LaCrosseSolutions
Address : S4601 State Hwy 35

Genoa, Wisconsin 54632
Contact: Mr. Jason Q. Spaide
Project: LACBWR Site Restoration Project

Client Sample ID: L1-SUB-TDS-FJGS-010-SB
Sample ID: 442612008
Project: ENRG07001
Client ID: ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Liquid Scintillation Analysis													
Liquid Scint Ni63, Solid "Dry Weight Corrected"													
Nickel-63	U	-0.408	+/-1.62	2.84	5.00	pCi/g			TXJ1	02/16/18	1727	1736338	12

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	JXO1	01/30/18	1256	1735459

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Am-05-RC Modified	
2	ASTM C 1475-00 Modified	
3	DOE EML HASL-300, Pu-11-RC Modified	
4	DOE EML HASL-300, Pu-11-RC Modified	
5	DOE RESL Ni-1	
6	DOE HASL 300, 4.5.2.3/Ga-01-R	
7	EPA 905.0 Modified/DOE RP501 Rev. 1 Modified	
8	EPA 906.0 Modified	
9	EPA EERF C-01 Modified	
10	DOE EML HASL-300, Tc-02-RC Modified	
11	DOE RESL Fe-1, Modified	
12	DOE RESL Ni-1, Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Americium-243 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			79.6	(15%-125%)
Curium-243/244 Tracer	Alphaspec Isotopic Am241 Am243, Cm243/244, Solid "Dry Weight Corrected"			76	(15%-125%)
Americium-243 Tracer	Alphaspec Np, Solid "Dry Weight Corrected"			71.5	(15%-125%)
Plutonium-242 Tracer	Alphaspec Pu238, 239/240, Solid "Dry Weight Corrected"			105	(15%-125%)
Plutonium-242 Tracer	Liquid Scint Pu241, Solid "Dry Weight Corrected"			105	(15%-125%)
Nickel Carrier	Gamma Ni59, Solid "Dry Weight Corrected"			101	(25%-125%)
Strontium Carrier	GFPC, Sr90, Solid "Dry Weight Corrected"			81.4	(25%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Solid "As Received"			93.8	(15%-125%)
Iron-59 Tracer	Liquid Scint Fe55, Solid "Dry Weight Corrected"			84.7	(15%-125%)
Nickel Carrier	Liquid Scint Ni63, Solid "Dry Weight Corrected"			74.2	(25%-125%)

Notes:

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

Certificate of Analysis

Report Date: February 26, 2018

Company :	LaCrosseSolutions
Address :	S4601 State Hwy 35
	Genoa, Wisconsin 54632
Contact:	Mr. Jason Q. Spaide
Project:	LACBWR Site Restoration Project

Client Sample ID:	L1-SUB-TDS-FJGS-010-SB	Project:	ENRG07001
Sample ID:	442612008	Client ID:	ENRG070

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

QC Summary

Report Date: February 26, 2018

LaCrosseSolutions
S4601 State Hwy 35
Genoa, Wisconsin
Contact: **Mr. Jason Q. Spaide**

Workorder: **442612**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch 1735499											
QC1203962043 442612002 DUP											
Americium-241	U	0.00405	U	0.0105	pCi/g	N/A		N/A	JXR5	02/08/18	13:41
	Uncertainty	+/-0.0225		+/-0.0288							
Americium-243	U	0.0194	U	0.0315	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0868		+/-0.0443							
Curium-243/244	U	0.00215	U	-0.00194	pCi/g	N/A		N/A			
	Uncertainty	+/-0.0225		+/-0.0167							
QC1203962044 LCS											
Americium-241	1.92			2.02	pCi/g		106	(75%-125%)		02/08/18	13:41
	Uncertainty			+/-0.280							
Americium-243			U	-0.00247	pCi/g			(75%-125%)			
	Uncertainty			+/-0.0231							
Curium-243/244	2.40			2.44	pCi/g		101	(75%-125%)			
	Uncertainty			+/-0.305							
QC1203962042 MB											
Americium-241			U	-0.00577	pCi/g					02/17/18	11:35
	Uncertainty			+/-0.0134							
Americium-243			U	0.000465	pCi/g						
	Uncertainty			+/-0.0214							
Curium-243/244			U	-0.00687	pCi/g						
	Uncertainty			+/-0.0186							
Batch 1735500											
QC1203962046 442612002 DUP											
Neptunium-237	U	0.000501	U	5.03E-10	pCi/g	N/A		N/A	JXR5	02/17/18	16:09
	Uncertainty	+/-0.00354		+/-0.00468							
QC1203962047 LCS											
Neptunium-237	1.48			1.59	pCi/g		107	(75%-125%)		02/10/18	16:03
	Uncertainty			+/-0.072							
QC1203962045 MB											
Neptunium-237			U	-0.0012	pCi/g					02/10/18	16:03
	Uncertainty			+/-0.0029							

