

Enclosure 11 to
LTR-RAC-20-94
Date: December 18, 2020

Enclosure 11

Response to Request for Additional Information

RA-433, Environmental Remediation

Environmental Remediation

	Description of Change	Reason for Change
1.	Revise 5.2.4.C and Tables 2-4 to add Sum of Fractions (SOF), remove Total Uranium limits, add explanatory footnotes, and to remove mg/kg (ppm) units for uranium analytical data	SOF is a tool for determination of regulatory compliance with prescribed environmental limits; Limits are based on pCi/g radiological units.

Department Acknowledgments:

EHS ENGINEERING ENV

EHS ENGINEERING RAD

EHS INCIDENT COMMANDER

EHS LICENSING

URRS ENGINEERING TECHNICIAN

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1.0 PURPOSE AND SCOPE

1.1	The purpose of the remediation process is to prevent migration of licensed material and/or contamination off-site and to minimize the impacts to future decommissioning.
1.2	In the event of a release, whether recent or newly detected, this procedure will be followed to determine the appropriate steps.
1.3	The procedure outlines the decision making process for either remediating the release or documenting the decision not to remediate prior to decommissioning.
1.4	In each instance, the procedure involves updating and analyzing the data in the Conceptual Site Model (CSM), including the migration pathways and potentially affected receptors.
1.5	This procedure also guides the evaluation and documentation of the decommissioning impacts resulting from the remediation actions or the absence thereof.

2.0 SUPPORTING DOCUMENTS

2.1	Controlled Forms
	1. NA
2.2	Controlled Sketches
	1. NA
2.3	Reference Procedures
	<ol style="list-style-type: none"> 1. RA-107, Corrective Action Program for Regulatory Events 2. RA-136, Soil Sampling & Disposal 3. RA-137, Decommissioning Recordkeeping 4. RA-434, Environmental Data Management 5. ROP-06-006, Collection of Routine Weekly and Monthly Environmental Samples 6. ROP-06-007, Groundwater Well Sampling
2.4	Procedure Basis
	<ol style="list-style-type: none"> 1. Regulatory Requirements/MAQP <ol style="list-style-type: none"> A. Consent Agreement 19-02-HW; South Carolina Department of Health and Environmental Control and Westinghouse Electric Company LLC. for the Westinghouse Columbia Fuel Fabrication Facility, February 2019. B. U.S. Environmental Protection Agency, Regional Screening Level, Summary Table, Industrial Soil Standard (TR=1E-06, HQ=1), November 2018. C. U.S. Environmental Protection Agency, Summary Table, Residential Soil Standard (TR=1E-06, HQ=1), November 2018. D. U.S. Environmental Protection Agency, Risk Assessment Guidance from Superfund, Volume I, Human Health Evaluation Manual, Office of Emergency and Remedial Response, January 1989 E. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Preliminary Remediation Goals, 2014 F. U.S. Nuclear Regulatory Commission, 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. G. U.S. Nuclear Regulatory Commission, Regulatory Guide 4.22, Decommissioning Planning During Operations, December 2012. H. Nuclear Energy Institute, Industry Groundwater Protection Initiative - Final Guidance Document (NEI 07-07), Revision 1, March 2019.

Denotes Change

Continued	<p>2.4 2. W-MS Documents</p> <p style="margin-left: 20px;">A. NA</p> <p>3. Miscellaneous</p> <p style="margin-left: 20px;">A. Storm Water Pollution Prevention Plan (SWPPP)</p> <p style="margin-left: 20px;">B. Spill Prevention Control and Countermeasures (SPCC) Plan</p> <p style="margin-left: 20px;">C. Risk Management Plan (RMP)</p> <p style="margin-left: 20px;">D. Site Emergency Plan (SEP)</p> <p style="margin-left: 20px;">E. Hazardous Materials Best Management Practices Contingency (Hazmat BMP)</p>
2.5	Commitment Summary
	<p>1. CAPR Commitments</p> <ul style="list-style-type: none"> • NA

