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Your ref: CA-19-02-HW
File #51377
Our ref: LTR-RAC-20-64

July 30, 2020

Subject: Technetium-99 Source Investigation Report

Ms. Kuhn:

Please see attached the *Technetium-99 Source Investigation Report*, which summarizes the sampling conducted as described in the *Technetium Source Investigation Work Plan* provided to SCDHEC on January 30, 2020, in response to Consent Agreement CA-19-02-HW.

The data generated by this assessment indicate that the source of the Tc-99 groundwater impact is historical and not the result of current operations at the facility.

Respectfully,

A handwritten signature in black ink, appearing to read 'C. Logsdon'.

Cynthia J. Logsdon
Principal Environmental Engineer
Westinghouse Electric Company, CFFF
(803) 312-4171

A handwritten signature in black ink, appearing to read 'W. Clark Evers'.

W. Clark Evers, CHP, CSP
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A handwritten signature in black ink, appearing to read 'Tom Hutto'.

Report reviewed by:
Thomas Hutto, PG
GEL Engineering, LLC

Columbia Fuel Fabrication Facility **Tc-99 Source Investigation Report**

Site History and Background

The Westinghouse Columbia Fuel Fabrication Facility (CFFF) manufactures commercial nuclear fuel near Columbia, South Carolina under Nuclear Regulatory Commission (NRC) Special Nuclear Material (SNM) license, SNM-1107. As part of the nuclear fuel production process, CFFF receives shipments of enriched Uranium (U) from gas centrifuge enrichment plants in the form of Uranium-Hexafluoride (UF₆) or Uranyl-Nitrate (UN). When U is used to manufacture nuclear fuel, Technetium (Tc-99) also exists in residual quantities within the U stock feed shipments. Tc-99 is a nuclear fission product of U. While it occurs naturally in very small quantities within the earth's crust, it is primarily man-made and produced during nuclear reactor operations where U is irradiated with neutrons.

Tc-99 was introduced into the commercial nuclear fuel cycle beginning in 1956, when high enriched U from U.S. Government military reactors was reprocessed (e.g. down-blended) into low enriched U fuel. Reprocessed U was used in the commercial nuclear fuel cycle until 1977; however due to residual impacts, Tc-99 remains in the nuclear fuel cycle to this day.

Potential external exposure risks from Tc-99 are considered to be low because Tc-99 is a weak beta emitter. The only potentially significant route of exposure to an individual is through the consumption of impacted water. The EPA has established a Maximum Contaminant Level (MCL) of 4 millirem per year (mrem/yr) for beta particles from manmade nuclides in drinking water. Using conservative assumptions, the average concentration of Tc-99 calculated to yield the MCL of 4 mrem/yr is 900 picocuries per liter (pCi/L). That is to say that if a person were to consume water with a Tc-99 concentration of 900 pCi/L throughout the year at a rate of 2 liters per day based on EPA modeling assumptions, that person would receive 4 mrem radiation exposure.

From a chemistry perspective, Tc-99 is highly soluble and mobile in groundwater, is considered stable over a wide pH range, and will likely migrate with the aqueous stream. Sorption of Tc-99 may occur in soils that contain high organic matter content; however in the absence of organic material, or strong reducing agents, little sorption is expected. For this reason, liquid streams (e.g. aqueous waste) are anticipated to be the most likely travel pathways for Tc-99. Solid wastes may retain a small amount of moisture or organic content, and therefore, also may contain trace quantities of Tc-99.

Historical Data Review

Historical review of environmental groundwater data collected at CFFF shows that gross beta concentrations (> 50 pCi/L) were present in surficial aquifer groundwater monitoring wells beginning in the 1980s when monitoring wells were first installed. Elevated gross beta in groundwater is an indication of the potential presence of Tc-99. To obtain specific data on Tc-99, CFFF began direct measurement of all 89 wells at the site for Tc-99 in October 2018. From October 2018 to the present, two groundwater monitoring wells, W-6 and W-11 (as shown on Figure 2 of the *Final Interim Remedial Investigation Data Summary Report*, July 2020), have had Tc-99 results in excess of the drinking water MCL. These monitoring wells are screened in the surficial aquifer downgradient, approximately 300 feet (W-6) and 600 feet (W-11), from the manufacturing operations. Each well is approximately 1 km (0.62 miles) from the nearest site boundary.

As discussed in the *Final Remedial Investigation Data Summary Report* dated July 15, 2020, newly installed monitoring wells W-92 (downgradient of W-11) and W-93 (upgradient of W-6) did not contain Tc-99 above the minimum detectible concentration (MDC). Both wells were installed in the lower zone

of the surficial aquifer. The data reported in the *Final Remedial Investigation Data Summary Report* demonstrates that the Tc-99 plume in the surficial aquifer is localized and not migrating offsite. Furthermore, the Gator Pond is also downgradient of both W-6 and W-11 in the direction of groundwater flow, and surface water monitoring results in the Remedial Investigation (RI) sampling from the Gator Pond and two additional downgradient samples did not detect Tc-99 above the MDC. Based on downgradient well and surface water monitoring results the area represented by W-6 and W-11 is relatively small (approximately 23,000 m²), and further assessment of Tc-99 in the surficial aquifer continues to be investigated under Consent Agreement (CA) CA-19-02-HW with the South Carolina Department of Health and Environmental Control (SCDHEC).

A review of historical events incorporated into the Conceptual Site Model (CSM) for CFFF did not identify any specific event that is the most likely source of the Tc-99. The historical gross beta data supports a theory that the current Tc-99 in groundwater monitoring wells W-6 and W-11 may be the result of a past surface release. Given the timeframe when elevated Gross Beta results in groundwater were first observed, and the apparent center of mass of the Tc-99 plume seen today, past practices in the area of the East Lagoon may be a potential source of impact. Further assessment of the horizontal and vertical extent of Tc-99 will be performed in the Phase II RI.

Investigative Sampling

This expedited Tc-99 investigation was performed under the CA to determine whether current operations at CFFF could be a source of Tc-99 to groundwater. The *Investigative Sampling Plan*, provided in **Attachment 1**, targeted the most likely sources of Tc-99, including both liquid and solid wastes, that could have the potential to contact the environment.

This *Investigative Sampling Plan* established methods for obtaining both solid and liquid samples for radiological analysis to evaluate Tc-99 and U concentrations. The *Investigative Sampling Plan* was prepared to ensure the proper collection, handling, documentation, and evaluation of the samples. The results of the *Investigative Sampling Plan* are analyzed in this *Tc-99 Source Investigation Summary Report*.

Sampling Procedure

The goal of the multi-phase Tc-99 investigation was to sample the potentially radiologically impacted media at locations thought most likely to be potential sources for Tc-99, as identified in the *Investigative Sampling Plan*. This iterative data collection process was designed to determine a starting point of investigation, gather and analyze data, and conduct additional sampling based on the initial results. Two types of sample matrices were collected: liquid samples (e.g. water and aqueous solutions) and solid samples (e.g. sludge, soil, sediment, and solid waste).

Aqueous process wastes are treated in accordance with the CFFF National Pollutant Discharge Elimination System (NPDES) permit prior to discharge to the Congaree River. Treatment for removal of U, ammonia and fluoride consists of filtration, flocculation, lime and caustic addition, distillation and settling in a series of holding lagoons (first in the West Lagoons and then in the North or South Lagoon). Calcium Fluoride (CaF₂) solids settle in the lagoons, and the treated process wastewater is discharged to the Congaree River. A simplified flow diagram of the aqueous process waste streams generated by current CFFF operations is provided in **Figure 1**. Table 1 provides the Phase I sample locations of the liquid and solid process streams that were believed to be the most likely to potentially contain Tc-99. These locations were sampled and analyzed first. SCDHEC observed the Phase I sample collection.

Table 1 – Phase I Sample Locations

SAMPLE DESCRIPTION	SAMPLE LOCATION	FIGURE 1 SAMPLE ID	SAMPLE MEDIA
Contaminated Sump	T-1187/T-1189	I-1	Liquid
Wastewater from Incinerator / SOLX Aqueous Waste	T-1148/T-1149	I-2	Liquid
Solution from Conversion	T-1160B/C	I-3	Liquid
Solution from Cylinder Recertification	T-1160A	I-4	Liquid
Waterglass wastewater	T-1166	I-5	Liquid
East Lagoon	Lagoon sludge and surrounding soil	I-6	Solid

The East Lagoon has been previously identified as an area of interest, and closure of the East Lagoon is planned to be completed in 2021. While Tc-99 was identified in one area of the lagoon sludge as described in the *East Lagoon Characterization Report* included in **Attachment 3**, it is not believed that current East Lagoon operations are an ongoing source of Tc-99. As part of this Work Plan, additional samples (sludge and soil) in the East Lagoon were collected to bound the previously identified Tc-99 area and to determine if any soil potentially contained Tc-99 in the surrounding area. Additional assessment of the soils beneath the East Lagoon liner will be completed once the lagoon is emptied and the liner is removed as part of closure activities.

Table 2 provides the Phase II sample locations of the liquid and solid process streams that are down stream of the processes believed to be potential sources of Tc-99. These locations were sampled after laboratory analysis confirmed the presence of Tc-99 in the associated Phase I process stream.

Table 2 – Phase II Sample Locations

SAMPLE DESCRIPTION	SAMPLE LOCATION	FIGURE 1 SAMPLE ID	SAMPLE MEDIA
Solution from Conversion	5 product lines, before and after bag filters(FL-x12A/B); V-1005A/B	II-1; II-2	Liquid
Scrap Cage Monitor Discharge	Scrap cage before Q-tank	II-3	Liquid
West II Lagoon	Grab sample from surface of lagoon	II-4	Liquid
Recycled Ammonia	T-19, T-20	II-5	Liquid
Waterglass Cake	Grab sample from available solids	II-6	Solid
Dewatering Plant Solids	Grab sample from available solids	II-7	Solid
CaF ₂ Pile	Grab sample from CaF ₂ pile	II-8	Solid

Analytical Laboratory

All samples were logged on a Chain of Custody form, stored in a sample cooler, and sealed and secured when not in the custody of the sampling crew. GEL Laboratories, LLC, was utilized for the analysis and has National Environmental Laboratory Accreditation Program (NELAP) certification, as well as all appropriate SCDHEC certifications. The analytical laboratory is capable of achieving reporting limits appropriate for characterization. The laboratory data reports contain complete documentation of the laboratory’s interaction with each sample, including a case narrative, descriptions of the analyses performed, the analytical methods used, and a description of the laboratory’s internal QC review process. The analytical laboratory reports are provided in **Attachment 2**.

Radiological Sample Results

The Phase I Liquid sample results are provided in Table 3.

Table 3 – Phase I Liquid Sample Results

Sample #	Sample ID	Sample Description	Gross Analyte Activity (pCi/L)				Tc-99 / U-235 Ratio
			U-234	U-235	U-238	Tc-99	
1	T-1166	Waterglass wastewater	95.2	5.1	15.5	271.0	53.0
2	T-1160A	Solution from Cylinder Recertification	23,700.0	1,070.0	3,590.0	305.0	0.29
3	T-1160B	Solution from Conversion	50,100.0	2,850.0	8,300.0	377.0	0.13
4	T-1149	Wastewater from Incinerator / SOLX Aqueous Waste	61,500.0	2,800.0	8,710.0	48.7	0.02
5	T-1189	Contaminated Sump	2,050.0	117.0	339.0	4.7	0.04

Tc-99 was identified in the greatest quantities in the liquid streams of the Waterglass wastewater, the Cylinder Recertification process solution, and the T-1160B Conversion process line. A much lower Tc-99 concentration was identified in wastewater from the Incinerator and Solvent Extraction (SOLX) aqueous waste stream, while the Tc-99 identified in the Contaminated Sump liquid was insignificant. It is also important to examine the relationship between Tc-99 and U concentrations in the samples.

Since it is known that Tc-99 arrives at CFFF in UF₆ cylinders or as UN, it is anticipated to identify U with Tc-99 in the liquid stream from cylinder recertification. This liquid stream consists of the water used to hydrostatically test the cylinders. It is also anticipated to identify Tc-99 in the Conversion process line, as the U fuel stock feed material is expected to contain Tc-99, and there has been little separation of U from the liquid stream. The liquid stream from Conversion and the liquid stream from Cylinder Recertification are both fed to the Waterglass process. The Waterglass process removes residual U in the form of Waterglass ‘cake’ and the wastewater is sent for ammonia recovery. The Waterglass wastewater is representative of the combined wastewaters from both Conversion and Cylinder Recertification.

It is also reasonable to identify lower levels of Tc-99 in the Incinerator and SOLX aqueous waste stream due to the expected dilution of the aqueous stream at this point. Also, the Contaminated Sump sample indicates that any U present is likely the result of superficial U within the plant interior (e.g. solid U powder or particles) that has become suspended in liquid (e.g. from housekeeping or mopping of areas where loose material is present), as no significant Tc-99 has been identified in this waste stream.

Phase I solid sampling focused on the East Lagoon. Previous East Lagoon Characterization sampling had identified Tc-99 in the sludge of the East Lagoon in one small area. The *East Lagoon Characterization Report* is provided in **Attachment 3**. Of the 16 East Lagoon characterization sample locations, Tc-99 was identified in only one sample. It is reasonable to identify Tc-99 in the lagoon sludge due to the high organic content of the material, but the identification of Tc-99 in only one of 16 samples indicates that the Tc-99 is isolated. Phase I sampling was performed to delineate the area of Tc-99 impacted sludge. Soil samples were also collected in the area immediately adjacent to the corner of the East Lagoon where Tc-99 was originally identified in the single sludge sample. The analytical results are summarized in Table 4.

Table 4 – Phase I Solid Sample Results

Sample #	Sample ID	Sample Description	Gross Analyte Activity (pCi/g)				Tc-99 / U-235 Ratio
			U-234	U-235	U-238	Tc-99	
6	EL-S-A	East Lagoon Sludge Follow up	728.0	37.7	155.0	203.0	5.38
7	EL-S-B	East Lagoon Sludge Follow up	1,360.0	61.2	262.0	52.4	0.86
8	EL-S-C	East Lagoon Sludge Follow up	11,100.0	502.0	2,100.0	19.5	0.039
9	EL-SO-D-2'	Soil adjacent to East Lagoon	1.9	0.1	1.6	0.0	0.00
10	EL-SO-D-4'	Soil adjacent to East Lagoon	0.8	0.0	0.5	0.0	0.00
11	EL-SO-D-6'	Soil adjacent to East Lagoon	0.8	0.0	0.8	1.1	25.3
12	EL-SO-E-2'	Soil adjacent to East Lagoon	1.7	0.0	0.8	0.0	0.00
13	EL-SO-E-4'	Soil adjacent to East Lagoon	3.0	0.1	1.4	0.9	6.70
14	EL-SO-E-6'	Soil adjacent to East Lagoon	3.4	0.3	1.5	0.0	0.00
15	EL-SO-F-2'	Soil adjacent to East Lagoon	2.7	0.1	1.1	0.3	3.28
16	EL-SO-F-4'	Soil adjacent to East Lagoon	1.0	0.1	0.6	0.0	0.00
17	EL-SO-F-6'	Soil adjacent to East Lagoon	0.7	0.0	0.7	0.0	0.00

Elevated Tc-99 was identified in one follow up sludge bounding sample, in residual quantities in the remaining two sludge bounding samples, and no Tc-99 was identified in the surrounding soil above the laboratory detection limit. These data, combined with the data from the *East Lagoon Characterization Report (Attachment 3)*, confirms that the East Lagoon is not a significant source of Tc-99 in the environment. It is also reasonable to presume that the Tc-99 identified in the small area of the East Lagoon originated from the same historical surface release that introduced Tc-99 into the environment.

The Phase I sample of the Solution from Conversion confirms that Tc-99 is in fact present in the U stock feed material. The Phase II Liquid sampling focused on the Conversion lines, both before and after the bag filters, as well as other areas of interest such as the Scrap Cage discharge, the West II Lagoon surface water, and the recycled Ammonia lines that are fed back into the Conversion process. Phase II Liquid sampling was designed to detect potential differences in Tc-99 concentrations across the manufacturing process by sampling individual conversion lines, and subsequent processes. The results of this sampling are summarized in Table 5.

Table 5 – Phase II Liquid Sample Results

Sample #	Sample ID / Description	Gross Analyte Activity (pCi/L)				Tc-99/U-235 Ratio
		U-234	U-235	U-238	Tc-99	
18	CL-1 Before	513,000	21,700	75,100	58.7	0.003
19	CL-1 After	32,900	1,600	5,480	50.1	0.031
20	CL-2 Before	282,000	12,900	32,900	449.0	0.035
21	CL-2 After	96,400	4,200	11,100	73.9	0.018
22	CL-3 Before	367,000	16,800	50,700	438.0	0.026
23	CL-3 After	30,900	1,390	4,000	16.4	0.012
24	CL-4 Before	174,000	9,220	28,300	142.0	0.015
25	CL-4 After	25,900	1,170	4,190	63.7	0.054
26	Scrap Cage Monitor Discharge	20,600	1,030	3,400	201.0	0.20
27	W2	3.9	0.6	1.0	96.0	157
28	T-19 Ammonia	0.1	0.0	0.1	13.4	N/A
29	T-20 Ammonia	0.2	0.0	0.2	0.0	N/A

The wastewater stream from the Conversion lines passes through a set of bag filters before it is sent to Waterglass. Samples were collected before and after these bag filters (samples 18-25). The bag filters capture fine U particulate, which is later recovered by nitric acid washing in the Scrap Cage. The wastewater from the acid washing process in the Scrap Cage is also sent to Waterglass (sample 26). These processes are expected to contain Tc-99 originating from the UF₆ feedstock.

After processing in Waterglass, wastewater is fed to the stills to recover ammonia that is reused in the Conversion process. The still bottoms are transferred to the West Lagoons (W2, sample 27). Lower Tc-99 concentrations are reported here due to mixing with large volumes of water in the lagoon. Recycled Ammonia is recovered from the Waterglass wastewater and reused in the Conversion process (T-19, sample 26, and T-20, sample 29).

The Phase II solid samples focused on the solid products removed from the Phase I and Phase II liquids, specifically the Waterglass cake, the Solid CaF₂ removed from the West II Lagoon, and the Dewatering Sludge. Phase II solid sampling was designed to determine if some Tc-99 may possibly be retained in the manufacturing process solids. The results of this sampling are summarized in Table 6.

Table 6 – Phase II Solid Sample Results

Sample #	Sample ID / Description	Gross Analyte Activity (pCi/g)				Tc-99/U-235 Ratio
		U-234	U-235	U-238	Tc-99	
30	WG-D46035	523,000	22,300	74,700	22.1	0.001
31	Calcium Fluoride	16.3	0.7	2.4	0.5	0.67
32	Sludge Dewatering D45671	3,510	156	507	3.5	0.02

The Waterglass Cake (sample 30), and the Dewatering Plant Solids (sample 31) represent the solid material that is extracted during the U recovery process. The CaF₂ is the solid material that is dredged from the West II Lagoon (sample 31). No significant Tc-99 was identified in any of the Phase II solid

samples, supporting the conclusion that by the time the aqueous wastewater stream is discharged into the site lagoons, any Tc-99 present tends to stay suspended in the liquid stream because of its high solubility.

