Westinghouse

Westinghouse Electric Company LLC
Nuclear Fuel
Columbia Fuel Site
5801 Bluff Road
Hopkins, South Carolina 29061
USA

Ms. Kim Kuhn
South Carolina Department of Health and Environmental Control (DHEC)
Bureau of Land and Waste Management
2600 Bull Street
Columbia, SC 29201

Direct tel: 803-647-3338
Direct fax: 803-695-3964
e-mail: parrnb@westinghouse.com

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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

Nancy Parr
Environmental Protection Manager
Westinghouse Electric Company LLC
803.647.3338

Report reviewed by:

Tom Hutto

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