QC Summary

Workorder: 442612

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Alpha Spec										
Batch 1738612										
QC1203970080 442612002 DUP										
Plutonium-238	U	-0.00713	U	-0.00563	pCi/g	N/A		N/A	JXR5	02/13/18 12:14
	Uncertainty	+/-0.0215		+/-0.017						
Plutonium-239/240	U	-0.00475	U	0.00625	pCi/g	N/A		N/A		
	Uncertainty	+/-0.021		+/-0.028						
QC1203970081 LCS										
Plutonium-238			U	-0.00663	pCi/g					02/13/18 13:56
	Uncertainty			+/-0.020						
Plutonium-239/240	1.94			1.95	pCi/g		100	(75%-125%)		
	Uncertainty			+/-0.263						
QC1203970079 MB										
Plutonium-238			U	0.0108	pCi/g					02/13/18 14:03
	Uncertainty			+/-0.0296						
Plutonium-239/240			U	0.00437	pCi/g					
	Uncertainty			+/-0.0243						
Batch 1738613										
QC1203970083 442612002 DUP										
Plutonium-241	U	-0.895	U	-1.53	pCi/g	N/A		N/A	JXR5	02/15/18 23:02
	Uncertainty	+/-2.01		+/-1.77						
QC1203970084 LCS										
Plutonium-241	70.1			55.7	pCi/g		79.6	(75%-125%)		02/16/18 01:06
	Uncertainty			+/-3.03						
QC1203970082 MB										
Plutonium-241			U	-0.222	pCi/g					02/15/18 20:58
	Uncertainty			+/-1.93						
Rad Gamma Spec										
Batch 1735521										
QC1203962085 442612002 DUP										
Cesium-137		0.0883		0.0764	pCi/g	14.5		(0% - 100%)	RXF2	02/01/18 15:34
	Uncertainty	+/-0.0335		+/-0.0308						
Cobalt-60	U	0.0135	U	-0.00256	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0161		+/-0.0182						
Europium-152	U	0.00115	U	-0.0269	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0301		+/-0.0465						

QC Summary

Workorder: 442612

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1735521										
Europium-154	U	-0.00388	U	0.0249	pCi/g	N/A		N/A	RXF2	02/01/18 15:34
	Uncertainty	+/-0.0407		+/-0.0582						
Europium-155	U	0.00836	U	0.000633	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0364		+/-0.0439						
Niobium-94	U	0.00262	U	0.00666	pCi/g	N/A		N/A		
	Uncertainty	+/-0.013		+/-0.0164						
QC1203962086 LCS										
Americium-241	488			504	pCi/g		103	(75%-125%)		02/01/18 10:37
	Uncertainty			+/-8.25						
Cesium-137	174			171	pCi/g		98.1	(75%-125%)		
	Uncertainty			+/-2.94						
Cobalt-60	135			132	pCi/g		97.8	(75%-125%)		
	Uncertainty			+/-3.13						
Europium-152			U	-0.485	pCi/g					
	Uncertainty			+/-1.23						
Europium-154			U	-0.0339	pCi/g					
	Uncertainty			+/-0.907						
Europium-155			U	-0.0701	pCi/g					
	Uncertainty			+/-1.12						
Niobium-94			U	0.257	pCi/g					
	Uncertainty			+/-0.407						
QC1203962084 MB										
Cesium-137			U	-0.00302	pCi/g					02/01/18 10:36
	Uncertainty			+/-0.0137						
Cobalt-60			U	-0.00916	pCi/g					
	Uncertainty			+/-0.0121						
Europium-152			U	0.0278	pCi/g					
	Uncertainty			+/-0.0283						
Europium-154			U	-0.049	pCi/g					
	Uncertainty			+/-0.0463						
Europium-155			U	0.0503	pCi/g					
	Uncertainty			+/-0.0469						