Summary

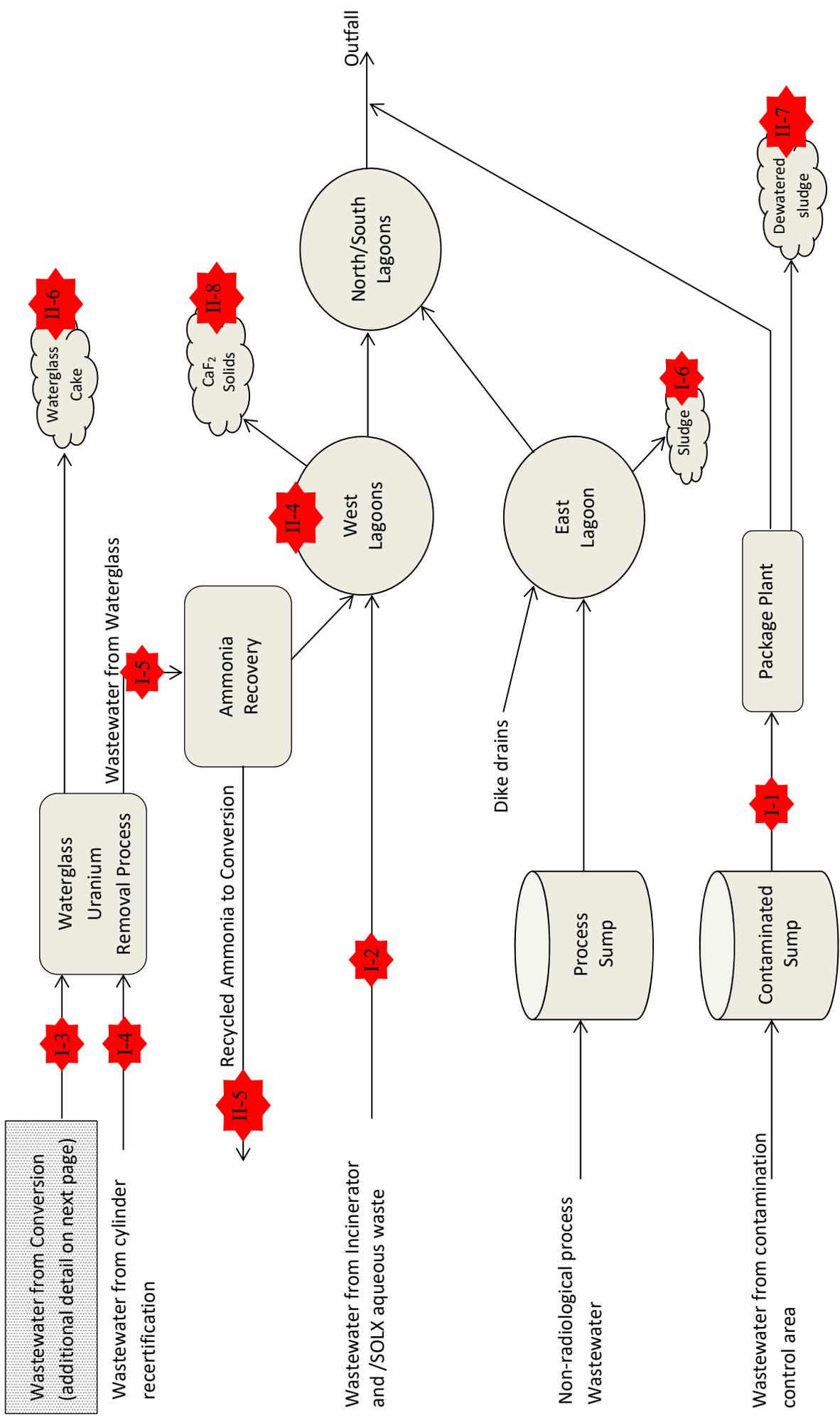
The Tc-99 Source Investigation sample data presented herein, combined with the site historical environmental sample data, the CSM, and the East Lagoon Characterization Data, support the conclusion that current site operations do not have the potential to introduce significant quantities of Tc-99 into the environment. Based on the available data, attempting to relate the current Tc-99 detected in groundwater to a specific historical event would be speculative. Therefore, CFFF's approach has been to rule out a current active source from ongoing operations and use the RI to assess the nature and extent of the legacy issue as well as to collect data that can be used to evaluate remediation options. In addition, under the RI, the soils underneath the East Lagoon liner will be characterized to identify the potential for legacy impact in this area, following the liner removal in 2021.

Only residual quantities of Tc-99 were identified in the aqueous U manufacturing process stream; the maximum Tc-99 result identified during the investigative sampling is 449 pCi/L, which is approximately 1/10th of the environmental impact observed in monitoring wells W-6 and W-11. Given the low level of Tc-99 detected in the current U fuel supply, it is reasonable to conclude that the impact of Tc-99 in the environment occurred sometime in the past and that no significant contributions are presently occurring.

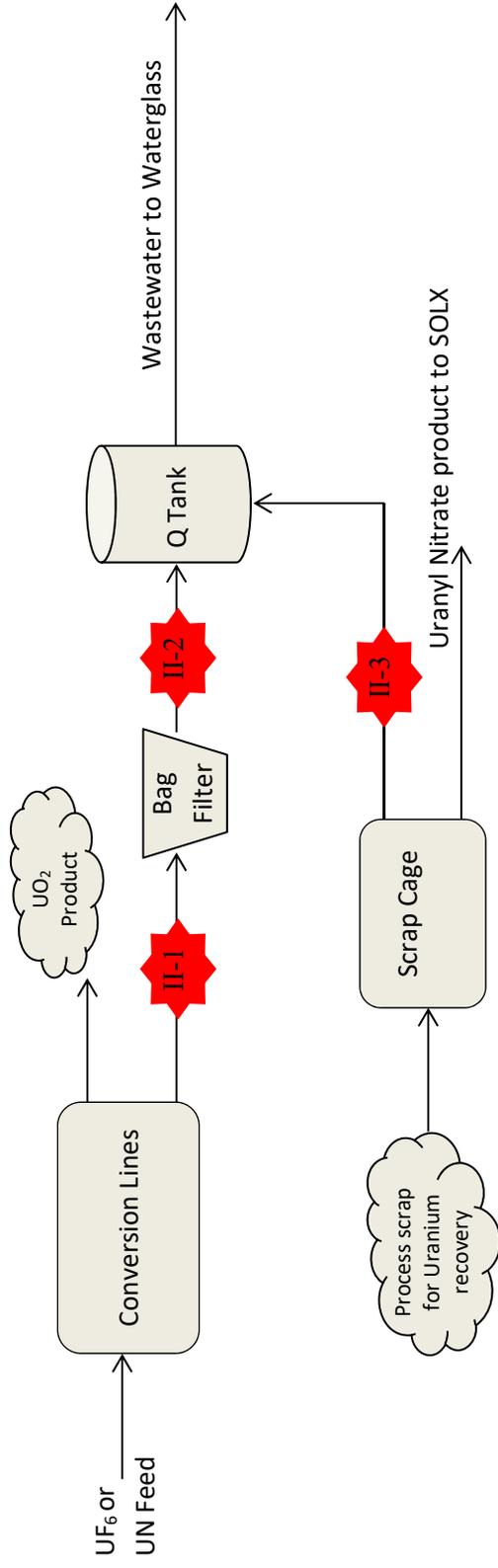
Figure 1

Aqueous Process Flow Map

Process Map and Sample Locations



Process Map and Sample Locations



Attachment 1

**Technicium Source Investigation Work Plan
LTR-RAC-20-11
January 30, 2020**



Westinghouse

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Our ref: LTR-RAC-20-11

January 30, 2020

**Technetium Source Investigation Work Plan
Consent Agreement CA-19-02-HW
File # 51377**

Dear Ms. Kuhn:

As part of the ongoing Remedial Investigation under Consent Agreement CA-19-02-HW, Westinghouse has prepared the following Technetium (Tc-99) Source Investigation Work Plan.

Sincerely,

Nancy Parr
Environmental Protection Manager
Westinghouse Electric Company LLC
803.647.3338

Report reviewed by:

Thomas Hutto, P.G.
GEL Engineering, LLC

Attachment:

Technetium (Tc-99) Source Investigation Work Plan

Columbia Fuel Fabrication Facility**Tc-99 Investigation Plan****Background**

The Westinghouse Columbia Fuel Fabrication Facility (CFFF) manufactures commercial nuclear fuel near Columbia, South Carolina. While Uranium (U) is the primary contaminant of concern, Technetium (Tc-99) also exists in residual quantities. Tc-99 does not occur naturally; it is a man-made isotope, and therefore no background level for Tc-99 exists. Tc-99 is also considered a "hard to detect" nuclide, as there is no reliable field identification method for locating Tc-99. Therefore, sample analysis in an analytical laboratory is required.

Investigative Sampling

In support of the expedited investigation requested by CFFF, a characterization effort is under way to gain better understanding into the extent of Tc-99 contamination at the facility. Data collected during this investigation will be used to fill potential characterization data gaps, and support development of future Remedial Investigation (RI) work. This sampling plan targets the most likely sources of Tc-99 including both liquid and solid wastes that have the potential to contact the environment. Analysis of changes in Tc-99 activity over time may help give an understanding into the potential sources and movement of Tc-99 at the CFFF. For this reason, the laboratory Requested Level (RL) for Tc-99 analysis sensitivity will be set as low as reasonably possible (0.5 pCi/L for liquids and 5.0 pCi/g for solids) to detect small variations in Tc-99 activity.

Additionally, each sample will be analyzed for Total U in an attempt to determine if a surrogate relationship between Tc-99 and Total U can be established. U analysis may help determine where in the product stream process the Tc-99 separates from the U. For these reasons, each sample will also be analyzed for Isotopic U, with a target RL of 0.5 pCi/L for liquids and 0.5 pCi/g for solids.

CFFF – Multi-Phase Tc-99 Investigative Sampling Plan

1. PURPOSE

This plan establishes methods for obtaining samples for radiological analysis to evaluate the extent of potential Technetium (Tc-99) contamination at the Columbia Fuel Fabrication Facility (CFFF). This plan is designed to ensure proper collection, handling, documentation, and evaluation of all sample media in support of the CFFF environmental goals, the SCDHEC Consent Agreement (CA), and the development of future RI work plans. Additional samples and analytical parameters not specified in this plan may be added based on the professional judgement of EH&S Operations or the Environmental Manager.

2. HEALTH AND SAFETY

All CFFF activities will be conducted in a manner that minimizes any potential adverse impact to the health and safety of the public, the employees, and the environment. Proper safety precautions shall be observed when collecting samples. Refer to the site Health and Safety Plan procedures for relevant health and safety requirements. Any questions, comments or concerns should be directed to the EH&S Operations and the Environmental Manager.

3. EQUIPMENT AND SUPPLIES

- Scoop
- Bowl
- Funnel
- Auger
- Sample Containers
- Field Logbooks
- Chain of Custody Forms (for specific laboratory to be used)
- Writing utensils (indelible ink, black preferred)
- Decontamination Supplies
- Personal Protective Equipment (Refer to the site Health and Safety Plan for relevant requirements)

4. QUALITY CONTROL

The objectives of the measurement data are to generate sufficient information to determine the presence or absence of contaminants within the sampled media. To meet these objectives, data acquired during the sample collection phase must be defensible.

All laboratory data will be evaluated when the analytical data package is received from the laboratory. QC sample results, applicable spike recoveries, and calibration summaries will be evaluated against the method quality criteria and the data will be flagged with data qualifiers if necessary. Acceptance or rejection of the data will depend upon professional judgment and the comparison of outlier values against site remediation criteria. A full explanation will be provided as to why any data are rejected, as well as any corrective actions that may be necessary.

5. PROCEDURE

A variety of techniques and tools exist for collecting samples of liquid and solid matrices. These include scoops, spades, funnels, or other tools to collect samples from a specified location. The following sections detail the generic procedures to be used for each type of sampling. Deviations from the protocols specified in this plan will be authorized by the Environmental Manager and documented in the field logbook.

5.1. General

The goal of the Multi-Phase Tc-99 Investigative Sampling is to sample the potentially radiologically contaminated media at locations thought most likely to be potential sources for Tc-99 contamination. This iterative data collection process is designed to determine a starting point of investigation, gather and analyze data, and proceed forward with additional sampling based on the initial results. Two types of sample matrices may be collected: liquid samples (e.g. water, and aqueous solutions) and solid samples (e.g. sludge, soil, sediment, or solid waste). Table 1 provides the phase one sample locations of the liquid and solid process streams that are believed to be the most likely sources of Tc-99. These locations will be sampled first and sent for laboratory analysis. It may be necessary to coordinate with the department manager at each sample location to ensure sample media may be safely collected without interrupting plant operations; wherever possible samples should be collected during normal system operations that represent normal operating conditions. Criticality safety must also be considered when collecting volumetric samples, and all Nuclear Criticality Safety (NCS) controls must be followed at all times. Samples will be collected in accordance with Sections 5.4.1 and 5.4.2, as appropriate.

Table 1 – Phase One Sample Locations

SAMPLE DESCRIPTION	SAMPLE LOCATION	SAMPLE MEDIA
Contaminated Sump	T-1187/T-1189	Liquid
Effluent from Incinerator / SOLX Aqueous Waste	T-1148/T-1149	Liquid
Solution from Conversion	T-1160B/C	Liquid
Solution from Cylinder Recertification	T-1160A	Liquid
Waterglass liquid effluent	T-1166	Liquid
East Lagoon	Lagoon sludge and surrounding soil	Solid

The East Lagoon has been previously identified as an area of interest. While Tc-99 has been identified in trace quantities in the Lagoon, it is not believed that the East Lagoon is a source of Tc-99 contamination. The purpose of collecting additional samples in the East Lagoon is to bound the previously identified elevated Tc-99 areas and to determine if any potential soil contamination has occurred in the surrounding area. Samples from the East Lagoon sludge, and the surrounding soil will be collected in accordance with Section 5.4.3.

Table 2 provides the phase two sample locations of the liquid and solid process streams that are down stream of the processes believed to be sources of Tc-99. These locations may be sampled if laboratory analysis confirms the presence of Tc-99 in the associated phase one process stream.

Table 2 – Phase Two Sample Locations

SAMPLE DESCRIPTION	SAMPLE LOCATION	SAMPLE MEDIA
Solution from Conversion	5 product lines, before and after bag filters(FL-x12A/B); V-1005A/B	Liquid
Waterglass Cake	Grab sample from available solids	Solid
Dewatering Plant Solids	Grab sample from available solids	Solid
CaF ₂ Pile	Grab sample from CaF ₂ pile	Solid

Each sample should be issued a unique sample ID, and information such as sample location, media, date and time of sample collection, and samplers name should be recorded in the field logbook to support the analysis and interpretation of the laboratory analytical results.

5.2. Decontamination

Care must be employed to avoid cross-contamination between sampling intervals and locations. Decontaminated or new disposable sampling equipment and new, disposable gloves shall be used for each sample collected. New gloves must be donned just prior to sample collection. All sampling equipment will be considered decontaminated when it is visually “clean”, and free of any remaining sample media.

5.3. Sample Homogenization

Samples collected under this sampling plan do not require homogenization, each sample collected will be considered a “grab” sample.

5.4. Sample Collection

The following steps are applicable to all sampling techniques:

1. Don new gloves and collect new disposable, or decontaminated sample equipment.
2. Select the appropriate sample container, and label it with the sample ID, sample location, date, time, matrix, analytical parameters, and the initials of the lead sampling person.
3. Select the appropriate sampling technique from the following sections and collect representative sample material.
4. Record the appropriate information and observations about the sample location in the field logbook. Also note any pictures taken of the area, and the associated sample ID correlating to each picture location.
5. After sampling activities have been completed, any remaining sample media not collected in the sample container should be returned to the location from where it originated.
6. Properly decontaminate all reusable sampling equipment after each sample interval and between locations.

5.4.1. Liquid Sample Collection

This section describes the generic process of collecting a liquid sample. Specific collection steps may be specified at each location depending on operational and criticality safety controls. Approximately 1 liter of liquid should be collected in a plastic bottle at each location for analysis.

1. Don new gloves and assemble necessary decontaminated sample equipment (e.g. scoop or funnel), as required.
2. Log the following information onto the sample container AND the Chain of Custody form:

- Sample ID
 - Sample Location
 - Time and Date of sample collection
 - Matrix: Liquid (of LQ)
 - Analytical parameters for analysis: Tc-99, Iso-U
 - Initials of the Sampler(s)
3. Fill the sample container from the sample location. Ensure that the minimum sample volume is collected.
 4. Seal the sample container, and place into a sample cooler or storage container under the direct supervision on the sampler. If the sample storage container is left unattended for any period of time, it should be sealed with a tamper proof custody seal and placed in a secure location.
 5. Any sample media that was collected, but not placed into a sample container should be returned to its point of origin or disposed appropriately.
 6. Fill additional sample containers as required following appropriate methods, using new or decontaminated equipment.
 7. Appropriately package samples to ensure container integrity during transport.

5.4.2. Solid Sample Collection

The following section describes the generic process of collecting a solid sample. Specific collection steps may be specified at each location depending on operational and criticality safety controls. Approximately 125ml of material should be collected in a sealable plastic container at each location for analysis.

1. Don new gloves and assemble necessary decontaminated sample equipment (e.g. scoop, bowl, or trowel), as required.
2. Log the following information onto the sample container AND the Chain of Custody form:
 - Sample ID
 - Sample Location
 - Time and Date of sample collection
 - Matrix: Solid (or semi-solid)
 - Analytical parameters for analysis: Tc-99, Iso-U
 - Initials of the Sampler(s)
3. Fill the sample container from the sample location. If collecting an environmental soil sample, remove any surface vegetation, roots, or rocks present in the sample. Ensure that the minimum sample volume is collected.
4. Seal the sample container, and place into a sample cooler or storage container under the direct supervision on the sampler. If the sample storage container is left unattended for any period of time, it should be sealed with a tamper proof custody seal and placed in a secure location.
5. Any sample media that was collected, but not placed into a sample container should be returned to its point of origin or disposed appropriately.
6. Fill additional sample containers as required following appropriate methods, using new or decontaminated equipment.
7. Appropriately package samples to ensure container integrity during transport.

5.4.3. East Lagoon Sample Collection

The following section describes the generic process of collecting solid samples from the E. Lagoon sludge and surrounding soil. Specific collection steps may be specified at each location depending on operational and criticality safety controls. Approximately 125ml of material should be collected in a sealable plastic container at each location for analysis.

1. Don clean gloves and assemble necessary decontaminated sample equipment (e.g. scoop, bowl, or trowel), as required.
2. Log the following information onto the sample container AND the Chain of Custody form:
 - Sample ID
 - Sample Location
 - Time and Date of sample collection
 - Matrix: Solid (or SS)
 - Analytical parameters for analysis: Tc-99, Iso-U
 - Initials of the Sampler(s)
3. Proposed East Lagoon sample locations are presented in Figure 1.
4. For sample locations in the East Lagoon, one sample should be collected at each location in accordance with the sampling method described in the East Lagoon Sediment Characterization Remedial Investigation Work Plan, Addendum 2, Revision 1 (LTR-RAC-19-49-R1). For sample locations in the soil adjacent to the East Lagoon, samples should be collected using a hand auger, in 2 ft intervals, to a total depth of 6ft.
5. At each desired sample location and depth, fill the sample container from the sample location. Remove any surface vegetation, roots, or rocks present in the sample, and ensure non-dedicated sample equipment is decontaminated prior to collection of subsequent depth intervals. Ensure that the minimum sample volume is collected.
6. Seal the sample container, and place into a sample cooler or storage container under the direct supervision on the sampler. If the sample storage container is left unattended for any period of time, it should be sealed with a tamper proof custody seal and placed in a secure location.
7. Any sample media that was collected, but not placed into a sample container should be returned to its point of origin or disposed appropriately.
8. Fill additional sample containers as required following appropriate methods, using new or decontaminated equipment.
9. Appropriately package samples to ensure container integrity during transport.

5.5. Sample Analysis

All samples collected will be logged on the appropriate Chain of Custody form, stored in a sample cooler, and sealed and locked when not under the custody of the sampling crew. Liquid samples will be acidified with nitric acid as needed to a pH of less than 2. No preservation is required for solid radiological sample media. All samples must be submitted to the laboratory within 180 days of sample collection. The Laboratory utilized for this project will have National Environmental Laboratory Accreditation Program (NELAP) certification, as well as any additional state certifications, as needed. The laboratory analytical procedures and RLs for each analyte are provided in Table 3:

Table 3 – Laboratory Analytical Method and RL

Analysis	Method	Laboratory Requested Level (RL)*
Iso-U (solid)	DOE HASL 300 U-02-RC Mod	0.5 pCi/g
Tc-99 (solid)	DOE HASL 300 Tc-02-RC Mod	5.0 pCi/g
Iso-U (liquid)	DOE HASL 300 U-02-RC Mod	0.5 pCi/L
Tc-99 (liquid)	DOE HASL 300 Tc-02-RC Mod	5.0 pCi/L

* The contract laboratories will make every effort to achieve the lowest possible detection limits. Actual detection limits will vary based on the moisture content of the samples as well as the chemical and physical consistency of the sample matrix.