3.0 TERMS AND DEFINITIONS

3.1	Refer to CA-042, Procedure Terms & Definitions for the following:
	<ol style="list-style-type: none"> 1. NA
3.2	The following Additional Terms/Definitions are used in this Procedure:
	<ol style="list-style-type: none"> 1. Conceptual Site Model (CSM) - A unifying hypothesis to describe the physical, chemical and biological processes that govern the transport, fate, risk, and level of impact of contamination to ecological and/or human receptors at a spatially defined site. The CSM may be written and/or graphical, and incorporates what is known about a site's hydrogeology, existing and past site activities that may have resulted in contaminant releases to the environment, the locations of those releases, and the contaminants of concern. The output is used as a synopsis of site conditions that provide the environmental investigator with an understanding of data gaps or uncertainty, and how to move forward on a project. It is a dynamic tool, and an iterative process that evolves as new insight to a project unfolds. 2. Dose and Risk Assessment - A site specific assessment of the risk and/or dose from residual contamination on the most reasonably exposed individual. The assessments evaluate the exposure pathways and scenarios and account for mitigation measures such as cover material. 3. Partition Coefficient (Kd) - Also known as the distribution coefficient. A measure of the migration potential of contaminants present in aqueous solution in contact with soil. It is a measure of the amount of contaminant absorbed into soil divided by the amount remaining in solution. Contaminants with a low Kd are more readily transported through soil than those with a high Kd. 4. Photoionization Detector (PID) - Is a type of gas detector used to measure volatile organic compounds (VOC) and other gases in concentrations from sub parts per billion to 10,000 parts per million. PIDs produce immediate readings and operate continuously. PIDs monitor VOCs such as solvents, fuels, degreasers and lubricants. 5. Release - An unintended discharge into the environment of any contaminant which has the potential to impact human health or the environment and the ability to migrate off the site. 6. Residual Risk Registry - A decommissioning file recordkeeping index that includes important information regarding the nature and extent of a release, the efforts taken to evaluate the contamination, the remediation of the release, if undertaken, and the final condition of the release area. The documentation will be used for estimation of future decommissioning efforts.

4.0 ROLES AND RESPONSIBILITIES	
4.1	EHS Environmental Engineering
	1. Responsible for administrative execution of this entire procedure.
4.2	EHS Incident Commander
	1. Responsible for stopping immediate releases, coordinating the use of instrumentation during initial assessment of liquid release, and initial cleanup.
4.3	URRS Engineering Technician
	1. Responsible for coordinating disposal efforts and record keeping of disposal manifests.
4.4	EHS Rad Safety
	1. Responsible for surveying and evaluating radiological information.

5.0 INSTRUCTIONS		
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	5.2	Remediation Process 7

5.1	Entry Conditions For Remediation Process
	<ul style="list-style-type: none">• A current release of a Potential Contaminant of Concern (PCOC) on the ground surface or environmental media will initiate the remediation process• A detection of a PCOC in an existing groundwater well that exceeds the drinking water standard Maximum Contaminant Level (MCL) and where the concentration is more than twice the historical average• CSM data analysis indicates need for remediation• The discovery of a past release through soil sampling activities
5.2	Remediation Process
	<ol style="list-style-type: none">1. Reportability determination of an Environmental Release<ol style="list-style-type: none">A. Upon discovery of a new release or the discovery of a historic release, the need for reporting will be determined.<ul style="list-style-type: none">• Determine type and quantity of the release to aid in making a determination of the need to report• Evaluate for reportability in accordance with RA-107, Corrective Action Program for Regulatory Events2. Documentation of the Release<ol style="list-style-type: none">A. Document the release in accordance with RA-137, Decommissioning Recordkeeping.B. At a minimum, the following information will be documented for decommissioning records:<ul style="list-style-type: none">• Best known information regarding date and time of the release• Location of the release• Source of the release and actions taken to stop the release• Contaminant(s) and quantity of the release, if it can be determined (include form and concentration of each nuclide)• Results of samples collected from the release and/or impacted area3. Initial Response and Evaluation<ol style="list-style-type: none">A. Take immediate action to stop any release in progress.