QC Summary

Workorder: 442612

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1735521										
Niobium-94			U	0.00513	pCi/g				RXF2	02/01/18 10:36
	Uncertainty			+/-0.012						
Batch 1736387										
QC1203964316 442612002 DUP										
Nickel-59	U	-0.739	U	-0.997	pCi/g	N/A		N/A	TXJ1	02/16/18 13:23
	Uncertainty	+/-1.51		+/-1.26						
QC1203964317 LCS										
Nickel-59	87.3			77.9	pCi/g		89.3	(75%-125%)		02/16/18 13:23
	Uncertainty			+/-5.17						
QC1203964315 MB										
Nickel-59			U	0.108	pCi/g					02/16/18 11:36
	Uncertainty			+/-1.42						
Rad Gas Flow										
Batch 1736879										
QC1203965530 442612005 DUP										
Strontium-90	U	-0.0657	U	-0.0745	pCi/g	N/A		N/A	KSD1	02/14/18 14:10
	Uncertainty	+/-0.125		+/-0.133						
QC1203965531 LCS										
Strontium-90	14.6			14.1	pCi/g		96.7	(75%-125%)		02/14/18 14:10
	Uncertainty			+/-0.765						
QC1203965529 MB										
Strontium-90			U	-0.155	pCi/g					02/14/18 14:10
	Uncertainty			+/-0.160						
Rad Liquid Scintillation										
Batch 1736325										
QC1203964127 442612002 DUP										
Iron-55	U	1.36	U	3.45	pCi/g	N/A		N/A	TXJ1	02/21/18 14:47
	Uncertainty	+/-3.24		+/-3.26						
QC1203964128 LCS										
Iron-55	112			115	pCi/g		103	(75%-125%)		02/21/18 15:34
	Uncertainty			+/-5.55						
QC1203964126 MB										
Iron-55			U	0.546	pCi/g					02/21/18 14:00
	Uncertainty			+/-3.02						

QC Summary

Workorder: 442612

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Liquid Scintillation										
Batch 1736338										
QC1203964166 442612002 DUP										
Nickel-63	U	0.189	U	-0.80	pCi/g	N/A		N/A	TXJ1	02/16/18 18:10
	Uncertainty	+/-1.56		+/-1.82						
QC1203964167 LCS										
Nickel-63	80.0			89.0	pCi/g		111	(75%-125%)		02/16/18 18:31
	Uncertainty			+/-3.76						
QC1203964165 MB										
Nickel-63			U	0.549	pCi/g					02/16/18 17:48
	Uncertainty			+/-1.84						
Batch 1736372										
QC1203964267 442612002 DUP										
Tritium	U	-0.202	U	8.42	pCi/g	N/A		N/A	MXH8	02/09/18 23:02
	Uncertainty	+/-4.32		+/-5.66						
QC1203964269 LCS										
Tritium	59.9			52.4	pCi/g		87.4	(75%-125%)		02/10/18 00:34
	Uncertainty			+/-6.04						
QC1203964266 MB										
Tritium			U	-0.151	pCi/g					02/09/18 22:15
	Uncertainty			+/-3.96						
QC1203964268 442612002 MS										
Tritium	184 U	-0.202		149	pCi/g		80.9	(75%-125%)		02/09/18 23:48
	Uncertainty	+/-4.32		+/-18.4						
Batch 1736377										
QC1203964283 442612002 DUP										
Carbon-14	U	1.87	U	-1.07	pCi/g	N/A		N/A	BXM4	02/08/18 18:00
	Uncertainty	+/-2.37		+/-2.22						
QC1203964285 LCS										
Carbon-14	130			125	pCi/g		96	(75%-125%)		02/08/18 19:23
	Uncertainty			+/-4.20						
QC1203964282 MB										
Carbon-14			U	-0.0748	pCi/g					02/08/18 17:19
	Uncertainty			+/-2.04						
QC1203964284 442612002 MS										
Carbon-14	298 U	1.87		291	pCi/g		97.7	(75%-125%)		02/08/18 18:41
	Uncertainty	+/-2.37		+/-9.69						

QC Summary

Workorder: 442612

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Liquid Scintillation										
Batch 1741806										
QC1203977935 442612002 DUP										
Technetium-99	U	-0.329	U	1.08	pCi/g	N/A		N/A	CXS7	02/26/18 06:08
	Uncertainty	+/-0.284		+/-1.03						
QC1203977936 LCS										
Technetium-99	40.1			38.8	pCi/g		96.7	(75%-125%)		02/25/18 00:27
	Uncertainty			+/-0.893						
QC1203977934 MB										
Technetium-99			U	0.428	pCi/g					02/24/18 21:28
	Uncertainty			+/-0.292						

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
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.