The laboratory data reports will consist of complete data packages that will contain complete documentation of the laboratory data report, and will include the following:

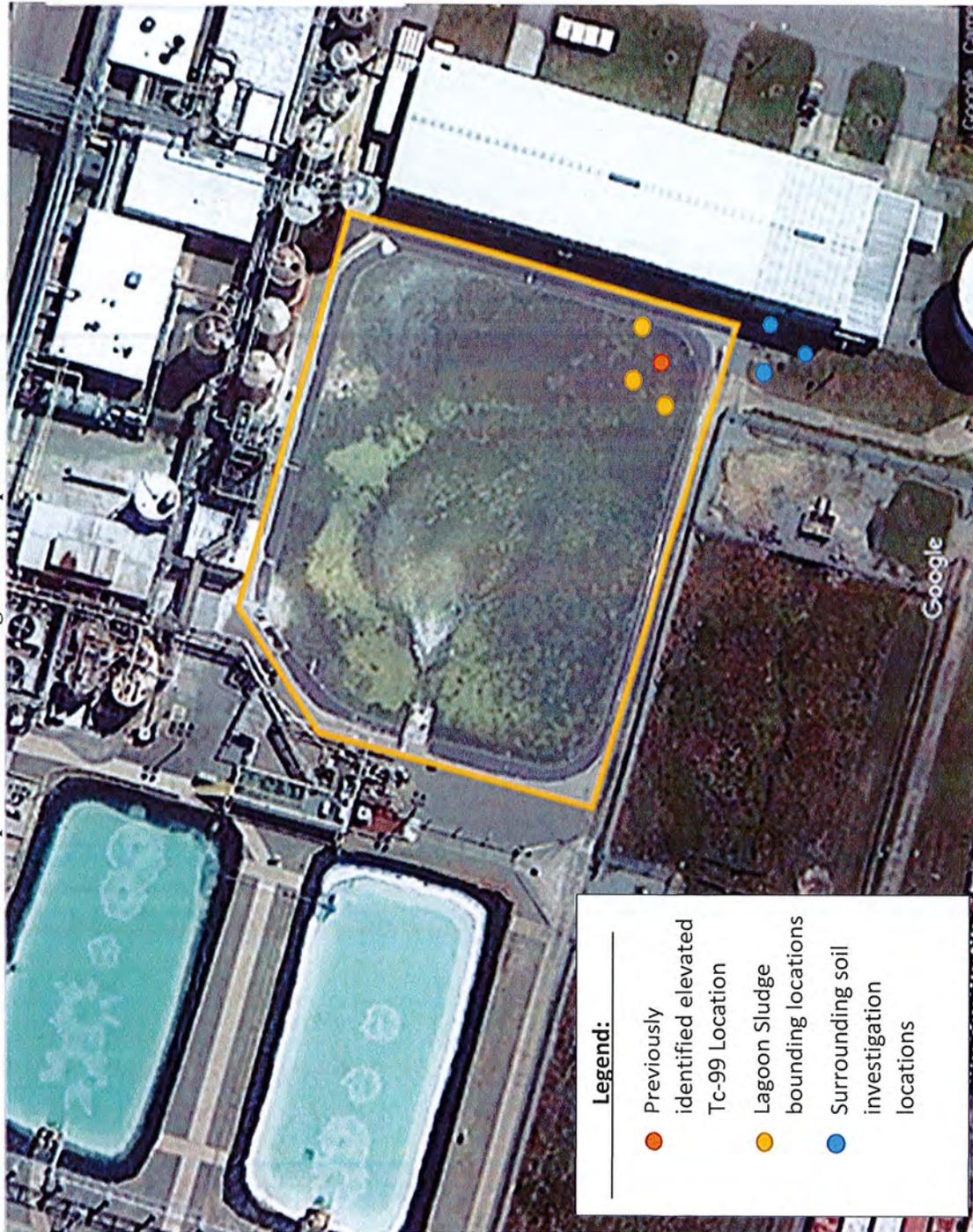
- Case narrative identifying the laboratory analytical batch number
- Matrix and number of samples included
- Analyses performed
- Analytical methods used
- Descriptions of any problems or exceedance of QC criteria and corrective actions taken

All laboratory analytical data will be reviewed and validated by project staff upon receipt to ensure completeness, and to compare the results to remedial guidelines. An investigation summary report will be prepared documenting field activities, laboratory analytical results, QC sample parameters, validation of results, and recommendations on follow up sampling locations or corrective actions.

6. RECORDS

Records generated as a result of this procedure shall be submitted to the designated electronic record storage system. Photographs of the sample collection process, copies of the chain of custody forms, figure(s) showing sampling locations and copies of the field logbook pages will be retained onsite for future use. The investigation summary report will be submitted to SCDHEC once completed.

Figure 1 – CFFF East Lagoon
Proposed Tc-99 Investigation Sample Locations



Attachment 2

Technicium Source Investigation Liquid and Solid Samples - GEL Analytical Results

Phase I

GEL Analytical Results
Sampling conducted: March 9, 2020
GEL Work Order: 506781
Report Date: March 19, 2020

Phase II

GEL Analytical Results
Sampling conducted: April 8-9, 2020
GEL Work Order: 510356
Report Date: May 13, 2020



March 19, 2020

Ms. Cynthia Logsdon
Westinghouse Electric Company, LLC
PO Drawer R
Columbia, South Carolina 29205

Re: ENV-CONSENTA-4500778461
Work Order: 506781

Dear Ms. Logsdon:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on March 11, 2020. This revised data report has been prepared and reviewed in accordance with GEL's standard operating procedures. This package is revised to include the correct reporting limits.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4707.

Sincerely,

Katelyn Gray
Project Manager

Purchase Order: 4500778461
Enclosures



GEL LABORATORIES LLC

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

Certificate of Analysis Report for

WNUC009 Westinghouse Electric Co, LLC

Client SDG: 506781 GEL Work Order: 506781

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, Katelyn Gray.



Reviewed by _____

GEL LABORATORIES LLC

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

Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID:	T-1166	Project:	WNUC00901
Sample ID:	506781001	Client ID:	WNUC009
Matrix:	Misc Liquid		
Collect Date:	09-MAR-20 09:19		
Receive Date:	11-MAR-20		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Alpha Spec Analysis												
Alphaspec U, Liquid "As Received"												
Pct Uranium-235		4.88				percent		MP2		03/14/20	0928 1979596	1
Uranium-233/234		95.2	+/-3.55	0.270	0.500	pCi/L						
Uranium-235/236		5.11	+/-0.919	0.235	0.500	pCi/L						
Uranium-238		15.5	+/-1.43	0.103	0.500	pCi/L						
Rad Liquid Scintillation Analysis												
Liquid Scint Tc99, Liquid "As Received"												
Technetium-99		271	+/-17.8	21.3	5.00	pCi/L		JJ3		03/17/20	0658 1979684	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			86.1	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			95.6	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

GEL LABORATORIES LLC

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

Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID:	T-1160A	Project:	WNUC00901
Sample ID:	506781002	Client ID:	WNUC009
Matrix:	Misc Liquid		
Collect Date:	09-MAR-20 09:26		
Receive Date:	11-MAR-20		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Liquid "As Received"

Pct Uranium-235		4.42				percent		MP2	03/16/20	1410	1980559	1
Uranium-233/234		23700	+/-708	44.5	0.500	pCi/L						
Uranium-235/236		1070	+/-167	28.6	0.500	pCi/L						
Uranium-238		3590	+/-276	25.9	0.500	pCi/L						

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Liquid "As Received"

Technetium-99		305	+/-18.5	21.5	5.00	pCi/L		JJ3	03/17/20	0901	1979684	2
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			51.8	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			98.9	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: T-1160B Project: WNUC00901
Sample ID: 506781003 Client ID: WNUC009
Matrix: Misc Liquid
Collect Date: 09-MAR-20 09:27
Receive Date: 11-MAR-20
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Liquid "As Received"

Pct Uranium-235		5.06				percent		MP2		03/16/20	1605	1980559	1
Uranium-233/234		50100	+/-1530	91.2	0.500	pCi/L							
Uranium-235/236		2850	+/-407	45.2	0.500	pCi/L							
Uranium-238		8300	+/-624	51.2	0.500	pCi/L							

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Liquid "As Received"

Technetium-99		377	+/-19.8	21.7	5.00	pCi/L		JJ3		03/17/20	1103	1979684	2
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			28.2	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			94.8	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID:	T-1149	Project:	WNUC00901
Sample ID:	506781004	Client ID:	WNUC009
Matrix:	Misc Liquid		
Collect Date:	09-MAR-20 09:29		
Receive Date:	11-MAR-20		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
High Rad Testing													
Alphaspec U, Liquid "As Received"													
Pct Uranium-235		4.75				percent			JXB7	03/16/20	2330	1980586	1
Uranium-233/234		61500	+/-1460	71.5	1.00	pCi/L							
Uranium-235/236		2800	+/-347	33.4	1.00	pCi/L							
Uranium-238		8710	+/-550	59.4	1.00	pCi/L							
Liquid Scint Tc99, Liquid "As Received"													
Technetium-99	U	48.7	+/-52.6	88.3	5.00	pCi/L			AXM6	03/17/20	0743	1979703	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			93.7	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			77	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: T-1189 Project: WNUC00901
Sample ID: 506781005 Client ID: WNUC009
Matrix: Misc Liquid
Collect Date: 09-MAR-20 09:33
Receive Date: 11-MAR-20
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Liquid "As Received"													
Pct Uranium-235		5.09				percent			MP2	03/16/20	1600	1980559	1
Uranium-233/234		2050	+/-121	16.3	0.500	pCi/L							
Uranium-235/236		117	+/-32.7	14.0	0.500	pCi/L							
Uranium-238		339	+/-49.3	12.2	0.500	pCi/L							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Liquid "As Received"													
Technetium-99		4.70	+/-1.58	2.53	5.00	pCi/L		JJ3		03/17/20	1305	1979684	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			79.6	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			93.9	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-S-A	Project: WNUC00901
Sample ID: 506781006	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 09:50	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Solid "Dry Weight Corrected"

Uranium-233/234		728	+/-19.7	1.10	1.00	pCi/g			MP2	03/17/20	0910	1980800	1
Uranium-235/236		37.7	+/-5.00	0.779	1.00	pCi/g							
Uranium-238		155	+/-9.10	0.631	1.00	pCi/g							

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Soil "As Received"

Technetium-99		203	+/-6.94	4.22	5.00	pCi/g			JJ3	03/17/20	0833	1979694	2
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The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			102	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			92.9	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

GEL LABORATORIES LLC

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

Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-S-B	Project: WNUC00901
Sample ID: 506781007	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 09:55	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		1360	+/-32.5	1.58	1.00	pCi/g			MP2	03/17/20	0910	1980800	1
Uranium-235/236		61.2	+/-7.67	1.29	1.00	pCi/g							
Uranium-238		262	+/-14.3	1.14	1.00	pCi/g							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99		52.4	+/-4.08	4.20	5.00	pCi/g			JJ3	03/17/20	0850	1979694	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			83.4	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			91.9	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

GEL LABORATORIES LLC

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

Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-S-C	Project: WNUC00901
Sample ID: 506781008	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 10:00	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
High Rad Testing													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99		19.5	+/-5.49	8.87	5.00	pCi/g			AXM6	03/17/20	0756	1979700	1
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		11100	+/-171	4.38	1.00	pCi/g			JXB7	03/16/20	2330	1979706	2
Uranium-235/236		502	+/-40.4	4.68	1.00	pCi/g							
Uranium-238		2100	+/-74.3	3.28	1.00	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	AXM6	03/12/20	1653	1979695

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Tc-02-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			78.1	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			51.7	(15%-125%)

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

Column headers are defined as follows:

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

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

Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-SO-D-2'	Project: WNUC00901
Sample ID: 506781009	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 10:19	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		1.87	+/-0.323	0.133	1.00	pCi/g			HAKB	03/16/20	1311	1979622	1
Uranium-235/236	U	0.0783	+/-0.0843	0.0959	1.00	pCi/g							
Uranium-238		1.60	+/-0.298	0.109	1.00	pCi/g							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99	U	-1.71	+/-2.16	3.91	5.00	pCi/g			JJ3	03/17/20	0906	1979694	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			88.3	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			95.5	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-SO-D-4'	Project: WNUC00901
Sample ID: 506781010	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 10:37	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		0.812	+/-0.193	0.101	1.00	pCi/g			HAKB	03/16/20	1311	1979622	1
Uranium-235/236	U	0.0145	+/-0.0495	0.0917	1.00	pCi/g							
Uranium-238		0.465	+/-0.147	0.0873	1.00	pCi/g							

Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99	U	-0.386	+/-2.50	4.37	5.00	pCi/g			JJ3	03/17/20	1433	1979694	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst	Comments
1	DOE EML HASL-300, U-02-RC Modified		
2	DOE EML HASL-300, Tc-02-RC Modified		

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			94.4	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			92.3	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-SO-D-6'	Project: WNUC00901
Sample ID: 506781011	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 10:54	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Solid "Dry Weight Corrected"

Uranium-233/234		0.777	+/-0.202	0.102	1.00	pCi/g			HAKB	03/16/20	1311	1979622	1
Uranium-235/236	U	0.0442	+/-0.0636	0.0767	1.00	pCi/g							
Uranium-238		0.822	+/-0.205	0.0717	1.00	pCi/g							

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Soil "As Received"

Technetium-99	U	1.12	+/-2.46	4.21	5.00	pCi/g			JJ3	03/17/20	1450	1979694	2
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The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			82.5	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			92.9	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-SO-E-2'	Project: WNUC00901
Sample ID: 506781012	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 11:19	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		1.66	+/-0.288	0.108	1.00	pCi/g			HAKB	03/16/20	1311	1979622	1
Uranium-235/236	U	0.0355	+/-0.0629	0.0952	1.00	pCi/g							
Uranium-238		0.842	+/-0.204	0.0605	1.00	pCi/g							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99	U	-1.08	+/-2.40	4.26	5.00	pCi/g			JJ3	03/17/20	1507	1979694	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			87.3	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			93.1	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-SO-E-4' Project: WNUC00901
Sample ID: 506781013 Client ID: WNUC009
Matrix: Solid
Collect Date: 09-MAR-20 11:24
Receive Date: 11-MAR-20
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Solid "Dry Weight Corrected"

Uranium-233/234		2.98	+/-0.380	0.103	1.00	pCi/g			HAKB	03/16/20	1311	1979622	1
Uranium-235/236		0.131	+/-0.0961	0.0852	1.00	pCi/g							
Uranium-238		1.37	+/-0.260	0.0964	1.00	pCi/g							

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Soil "As Received"

Technetium-99	U	0.878	+/-2.38	4.08	5.00	pCi/g			JJ3	03/17/20	1523	1979694	2
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The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			86.8	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			94.6	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-SO-E-6'	Project: WNUC00901
Sample ID: 506781014	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 11:33	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		3.35	+/-0.469	0.134	1.00	pCi/g			HAKB	03/16/20	1311	1979622	1
Uranium-235/236		0.323	+/-0.169	0.115	1.00	pCi/g							
Uranium-238		1.54	+/-0.318	0.0932	1.00	pCi/g							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99	U	-0.714	+/-2.34	4.12	5.00	pCi/g			JJ3	03/17/20	1540	1979694	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			72.8	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			92.5	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-SO-F-2' Project: WNUC00901
Sample ID: 506781015 Client ID: WNUC009
Matrix: Solid
Collect Date: 09-MAR-20 11:46
Receive Date: 11-MAR-20
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		2.69	+/-0.380	0.133	1.00	pCi/g			HAKB	03/16/20	1311	1979622	1
Uranium-235/236		0.0967	+/-0.0878	0.0805	1.00	pCi/g							
Uranium-238		1.12	+/-0.246	0.100	1.00	pCi/g							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99	U	0.317	+/-2.23	3.86	5.00	pCi/g			JJ3	03/17/20	1556	1979694	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst	Comments
1	DOE EML HASL-300, U-02-RC Modified		
2	DOE EML HASL-300, Tc-02-RC Modified		

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			84.4	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			95	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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

Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-SO-F-4'	Project: WNUC00901
Sample ID: 506781016	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 11:56	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Solid "Dry Weight Corrected"

Uranium-233/234		1.02	+/-0.247	0.128	1.00	pCi/g			HAKB	03/16/20	1311	1979622	1
Uranium-235/236	U	0.100	+/-0.0953	0.101	1.00	pCi/g							
Uranium-238		0.600	+/-0.190	0.103	1.00	pCi/g							

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Soil "As Received"

Technetium-99	U	-1.30	+/-2.19	3.90	5.00	pCi/g			JJ3	03/17/20	1613	1979694	2
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The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			75.5	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			93.3	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: March 19, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: EL-SO-F-6'	Project: WNUC00901
Sample ID: 506781017	Client ID: WNUC009
Matrix: Solid	
Collect Date: 09-MAR-20 12:08	
Receive Date: 11-MAR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		0.732	+/-0.217	0.103	1.00	pCi/g			HAKB	03/16/20	1311	1979622	1
Uranium-235/236	U	0.0347	+/-0.0681	0.0944	1.00	pCi/g							
Uranium-238		0.706	+/-0.212	0.0973	1.00	pCi/g							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99	U	-0.0515	+/-2.38	4.16	5.00	pCi/g			JJ3	03/17/20	1629	1979694	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	03/12/20	1414	1979613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			70.8	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			92	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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QC Summary

Report Date: March 19, 2020

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Westinghouse Electric Company, LLC

PO Drawer R
Columbia, South Carolina

Contact: Ms. Cynthia Logsdon

Workorder: 506781

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
High Rad Testing											
Batch	1979700										
QC1204523272	506781008	DUP									
Technetium-99		19.5		36.5	pCi/g	60.5		(0% - 100%)	AXM6	03/17/20	12:14
	Uncertainty	+/-5.49		+/-5.94							
QC1204523273	LCS										
Technetium-99	308			241	pCi/g		78.3	(75%-125%)		03/17/20	14:17
	Uncertainty			+/-19.8							
QC1204523271	MB										
Technetium-99			U	-0.263	pCi/g					03/17/20	10:04
	Uncertainty			+/-5.41							
Batch	1979703										
QC1204523283	506781004	DUP									
Technetium-99		48.7	U	38.3	pCi/L	N/A			N/AAXM6	03/17/20	11:57
	U	+/-52.6		+/-53.8							
QC1204523284	LCS										
Technetium-99	3030			2890	pCi/L		95.4	(75%-125%)		03/17/20	14:00
	Uncertainty			+/-207							
QC1204523282	MB										
Technetium-99			U	53.6	pCi/L					03/17/20	09:51
	Uncertainty			+/-44.2							
Batch	1979706										
QC1204523290	506781008	DUP									
Uranium-233/234		11100		12100	pCi/g	8.31		(0%-20%)	JXB7	03/16/20	23:30
	Uncertainty	+/-171		+/-194							
Uranium-235/236		502		555	pCi/g	10		(0%-20%)			
	Uncertainty	+/-40.4		+/-46.4							
Uranium-238		2100		2460	pCi/g	15.7		(0%-20%)			
	Uncertainty	+/-74.3		+/-87.7							
QC1204523291	LCS										
Uranium-233/234				71.9	pCi/g					03/16/20	23:30
	Uncertainty			+/-9.15							
Uranium-235/236				2.88	pCi/g						
	Uncertainty			+/-2.20							

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
High Rad Testing											
Batch	1979706										
Uranium-238	74.8			77.6	pCi/g		104	(75%-125%)	JXB7	03/16/20	23:30
	Uncertainty			+/-9.50							
QC1204523289	MB										
Uranium-233/234			U	0.474	pCi/g					03/16/20	23:30
	Uncertainty			+/-0.902							
Uranium-235/236			U	-0.0597	pCi/g						
	Uncertainty			+/-0.515							
Uranium-238			U	-0.0965	pCi/g						
	Uncertainty			+/-0.427							
Batch	1980586										
QC1204525412	506781004 DUP										
Pct Uranium-235		4.75		4.32	percent	9.59		(0%-20%)	JXB7	03/16/20	23:30
Uranium-233/234		61500		66900	pCi/L	8.36		(0%-20%)			
	Uncertainty	+/-1460		+/-1550							
Uranium-235/236		2800		2970	pCi/L	5.82		(0%-20%)			
	Uncertainty	+/-347		+/-364							
Uranium-238		8710		10200	pCi/L	15.9		(0%-20%)			
	Uncertainty	+/-550		+/-607							
QC1204525413	LCS										
Pct Uranium-235				0.796	percent					03/16/20	23:30
Uranium-233/234				2620	pCi/L						
	Uncertainty			+/-293							
Uranium-235/236				134	pCi/L						
	Uncertainty			+/-78.6							
Uranium-238	2730			2590	pCi/L		95.1	(75%-125%)			
	Uncertainty			+/-288							
QC1204525411	MB										
Pct Uranium-235			U	0.000	percent					03/16/20	23:30
Uranium-233/234			U	6.04	pCi/L						
	Uncertainty			+/-29.4							

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
High Rad Testing											
Batch	1980586										
Uranium-235/236			U	-2.50	pCi/L				JXB7	03/16/20	23:30
	Uncertainty			+/-21.6							
Uranium-238			U	12.8	pCi/L						
	Uncertainty			+/-29.4							
Rad Alpha Spec											
Batch	1979596										
QC1204523023	LCS										
Pct Uranium-235				1.09	percent				MP2	03/14/20	09:28
Uranium-233/234				14.0	pCi/L						
	Uncertainty			+/-1.33							
Uranium-235/236				1.03	pCi/L						
	Uncertainty			+/-0.409							
Uranium-238	13.6			14.6	pCi/L		107	(75%-125%)			
	Uncertainty			+/-1.35							
QC1204523834	LCSD										
Pct Uranium-235				0.670	percent	47.4				03/14/20	09:28
Uranium-233/234				12.6	pCi/L	10.7					
	Uncertainty			+/-1.25							
Uranium-235/236				0.566	pCi/L	58.4					
	Uncertainty			+/-0.313							
Uranium-238	13.6			13.0	pCi/L	11.1	95.7	(0%-20%)			
	Uncertainty			+/-1.27							
QC1204523021	MB										
Pct Uranium-235			U	0.000	percent					03/14/20	09:28
Uranium-233/234			U	0.223	pCi/L						
	Uncertainty			+/-0.223							
Uranium-235/236			U	0.0451	pCi/L						
	Uncertainty			+/-0.154							
Uranium-238			U	0.0464	pCi/L						
	Uncertainty			+/-0.145							