5.2.3
 Continued

- B. Evaluate the release to determine the actions necessary for the protection of human health and the environment, which may include:
- Collect and contain any standing liquid for testing and subsequent disposal.
 - Collect surface water samples as appropriate, per ROP-06-006, Collection of Routine Weekly and Monthly Environmental Samples.

NOTE

The soil will be removed to the extent practical, with the focus being on the removal of any material with noticeable impacts, either visual impacts (e.g., staining, stressed/dead vegetation) or scanning results (e.g., response with PID or scanning meters)

- Remove and contain accessible soil, vegetation and other material in the area of impact for testing and subsequent disposal.
- Utilize instrumentation and/or methodology in Table 1 to determine if additional removal is necessary. Refer to Table 3 for particular contaminants of concern.

Table 1

Contaminant	Instrumentation/ Methodology
Techneium - 99	Geiger-Mueller Ludlum 44-9 (levels >5,000 pCi/g)
Radiological contaminants (gamma emitter)	Sodium-Iodide; (2x2 NaI probe –Ludlum 44-10 or equivalent)
Alpha surface contamination	RadEye (HP 380 or equivalent)
Volatile Organic Compounds (various) e.g. Tetrachloroethylene (PCE), Trichloroethylene (TCE)	PID
Acid/base	Litmus (pH) paper

- C. Document the action taken including quantity and the volume of material removed as appropriate in step 5.2.2.3.B in accordance with RA-137.
- Waste manifest will be kept and a copy will be included in the record of the release

4. Characterization of Residual Impact (after initial release cleanup)

- A. Collect soil samples to evaluate the residual impacts of the release.
- The number of samples required will be determined by EHS Environmental Engineering
 - Review the Storm Water Pollution Prevention Plan (SWPPP), Spill Prevention Control and Countermeasures (SPCC) Plan, Risk Management Plan (RMP), Site Emergency Plan (SEP), and/or Hazardous Materials Best Management Practices Contingency (Hazmat BMP) to determine if additional investigation or actions are required.
 - Review the Consent Agreement (19-02-HW) to determine if additional investigation or actions are required by the Consent Agreement

5.2.4
 Continued

B. Collect soil sample per CFFF procedure RA-136, Soil Sampling & Disposal.

NOTE

Laboratory analysis must follow the necessary methods for achieving reporting limits that are at least as low as the action level for each contaminant of concern

C. The radiological action levels in **Table 2** and **Table 4** are based on single contaminant concentrations for each isotope. When multiple radionuclides are present, a "sum of fractions" or SOF approach should be used to determine compliance with the concentration limit.

- If background subtraction is to be performed, subtract the environmental background concentration from the sample concentration
 - If no background subtraction is necessary, the gross sample concentration may be used
- Only positive results should be used to calculate the sum of fractions, all negative sample results should be set to zero before performing the calculation
- A SOF result exceeding 1.0 indicates that the screening level has not been met
 - A SOF result less than or equal to 1.0 indicates the sample result is below the screening level
- Calculate the sum of fractions for each unique sample using the following equation:

$$SOF = \frac{Conc_{U-234}}{SSL_{U-234}} + \frac{Conc_{U-235}}{SSL_{U-235}} + \frac{Conc_{U-238}}{SSL_{U-238}} + \frac{Conc_{Tc-99}}{SSL_{Tc-99}}$$

D. Compare the Laboratory results to the EPA Regional Screening Levels (RSL) for resident soil and Soil Screening Levels (SSL) for protection of groundwater that are based on risk and Drinking Water Standard (MCL) contained in **Table 2**.