QC Summary

Workorder: **442612**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

^ 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 #: 442612

Product: **Alphaspec Isotopic Am241 Am243, Cm243/244, Solid**
Analytical Method: DOE EML HASL-300, Am-05-RC Modified
Analytical Procedure: GL-RAD-A-011 REV# 26
Analytical Batch: 1735499

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203962042	Method Blank (MB)
1203962043	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203962044	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
The Am-243 traced portion of samples 1203962042 (MB), 442612006 (L1-SUB-TDS-FJGS-007-SB) and 442612008 (L1-SUB-TDS-FJGS-010-SB) were recounted due to a peak shift. The recounts are reported. The Cm-244 traced portion of sample 1203962043 (L1-SUB-TDS-FJGS-003-SBDUP) was recounted due to results more negative than the three sigma TPU and then counted again due to a suspected false positive. The third count is reported. The Am-243 traced portion of sample 442612007 (L1-SUB-TDS-FJGS-008-SB) was recounted due to a peak shift and then counted again due to a suspected false positive. The third count is reported.

Miscellaneous Information

Manual Integration
Manual integration of alpha spectroscopy spectra 442612006 (L1-SUB-TDS-FJGS-007-SB) was performed to fully separate counts in Regions of Interest which would have been biased.

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

Additional Comments
The tracer peak centroid for the Cm-244 traced portion of sample 442612005 (L1-SUB-TDS-FJGS-006-SB) is greater than 50 keV from the expected library energy value for the tracer; however, the tracer yield requirement was met and the tracer peak is within the tracer region of interest.

Product: **Alphaspec Np, Solid**
Analytical Method: ASTM C 1475-00 Modified
Analytical Procedure: GL-RAD-A-032 REV# 21
Analytical Batch: 1735500

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203962045	Method Blank (MB)
1203962046	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203962047	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 1203962046 (L1-SUB-TDS-FJGS-003-SBDUP), 442612002 (L1-SUB-TDS-FJGS-003-SB), 442612003 (L1-SUB-TDS-FJGS-004-SB), 442612004 (L1-SUB-TDS-FJGS-005-SB), 442612006 (L1-SUB-TDS-FJGS-007-SB) and 442612007 (L1-SUB-TDS-FJGS-008-SB) were recounted due to high MDCs. The recounts are reported. Sample 442612005 (L1-SUB-TDS-FJGS-006-SB) was recounted twice due to high MDC. The third count is reported. Sample 442612008 (L1-SUB-TDS-FJGS-010-SB) was recounted due to high MDC and then again due to a false positive. The third count is reported.

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

Product: **Alphaspec Pu238, 239/240, Solid**
Analytical Method: DOE EML HASL-300, Pu-11-RC Modified
Analytical Procedure: GL-RAD-A-011 REV# 26
Analytical Batch: 1738612

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203970079	Method Blank (MB)
1203970080	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203970081	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

Sample Re-prep/Re-analysis
Samples were reprepped due to low carrier/tracer yield. The re-analysis is being reported.

Recounts
Samples 442612003 (L1-SUB-TDS-FJGS-004-SB) and 442612007 (L1-SUB-TDS-FJGS-008-SB) were recounted due to a peak shift. The recounts are reported.