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1979622										
QC1204523078	506693001 DUP										
Uranium-233/234		1.64		1.93	pCi/g	16.1		(0%-20%)	HAKB	03/16/20	13:11
	Uncertainty	+/-0.294		+/-0.306							
Uranium-235/236	U	0.0618		0.0880	pCi/g	11		(0% - 100%)			
	Uncertainty	+/-0.0729		+/-0.0799							
Uranium-238		0.821		0.998	pCi/g	19.5		(0%-20%)			
	Uncertainty	+/-0.207		+/-0.220							
QC1204523079	LCS										
Uranium-233/234				4.98	pCi/g					03/16/20	13:11
	Uncertainty			+/-0.486							
Uranium-235/236				0.374	pCi/g						
	Uncertainty			+/-0.151							
Uranium-238	5.20			4.88	pCi/g		93.8	(75%-125%)			
	Uncertainty			+/-0.480							
QC1204523077	MB										
Uranium-233/234			U	0.0240	pCi/g					03/16/20	13:11
	Uncertainty			+/-0.0586							
Uranium-235/236			U	-0.00869	pCi/g						
	Uncertainty			+/-0.0384							
Uranium-238			U	0.0111	pCi/g						
	Uncertainty			+/-0.0417							
Batch	1980559										
QC1204525329	LCS										
Pct Uranium-235				1.24	percent				MP2	03/16/20	14:10
Uranium-233/234				470	pCi/L						
	Uncertainty			+/-54.3							
Uranium-235/236				39.6	pCi/L						
	Uncertainty			+/-18.0							
Uranium-238	545			490	pCi/L		89.9	(75%-125%)			
	Uncertainty			+/-55.4							
QC1204525330	LCSD										
Pct Uranium-235				0.869	percent	35.2				03/16/20	14:10

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1980559										
Uranium-233/234				528	pCi/L	11.5			MP2	03/16/20	14:10
	Uncertainty			+/-63.9							
Uranium-235/236				31.9	pCi/L	21.4					
	Uncertainty			+/-18.0							
Uranium-238	545			565	pCi/L	14.3	104	(0%-20%)			
	Uncertainty			+/-66.0							
QC1204525328	MB										
Pct Uranium-235			U	0.000	percent					03/16/20	14:10
Uranium-233/234			U	2.01	pCi/L						
	Uncertainty			+/-7.64							
Uranium-235/236			U	2.31	pCi/L						
	Uncertainty			+/-6.49							
Uranium-238			U	0.0747	pCi/L						
	Uncertainty			+/-5.54							
Batch	1980800										
QC1204526063	506781006 DUP										
Uranium-233/234		728		668	pCi/g	8.68		(0%-20%)	MP2	03/17/20	09:10
	Uncertainty	+/-19.7		+/-21.9							
Uranium-235/236		37.7		29.8	pCi/g	23.3*		(0%-20%)			
	Uncertainty	+/-5.00		+/-5.18							
Uranium-238		155		139	pCi/g	10.7		(0%-20%)			
	Uncertainty	+/-9.10		+/-10.0							
QC1204526064	LCS										
Uranium-233/234				53.7	pCi/g					03/17/20	09:10
	Uncertainty			+/-6.37							
Uranium-235/236				3.13	pCi/g						
	Uncertainty			+/-1.77							
Uranium-238	52.4			55.6	pCi/g		106	(75%-125%)			
	Uncertainty			+/-6.47							
QC1204526062	MB										
Uranium-233/234			U	-0.0547	pCi/g					03/17/20	09:10
	Uncertainty			+/-0.502							

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1980800										
Uranium-235/236			U	0.110	pCi/g				MP2	03/17/20	09:10
	Uncertainty			+/-0.495							
Uranium-238			U	0.115	pCi/g						
	Uncertainty			+/-0.397							
Rad Liquid Scintillation											
Batch	1979684										
QC1204523240	LCS										
Technetium-99	151			156	pCi/L		103	(75%-125%)	JJ3	03/17/20	17:11
	Uncertainty			+/-9.30							
QC1204523603	LCSD										
Technetium-99	151			143	pCi/L	9.01	94.4	(0%-20%)		03/17/20	17:28
	Uncertainty			+/-8.60							
QC1204523238	MB										
Technetium-99			U	-0.549	pCi/L					03/17/20	15:08
	Uncertainty			+/-1.25							
Batch	1979694										
QC1204523258	506693001 DUP										
Technetium-99	U	-0.349	U	0.524	pCi/g	N/A		N/A	JJ3	03/17/20	17:02
	Uncertainty	+/-2.19		+/-2.52							
QC1204523259	LCS										
Technetium-99	56.8			56.3	pCi/g		99	(75%-125%)		03/17/20	17:19
	Uncertainty			+/-3.95							
QC1204523257	MB										
Technetium-99			U	-0.228	pCi/g					03/17/20	16:46
	Uncertainty			+/-2.24							

Notes:

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

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded
- J See case narrative for an explanation

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QC Summary

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
J											
K											
L											
M											
M											
N/A											
N1											
ND											
NJ											
Q											
R											
U											
UI											
UJ											
UL											
X											
Y											
^											
h											

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
Westinghouse Electric Co, LLC
SDG #: 506781**

Product: Alphaspec U, Solid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1979706

Preparation Method: Dry Soil Prep

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

Preparation Batch: 1979695

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781008	EL-S-C
1204523289	Method Blank (MB)
1204523290	506781008(EL-S-C) Sample Duplicate (DUP)
1204523291	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204523289 (MB)	Uranium-233/234	Result 0.474 < MDA 1.5 > RDL 1 pCi/g
	Uranium-235/236	Result -0.0597 < MDA 1.19 > RDL 1 pCi/g
	Uranium-238	Result -0.0965 < MDA 1.11 > RDL 1 pCi/g

Miscellaneous Information

Manual Integration

Manual integrations of alpha spectroscopy spectra 1204523290 (EL-S-CDUP) and 506781008 (EL-S-C) were performed to fully separate counts in Regions of Interest which would have been biased.

Additional Comments

The tracer peak centroid for sample 506781008 (EL-S-C) 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 U, Liquid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1980586

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781004	T-1149
1204525411	Method Blank (MB)
1204525412	506781004(T-1149) Sample Duplicate (DUP)
1204525413	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.

Preparation Information

Aliquot Reduced

aliquots were reduced due to high activity based on Gamma data.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204525411 (MB)	Uranium-233/234	Result 6.04 < MDA 58.1 > RDL 1 pCi/L
	Uranium-235/236	Result -2.5 < MDA 50 > RDL 1 pCi/L
	Uranium-238	Result 12.8 < MDA 46.7 > RDL 1 pCi/L

Technical Information

Sample Re-prep/Re-analysis

Sample 506781004 (T-1149) was re-prepped due to low carrier/tracer yield. The re-analysis is being reported.

Product: Alphaspec U, Liquid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1979596

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781001	T-1166
1204523021	Method Blank (MB)
1204523023	Laboratory Control Sample (LCS)
1204523834	Laboratory Control Sample Duplicate (LCSD)

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: Alphaspec U, Solid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1979622

Preparation Method: Dry Soil Prep

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

Preparation Batch: 1979613

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781009	EL-SO-D-2'
506781010	EL-SO-D-4'
506781011	EL-SO-D-6'
506781012	EL-SO-E-2'
506781013	EL-SO-E-4'
506781014	EL-SO-E-6'
506781015	EL-SO-F-2'
506781016	EL-SO-F-4'
506781017	EL-SO-F-6'
1204523077	Method Blank (MB)
1204523078	506693001(FM-1-2') Sample Duplicate (DUP)
1204523079	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this

report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Alphaspec U, Liquid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1980559

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781002	T-1160A
506781003	T-1160B
506781005	T-1189
1204525328	Method Blank (MB)
1204525329	Laboratory Control Sample (LCS)
1204525330	Laboratory Control Sample Duplicate (LCSD)

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.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204525328 (MB)	Uranium-233/234	Result 2.01 < MDA 14.8 > RDL 0.5 pCi/L
	Uranium-235/236	Result 2.31 < MDA 6.93 > RDL 0.5 pCi/L
	Uranium-238	Result 0.0747 < MDA 12.3 > RDL 0.5 pCi/L

Technical Information

Sample Re-prep/Re-analysis

Samples 506781002 (T-1160A), 506781003 (T-1160B) and 506781005 (T-1189) were re-prepped due to low carrier/tracer yield. The re-analysis is being reported.

Product: Alphaspec U, Solid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1980800

Preparation Method: Dry Soil Prep

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

Preparation Batch: 1979613

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781006	EL-S-A
506781007	EL-S-B
1204526062	Method Blank (MB)
1204526063	506781006(EL-S-A) Sample Duplicate (DUP)
1204526064	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1204526063 (EL-S-ADUP)	Uranium-235/236	RPD 23.3* (0.00%-20.00%) RER 1.52 (0-3)

Technical Information

Sample Re-prep/Re-analysis

Samples were re-prepped due to low carrier/tracer yield. The re-analysis is being reported.

Product: Dry Weight

Preparation Method: Dry Soil Prep

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

Preparation Batch: 1979613

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781006	EL-S-A
506781007	EL-S-B
506781009	EL-SO-D-2'

506781010	EL-SO-D-4'
506781011	EL-SO-D-6'
506781012	EL-SO-E-2'
506781013	EL-SO-E-4'
506781014	EL-SO-E-6'
506781015	EL-SO-F-2'
506781016	EL-SO-F-4'
506781017	EL-SO-F-6'

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Dry Weight

Preparation Method: Dry Soil Prep

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

Preparation Batch: 1979695

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781008	EL-S-C

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Liquid Scint Tc99, Soil

Analytical Method: DOE EML HASL-300, Tc-02-RC Modified

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1979700

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781008	EL-S-C
1204523271	Method Blank (MB)
1204523272	506781008(EL-S-C) Sample Duplicate (DUP)
1204523273	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.

Preparation Information

Preparation Information

Performed a double iron scavenge and all part 61 clean ups and rinses to reduce interferences.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204523271 (MB)	Technetium-99	Result -0.263 < MDA 9.21 > RDL 5 pCi/g

Product: Liquid Scint Tc99, Liquid

Analytical Method: DOE EML HASL-300, Tc-02-RC Modified

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1979703

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781004	T-1149
1204523282	Method Blank (MB)
1204523283	506781004(T-1149) Sample Duplicate (DUP)
1204523284	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.

Preparation Information

Preparation Information

Performed a double iron scavenge and all part 61 clean ups and rinses to reduce interferences.

Quality Control (QC) Information

RDL Met

Samples (See Below) did not meet the detection limits due to limited sample volume. Samples were counted the maximum count time in order to achieve the lowest MDAs possible.

Sample	Analyte	Value
1204523282 (MB)	Technetium-99	Result 53.6 < MDA 73.8 > RDL 50 pCi/L
1204523283 (T-1149DUP)	Technetium-99	Result 38.3 < MDA 90.6 > RDL 50 pCi/L
506781004 (T-1149)	Technetium-99	Result 48.7 < MDA 88.3 > RDL 50 pCi/L

Product: Liquid Scint Tc99, Liquid

Analytical Method: DOE EML HASL-300, Tc-02-RC Modified

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1979684

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781001	T-1166
506781002	T-1160A
506781003	T-1160B
506781005	T-1189
1204523238	Method Blank (MB)
1204523240	Laboratory Control Sample (LCS)
1204523603	Laboratory Control Sample Duplicate (LCSD)

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.

Preparation Information**Aliquot Reduced**

506781001 (T-1166), 506781002 (T-1160A) and 506781003 (T-1160B) aliquot volumes were reduced due to the sample matrix.

Product: Liquid Scint Tc99, Soil

Analytical Method: DOE EML HASL-300, Tc-02-RC Modified

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1979694

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
506781006	EL-S-A
506781007	EL-S-B
506781009	EL-SO-D-2'
506781010	EL-SO-D-4'
506781011	EL-SO-D-6'
506781012	EL-SO-E-2'
506781013	EL-SO-E-4'
506781014	EL-SO-E-6'
506781015	EL-SO-F-2'
506781016	EL-SO-F-4'
506781017	EL-SO-F-6'
1204523257	Method Blank (MB)
1204523258	506693001(FM-1-2') Sample Duplicate (DUP)
1204523259	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL Laboratories, LLC
 2040 Savage Road
 Charleston, SC 29407
 Phone: (843) 556-8171
 Fax: (843) 766-1178

Sample ID	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code	Field Filtered	Sample Matrix	Should this sample be considered:		Total number of containers	Sample Analysis Requested (6) (Fill in the number of containers for each test)						Comments			
						Yes, please supply isotopic info.	(7) Known or possible hazards		Isotopic U by Alpha Spec	TC-99								
T-1166	3/9/2020	0919	G	N	ML			1	X	X								
T-1160A	3/9/2020	0926	G	N	ML	X		1	X	X								
T-1160B	3/9/2020	0927	G	N	ML	X		1	X	X								
T-1149	3/9/2020	0929	G	N	ML	X		1	X	X								
T-1189	3/9/2020	0933	G	N	ML	X		1	X	X								
EL-S-A	3/9/2020	0950	G	N	SD	X		1	X	X								
EL-S-B	3/9/2020	0955	G	N	SD	X		1	X	X								
EL-S-C	3/9/2020	1000	G	N	SD	X		1	X	X								
EL-SO-D-2'	3/9/2020	1019	G	N	SO			1	X	X								
EL-SO-D-4'	3/9/2020	1037	G	N	SO			1	X	X								

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
<u>Randy Crews</u>	3/11/2020	1011			
<u>[Signature]</u>	3/11/2020	1038			
<u>[Signature]</u>	3/11/2020	1045			

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=Soil, SS=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Feat, N=Nasal

5) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).

6) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate. If no preservative is added = leave field blank

7) **KNOWN OR POSSIBLE HAZARDS**

RCRA Metals	Characteristic Hazards	Listed Waste	Other
As = Arsenic Ba = Barium Cd = Cadmium Cr = Chromium Pb = Lead	FL = Flammable/Ignitable CO = Corrosive RE = Reactive TSCA Regulated PCB = Polychlorinated biphenyls	LW = Listed Waste (F, K, P and U-listed wastes.) Waste code(s):	OT = Other / Unknown (i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.) Description:

For Lab Receiving Use Only: Custody Seal Intact? Yes No Cooler Temp: 2 °C

Sample Collection Time Zone: Eastern Pacific Central Mountain Other:

TAT Requested: Normal: 5 day (Subject to Surecharge)
 Rush: Yes No
 Fax Results: Yes No
 Select Deliverable: C of A QC Summary Level 1 Level 2 Level 3 Level 4
 Additional Remarks:
 For Lab Receiving Use Only: Custody Seal Intact? Yes No Cooler Temp: 2 °C
 Sample Collection Time Zone: Eastern Pacific Central Mountain Other:

GEL Laboratories, LLC
 2040 Savage Road
 Charleston, SC 29407
 Phone: (843) 556-8171
 Fax: (843) 766-1178

Sample ID	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (a)	Field Filtered (b)	Sample Matrix (c)	Should this sample be considered:	Total number of containers	Sample Analysis Requested (5)	Preservative Type (6)	Comments
EL-SO-D-6'	3/9/2020	1054	G	N	SO	Yes, please supply isotopic info.)	1	Isotopic U by Alpha Spec TC-99		Note: extra sample is required for sample specific QC
EL-SO-E-2'	3/9/2020	1119	G	N	SO	(7) Known or possible Hazards	1			
EL-SO-E-4'	3/9/2020	1124	G	N	SO	Radioactive (if yes, please supply isotopic info.)	1			
EL-SO-E-6'	3/9/2020	1133	G	N	SO		1			
EL-SO-F-2'	3/9/2020	1146	G	N	SO		1			
EL-SO-F-4'	3/9/2020	1156	G	N	SO		1			
EL-SO-F-6'	3/9/2020	1208	G	N	SO		1			

Chain of Custody Signatures

Relinquished By (Signed)	Date	Received by (signed)	Date	Time
<u>Randy Crews</u>	3/11/2020			
<u>[Signature]</u>	3/11/2020			
<u>[Signature]</u>	3/11/2020			

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, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Faecal, N=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B 7470A - 1).

6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) **KNOWN OR POSSIBLE HAZARDS**

RCRA Metals
 As = Arsenic Hg = Mercury
 Ba = Barium Se = Selenium
 Cd = Cadmium Ag = Silver
 Cr = Chromium MR = Misc. RCRA metals
 Pb = Lead

Characteristic Hazards
 FL = Flammable/Ignitable
 CO = Corrosive
 RE = Reactive

Listed Waste
 LW = Listed Waste
 (F, K, P and U-listed wastes.)
 Waste code(s): _____

Other
 OT = Other / Unknown
 (i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
 Description: _____

TAT Requested: Normal: 5 day (Subject to Surcharge) Rush: X Specify: 5 day (Subject to Surcharge)

Fax Results: Yes No

Select Deliverable: C of A QC Summary Level 1 Level 2 Level 3 Level 4

Additional Remarks:
 For Lab Receiving Use Only: Custody Seal Intact? Yes No Cooler Temp: 2 °C
 Sample Collection Time Zone: Eastern Pacific Central Mountain Other: _____

Please provide any additional details below regarding handling and/or disposal concerns. (i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)

Nuclear Material RECEIPT/SHIPMENT Request

Fill in ALL shaded areas
Submit Completed Form to EH&S Safeguards Coordinator

FORM NO.:	NMM-CP-620-1
REVISION:	1
PAGE:	1 OF 1
EFFECTIVE DATE:	04-10-08

<input checked="" type="checkbox"/> TO BE SHIPPED
<input type="checkbox"/> TO BE RECEIVED

SHIPPER/RECEIVER IS:
DOMESTIC? <u> x </u> Yes
FOREIGN? <u> </u> Yes

REQUESTER:
Name <u>Cynthia Logsdon</u>
Department <u>EHS Environmental Engineering</u>
Phone <u>x3171</u>
Date of Request <u>03-11-2020</u>

FACILITY NAME & ADDRESS
C/O GEL courier GEL Laboratories 2040 Savage Road, Charleston, SC 29407

CONTACT NAME / PHONE / FAX
Katelyn Gray, Project Manager Office Direct: 843.852.5814 Office Main: 843.556.8171 ext.4707 Fax: 843.766.1178 E-Mail: Katelyn.gray@gel.com

DESCRIPTION OF MATERIAL REQUESTED TO BE RECEIVED			
MATERIAL TYPE	MATERIAL FORM	CONTAINER TYPE	NO. OF CONTAINERS
<input type="checkbox"/> Depleted (<0.711 %U235)	(Powder, Pellets, Rods, etc.)	(Drum, Pail, Box, etc.)	Total 17 containers in 1 cooler
<input type="checkbox"/> Natural (=0.711 %U235)	Contamination	Samples	
<input checked="" type="checkbox"/> Enriched (>0.711 %U235)			

MATERIAL QUANTITIES (TOTAL)			
Net Weight	Grams Uranium	Grams U235	%U235
6000.583 grams		0.017820353	

SPECIAL INSTRUCTIONS/COMMENTS

These samples include three samples of sludge from the East Lagoon, five liquid samples from wastewater treatment process tanks, and nine soil samples. The U235 quantity for the East Lagoon sludge samples is based on sample results received from GEL during the East Lagoon sludge sampling campaign in October 2019. The sample result was based on dried material, whereas this net weight is of wet samples.

Liquid sample U235 quantities are based on calculations derived from Chem Lab ppm U sample results received on 3-10-2020. The soil samples are assumed non-radioactive.

These samples are being sent to a laboratory that is licensed to receive radiological samples for Tc-99 and Isotopic Uranium characterization analyses.