- If screening levels are met, there is no need for further investigation or remediation
 - The release and response will be documented and the CSM will be updated as described in RA-434
- If screening levels are not met, proceed to Section 5.2.4.E

Table 2

Contaminant	Screening Level	Basis of Screening Level
Uranium - 234	13 pCi/g	NUREG 1757, Vol. 2 , Rev. 1, Appendix H ¹
Uranium – 235	8 pCi/g	NUREG 1757, Vol. 2 , Rev. 1, Appendix H ¹
Uranium – 238	14 pCi/g	NUREG 1757, Vol. 2 , Rev. 1, Appendix H ¹
Technetium - 99	19 pCi/g	NUREG 1757 Vol. 2 , Rev. 1, Appendix H ¹
Tetrachloroethylene (PCE)	0.0023 mg/Kg	EPA Regional Screening Levels ²
Fluoride	600 mg/Kg	EPA Regional Screening Levels ²
Nitrate	130,000 mg/Kg	EPA Regional Screening Levels ³

¹NUREG-1757 Vol. 2, Rev.1 Consolidated Decommissioning Guidance, Appendix H: Criteria for Conduction Screening Dose Modeling Evaluations, Table H-2, September 2006. Screening levels are equivalent to 25 mrem/y TEDE to the critical group. These levels are considered suitable for unrestricted use per 10CFR20.1402

²USEPA MCL-based Soil Screening Level (TR=1E-06, HQ=1), November 2018.

³USEPA Regional Screening Level, Summary Table, Residential Soil Screening (TR=1E-06, HQ=1), November 2018

5.2.4
 Continued

- E.** Compare the laboratory results to the action levels listed in **Table 4** to determine the need for further remediation.
- The action levels for soil at the CFFF are set based on the industrial use scenario and are not intended to be indicative of the requirements for final site conditions upon decommissioning
 - Potential groundwater impacts will be monitored through the sampling of downgradient wells per ROP-06-007, Groundwater Well Sampling
 - The soil action levels are established as guidance for residual impacts that are protective of human health and the environment, including potential impacts to groundwater
 - If groundwater sampling results indicate degrading groundwater conditions, such as a result that exceeds twice the historic average for a contaminant, then the soil action levels for removal will be reviewed and revised as necessary
 - Compare groundwater laboratory results to the drinking water standard MCLs
 - The constituents of concern for CFFF are listed in **Table 3**
 - The "sum of fractions" approach does **NOT** apply to drinking water MCLs; the MCL is a maximum permissible value
 - If MCLs are met, there is no need for further investigation
 - If MCLs are not met, enter a CAP and follow Communication Protocol for CA 19-02-HW

Table 3

Contaminant	Drinking Water MCL
Fluoride	4 mg/L
Nitrate	10 mg/L
Tetrachloroethylene (PCE)	0.005 mg/L
Technetium – 99 ¹	900 pCi/L ²
Uranium	30 µg/L ³

¹U.S. Environmental Protection Agency, National Primary Drinking Water Regulations.

²This MCL was established based on carcinogenic risk (i.e. ingestion of this concentration is equal to a radiological dose of 4 mrem/y).

³Soluble uranium is a nephrotoxin thus chemical toxicity is the limiting health hazard. This MCL was established based on non-carcinogenic risk (i.e. established to protect against kidney damage **not** radiological dose because radiological dose from soluble uranium is insignificant).

Table 4

Contaminant	Action Level	Basis of Action Level
Uranium - 234	3,310 pCi/g	NUREG 1757, Appendix H ¹
Uranium – 235	39 pCi/g	NUREG 1757, Appendix H ¹
Uranium – 238	179 pCi/g	NUREG 1757, Appendix H ¹
Technetium - 99	89,400 pCi/g	NUREG 1757, Appendix H ¹
Tetrachloroethylene (PCE)	100 mg/kg	EPA Regional Screening Levels ²
Fluoride	3,100 mg/kg	EPA Regional Screening Levels ³
Nitrate	130,000 mg/kg	EPA Regional Screening Levels ³

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. **The individual isotope limits are based on carcinogenic risk.**

² USEPA Regional Screening Level, Summary Table, Industrial Soil Standard (TR=1E-06, HQ=1), November 2018.