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612001	L1-SUB-TDS-FSGS-010-SB
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Gamma, Cs137, Co60, Nb94, Eu152, Eu154, Eu155**
Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Analytical Procedure: GL-RAD-A-013 REV# 27
Analytical Batch: 1735521

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203962084	Method Blank (MB)
1203962085	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203962086	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Gamma Ni59, Solid**

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

Analytical Method: DOE RESL Ni-1
Analytical Procedure: GL-RAD-A-022 REV# 18
Analytical Batch: 1736387

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203964315	Method Blank (MB)
1203964316	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203964317	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **GFPC, Sr90, Solid**
Analytical Method: EPA 905.0 Modified/DOE RP501 Rev. 1 Modified
Analytical Procedure: GL-RAD-A-004 REV# 19
Analytical Batch: 1736879

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612001	L1-SUB-TDS-FSGS-010-SB
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203965529	Method Blank (MB)

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

1203965530	442612005(L1-SUB-TDS-FJGS-006-SB) Sample Duplicate (DUP)
1203965531	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
Sample 442612004 (L1-SUB-TDS-FJGS-005-SB) was recounted due to results more negative than the three sigma TPU. The second count is reported.

Product: **Liquid Scint Pu241, Solid**
Analytical Method: DOE EML HASL-300, Pu-11-RC Modified
Analytical Procedure: GL-RAD-A-035 REV# 19
Analytical Batch: 1738613

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203970082	Method Blank (MB)
1203970083	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203970084	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

Sample Re-prep/Re-analysis

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

Samples were reprepped due to low carrier/tracer yield. The re-analysis is being reported.

Product: **Liquid Scint Fe55, Solid**
Analytical Method: DOE RESL Fe-1, Modified
Analytical Procedure: GL-RAD-A-040 REV# 13
Analytical Batch: 1736325

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203964126	Method Blank (MB)
1203964127	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203964128	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Liquid Scint Ni63, Solid**
Analytical Method: DOE RESL Ni-1, Modified
Analytical Procedure: GL-RAD-A-022 REV# 18
Analytical Batch: 1736338

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 22
Preparation Batch: 1735459

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203964165	Method Blank (MB)
1203964166	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203964167	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **LSC, Tritium Distillation, Solid**
Analytical Method: EPA 906.0 Modified
Analytical Procedure: GL-RAD-A-002 REV# 22
Analytical Batch: 1736372

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203964266	Method Blank (MB)
1203964267	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203964268	442612002(L1-SUB-TDS-FJGS-003-SB) Matrix Spike (MS)
1203964269	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Recounts
Sample 442612006 (L1-SUB-TDS-FJGS-007-SB) was recounted to verify sample results. Recount is reported.

Miscellaneous Information

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

Additional Comments
The matrix spike, 1203964268 (L1-SUB-TDS-FJGS-003-SBMS), aliquot was reduced to conserve sample volume.

Product: **Liquid Scint C14, Solid**
Analytical Method: EPA EERF C-01 Modified
Analytical Procedure: GL-RAD-A-003 REV# 15
Analytical Batch: 1736377

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB
442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203964282	Method Blank (MB)
1203964283	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203964284	442612002(L1-SUB-TDS-FJGS-003-SB) Matrix Spike (MS)
1203964285	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Miscellaneous Information

Additional Comments
The matrix spike, 1203964284 (L1-SUB-TDS-FJGS-003-SBMS), aliquot was reduced to conserve sample volume.

Product: **Liquid Scint Tc99, Solid**
Analytical Method: DOE EML HASL-300, Tc-02-RC Modified
Analytical Procedure: GL-RAD-A-059 REV# 5
Analytical Batch: 1741806

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

GEL Sample ID#	Client Sample Identification
442612002	L1-SUB-TDS-FJGS-003-SB

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

442612003	L1-SUB-TDS-FJGS-004-SB
442612004	L1-SUB-TDS-FJGS-005-SB
442612005	L1-SUB-TDS-FJGS-006-SB
442612006	L1-SUB-TDS-FJGS-007-SB
442612007	L1-SUB-TDS-FJGS-008-SB
442612008	L1-SUB-TDS-FJGS-010-SB
1203977934	Method Blank (MB)
1203977935	442612002(L1-SUB-TDS-FJGS-003-SB) Sample Duplicate (DUP)
1203977936	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Sample Re-prep/Re-analysis
Samples were reprepped due to high relative percent difference/relative error ratio. The re-analysis is being reported.

Recounts
Sample 1203977935 (L1-SUB-TDS-FJGS-003-SBDUP) was recounted due to results more negative than the three sigma TPU. The second count 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.