APPROVALS	COMMENTS	DATE
n/a	Not being shipped; pickup by lab courier service	n/a
_____ U.S. Transport Operations		
_____ EH&S Item Control Coordinator		03-11-2020
_____ EH&S Measurement Control Coordinator		03-11-2020

Nuclear Material RECEIPT/SHIPMENT Request

FORM NO.:	NMM-CP-620-1
REVISION:	1
PAGE:	2 OF 1
EFFECTIVE DATE:	04-10-08

Fill in ALL shaded areas
Submit Completed Form to EH&S Safeguards Coordinator

<hr/> EH&S Safeguards Coordinator		03-11-2020
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Denotes Change

Printed Copies are Uncontrolled

SAMPLE RECEIPT & REVIEW FORM

506781

Client: WNUC SDG/AR/COC/Work Order: KG
 Received By: TVE Date Received: 3/11/20
 Carrier and Tracking Number: _____
 Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____ If UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?	<input checked="" type="checkbox"/>		Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> CPM / mR/hr Classified as: <u>Rad 1</u> <u>Rad 2</u> Rad 3
D) Did the client designate samples are hazardous?	<input checked="" type="checkbox"/>		COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?	<input checked="" type="checkbox"/>		If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other: _____

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>			Circle Applicable: Client contacted and provided COC COC created upon receipt
3 Samples requiring cold preservation within (0 ≤ deg. C)?*	<input checked="" type="checkbox"/>			Preservation Method: <u>Wet Ice</u> Ice Packs Dry Ice None Other: *all temperatures are recorded in Celsius
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>			Temperature Device Serial #: <u>371-18</u> TEMP: <u>2°C</u> Secondary Temperature Device Serial # (if Applicable):
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>			Sample ID's and Containers Affected:
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>			If Preservation added, Lot#:
				If Yes, are Encores or Soil Kits present for solids? Yes <input checked="" type="checkbox"/> No ___ NA ___ (If yes, take to VOA Freezer)
				Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
8 Samples received within holding time?	<input checked="" type="checkbox"/>			Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___ Sample ID's and containers affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>			ID's and tests affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>			ID's and containers affected:
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>			Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
12 Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>			Circle Applicable: No container count on COC Other (describe)
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>			Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

List of current GEL Certifications as of 19 March 2020

State	Certification
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122020-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-20-16
Utah NELAP	SC000122020-32
Vermont	VT87156
Virginia NELAP	460202
Washington	C780



May 13, 2020

Ms. Cynthia Logsdon
Westinghouse Electric Company, LLC
PO Drawer R
Columbia, South Carolina 29205

Re: ENV-CONSENTA-4500778461
Work Order: 510356

Dear Ms. Logsdon:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on April 29, 2020. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4707.

Sincerely,

Nina Gampe for
Katelyn Gray
Project Manager

Purchase Order: 4500775170
Enclosures



GEL LABORATORIES LLC

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

Certificate of Analysis Report for

WNUC009 Westinghouse Electric Co, LLC

Client SDG: 510356 GEL Work Order: 510356

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, Katelyn Gray.



Reviewed by _____

GEL LABORATORIES LLC

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

Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: CL-1 Before	Project: WNUC00901
Sample ID: 510356001	Client ID: WNUC009
Matrix: Misc Liquid	
Collect Date: 09-APR-20 07:00	
Receive Date: 29-APR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
High Rad Testing													
Alphaspec U, Liquid "As Received"													
Pct Uranium-235		4.29				percent			JXB7	05/12/20	1854	1996515	1
Uranium-233/234		5.13E+05	+/-6850	242	1.00	pCi/L							
Uranium-235/236		21700	+/-1570	88.3	1.00	pCi/L							
Uranium-238		75100	+/-2620	167	1.00	pCi/L							
Liquid Scint Tc99, Liquid "As Received"													
Technetium-99	U	58.7	+/-77.2	130	5.00	pCi/L			AXM6	05/11/20	0853	1993870	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			31.5	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			90.1	(15%-125%)

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

Column headers are defined as follows:

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

GEL LABORATORIES LLC

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

Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID:	CL-1 After	Project:	WNUC00901
Sample ID:	510356002	Client ID:	WNUC009
Matrix:	Misc Liquid		
Collect Date:	09-APR-20 07:00		
Receive Date:	29-APR-20		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Liquid "As Received"

Pct Uranium-235		4.34				percent			BXA4	05/02/20	0836	1993987	1
Uranium-233/234		32900	+/-447	25.7	0.500	pCi/L							
Uranium-235/236		1600	+/-110	5.85	0.500	pCi/L							
Uranium-238		5480	+/-183	22.7	0.500	pCi/L							

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Liquid "As Received"

Technetium-99	U	50.1	+/-30.8	51.1	5.00	pCi/L		JJ3	05/05/20	1341	1993585	2
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			89	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			98.9	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

GEL LABORATORIES LLC

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

Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID:	CL-2 Before	Project:	WNUC00901
Sample ID:	510356003	Client ID:	WNUC009
Matrix:	Misc Liquid		
Collect Date:	09-APR-20 07:00		
Receive Date:	29-APR-20		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Liquid "As Received"

Pct Uranium-235		5.74				percent			BXA4	05/02/20	0836	1993987	1
Uranium-233/234		2.82E+05	+/-1990	55.6	0.500	pCi/L							
Uranium-235/236		12900	+/-472	13.5	0.500	pCi/L							
Uranium-238		32900	+/-678	27.9	0.500	pCi/L							

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Liquid "As Received"

Technetium-99		449	+/-36.6	51.7	5.00	pCi/L			JJ3	05/05/20	1547	1993585	2
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			39.3	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			97.4	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

GEL LABORATORIES LLC

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

Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: CL-2 After Project: WNUC00901
Sample ID: 510356004 Client ID: WNUC009
Matrix: Misc Liquid
Collect Date: 09-APR-20 07:00
Receive Date: 29-APR-20
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Liquid "As Received"													
Pct Uranium-235		5.54				percent			BXA4	05/02/20	0836	1993987	1
Uranium-233/234		96400	+/-836	35.8	0.500	pCi/L							
Uranium-235/236		4200	+/-194	28.7	0.500	pCi/L							
Uranium-238		11100	+/-284	20.9	0.500	pCi/L							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Liquid "As Received"													
Technetium-99		73.9	+/-30.9	50.7	5.00	pCi/L		JJ3		05/05/20	1753	1993585	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			77.9	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			99.9	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID:	CL-3 Before	Project:	WNUC00901
Sample ID:	510356005	Client ID:	WNUC009
Matrix:	Misc Liquid		
Collect Date:	09-APR-20 07:00		
Receive Date:	29-APR-20		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Liquid "As Received"

Pct Uranium-235		4.90				percent			BXA4	05/02/20	0836	1993987	1
Uranium-233/234		3.67E+05	+/-2730	103	0.500	pCi/L							
Uranium-235/236		16800	+/-650	50.1	0.500	pCi/L							
Uranium-238		50700	+/-1020	76.2	0.500	pCi/L							

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Liquid "As Received"

Technetium-99		438	+/-36.0	51.0	5.00	pCi/L			JJ3	05/05/20	2000	1993585	2
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			27.3	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			100	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: CL-3 After Project: WNUC00901
Sample ID: 510356006 Client ID: WNUC009
Matrix: Misc Liquid
Collect Date: 09-APR-20 07:00
Receive Date: 29-APR-20
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Liquid "As Received"													
Pct Uranium-235		5.12				percent			BXA4	05/02/20	0836	1993987	1
Uranium-233/234		30900	+/-439	27.7	0.500	pCi/L							
Uranium-235/236		1390	+/-104	15.4	0.500	pCi/L							
Uranium-238		4000	+/-158	23.4	0.500	pCi/L							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Liquid "As Received"													
Technetium-99	U	16.4	+/-32.2	54.4	5.00	pCi/L		JJ3		05/05/20	2206	1993585	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			94.9	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			93.6	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: CL-4 Before	Project: WNUC00901
Sample ID: 510356007	Client ID: WNUC009
Matrix: Misc Liquid	
Collect Date: 09-APR-20 07:00	
Receive Date: 29-APR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Alpha Spec Analysis												
Alphaspec U, Liquid "As Received"												
Pct Uranium-235		4.82				percent			BXA4	05/02/20	0836 1993987	1
Uranium-233/234		1.74E+05	+/-1460	42.8	0.500	pCi/L						
Uranium-235/236		9220	+/-374	48.4	0.500	pCi/L						
Uranium-238		28300	+/-588	45.8	0.500	pCi/L						

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Liquid "As Received"												
Technetium-99		142	+/-32.5	51.8	5.00	pCi/L			JJ3	05/06/20	0012 1993585	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			40.8	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			97.9	(15%-125%)

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

Column headers are defined as follows:

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

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Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: CL-4 After	Project: WNUC00901
Sample ID: 510356008	Client ID: WNUC009
Matrix: Misc Liquid	
Collect Date: 09-APR-20 07:00	
Receive Date: 29-APR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Alpha Spec Analysis												
Alphaspec U, Liquid "As Received"												
Pct Uranium-235		4.15				percent			BXA4	05/02/20	0836 1993987	1
Uranium-233/234		25900	+/-385	23.2	0.500	pCi/L						
Uranium-235/236		1170	+/-91.4	17.7	0.500	pCi/L						
Uranium-238		4190	+/-155	14.3	0.500	pCi/L						
Rad Liquid Scintillation Analysis												
Liquid Scint Tc99, Liquid "As Received"												
Technetium-99		63.7	+/-31.8	52.5	5.00	pCi/L		JJ3		05/06/20	0219 1993585	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			87.7	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			97.5	(15%-125%)

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: Scrap Cage Monitor Discharge	Project: WNUC00901
Sample ID: 510356009	Client ID: WNUC009
Matrix: Misc Liquid	
Collect Date: 09-APR-20 07:00	
Receive Date: 29-APR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
Rad Alpha Spec Analysis												
Alphaspec U, Liquid "As Received"												
Pct Uranium-235		4.50				percent			BXA4	05/06/20	1029 1994754	1
Uranium-233/234		20600	+/-2530	517	0.500	pCi/L						
Uranium-235/236		1030	+/-677	566	0.500	pCi/L						
Uranium-238		3400	+/-1050	478	0.500	pCi/L						
Rad Liquid Scintillation Analysis												
Liquid Scint Tc99, Liquid "As Received"												
Technetium-99		201	+/-38.0	59.6	5.00	pCi/L		JJ3	05/06/20	0537 1993585		2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			94.8	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			84.6	(15%-125%)

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

Column headers are defined as follows:

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

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Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID:	W2	Project:	WNUC00901
Sample ID:	510356010	Client ID:	WNUC009
Matrix:	Misc Liquid		
Collect Date:	09-APR-20 08:00		
Receive Date:	29-APR-20		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Liquid "As Received"													
Pct Uranium-235		15.0				percent			BXA4	05/09/20	0959	1995388	1
Uranium-233/234		3.93	+/-0.980	0.997	0.500	pCi/L							
Uranium-235/236		0.613	+/-0.394	0.167	0.500	pCi/L							
Uranium-238	U	0.541	+/-0.433	0.604	0.500	pCi/L							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Liquid "As Received"													
Technetium-99		96.0	+/-32.3	52.5	5.00	pCi/L		JJ3		05/06/20	0744	1993585	2

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			99.9	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			95.6	(15%-125%)

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

Column headers are defined as follows:

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

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Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID:	T-19 Ammonia	Project:	WNUC00901
Sample ID:	510356011	Client ID:	WNUC009
Matrix:	Misc Liquid		
Collect Date:	09-APR-20 08:00		
Receive Date:	29-APR-20		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Liquid "As Received"

Pct Uranium-235	U	0.000				percent			MXS2	05/06/20	0951 1994758	1
Uranium-233/234	U	0.0545	+/-0.309	0.580	0.500	pCi/L						
Uranium-235/236	U	-0.0504	+/-0.221	0.482	0.500	pCi/L						
Uranium-238	U	0.122	+/-0.240	0.390	0.500	pCi/L						

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Liquid "As Received"

Technetium-99	U	13.4	+/-83.4	142	5.00	pCi/L		JJ3	05/06/20	0951 1993585	2
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			32.8	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			35.8	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: T-20 Ammonia	Project: WNUC00901
Sample ID: 510356012	Client ID: WNUC009
Matrix: Misc Liquid	
Collect Date: 09-APR-20 08:00	
Receive Date: 29-APR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time Batch	Method
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Rad Alpha Spec Analysis

Alphaspec U, Liquid "As Received"

Pct Uranium-235	U	0.000				percent			MXS2	05/09/20	1307 1994758	1
Uranium-233/234	U	0.206	+/-0.258	0.391	0.500	pCi/L						
Uranium-235/236	U	-0.0535	+/-0.165	0.340	0.500	pCi/L						
Uranium-238	U	0.167	+/-0.205	0.275	0.500	pCi/L						

Rad Liquid Scintillation Analysis

Liquid Scint Tc99, Liquid "As Received"

Technetium-99	U	-28.5	+/-134	228	5.00	pCi/L		JJ3	05/06/20	1159 1993585	2
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The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Liquid "As Received"			36.4	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Liquid "As Received"			22.3	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: WG-D46035 Project: WNUC00901
Sample ID: 510356013 Client ID: WNUC009
Matrix: Sludge
Collect Date: 09-APR-20 08:00
Receive Date: 29-APR-20
Collector: Client

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
High Rad Testing													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99	U	22.1	+/-29.5	49.6	5.00	pCi/g			AXM6	05/10/20	0707	1994804	1
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		5.23E+05	+/-8800	392	1.00	pCi/g			JXB7	05/12/20	1854	1996516	2
Uranium-235/236		22300	+/-2020	264	1.00	pCi/g							
Uranium-238		74700	+/-3330	270	1.00	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	AXM6	05/05/20	1719	1994801

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, Tc-02-RC Modified	
2	DOE EML HASL-300, U-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			71.8	(15%-125%)
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			63	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Certificate of Analysis

Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID:	Calcium Fluoride	Project:	WNUC00901
Sample ID:	510356014	Client ID:	WNUC009
Matrix:	Solid		
Collect Date:	09-APR-20 08:00		
Receive Date:	29-APR-20		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		16.3	+/-1.10	0.178	1.00	pCi/g			BXA4	05/04/20	1643	1993662	1
Uranium-235/236		0.703	+/-0.266	0.181	1.00	pCi/g							
Uranium-238		2.40	+/-0.428	0.166	1.00	pCi/g							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99	U	0.473	+/-2.48	4.30	5.00	pCi/g			JJ3	05/05/20	0555	1993830	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	04/30/20	0951	1993645

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			90.2	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			87.9	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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Report Date: May 13, 2020

Company : Westinghouse Electric Company, LLC
Address : PO Drawer R

Columbia, South Carolina 29205

Contact: Ms. Cynthia Logsdon
Project: ENV-CONSENTA-4500778461

Client Sample ID: Sludge Dewatering D45671	Project: WNUC00901
Sample ID: 510356015	Client ID: WNUC009
Matrix: Solid	
Collect Date: 08-APR-20 14:00	
Receive Date: 29-APR-20	
Collector: Client	

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Alpha Spec Analysis													
Alphaspec U, Solid "Dry Weight Corrected"													
Uranium-233/234		3510	+/-113	4.72	1.00	pCi/g			BXA4	05/04/20	1715	1993662	1
Uranium-235/236		156	+/-26.7	5.49	1.00	pCi/g							
Uranium-238		507	+/-43.1	4.80	1.00	pCi/g							
Rad Liquid Scintillation Analysis													
Liquid Scint Tc99, Soil "As Received"													
Technetium-99	U	3.52	+/-2.56	4.22	5.00	pCi/g			JJ3	05/05/20	0611	1993830	2

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	04/30/20	0951	1993645

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE EML HASL-300, U-02-RC Modified	
2	DOE EML HASL-300, Tc-02-RC Modified	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
Uranium-232 Tracer	Alphaspec U, Solid "Dry Weight Corrected"			16.5	(15%-125%)
Technetium-99m Tracer	Liquid Scint Tc99, Soil "As Received"			90.3	(15%-125%)

Notes:

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

Column headers are defined as follows:

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

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QC Summary

Report Date: May 13, 2020

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Westinghouse Electric Company, LLC

PO Drawer R
Columbia, South Carolina

Contact: Ms. Cynthia Logsdon

Workorder: 510356

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
High Rad Testing											
Batch	1993870										
QC1204554246	510356001	DUP									
Technetium-99	U	58.7	U	-36.0	pCi/L	N/A		N/A	AXM6	05/11/20	10:54
QC1204554247	LCS										
Technetium-99	7560			7720	pCi/L		102	(75%-125%)		05/10/20	23:04
QC1204554245	MB										
Technetium-99			U	54.7	pCi/L					05/10/20	19:01
Batch	1994804										
QC1204556160	510356013	DUP									
Technetium-99	U	22.1	U	-31.5	pCi/g	N/A		N/A	AXM6	05/10/20	11:09
QC1204556161	LCS										
Technetium-99	2210			2140	pCi/g		96.8	(75%-125%)		05/10/20	13:10
QC1204556159	MB										
Technetium-99			U	-11.6	pCi/g					05/10/20	09:08
Batch	1996515										
QC1204559802	510356001	DUP									
Pct Uranium-235		4.29		4.34	percent	1.18		(0%-20%)	JXB7	05/12/20	18:54
Uranium-233/234		5.13E+05		2.62E+05	pCi/L	64.7*		(0%-20%)			
Uranium-235/236		21700		11300	pCi/L	62.9*		(0%-20%)			
Uranium-238		75100		38600	pCi/L	64.1*		(0%-20%)			

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
High Rad Testing											
Batch	1996515										
QC1204559803	LCS										
Pct Uranium-235				1.16	percent				JXB7	05/12/20	18:54
Uranium-233/234				2420	pCi/L						
Uranium-235/236				198	pCi/L						
Uranium-238	2730			2620	pCi/L		96.1	(75%-125%)			
QC1204559801	MB										
Pct Uranium-235			U	0.000	percent					05/12/20	18:54
Uranium-233/234			U	8.34	pCi/L						
Uranium-235/236			U	-2.49	pCi/L						
Uranium-238			U	-3.69	pCi/L						
Batch	1996516										
QC1204559805	510356013	DUP									
Uranium-233/234				5.23E+05	5.05E+05	pCi/g	3.43	(0%-20%)	JXB7	05/12/20	18:54
Uranium-235/236				22300	21700	pCi/g	2.77	(0%-20%)			
Uranium-238				74700	73300	pCi/g	1.86	(0%-20%)			
QC1204559806	LCS										
Uranium-233/234				8330	pCi/g					05/12/20	18:54
Uranium-235/236			U	232	pCi/g						
Uranium-238	9080			7990	pCi/g		88	(75%-125%)			

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QC Summary

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
High Rad Testing											
Batch	1996516										
QC1204559804	MB										
Uranium-233/234			U	-111	pCi/g				JXB7	05/12/20	18:54
Uranium-235/236			U	16.0	pCi/g						
Uranium-238			U	-47.8	pCi/g						
Rad Alpha Spec											
Batch	1993662										
QC1204553781	510356014	DUP									
Uranium-233/234			16.3	14.0	pCi/g	15.4		(0%-20%)	BXA4	05/04/20	16:43
Uranium-235/236			0.703	0.677	pCi/g	3.84		(0%-20%)			
Uranium-238			2.40	2.75	pCi/g	13.4		(0%-20%)			
QC1204553782	LCS										
Uranium-233/234				13.8	pCi/g					05/04/20	16:43
Uranium-235/236				0.853	pCi/g						
Uranium-238	12.6			14.1	pCi/g		112	(75%-125%)			
QC1204553780	MB										
Uranium-233/234				0.394	pCi/g					05/04/20	16:43
Uranium-235/236			U	0.0837	pCi/g						
Uranium-238			U	0.0171	pCi/g						
Batch	1993987										
QC1204554512	510356002	DUP									
Pct Uranium-235			4.34	4.32	percent	0.398		(0%-20%)	BXA4	05/02/20	08:36

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QC Summary

Workorder: 510356

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1993987										
Uranium-233/234		32900		32600	pCi/L	1.06		(0%-20%)	BXA4	05/02/20	08:36
Uranium-235/236		1600		1560	pCi/L	2.29		(0%-20%)			
Uranium-238		5480		5360	pCi/L	2.12		(0%-20%)			
QC1204554513	LCS										
Pct Uranium-235				0.777	percent					05/02/20	08:36
Uranium-233/234				2900	pCi/L						
Uranium-235/236				144	pCi/L						
Uranium-238	2730			2850	pCi/L		105	(75%-125%)			
QC1204554511	MB										
Pct Uranium-235				4.24	percent					05/02/20	08:36
Uranium-233/234				85.2	pCi/L						
Uranium-235/236				5.88	pCi/L						
Uranium-238				20.6	pCi/L						
Batch	1994754										
QC1204556076	510356009	DUP									
Pct Uranium-235		4.50		7.23	percent	46.6		(0%-20%)	BXA4	05/06/20	09:16
Uranium-233/234		20600		18100	pCi/L	13.3		(0%-20%)			
Uranium-235/236		1030		1510	pCi/L	37.8		(0% - 100%)			

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QC Summary

Workorder: 510356

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1994754										
Uranium-238		3400		3010	pCi/L	12.1		(0%-20%)	BXA4	05/06/20	09:16
QC1204556077	LCS										
Pct Uranium-235				0.716	percent					05/06/20	09:16
Uranium-233/234				14100	pCi/L						
Uranium-235/236				582	pCi/L						
Uranium-238	13600			12500	pCi/L		92	(75%-125%)			
QC1204556075	MB										
Pct Uranium-235			U	0.000	percent					05/06/20	09:16
Uranium-233/234			U	62.8	pCi/L						
Uranium-235/236			U	115	pCi/L						
Uranium-238			U	32.2	pCi/L						
Batch	1994758										
QC1204556079	510356010	DUP									
Pct Uranium-235		6.31		5.38	percent	15.9		(0%-20%)	MXS2	05/06/20	09:51
Uranium-233/234		39.3		3.94	pCi/L	164*		(0%-20%)			
Uranium-235/236		3.02		0.340	pCi/L	160*		(0%-20%)			
Uranium-238		6.96		0.928	pCi/L	153*		(0%-20%)			