³ USEPA Regional Screening Level, Summary Table, Residential Soil Standard (TR=1E-06, HQ=1), November 2018

5.2.4 Continued	<p>F. If laboratory results indicate the results are below the action levels identified in Table 4, the area is suitable for industrial use.</p> <ol style="list-style-type: none">(1) Therefore, the initial remedial efforts:<ul style="list-style-type: none">• Were protective of human health and the environment• Met regulatory and permit requirements• Will prevent off-site migration of contamination(2) At this stage, the process can move to Section 5.2.6 - Updating the CSM and Residual Risk Registry.(3) Otherwise, additional remediation must be considered and the process will proceed to Section 5.2.5 - Develop and Implement Remedial Actions. <p>5. Develop and Implement Remedial Actions:</p> <p>A. If the laboratory results exceed the action levels in Table 4, further remedial actions will be evaluated and implemented.</p> <ul style="list-style-type: none">• The evaluation will consider the following:<ul style="list-style-type: none">• Dose/risk under current circumstances (industrial worker scenario)• The potential for off-site impacts if the contamination is left in place• An assessment of site conditions may be required as part of the decision making process <p>B. Determine the need for continued removal:</p> <ul style="list-style-type: none">• The decision to remediate the contamination above the action levels will be based on the most current CSM and current plant operations. The evaluation will consider, at a minimum, the following items (similar to CERCLA criteria for remedial alternative evaluation):<ol style="list-style-type: none">(1) Overall Protection of Human Health and the Environment(2) Compliance with Regulations and Permits(3) Long Term Effectiveness(4) Reduction in Toxicity, Mobility or Volume through Treatment(5) Short-term Effectiveness(6) Implementability(7) Current cost verses future benefit <p>C. Evaluate the Effectiveness of Remedial Action:</p> <ol style="list-style-type: none">(1) Using the results of the criteria from 5.2.5.B, an appropriate remedial action will be performed with the intent of achieving the action levels where possible.<ul style="list-style-type: none">• If the remedial action achieves the action levels, the process can move to Section 5.2.6 - Updating the CSM and Residual Risk Registry• Otherwise, additional evaluation will be required through conducting a risk/dose assessment as described in Section 5.2.5.D
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5.2.5 Continued	<p>D. Conduct Site Specific Risk/Dose Assessment:</p> <ol style="list-style-type: none">(1) In the event that the action levels cannot be achieved due to the nature or extent of the contamination, as in the case of inaccessibility, a risk/dose assessment will be performed to ensure protectiveness under the current site conditions.(2) The assessment will take into account site specific and chemical specific parameters, such as soil pH and chemical retardation factors (Kd), engineering controls, and routes of potential migration and exposure.<ol style="list-style-type: none">(a) The results of the assessment may include land use restriction and/or controls, in which case, they will be documented in the Residual Risk Registry.<ul style="list-style-type: none">• If the assessment indicates that the current site-specific conditions are not protective (exceed USEPA Target Risk Range $10E-4$ target risk or an annual dose threshold of 25 mRem/year), continued remediation is warranted and additional removal must be performed• If additional action is not feasible, written approval from the Columbia Fuel Operations Vice President is required to restrict the area to control exposure and to minimize the risk/dose to human health <p>E. Update CSM based on remaining extent of contamination per requirements in RA-434, Environmental Data Management.</p>
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TITLE: ENVIRONMENTAL REMEDIATION
TYPE: REFERENCE USE
DATE: 01-16-20