GEL Laboratories LLC PO Box 30712 Charleston, SC 29417 2040 Savage Road Charleston, SC 29407 P 843.556.8171 F 843.766.1178 www.gel.com

Page: 1 of 1
Project #: LACBWR Site
GEL Quote #:
COC Number (1):
PO Number: 672583

GEL Chain of Custody and Analytical Request

See www.gel.com for GEL's Sample Acceptance SOP

GEL Work Order Number: 442612

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: La Crosse Solutions | Phone #: 608 689 4259
Project/Site Name: LACBWR - Genoa WI | Fax #: ———
Address: 54601 State Road 35
Collected by: | Send Results: Scott Zoller SGZoller@energysolutions.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive	TSCA Regulated	Total number of containers	Sr-90	Ni59, Co60, Nb94	Cs137, Eu152, Eu154	Eu155, Pu241	H3, C14, Fe55	Ni63, Tc-99	Np237, Pu238	Pu239, Pu240	Am241, Am243	Cm243, Cm244	Comments Note: extra sample is required for sample specific QC
																			<-- Preservative Type (6)
LI-SUB-TDS-FSGS-010-SB	01-08-18	1220	N	N	SO	N		1	1										
LI-SUB-TDS-FJGS-003-SB	01-15-18	0957	N	N	SO	N		1	1	1	1	1	1	1	1	1	1	1	MDC < 0.01 pCi
LI-SUB-TDS-FJGS-004-SB	01-15-18	1007	N	N	SO	N		1	1	1	1	1	1	1	1	1	1	1	Np-137
LI-SUB-TDS-FJGS-005-SB	01-15-18	1020	N	N	SO	N		1	1	1	1	1	1	1	1	1	1	1	
LI-SUB-TDS-FJGS-006-SB	01-15-18	1213	N	N	SO	N		1	1	1	1	1	1	1	1	1	1	1	
LI-SUB-TDS-FJGS-007-SB	01-15-18	1220	N	N	SO	N		1	1	1	1	1	1	1	1	1	1	1	
LI-SUB-TDS-FJGS-008-SB	01-15-18	1223	N	N	SO	N		1	1	1	1	1	1	1	1	1	1	1	
LI-SUB-TDS-FJGS-010-SB	01-15-18	1235	N	N	SO	N		1	1	1	1	1	1	1	1	1	1	1	
																			All samples are to be returned please.

TAT Requested: Normal: X Rush: Specify: (Subject to Surcharge) Fax Results: Yes / (No)

Circle Deliverable: C of A / QC Summary / Level 1 / (Level 2) / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

None

Sample Collection Time Zone: Eastern / Pacific / (Central) / Other ______ / Mountain

Chain of Custody Signatures

	Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1	[signature]	01-25-18	0650	[signature]	1/30/18	0900
2						
3						

Sample Shipping and Delivery Details

GEL PM:
Method of Shipment: | Date Shipped:
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW=Drinking Water, GW=Groundwater, SW=Surface Water, WW=Waste Water, W=Water, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Fecal, N=Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. *8260B* - 3, *6010B/7470A* - 1).
6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? *YES* *NO*
Cooler Temp: *C*

WHITE = LABORATORY **YELLOW = FILE** **PINK = CLIENT**

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

EK

Client: ENRG	SDG/AR/COC/Work Order:
Received By: C. TARPLIN	Date Received: 30 JAN 2018
Carrier and Tracking Number	Circle Applicable: FedEx Express (FedEx Ground) UPS Field Services Courier Other 7713 2037 4024

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 62 (CPM) mR/Hr Classified as: Rad 1 Rad 2 Rad 3
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry Ice (None) Other: *all temperatures are recorded in Celsius TEMP: 12°C
4	Daily check performed and passed on IR temperature gun?	✓			**Temperature Device Serial #:** IR4-17 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?		✓		Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes . No___ N/A___ (If unknown, select No) VOA vials free of headspace? Yes___ No___ N/A___ Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials EMR Date 01/31/18 Page 1 of 1

GL-CHL-SR-001 Rev 5

List of current GEL Certifications as of 26 February 2018

State	Certification
Alaska	17−018
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
Delaware	SC00012
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 Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA180011
Maryland	270
Massachusetts	M−SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122018−1
New Hampshire NELAP	205415
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 Radchem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−18−13
Utah NELAP	SC000122017−25
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404