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QC Summary

Workorder: 510356

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1994758										
QC1204556080	LCS										
Pct Uranium-235				0.987	percent				MXS2	05/06/20	09:51
Uranium-233/234				27.9	pCi/L						
Uranium-235/236				1.84	pCi/L						
Uranium-238	27.3			28.7	pCi/L		105	(75%-125%)			
<hr/>											
QC1204556078	MB										
Pct Uranium-235			U	0.000	percent					05/06/20	09:51
Uranium-233/234			U	0.128	pCi/L						
Uranium-235/236			U	0.0744	pCi/L						
Uranium-238			U	0.0301	pCi/L						
<hr/>											
Batch	1995388										
QC1204557480	510356010 DUP										
Pct Uranium-235		15.0	U	0.000	percent	200		(0%-20%)	BXA4	05/09/20	09:59
Uranium-233/234		3.93		5.17	pCi/L	27.1*		(0%-20%)			
Uranium-235/236		0.613	U	0.227	pCi/L	33.9		(0% - 100%)			
Uranium-238	U	0.541	U	0.598	pCi/L	N/A			N/A		
<hr/>											
QC1204557481	LCS										
Pct Uranium-235				0.631	percent					05/09/20	09:59
Uranium-233/234				66.7	pCi/L						

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rad Alpha Spec											
Batch	1995388										
Uranium-235/236				2.98	pCi/L				BXA4	05/09/20	09:59
Uranium-238	68.1			72.9	pCi/L		107	(75%-125%)			
QC1204557479	MB										
Pct Uranium-235			U	0.000	percent					05/09/20	09:59
Uranium-233/234			U	-0.216	pCi/L						
Uranium-235/236			U	0.0575	pCi/L						
Uranium-238			U	-0.140	pCi/L						
Rad Liquid Scintillation											
Batch	1993585										
QC1204553577	510356002	DUP									
Technetium-99			U	50.1	U	33.9	pCi/L	N/A	N/A	JJ3	05/06/20 16:13
QC1204553578	LCS										
Technetium-99	2520			2270	pCi/L		90.2	(75%-125%)		05/06/20	18:19
QC1204553576	MB										
Technetium-99			U	-6.52	pCi/L					05/06/20	14:06
Batch	1993830										
QC1204554189	510356014	DUP									
Technetium-99			U	0.473	U	0.920	pCi/g	N/A	N/A	JJ3	05/05/20 06:45
QC1204554190	LCS										
Technetium-99	55.6			57.8	pCi/g		104	(75%-125%)		05/05/20	07:02
QC1204554188	MB										
Technetium-99			U	0.428	pCi/g					05/05/20	06:28

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QC Summary

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
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Notes:

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported
- BD Results are either below the MDC or tracer recovery is low
- FA Failed analysis.
- H Analytical holding time was exceeded
- J See case narrative for an explanation
- J Value is estimated
- K Analyte present. Reported value may be biased high. Actual value is expected to be lower.
- L Analyte present. Reported value may be biased low. Actual value is expected to be higher.
- M M if above MDC and less than LLD
- M REMP Result > MDC/CL and < RDL
- N/A RPD or %Recovery limits do not apply.
- N1 See case narrative
- ND Analyte concentration is not detected above the detection limit
- NJ Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Q One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
- R Sample results are rejected
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- UI Gamma Spectroscopy--Uncertain identification
- UJ Gamma Spectroscopy--Uncertain identification
- UL Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Other specific qualifiers were required to properly define the results. Consult case narrative.
- ^ RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
- h Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

**Radiochemistry
 Technical Case Narrative
 Westinghouse Electric Co, LLC
 SDG #: 510356**

Product: Alphaspec U, Liquid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1996515

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356001	CL-1 Before
1204559801	Method Blank (MB)
1204559802	510356001(CL-1 Before) Sample Duplicate (DUP)
1204559803	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.

Preparation Information

Aliquot Reduced

aliquots were reduced due to high activity based on Gamma data.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and Duplicate, (see below), did not meet the duplication criteria list below due to the extremely small aliquot size used not being a true representation of the samples and due to the non-homogenous matrix of the samples. The aliquots were reduced due to the high levels of activity in the samples.

Sample	Analyte	Value
1204559802 (CL-1 BeforeDUP)	Uranium-233/234	RPD 64.7* (0.00%-20.00%)
	Uranium-235/236	RPD 62.9* (0.00%-20.00%)
	Uranium-238	RPD 64.1* (0.00%-20.00%)

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204559801 (MB)	Uranium-233/234	Result 8.34 < MDA 67 > RDL 1 pCi/L

	Uranium-235/236	Result -2.49 < MDA 49.8 > RDL 1 pCi/L
	Uranium-238	Result -3.69 < MDA 62.1 > RDL 1 pCi/L

Technical Information

Sample Re-prep/Re-analysis

Samples were re-prepped due to low carrier/tracer yield. The re-analysis is being reported.

Product: Alphaspec U, Solid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1996516

Preparation Method: Dry Soil Prep

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

Preparation Batch: 1994801

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356013	WG-D46035
1204559804	Method Blank (MB)
1204559805	510356013(WG-D46035) Sample Duplicate (DUP)
1204559806	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.

Preparation Information

Aliquot Reduced

aliquots were reduced due to high activity based on Gamma data.

Quality Control (QC) Information

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204559804 (MB)	Uranium-233/234	Result -111 < MDA 284 > RDL 1 pCi/g
	Uranium-235/236	Result 16 < MDA 170 > RDL 1 pCi/g

	Uranium-238	Result -47.8 < MDA 201 > RDL 1 pCi/g
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Technical Information

Sample Re-prep/Re-analysis

Samples were reprepared due to low carrier/tracer yield. The re-analysis is being reported.

Product: Alphaspec U, Solid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1993662

Preparation Method: Dry Soil Prep

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

Preparation Batch: 1993645

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356014	Calcium Fluoride
510356015	Sludge Dewatering D45671
1204553780	Method Blank (MB)
1204553781	510356014(Calcium Fluoride) Sample Duplicate (DUP)
1204553782	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Method Blank Criteria

The blank result (See Below) is greater than the MDC but less than the required detection limit.

Sample	Analyte	Value
1204553780 (MB)	Uranium-233/234	Result: 0.394 pCi/g > MDA: 0.187 pCi/g <= RDL: 1.00 pCi/g

Product: Alphaspec U, Liquid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1993987

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356002	CL-1 After
510356003	CL-2 Before
510356004	CL-2 After
510356005	CL-3 Before
510356006	CL-3 After
510356007	CL-4 Before
510356008	CL-4 After
1204554511	Method Blank (MB)
1204554512	510356002(CL-1 After) Sample Duplicate (DUP)
1204554513	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.

Quality Control (QC) Information

Method Blank Criteria

The blank (See Below) activity is greater than the MDC but is less than five percent of the lowest activity in the batch.

Sample	Analyte	Value
1204554511 (MB)	Uranium-233/234	Result: 85.2 pCi/L > MDA: 19.8 pCi/L > RDL: 0.500 pCi/L
	Uranium-238	Result: 20.6 pCi/L > MDA: 15.2 pCi/L > RDL: 0.500 pCi/L

The blank activity is equal to the MDC but is less than five percent of the lowest activity in the batch.

Sample	Analyte	Value
1204554511 (MB)	Uranium-235/236	Result: 5.88 pCi/L > MDA: 5.88 pCi/L > RDL: 0.500 pCi/L

Technical Information

Sample Re-prep/Re-analysis

Samples were re-prepped due to low carrier/tracer yield. The re-analysis is being reported.

Product: Alphaspec U, Liquid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1994754

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356009	Scrap Cage Monitor Discharge
1204556075	Method Blank (MB)
1204556076	510356009(Scrap Cage Monitor Discharge) Sample Duplicate (DUP)
1204556077	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.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and Duplicate, (see below), did not meet the duplication criteria list below due to the extremely small aliquot size used not being a true representation of the samples. The aliquots were reduced due to the high levels of activity in the samples. The duplication criteria was met for all other isotopes. A RER value cannot be calculated as a TPU value is not associated with Percent U-235.

Sample	Analyte	Value
1204556076 (Scrap Cage Monitor DischargeDUP)	Pct Uranium-235	46.6* (0%-20%)

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204556075 (MB)	Uranium-233/234	Result 62.8 < MDA 655 > RDL 0.5 pCi/L
	Uranium-235/236	Result 115 < MDA 616 > RDL 0.5 pCi/L
	Uranium-238	Result 32.2 < MDA 459 > RDL 0.5 pCi/L

Technical Information

Sample Re-prep/Re-analysis

Sample (insert sample id) was re-prepped twice due to a low tracer yield. The third analysis is being reported. 510356009 (Scrap Cage Monitor Discharge).

Product: Alphaspec U, Liquid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1994758

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356011	T-19 Ammonia
510356012	T-20 Ammonia
1204556078	Method Blank (MB)
1204556079	510356010(W2) Sample Duplicate (DUP)
1204556080	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.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1204556079 (W2DUP)	Uranium-235/236	RPD 160* (0.00%-20.00%) RER 2.26 (0-3)

The Sample and Duplicate, (See Below), did not meet the duplication criteria listed below due to the non-homogenous matrix of the samples.

Sample	Analyte	Value
1204556079 (W2DUP)	Uranium-233/234	RPD 164* (0.00%-20.00%)
	Uranium-238	RPD 153* (0.00%-20.00%)

RDL Met

Sample did not meet the detection limit due to low sample yield. The client yield requirement was met. The sample was counted the maximum count time in order to achieve the lowest possible MDAs.

Sample	Analyte	Value
510356011 (T-19 Ammonia)	Uranium-233/234	Result 0.0545 < MDA 0.58 > RDL 0.5 pCi/L

Technical Information

Sample Re-prep/Re-analysis

Samples 510356010 (W2), 510356011 (T-19 Ammonia) and 510356012 (T-20 Ammonia) were re-prepped due to high blank activity. The re-analysis is being reported for 510356011 and 510356012. Sample 510356010 is being included for QC purposes only.

Recounts

Sample 510356012 (T-20 Ammonia) was recounted due to high MDC. The recount is reported.

Miscellaneous Information

Additional Comments

Sample 510356010 (W2) is being included for QC purposes only.

Product: Alphaspec U, Liquid

Analytical Method: DOE EML HASL-300, U-02-RC Modified

Analytical Procedure: GL-RAD-A-011 REV# 27

Analytical Batch: 1995388

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356010	W2
1204557479	Method Blank (MB)
1204557480	510356010(W2) Sample Duplicate (DUP)
1204557481	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.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1204557480 (W2DUP)	Uranium-233/234	RPD 27.1* (0.00%-20.00%) RER 1.54 (0-3)

The Percent Uranium-235 does not meet the relative percent difference requirements for the QC and DUP 1204557480 (W2DUP) and 510356010 (W2); however, the U-235/236 does meet the relative percent difference requirements with a value of 33.9%.

RDL Met

The blank (See Below) did not meet the detection limit due to keeping the blank volume consistent with the other sample aliquots.

Sample	Analyte	Value
1204557479 (MB)	Uranium-233/234	Result -0.216 < MDA 0.705 > RDL 0.5 pCi/L
	Uranium-238	Result -0.14 < MDA 0.67 > RDL 0.5 pCi/L

Samples (See Below) did not meet the detection limits due to the small sample aliquots used. The aliquots were reduced due to the matrix of the samples. The samples were counted the maximum count time in order to achieve the lowest possible MDAs.

Sample	Analyte	Value
1204557480 (W2DUP)	Uranium-238	Result 0.598 < MDA 0.704 > RDL 0.5 pCi/L
510356010 (W2)	Uranium-238	Result 0.541 < MDA 0.604 > RDL 0.5 pCi/L

Technical Information

Sample Re-prep/Re-analysis

Sample 510356010 (W2) was reprepared once due to high MB activity and a second time due to low tracer yield recovery. The third analysis is being reported.

Product: Dry Weight

Preparation Method: Dry Soil Prep

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

Preparation Batch: 1993645

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356014	Calcium Fluoride
510356015	Sludge Dewatering D45671

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Dry Weight

Preparation Method: Dry Soil Prep

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

Preparation Batch: 1994801

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356013	WG-D46035

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: Liquid Scint Tc99, Liquid

Analytical Method: DOE EML HASL-300, Tc-02-RC Modified

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1993870

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356001	CL-1 Before
1204554245	Method Blank (MB)
1204554246	510356001(CL-1 Before) Sample Duplicate (DUP)
1204554247	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.

Preparation Information

Preparation Information

Performed a double iron scavenge and all part 61 clean ups and rinses to reduce interferences.

Quality Control (QC) Information

RDL Met

Samples (See Below) did not meet the detection limits due to the small sample aliquots used. The aliquots were reduced due to the matrix of the samples. The samples were counted the maximum count time in order to achieve the lowest possible MDAs.

<u>Sample</u>	<u>Analyte</u>	<u>Value</u>
1204554245 (MB)	Technetium-99	Result 54.7 < MDA 143 > RDL 5 pCi/L
1204554246 (CL-1 BeforeDUP)	Technetium-99	Result -36 < MDA 134 > RDL 5 pCi/L
510356001 (CL-1 Before)	Technetium-99	Result 58.7 < MDA 130 > RDL 5 pCi/L

Technical Information

Recounts

Samples 1204554246 (CL-1 BeforeDUP) and 510356001 (CL-1 Before) were recounted due to high relative percent difference/relative error ratio. The recounts are reported.

Product: Liquid Scint Tc99, Soil

Analytical Method: DOE EML HASL-300, Tc-02-RC Modified

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1994804

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356013	WG-D46035
1204556159	Method Blank (MB)
1204556160	510356013(WG-D46035) Sample Duplicate (DUP)
1204556161	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.

Preparation Information

Preparation Information

Performed a double iron scavenge and all part 61 clean ups and rinses to reduce interferences.

Quality Control (QC) Information

RDL Met

Samples (See Below) did not meet the detection limits due to the small sample aliquots used. The aliquots were reduced due to the matrix of the samples. The samples were counted the maximum count time in order to achieve the lowest possible MDAs.

Sample	Analyte	Value
1204556159 (MB)	Technetium-99	Result -11.6 < MDA 46.9 > RDL 5 pCi/g
1204556160 (WG-D46035DUP)	Technetium-99	Result -31.5 < MDA 43.6 > RDL 5 pCi/g
510356013 (WG-D46035)	Technetium-99	Result 22.1 < MDA 49.6 > RDL 5 pCi/g

Product: Liquid Scint Tc99, Liquid

Analytical Method: DOE EML HASL-300, Tc-02-RC Modified

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1993585

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356002	CL-1 After
510356003	CL-2 Before
510356004	CL-2 After
510356005	CL-3 Before
510356006	CL-3 After
510356007	CL-4 Before
510356008	CL-4 After
510356009	Scrap Cage Monitor Discharge
510356010	W2
510356011	T-19 Ammonia
510356012	T-20 Ammonia
1204553576	Method Blank (MB)
1204553577	510356002(CL-1 After) Sample Duplicate (DUP)
1204553578	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.

Preparation Information

Aliquot Reduced

aliquot volumes were reduced due to the sample matrix.

Quality Control (QC) Information

RDL Met

Samples (See Below) did not meet the detection limits due to the small sample aliquots used. The aliquots were reduced due to the matrix of the samples. The samples were counted the maximum count time in order to achieve the lowest possible MDAs.

Sample	Analyte	Value
1204553576 (MB)	Technetium-99	Result -6.52 < MDA 50.5 > RDL 5 pCi/L
1204553577 (CL-1 AfterDUP)	Technetium-99	Result 33.9 < MDA 57.1 > RDL 5 pCi/L
510356002 (CL-1 After)	Technetium-99	Result 50.1 < MDA 51.1 > RDL 5 pCi/L
510356006 (CL-3 After)	Technetium-99	Result 16.4 < MDA 54.4 > RDL 5 pCi/L
510356011 (T-19 Ammonia)	Technetium-99	Result 13.4 < MDA 142 > RDL 5 pCi/L
510356012 (T-20 Ammonia)	Technetium-99	Result -28.5 < MDA 228 > RDL 5 pCi/L

Product: Liquid Scint Tc99, Soil

Analytical Method: DOE EML HASL-300, Tc-02-RC Modified

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1993830

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
510356014	Calcium Fluoride
510356015	Sludge Dewatering D45671
1204554188	Method Blank (MB)
1204554189	510356014(Calcium Fluoride) Sample Duplicate (DUP)
1204554190	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Page: 1 of 2
 Project # ENV-CONSENTA
 GEL Quote #: WNU0009
 GEL Logo: **GEL** Laboratories LLC
 Chemistry | Radiochemistry | Radiobiology | Specialty Analytics
 Chain of Custody and Analytical Request
 GEL Work Order Number: 510356
 Client Name: Westinghouse
 Phone # 803.647.3171
 Fax # 803.695.3964
 Project/Site Name: Te-99-Source-Investigation-Phase 2
 Address: 5801 Bluff Road, Hopkins, SC 29061
 Collected By: Randy Crews
 Send Results To: logsdoci@westinghouse.com

GEL Laboratories, LLC
 2040 Savage Road
 Charleston, SC 29407
 Phone: (843) 556-8171
 Fax: (843) 766-1178

Sample ID	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (a)	Field Filtered (b)	Sample Matrix (c)	Radioactive (if yes, please supply isotopic info.)	Should this sample be considered: (7) Known or possible Hazards	Sample Analysis Requested (6) (Fill in the number of containers for each test)		Comments
								Total number of containers	Isotopic U (by Alpha Spec)	
CL-1 Before	4/9/2020	0700	G	N	ML	X		1	X	
CL-1 After	4/9/2020	0700	G	N	ML	X		1	X	
CL-2 Before	4/9/2020	0700	G	N	ML	X		1	X	
CL-2 After	4/9/2020	0700	G	N	ML	X		1	X	
CL-3 Before	4/9/2020	0700	G	N	ML	X		1	X	
CL-3 After	4/9/2020	0700	G	N	ML	X		1	X	
CL-4 Before	4/9/2020	0700	G	N	ML	X		1	X	
CL-4 After	4/9/2020	0700	G	N	ML	X		1	X	
Scrap Cage Monitor Discharge	4/9/2020	0700	G	N	ML	X		1	X	
W2	4/9/2020	0800	G	N	ML					

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
Randy Crews	4/29/2020	1003		4/29/2020	1503
	4/29/2020	1050		4/29/2020	1455
	4/29/2020	1455		4/29/2020	1455

1 Secure Location 4/29/2020 1503
 2 Secure Location 4/29/2020 1050
 3 Secure Location 4/29/2020 1455
 For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Additional Remarks:
 For Lab Receiving Use Only: Custody Seal Intact? Yes No Cooler Temp: 12 °C
 Sample Collection Time Zone: Eastern Pacific Mountain Other:

TAT Requested: Normal: Rush: Specify: 10 Day TAT (Subject to Surcharge)
 Fax Results: Yes No
 Select Deliverable: C of A QC Summary Level 1 Level 2 Level 3 Level 4

KNOWN OR POSSIBLE HAZARDS

RCRA Metals	Characteristic Hazards	Listed Waste	Other
As = Arsenic Ba = Barium Cd = Cadmium Cr = Chromium Pb = Lead	FL = Flammable/ignitable CO = Corrosive RE = Reactive	LW = Listed Waste (F,K,P and U-listed wastes.) Waste code(s):	OT = Other / Unknown (i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.) Description:

Please provide any additional details below regarding handling and/or disposal concerns. (i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)

1.) Chain of Custody Number = Client Determined
 2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
 3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
 4.) Matrix Codes: DW=Drinking Water, GW=Groundwater, SW=Surface Water, WW=Waste Water, W=Water, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Fecal, N=Nasal
 5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
 6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, if no preservative is added = leave field blank
 7.) TSCA Regulated PCB = Polychlorinated biphenyls

GEL Laboratories LLC
 Chemistry | Radiochemistry | Radiobiology | Speciality Analytics
Chain of Custody and Analytical Request
 GEL Project Manager: Katelyn Gray
 Phone # 803.647.3171
 Fax # 803.695.3964
 GEL Work Order Number: _____
 GEL Laboratories, LLC
 2040 Savage Road
 Charleston, SC 29407
 Phone: (843) 556-8171
 Fax: (843) 766-1178