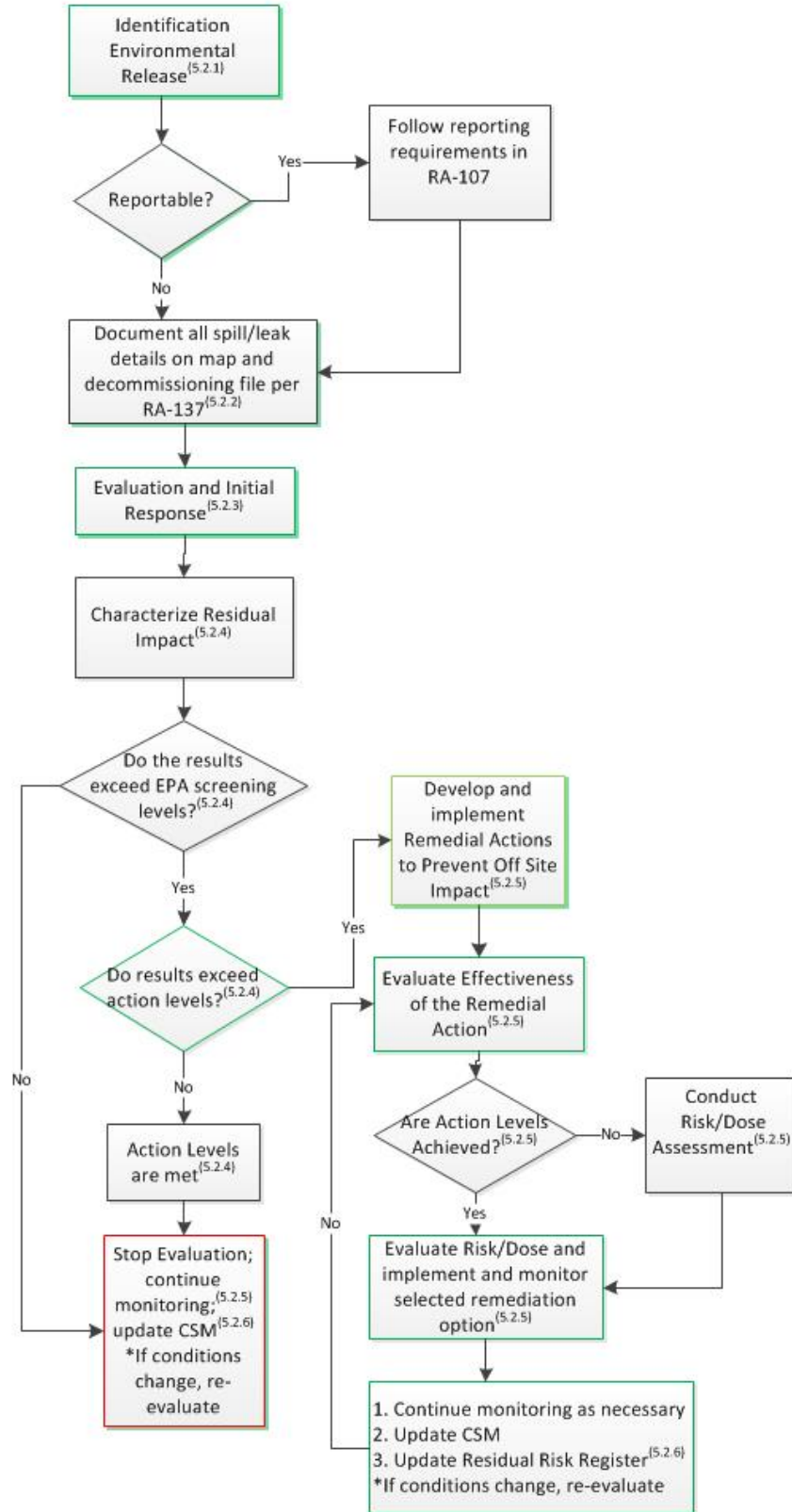
PROCEDURE NO:
REFERENCE NO:
REVISION:

RA-433
NONE
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6.0 ATTACHMENTS	
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Attachment 1: Columbia Environmental Remediation Process

Columbia Environmental Remediation Process



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