Sample ID <i>*For composites - indicate start and stop date time</i>	*Date Collected (mm-dd-yy)	*Time Collected (Military (hhmm))	QC Code (a)	Field Filtered (b)	Sample Matrix (c)	Should this sample be considered:		Total number of containers	Isotopic U (by Alpha Spec)	Preservative Type (6)	Comments
						Yes, please supply isotopic info.)	(7) Known or possible Hazards				
T-19 Ammonia	4/9/2020	0800	G	N	ML			1	X		
T-20 Ammonia	4/9/2020	0800	G	N	ML			1	X		
WG-D46035	4/9/2020	0800	G	N	ML			1	X		
Calcium Fluoride	4/9/2020	0800	G	N	ML			1	X		
Sludge Dewatering D45671	4/8/2020	1400	G	N	ML			1	X		

Chain of Custody Signatures

Relinquished By (Signed)	Date	Received by (signed)	Date	Time
<i>Randy Crews</i>	4/29/2020	<i>[Signature]</i>	4/29/2020	1003
<i>[Signature]</i>	4/29/2020	<i>[Signature]</i>	4/29/2020	1058
<i>[Signature]</i>	4/29/2020	<i>[Signature]</i>	4/29/2020	1455

1 Secure Location 1003
 2 Secure Location 1058
 3 1455
 Additional Remarks: For Lab Receiving Use Only: Custody Seal Intact? [] Yes [] No Cooler Temp: 16 °C
 Sample Collection Time Zone: [] Eastern [] Pacific [] Central [] Mountain [] Other:

TAT Requested: Normal: _____ Rush: X Specify: 10 Day TAT (Subject to Surcharge)
 Fax Results: [] Yes [X] No
 Select Deliverable: [] C of A [] QC Summary [] Level 1 [] Level 2 [] Level 3 [] Level 4

KNOWN OR POSSIBLE HAZARDS

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=Faecal, N=Nasal
 5) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).
 6) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank
 7) **KNOWN OR POSSIBLE HAZARDS**

RCRA Metals	Characteristic Hazards	Listed Waste	Other
As = Arsenic Ba = Barium Cd = Cadmium Cr = Chromium Pb = Lead	FL = Flammable/Ignitable CO = Corrosive RE = Reactive	LW = Listed Waste F, K, P and U- (listed wastes) Waste code(s):	OT = Other / Unknown (i.e.: High/Low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.) Description:

Please provide any additional details below regarding handling and/or disposal concerns. (i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)

SAMPLE RECEIPT & REVIEW FORM

510356

Client: <u>WNUC</u>		SDG/AR/COC/Work Order: <u>CG</u>	
Received By: <u>SJR</u>		Date Received: <u>4-29-20</u>	
Carrier and Tracking Number		Circle Applicable: FedEx Express FedEx Ground UPS Field Services <u>Courier</u> Other	
Suspected Hazard Information		Yes	No
			*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A) Shipped as a DOT Hazardous?			Hazard Class Shipped: _____ UN#: _____ IF UN2910, Is the Radioactive Shipment Survey Compliant? Yes ___ No ___
B) Did the client designate the samples are to be received as radioactive?		<input checked="" type="checkbox"/>	COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>75</u> CPM (mR/hr) Classified as <u>Rad 1</u> Rad 2 Rad 3
D) Did the client designate samples are hazardous?		<input checked="" type="checkbox"/>	COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?		<input checked="" type="checkbox"/>	If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:
Sample Receipt Criteria		Yes	NA
			No
			Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	Preservation Method: Wet Ice Ice Packs Dry ice <u>None</u> Other: *all temperatures are recorded in Celsius TEMP: <u>16C</u>
4	Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	Temperature Device Serial # <u>IR3-19</u> Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	If Yes, are Encores or Soil Kits present for solids? Yes ___ No ___ NA ___ (If yes, take to VOA Freezer)
			Do liquid VOA vials contain acid preservation? Yes ___ No ___ NA ___ (If unknown, select No)
			Are liquid VOA vials free of headspace? Yes ___ No ___ NA ___
8	Samples received within holding time?	<input checked="" type="checkbox"/>	ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	ID's and containers affected:
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>	
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	Circle Applicable: Not relinquished Other (describe)
Comments (Use Continuation Form if needed):			
<u>CL-Before and W6-D46035 are both Rad-2</u> <u>All other samples marked Rad are Rad-1</u>			

PM (or PMA) review: Initials SH Date 4/30/20 Page 1 of 1

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020047422	Date Sampled 04/14/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. SCRAP CAGE AFTER

Remarks:

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020047422
				SCRAP ----
				SCRAP ----
U	ppm			5.89

QC Disposition By: Candice Singletary, 38208
Date and Time: 04/14/20 13:11

Page 1 of 1

Disposition: **ACCEPT**

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020047420	Date Sampled 04/14/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. CL-1 DC FILTER

Remarks:

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020047420
				CL-1 DC
				CL-1 DC
U	ppm			8.59

QC Disposition By: Candice Singletary, 38208
Date and Time: 04/14/20 13:08

Page 1 of 1

Disposition: **ACCEPT**

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020047941	Date Sampled 04/15/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. CL2 AFTER

Remarks:

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020047941
				CL2 AFTER
U	ppm			19.60

QC Disposition By: Shanedra Calvin, 38287 Date and Time: 04/15/20 12:10	Page 1 of 1	Disposition: ACCEPT
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MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020047421	Date Sampled 04/14/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. CL3 AFTER

Remarks:

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020047421
				CL3 AFTER
				CL-3 AFTER
U	ppm			19.79

QC Disposition By: Candice Singletary, 38208

Date and Time: 04/14/20 13:10

Page 1 of 1

Disposition: **ACCEPT**

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020047423	Date Sampled 04/14/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. CL4 AFTER

Remarks:

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020047423
				CL4 AFTER
				CL-4 AFTER
U	ppm			13.36

QC Disposition By: Candice Singletary, 38208
Date and Time: 04/14/20 13:13
Page 1 of 1
Disposition: **ACCEPT**

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020046809	Date Sampled 04/13/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. CL1BEFORE

Remarks: CL1BEFORE

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020046809
				CL1BEFORE
				CL1BEFORE
U	ppm			250

QC Disposition By: Angenett McFadden, 30204

Date and Time: 04/13/20 15:25

Page 1 of 1

Disposition: ACCEPT

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020046811	Date Sampled 04/13/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. CL2 BEFORE

Remarks: CL2BEFORE

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020046811
				CL2 -----
				CL2 -----
U	ppm			110

QC Disposition By: Angenett McFadden, 30204
Date and Time: 04/13/20 15:25 Page 1 of 1 Disposition: **ACCEPT**

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020046812	Date Sampled 04/13/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. CL3 BEFORE

Remarks: CL3 BEFORE

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020046812
				CL3 -----
				CL3 -----
U	ppm			210

QC Disposition By: Angenett McFadden, 30204
Date and Time: 04/13/20 15:26
Page 1 of 1
Disposition: **ACCEPT**

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020047402	Date Sampled 04/14/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. CL4-BEFORE

Remarks: CL4-BEFORE

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020047402
				CL4-BEFOR
U	ppm			40

QC Disposition By: Angenett McFadden, 30204
Date and Time: 04/14/20 12:30

Disposition: **ACCEPT**

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020047406	Date Sampled 04/14/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. T-20

Remarks:

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020047406
				T-20
				URRS
U	ppm			<0.01

QC Disposition By: Rickel Murray, 36695 Date and Time: 04/14/20 14:01	Page 1 of 1	Disposition: ACCEPT
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MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020047405	Date Sampled 04/14/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. T-19

Remarks:

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020047405
				T-19
				URRS
U	ppm			<0.01

QC Disposition By: Rickel Murray, 36695
Date and Time: 04/14/20 14:00
Page 1 of 1
Disposition: ACCEPT

MISC_AQUEOUS_U Analytical Report

Lab Report No. 2020047404	Date Sampled 04/14/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. WEST 2

Remarks:

Parameter	Units	Low Spec	High Spec	Sub Sample ID & Analysis Results
				2020047404
				WEST 2
				URRS
U	ppm			0.03

QC Disposition By: Rickel Murray, 36695
 Date and Time: 04/14/20 14:00

Disposition: **ACCEPT**

Weight (g)						Plant Nominal			
Tare (liquid)	60.85					% U235 by Weight			
West 2	1049.25 g	PPM/U =	0.03 =	0.03	mgU	4.254	0.001276	mg U-235	
T-19	916.45 g	PPM/U =	< 0.01 =	0.01	mgU	4.254	0.000425	mg U-235	
T-20	923.05 g	PPM/U =	< 0.01 =	0.01	mgU	4.254	0.000425	mg U-235	
Conversion Line 1 Before	1008.48 g	PPM/U =	250 =	250	mgU	4.254	10.635	mg U-235	
Conversion Line 2 Before	944.29 g	PPM/U =	110 =	110	mgU	4.254	4.6794	mg U-235	
Conversion Line 3 Before	989.39 g	PPM/U =	210 =	210	mgU	4.254	8.9334	mg U-235	
Conversion Line 4 Before	945.71 g	PPM/U =	40 =	40	mgU	4.254	1.7016	mg U-235	
Conversion Line 1 After	950.16 g	PPM/U =	8.59 =	8.59	mgU	4.254	0.365419	mg U-235	
Conversion Line 2 After	972.67 g	PPM/U =	19.6 =	19.60	mgU	4.254	0.833784	mg U-235	
Conversion Line 3 After	917.64 g	PPM/U =	19.79 =	19.79	mgU	4.254	0.841867	mg U-235	
Conversion Line 4 After	958.90 g	PPM/U =	13.36 =	13.36	mgU	4.254	0.568334	mg U-235	
Scrap Cage Monitor	1032.91 g	PPM/U =	5.89 =	5.89	mgU	4.254	0.250561	mg U-235	
Biosolids	49.05 g	PPM/U =	211.1 =	211.10	mgU	4.254	8.980194	mg U-235	
Waterglass cake	153.79 g	PPM/U =	33794 =	33794	mgU	4.254	1437.597	mg U-235	
Calcium Fluoride	171.93 g	PPM/U =	8.96 =	8.96	mgU	4.254	0.381158	mg U-235	
TOTALS	11983.67 g			TOTALS:	34691.34 mgU		1475.77	mg U-235	
					34.69 g U		1.47577	g U-235	

CALCIUM_FLUORIDE Analytical Report

Lab Report No. 2020047844	Date Sampled 04/15/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. Calcium Fluoride

Blend/Lot No.

Remarks:

WinLIMS #	Sample ID	Parameters & Analysis Results
		U
		ppm
2020047844	Calcium Fluoride	8.96

QC Disposition By: Laurie Harvey, 35793
Date and Time: 04/15/20 10:48
Page 1 of 1
Disposition: ACCEPT

MISC_SOLID Analytical Report

Lab Report No. 2020047950	Date Sampled 04/15/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. D45671 SLUDGE DEWATER

Blend/Lot No. D45671

Remarks: D45671

WirLIMS #	Sample ID	Parameters & Analysis Results
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		U
		ppm
2020047950	D45671 SLUDGE DEWATER	211.10

QC Disposition By: Mark Krissinger, 31766 Date and Time: 04/15/20 12:30	Page 1 of 1	Disposition: ACCEPT
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MISC_SOLID Analytical Report

Lab Report No. 2020046788	Date Sampled 04/13/2020	Enrichment 4.25
EPN No.	Contract XCES50	Submitter Sample No. D46035 waterglass

Blend/Lot No. **D46035**

Remarks: **D46035**

WinLIMS #	Sample ID	Parameters & Analysis Results
		U
		ppm
2020046788	D46035 waterglass	33794

QC Disposition By: Angenett McFadden, 30204
Date and Time: 04/13/20 15:24
Page 1 of 1
Disposition: **ACCEPT**

List of current GEL Certifications as of 13 May 2020

State	Certification
Alaska	17-018
Alaska Drinking Water	SC00012
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M-SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122020-1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	2019-165
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-20-16
Utah NELAP	SC000122020-32
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Attachment 3

**Waste Treatment Area Operable Unit East Lagoon Characterization Summary Report
LTR-RAC-19-97
December 6, 2019**



Westinghouse

Westinghouse Electric Company LLC
Nuclear Fuel
Columbia Fuel Site
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Hopkins, South Carolina 29061
USA

Ms. Kim Kuhn
Ms. Crystal Rippy
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Our ref: LTR-RAC-19-97

Wastewater Treatment Area Operable Unit East Lagoon Characterization Summary Report

December 6, 2019

Dear Ms. Kuhn and Ms. Rippy:

Westinghouse has prepared the following East Lagoon Characterization Summary Report. The East Lagoon Sludge Characterization Remedial Investigation Work Plan was submitted to SCDHEC on September 26, 2019, and the results of that sampling effort are reported herein.

Executive Summary

The East Lagoon sampling effort was safely and successfully executed in coordination with SCDHEC representatives. The goal of the sampling effort was to gain the understanding necessary to plan for the remediation of the lagoon and determine the appropriate disposal pathway for the lagoon material. The analytical sample results indicate that: 1) No hazardous waste was identified the lagoon; 2) Critically Safety controls will not likely be necessary given the low radiological concentrations; and 3) The sludge may be removed from the lagoon, stabilized and packaged on site, and shipped for offsite disposal achieving the ultimate goal of East Lagoon closure. In addition the data will be incorporated into future closure planning activities including soil sampling planned for below the lagoon liner.

Site History and Background

The Westinghouse Columbia Fuel Fabrication Facility (Westinghouse) manufactures commercial nuclear fuel near Columbia, South Carolina under Nuclear Regulatory Commission (NRC) Special Nuclear Material (SNM) license SNM-1107. A feature of interest on the site is known as the East Lagoon.

The East Lagoon is a wastewater treatment/settling pond that is approximately 160' x 130' and its operations are authorized under Westinghouse's National Pollutant Discharge Elimination System (NPDES) permit. The lagoon currently receives an average of 20,000 gallons of wastewater per day, primarily from regeneration water from resin beds with lesser amounts from chemical laboratory sinks, LECO machines, tank farm containment dike, UT cleaners and furnaces, and the HERMIE strap washing process. The lagoon has been in service for almost 40 years and historically received other process waste streams containing radiological elements.

The lagoon is estimated to contain up to approximately 4 feet of chemically and radiologically impacted sludge and while it was re-lined with 36-mil Hypalon® in the 1981-1982 timeframe the liner is beyond its

useful life. The possibility of soil impacts under and around the lagoon exists due to leaching. Previous characterization samples have shown elevated levels of uranium, fluorides, and nitrates in the East Lagoon Sludge.

Pursuant to the February 26, 2019 DHEC Consent Agreement, Westinghouse has initiated a comprehensive Remedial Investigation (RI) to evaluate the environmental status of the site as a whole and to determine what remedial actions are appropriate. The lagoon is within the scope of the RI and denoted as the Wastewater Treatment Area Operable Unit (OU). The initial RI Work Plan approved by the Department on June 19, 2019, contains the following description of the Wastewater Treatment Area OU:

Two lined settling ponds (North and South Lagoons), one process wastewater pond (East Lagoon), a sodium silicate (Waterglass) wastewater treatment process to treat U-contaminated, ammoniated wastewater from the conversion process, and several storage tanks exist in the Wastewater Treatment Area OU... The East Lagoon was last relined in the 1980's when the Waterglass process was installed. The liner is constructed of 36-mil Hypalon®. There is a significant quantity of U-contaminated sludge that has settled in the East Lagoon.

The East Lagoon currently receives non-SNM liquid inputs such as effluent from the Deionized Water Building and rainwater from containment areas such as the chemical tank farm. The East Lagoon is monitored for pH and liquid level and is sampled for fluoride, ammonia and Total Suspended Solids (TSS). Once full, the East Lagoon is pumped to either the North or South Lagoon. Before the North or South Lagoon is discharged, a four corner sample is taken and analyzed for pH, TSS, ammonia, fluoride and activity. The East Lagoon also provides extra capacity for overflow from other lagoons or for containment in the event of a spill or emergency. Past practices associated with East Lagoon operations included the introduction of materials containing low level, radiological contamination. Because of these past practices, sediment in the East Lagoon is contaminated with uranium. Characterization of the East Lagoon sediment is included in this initial work plan.

Although Westinghouse is still working through the RI, it has been determined that the lagoon will be remediated and closed. Therefore, the site submitted a sampling plan to DHEC which was approved on October 2, 2019. The plan established methods for obtaining sludge samples for radiological and chemical analysis to evaluate subsurface conditions of the East Lagoon following its closure. The plan included characterization of the sludge to determine the method for its safe removal and disposal. This report contains the results of the sampling and proposed next steps.

Sampling Procedure

The objective of the sampling procedure was to generate sufficient information to determine the presence or absence of contaminants within the sample media and to evaluate potential remedial actions. Sludge sampling was designed to follow EPA guidance, as advised in EPA Region 4 Operating Procedure SESDPROC-200-R3, Sediment Sampling. The East Lagoon sludge was estimated to be up to approximately 4 feet in depth and covered by a shallow layer of water. Based on this understanding, the method selected to sample the East Lagoon was to use a Sludge Push Probe, with an internal acetate sleeve that is capable of collecting sludge in vertical columns.

A systematic grid sampling strategy was selected for sampling. The grid sampling ensured that the sludge is fully and uniformly represented in the collected data. The East Lagoon was sub-divided into 15 separate grids using east-west and north-south transect lines (Attachment 1, Figure 1). In addition to the

systematic samples, biased samples were also collected at locations where site processes discharge to the East Lagoon. At locations where the biased samples and systematic samples were co-located, a single sample location was used for representation of that specific grid and the process inlet. All samples were analyzed for Uranium, Technesium-99, Fluoride, Nitrate, and Ammonia. In addition, a more extensive parameter list was analyzed in three samples. The more extensive analyses include the full Toxicity Characteristic Leaching Parameters (TCLP) list and the TCL/TAL except for pesticides and herbicides (in both TCLP and TCL) since these parameters are not potentially present in the sludge. The specific sample grid locations, descriptions, and analytical parameters are provided in Table 1.

Table 1 –Sample Locations and Descriptions

SAMPLE LOCATION	Sample ID	Water Cover (ft)	Sediment Depth (ft)	LOCATION TYPE	LOCATION PURPOSE	Analysis
1	100819-01	0.5	1	Systematic and biased	Grid 1 and biased for discharge from Sulfuric Acid Dike Drain.	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
1 (FD)	100819-02	0.5	1	Systematic and biased	Grid 1 and biased for discharge from Sulfuric Acid Dike Drain.	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
2	100819-03	0.25	1	Biased	Discharge from Still 1 relief, T-1187. Selected for TCLP and TCL/TAL analysis.	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate, TCLP, TCL/TAL
3	100819-06	0	2	Systematic and biased	Grid 2 and biased for discharge from T-1110/1111 dike drain.	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
4	100919-01	0.5	0.5	Systematic and biased	Grid 3 and biased for discharge from Lime silo and nitric acid dike drain.	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
5	100819-04	0	2	Systematic and biased	Grid 4 and biased for discharge from Process sump, Still 2 relief, and Still 1&2 bottoms. Selected for TCLP and TCL/TAL analysis.	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate, TCLP, TCL/TAL
6	100919-02	0.5	0.5	Systematic and biased	Grid 5 and biased for location of bleached liner.	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
7	100919-03	1	3	Systematic only	Grid 6	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate

8	100919-04	1	3	Systematic only	Grid 7	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
9	100919-05	0.5	3.5	Systematic only	Grid 8	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
10	100819-05	0.5	3.5	Systematic only	Grid 9 and selected for TCLP and TCL/TAL analysis.	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate, TCLP, TCL/TAL
11	100919-06	1	3	Systematic only	Grid 10	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
12	100919-07	2	2	Systematic only	Grid 11	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
13	100919-08	1.5	2.5	Systematic only	Grid 12	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
14	100919-09	1.5	2.5	Systematic only	Grid 13	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
15	100919-10	1.5	2.5	Systematic only	Grid 14	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate
16	100919-11	0.5	0.5	Systematic only	Grid 15	ISO-U, Tc-99, Fluoride, Ammonia, Nitrate

At each location care was taken not to puncture the liner. Sludge depths were recorded in the field logbook for characterization purposes. Each sample was field screened using beta/gamma sensitive radiological detectors and a Photo Ionization Detector (PID) prior to packaging the sample. One sample was collected at each of the 16 identified locations from the East Lagoon. SCDHEC also collected split samples at a majority of the lagoon sample locations for comparison to the reported analytical results. A unique sample ID was generated and assigned to each individual sample collected. Samples were sent to offsite analytical laboratory for analysis of radiological (Iso-U, Tc-99) and chemical parameters (Fluoride, Nitrate, Ammonia, TCLP, TCL/TAL as appropriate) by the methods described in Table 2.

Table 2 – Analytical Methods

Analysis	Method	Laboratory Requested Reporting Level (RL)*
Iso-U	SW6020A	1.0 pCi/g
Tc-99	DOE HASL 300 Tc-02-RC Mod	5.0 pCi/g
Fluoride	SW 9056A	0.1 mg/L
Nitrate	SW 9056A	0.1 mg/L
Ammonia	EPA 350.1 Mod/ SM 4500-NH3 B Mod	0.25 mg/L
TCL/TAL	SW846 8260B/8270B/6010C/7470A	Lowest achievable

TCLP	SW 1311/8260B/ 8270D/6010C/7470A	< TCLP Limits
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* The contract laboratories make every effort to achieve the lowest possible detection limits. However, note that detection limits will vary based on the moisture content of the sludge samples as well as the chemical and physical consistency of the sample matrix.

Analytical Laboratory

All samples collected were logged on a Chain of Custody form, stored in a sample cooler, and sealed and secured when not under the constant supervision of the sampling crew. GEL Laboratories, LLC was utilized for this project and has National Environmental Laboratory Accreditation Program (NELAP) certification, as well as all appropriate SCDHEC certifications. The analytical laboratory is capable of achieving reporting limits appropriate for waste characterization. The laboratory data reports consist of complete data packages that contain complete documentation of the laboratory data report, and include a case narrative, descriptions of the analyses performed and the analytical methods used, and well as a description of the laboratories internal QC review process. All laboratory data was evaluated when the analytical data package was delivered by the laboratory.

Analytical Sample Results

Review of the analytical sample results have shown that no hazardous waste has been identified. Furthermore, the samples results show low radiological concentrations that indicate Criticality Safety controls will likely not be necessary. Analytical sample results show that the East Lagoon sludge may be removed from the lagoon, stabilized and packaged on site, and shipped for offsite disposal safely and successfully.

Radiological Sample Results

The full laboratory analytical report is provided in Attachment 2. Radiological results were compared to the Industrial Use criteria provided in CFFF site procedure RA-443 and are summarized in Table 3.

Table 3 – Industrial Radiological Levels

Contaminant	Action Level	Basis of Action Level
Uranium - 234	3,310 pCi/g (0.5 ppm)	NUREG 1757, Appendix H ¹
Uranium – 235	39 pCi/g (18 ppm)	NUREG 1757, Appendix H ¹
Uranium – 238	179 pCi/g (553 ppm)	NUREG 1757, Appendix H ¹
Total Uranium	2,933 pCi/g* (1,230 ppm)	NUREG 1757, Appendix H ¹
Technetium - 99	89,400 pCi/g (5.2 ppm)	NUREG 1757, Appendix H ¹

¹ NUREG-1757 Vol. 1, Rev.2 Consolidated Decommissioning Guidance, Appendix H: Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission, Final Report September 2006.

Radiological sample results are provided in units of picocuries (pCi) per gram (g) of sample media. Sample results that were reported less than the analytical minimum detectible concentration (MDC) are reported as zero. For comparison to the Industrial use limits provided in Table 3, a sum of fractions (SOF) approach was used. Meaning that each radioisotope was compared to the action level provided, and the result was determined as a fraction of the action level. Then all fractions were summed for each sample. If the SOF was less than or equal to 1.0, the Industrial action level was not exceeded. A SOF exceeding 1.0 indicates that the sample exceeded the Industrial use action level.

Table 4 – East Lagoon Radiological Results

Sample Description	Sample ID	Analyte (pCi/g)				SOF Industrial
		U-234	U-235	U-238	Tc-99	
Location #1	100819-01	370	13	45	0	0.7
Location #1 (FD)	100819-02	375	14	49	0	0.8
Location #2	100819-03	103	4	15	0	0.2
Location #3	100819-06	488	35	62	0	1.4
Location #4	100919-01	155	6	21	0	0.3
Location #5	100819-04	883	33	126	0	1.8
Location #6	100919-02	456	18	59	0	0.9
Location #7	100919-03	1,698	69	240	0	3.6
Location #8	100919-04	309	12	53	0	0.7
Location #9	100919-05	8,086	339	1,296	0	18.4
Location #10	100819-05	13,373	565	2,055	0	30.0
Location #11	100919-06	10,698	440	1,710	0	24.1
Location #12	100919-07	4,466	192	798	0	10.7
Location #13	100919-08	4,373	178	783	0	10.3
Location #14	100919-09	6,282	246	1,077	0	14.2
Location #15	100919-10	15,177	634	2,535	0	35.0
Location #16	100919-11	1,045	42	162	164	2.3
Waste Profile	101019-01	216	8	57	0	0.6

As can be seen from the radiological sample results, most (approximately 69%) of the radiological results from the East Lagoon are elevated above the Industrial Use action levels and require remediation. However, targeted or isolated remediation of the lagoon is not practical, and therefore Westinghouse is proposing to remediate the entire lagoon. Given this approach, the average radiological results of the East Lagoon, while elevated, do not exceed DOT shipping criteria, or reasonable Waste Acceptance Criteria (WAC), and are suitable for remediation and offsite disposal.

Furthermore, the results will be used to guide the decision making process, and determine necessary work controls during remediation planning for both the Health Physics and Environmental groups. Based on the low U-235 concentration, Criticality Safety controls will likely not be necessary. As the sample results do show that the lagoon sludge is likely to exceed the Industrial Use action level, care should be taken during remediation to ensure that worker exposure is minimized. Engineering controls such as the use of heavy equipment, administrative controls such as dose monitoring, and proper personal protective equipment (PPE) usage will all be required. The average fissile concentration of the sludge based on the sample results has been calculated to be approximately 0.1 grams U-235/L or less, with a maximum anticipated value of approximately 0.5 grams U-235/L or less in isolated areas, and as such extensive Criticality Safety considerations are not anticipated.

Tc-99 was detected in one lagoon sludge sample, Location #16 in the SW corner of the lagoon. This single occurrence indicates that Tc-99 is localized in the sludge. Furthermore, Tc-99 at the concentration detected in Location #16 does not pose any issues for disposal.

During the characterization sampling event a representative from U.S. Ecology (USE), a potential future disposal facility, was present to perform stabilization testing on the sludge material. The stabilization included mixing the sludge material with Calcium Fluoride, and Portland cement to remove any excess water, and solidify the mixture for packaging, transport, and disposal of site. The Waste profile sample listed above is a sample of the final mixture suggested by USE and will likely provide a good representation of the final waste profile characteristics.

Chemical Sample Results

Chemical results were also compared to the Industrial Use criteria provided in CFFF site procedure RA-443, with the exception of ammonia, which does not have an established action level. The chemical parameters are summarized in Table 5.

Table 5 – Industrial Chemical Levels

Contaminant	Action Level	Basis of Action Level
Fluoride	3,100 mg/kg	EPA Regional Screening Levels ¹
Nitrate	130,000 mg/kg	EPA Regional Screening Levels ¹

¹ USEPA Regional Screening Level, Summary Table, Residential Soil Standard (TR=1E-06, HQ=1), November 2018

Chemical sample results are provided in units of parts per million (ppm) of sample media. Sample results that were reported less than the analytical minimum detectible concentration (MDC) are reported as non-detects (ND).

Table 6 – East Lagoon Chemical Results

Sample Description	Sample ID	Analyte (ppm)		
		Fluoride	Nitrate	Ammonia
Location #1	100819-01	246	9.0	1720
Location #1 (FD)	100819-02	202	5.5	1010
Location #2	100819-03	45.4	7.5	325
Location #3	100819-06	46.0	1.9	197
Location #4	100919-01	58.8	<MDC	77.3
Location #5	100819-04	127	71.4	248
Location #6	100919-02	121	<MDC	397
Location #7	100919-03	87.8	2.1	755
Location #8	100919-04	1.9	343	227
Location #9	100919-05	2.2	302	533
Location #10	100819-05	<MDC	600	721
Location #11	100919-06	<MDC	700	663
Location #12	100919-07	<MDC	479	193
Location #13	100919-08	<MDC	285	423
Location #14	100919-09	<MDC	363	636
Location #15	100919-10	2.4	330	755

Location #16	100919-11	50.3	2.5	58.0
Waste Profile	101019-01	86.6	46.8	72.0

As can be seen from the chemical sample results, all of the chemical results from the East Lagoon are below the Industrial Use action levels, and are consistent with past sample results collected from the lagoon indicating no significant changes over time. These results do not adversely impact the plan to remediate the East Lagoon, and dispose of the lagoon sludge at an off-site facility.

TCLP / TCL / VOC Sample Results

Three locations were identified for a more in-depth chemical analysis. These sample results are provided in units of micrograms (ug) per kilogram (Kg) for total sample concentrations, or milligrams (mg) per Liter (L) for TCLP sample concentrations since TCLP analyzes the liquid extract derived from the TCLP extraction process. Sample results that were reported less than the analytical minimum detectible concentration (MDC) are reported as non-detects (ND), and only those parameters with at least one positive result per sample are reported. See the full analytical report provided in Attachment 2 for all laboratory analytical parameters.

TCLP results support the conclusion that the East Lagoon sludge is non-hazardous. Only three of the TCLP constituents were detected, all at concentrations well below hazardous levels.

Table 7 – TCLP Results

Type	Analyte	Units	Hazardous Limits	Location # 2 (100819-03)	Location #5 (100819-04)	Location #10 (100819-05)
TCLP Metal As Rec.	Barium	mg/L	100	2.54	0.56	2.00
	Chromium	mg/L	5.0	<MDC	<MDC	0.01
	Selenium	mg/L	1.0	0.13	0.15	0.13

Total concentration levels were also analyzed by the laboratory. Total concentration results are useful in understanding what constituents are present in the lagoon. However, since no hazardous leaching was determined by the TCLP results, there is no concern with elevated total concentration results relative to sludge disposal. However, the data will be used to design soil sampling that will be conducted following removal of the East Lagoon liner.

Table 8 – Total Concentration Results

Type	Analyte	Units	Location # 2 (100819-03)	Location #5 (100819-04)	Location #10 (100819-05)
Dry Wt Cor.	Mercury	ug/Kg	17	917	<MDC
Metals Dry Wt Cor.	Aluminum	ug/Kg	964,000	18,800,000	6,900,000
	Antimony	ug/Kg	1,880	<MDC	70,700
	Arsenic	ug/Kg	<MDC	<MDC	3,140
	Barium	ug/Kg	396,000	3,820,000	908,000
	Beryllium	ug/Kg	<MDC	<MDC	1,620
	Cadmium	ug/Kg	<MDC	5,800	56,700
	Calcium	ug/Kg	151,000,000	792,000,000	301,000,000
	Chromium	ug/Kg	25,900	87,500	381,000

	Cobalt	ug/Kg	903	9,900	9,150
	Copper	ug/Kg	7,330	176,000	325,000
	Iron	ug/Kg	1,530,000	24,200,000	7,870,000
	Lead	ug/Kg	5,850	45,700	538,000
	Magnesium	ug/Kg	9,440,000	20,800,000	3,930,000
	Manganese	ug/Kg	48,600	184,000	94,800
	Nickel	ug/Kg	48,400	119,000	213,000
	Potassium	ug/Kg	158,000	7,970,000	1,710,000
	Selenium	ug/Kg	3,200	27,600	3,060
	Silver	ug/Kg	11,100	39,500	64,300
	Sodium	ug/Kg	2,590,000	5,730,000	7,680,000
	Vanadium	ug/Kg	2,990	38,700	13,100
	Zinc	ug/Kg	207,000	1,380,000	2,260,000
S-VOC Dry Wt Cor.	Benzo(a)anthracene	ug/Kg	<MDC	1,750	<MDC
	Benzo(a)pyrene	ug/Kg	<MDC	<MDC	1,450
	Benzo(a)fluoranthene	ug/Kg	<MDC	1,920	1,500
	Benzo(ghi)perylene	ug/Kg	<MDC	2,430	2,430
	Carbazole	ug/Kg	<MDC	<MDC	1,640
	Chrysene	ug/Kg	<MDC	1,440	<MDC
	Di-n-butyl phthalate	ug/Kg	<MDC	3,540	<MDC
	Di-n-octyl phthalate	ug/Kg	<MDC	<MDC	4,720
	Fluoranthene	ug/Kg	<MDC	2,670	5,010
	Indeno(1,2,3-cd)pyrene	ug/Kg	<MDC	<MDC	1,540
	Phenanthrene	ug/Kg	<MDC	<MDC	2,100
	Pyrene	ug/Kg	<MDC	1,840	3,370
	bis(2-Ethylhexyl)phthalate	ug/Kg	<MDC	16,300	59,700
VOC Dry Wt Cor.	2-Butanone	ug/Kg	49.50	<MDC	<MDC
	Acetone	ug/Kg	1,800	2,540	<MDC
	Carbon disulfide	ug/Kg	24.70	12.40	1,110
	Chloroform	ug/Kg	6.92	<MDC	<MDC
	Methylene chloride	ug/Kg	23.80	24.20	<MDC
	Styrene	ug/Kg	3.02	<MDC	286
	Toluene	ug/Kg	<MDC	<MDC	426
	cis-1,2-Dichloroethylene	ug/Kg	<MDC	<MDC	1,910
	m,p-Xylenes	ug/Kg	<MDC	<MDC	538
	Xylene	ug/Kg	<MDC	<MDC	262

As can be seen from the TCLP and Total Concentration sample results, all of the chemical results from the East Lagoon are below Hazardous Waste levels and are consistent with past sample results collected from the lagoon indicating no significant change over time. These results do not adversely impact the plan to remediate the East Lagoon and dispose of the lagoon sludge at an off-site facility. However, as

noted above, these results will be useful for the future environmental evaluation that will occur after the East Lagoon has been removed from service.

Additional Sampling

One sample was collected that was not specifically prescribed by the East Lagoon characterization sampling plan. A VOC sample was collected from the Calcium Fluoride material that was used in the USEI waste stabilization testing. This sample, 100919-12, did not demonstrate any volatile characteristics; however, Acetone was detected below RCRA Universal Treatment Standard limits, likely a laboratory contaminant, as it is not an expected Contaminant of Potential Concern (COPC) at the Columbia facility.

While this one sample result does not demonstrate any VOC contamination, it is recommended that approximately 5-10 samples be collected from various points on the remaining Calcium Fluoride pile to ensure that it is suitable for future incorporation into the waste stream.

Deviations

As stated in the Characterization sampling plan provided in Attachment 1:

“Deviations from the requirements specified in this plan must be authorized by the Environmental Manager and documented in the field logbook to allow recreation of the modified process.”

Several minor deviations from the written plan were determined to be necessary, however none of the deviations had any effect on the quality or the integrity of the data collected. These deviations were discussed between the sampling crew, the Environmental Manager, and the Department regulators observing the sampling in advance of taking any actions in the field. Deviations were recorded in the recorded field notes provided in Attachment 3, and are reported here as follows:

- 1) Section 5.1 of the sample plan stated to collect approximately 1 liter of sludge for analysis from each location, however after contacting the analytical laboratory, it was determined that only 125 ml of sludge was needed per sample location for radiological and chemical analysis (with the exception of TCLP sample locations, which require more volume). Therefore, only the laboratory supplied 125 ml sample jars were used for sample collection (with the exception of TCLP samples).
- 2) Section 5.4.1 of the sample plan directed sampling to be performed on the top 2 feet of sludge present in the lagoon, and to collect a separate sample from any remaining material below the top 2 feet. However, upon the initiation of sampling it quickly became apparent that the sludge in the lagoon is quite fluid, and separating the material into layers was not a practical goal. After discussion with SCDHEC, it was agreed that only a single composite sample would be collected at each location.
- 3) Section 4.0 of the sample plan stated that a Field Blank (FB) sample should be collected at each location where VOC sample collection was performed. After sampling began, the field crew had determined that it was most practical to set up one sampling area, and to collect each sludge sample from the lagoon, then bring the sample to the sample preparation area for evaluation and packaging. Furthermore, all VOC samples were to be collected on the same day. This practice was discussed with SCDHEC, and it was agreed that due to this practice, it was only necessary to collect one FB sample. Additionally, as VOC sample collection was limited to one day, only one Rinsate Blank

sample was collected at the end of the first day of sampling. Rinsate blank sampling is for VOCs only, and VOC samples from the lagoon were only collected on the first day.

- 4) While attempting to collect a sample in the center of the pond, the Sediment Sample Push Probe with an internal acetate liner became dislodged from the extension handle in use at the time, and the sample probe fell into the lagoon where it was determined to be irretrievable. Therefore, sample collection continued using a PVC pipe, with one open end, and one threaded end capable of sealing shut. Samples were collected by driving the PVC pipe into the sludge, and sealing the open end to create a vacuum lock. The PVC pipe was then placed over the sample collection bowl, and the seal was slowly opened to allow the sludge contained inside to transfer to the bowl. The PVC pipe was decontaminated in accordance with the directions in Section 5.2 of the sample plan before sample collection at the next location.

Quality Control

To ensure the validity of the data from the characterization sampling, four types of field QC samples were collected and submitted to the analytical laboratory for analysis:

Field Duplicate (FD) samples - One FD sample was collected and was identified such that project personnel could identify the duplicate but submitted "blind" to the laboratory with two different sample identifiers (IDs).

The FD samples was analyzed for the same parameters as the primary sample. The FD sample was analyzed and reported to be within 10% of the parent sample, and the results are determined to be acceptable and within the expected typical variable range of environmental samples.

Field Blank (FB) samples - One FB samples was collected during sampling for Target Compound List/Target Analyte List (TCL/TAL) samples as specified below. The FB samples was analyzed for the EPA's TCL of volatile organic compounds (VOCs). The FB sample consisted of deionized (DI) water poured directly into sample vials contemporaneous with collection of the TCL/TAL samples.

Commercially available DI water was used for the FB sample. The sample results do show some positive results for minerals that are typically expected in most water samples, indicating that the DI water used was not laboratory grade. However, the metals and minerals identified in the FB sample are only identified in trace quantities, and do not pose any interference with the COPCs from the East Lagoon. Additionally, no volatile compounds were identified in the FB sample.

Rinsate Blank (RB) samples - One RB sample was collected each day sampling equipment was reused in the field and field cleaned per the specifications in Section 5.2. RB samples were collected from the final rinse of the sampling equipment after the cleaning procedure has been performed.

The RB sample was analyzed for the list of parameters being tested that day. The RB sample was collected by pouring DI water over the decontaminated sample bowl, and then collecting the DI water into sample containers for analysis. The RB sample results demonstrate the same trace minerals and metals that were identified in the FB sample, as well as trace quantities of other contaminants. However, all of the reported quantities are slightly above the laboratory detection limit, but well below the reporting limit, indicating that these trace quantities are estimated

values, and can be considered insignificant. Therefore no potential for environmental cross contamination is suspected.

Trip Blanks (TB) samples - A TB packaged in VOC sample vials was provided by the laboratory. The sample vials were taken to the site in sample coolers and returned to the laboratory unopened.

The TB samples were tested for TCL VOCs. No positive detections were reported by the laboratory, indicating that there is no potential for environmental cross contamination.

In addition to field QC samples, the analytical laboratory conducted internal QC procedures specific to each analytical method to evaluate analytical accuracy and precision relative to the sample matrices. Examples of laboratory QC samples include Matrix Spike (MS) and Matrix Spike Duplicate (MSD) samples, Laboratory Control Samples (LCS), and internal duplicate samples.

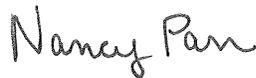
All sample data provided in the analytical laboratory report satisfactorily met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with some minor exceptions. These exceptions are provided in the case narrative of the laboratory reports provided in Attachment 2, and have been reviewed by the CFFF Environmental Staff. All exceptions have been determined appropriate, and therefore the laboratory analytical results are deemed valid. Some samples were noted to be analyzed beyond analytical holding time, while others were noted to be out of temperature tolerance. Despite these conditions, the laboratory analytical data is still useful for the intended purpose of determining disposal criteria, and future work planning. All analytical methods were performed under NELAP certification, and the analysis has met all of the requirements of the NELAC standard.

Final Summary

The purpose of the East Lagoon Characterization Survey Plan was to acquire sufficient radiological and chemical characterization data in support of plans to remediate the lagoon. To that end, additional sampling of the lagoon sludge was required to gain additional understanding into the potential disposal alternatives, as well as possible future Criticality Safety, Health Physics, and Health and Safety controls. All radiological and chemical laboratory data was reviewed and found to be acceptable for their intended use. All QC procedures were followed, and the data collected found to be of sufficient quality, that the results may be considered accurate.

The data collected during characterization is sufficient to classify the sludge for off-site disposal and to support the development of remediation plans to support the timely closure of the East Lagoon.

Sincerely,



Nancy Parr
Environmental Protection Manager
Westinghouse Electric Company LLC
803.647.3338

Report reviewed by:



Thomas Hutto, P.G.
GEL Engineering, LLC

Attachments:

Attachment 1 – Wastewater Treatment Area Operable Unit East Lagoon Sludge Characterization
Remedial Investigation Work Plan Addendum 2, Revision 1, Dated September 26, 2019

Attachment 2 – GEL Analytical Laboratory Results

Attachment 3 – Field Notes