



Department of Energy
Savannah River Operations Office
P O Box A
Aiken, South Carolina 29802

ARF-023028

DEC 21 2020

Ms. Susan B. Fulmer, P. G., Manager
Federal Remediation Section
Division of Site Assessment, Remediation and Revitalization
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Mr. Jon Richards
Savannah River Site Remedial Project Manager
Superfund Division
U. S. Environmental Protection Agency, Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30303

Dear Ms. Fulmer and Mr. Richards:

SUBJECT: Proposed Plan for the Lower Three Runs Integrator Operable Unit (U) (SRNS-RP-2019-00058, Revision 1.1 Redline, December 2020) (Redline Pages and Clean Copy), Revised Fact Sheet (SRNS-RP-2020-00110, December 2020), and Savannah River Site's Responses to the Regulatory Comments on the Revision 1 Document, SEMS Number: 35

In accordance with the terms of the Federal Facility Agreement, the U. S. Department of Energy is submitting the subject information for your review. The South Carolina Department of Health and Environmental Control (SCDHEC) approved the Revision 1 document on October 20, 2020 and the U. S. Environmental Protection Agency (EPA) provided comments on the Revision 1 Document on November 13, 2020. The draft Savannah River Site's (SRS) comment responses were transmitted electronically to the SCDHEC and EPA on December 3, 2020. The enclosed final SRS' responses have been incorporated into the revised document. Please review the enclosures and provide your approval within thirty (30) days of receipt. The effort and time that the SCDHEC and the EPA have provided on this operable unit are greatly appreciated.

Questions from you or your staff may be directed to me at (803) 952-8365.

Sincerely, **Brian T.**

Hennessey

Brian T. Hennessey
SRS Remedial Project Manager
Infrastructure and Area Completion Division

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Hennessey
Date: 2020.12.16 17:43:07 -05'00'

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DEC 21 2020

Ms. Susan Fulmer
Mr. Jon Richards

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Enclosures:

1. Proposed Plan for the Lower Three Runs Integrator Operable Unit (U) (SRNS-RP-2019-00058, Revision 1.1, December 2020) SEMS Number: 35 (Redline Pages and Clean Copy)
2. Lower Three Runs Integrator Operable Unit Fact Sheet, SEMS Number: 35 (SRNS-RP-2020-00110, December 2020)
3. SRS Responses to EPA Comments on the Proposed Plan for the Lower Three Runs Integrator Operable Unit (U) (SRNS-RP-2019-00058, Revision 1, September 2020) SEMS Number: 35

cc w/o encl:

J. Blalock, SCDHEC-Columbia
S. French, SCDHEC-Columbia
M. Reece, SCDHEC-Columbia
G. K. Taylor, SCDHEC-Columbia
T. Fuss, SCDHEC–Aiken Environmental Affairs Office
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B. Cameron, SCDHEC–Aiken Environmental Affairs Office

cc w/encl:

R. H. Pope, EPA-Atlanta
M. McRae, TechLaw, Inc.

SRS Responses to
UNITED STATE ENVIRONMENTAL PROTECTION AGENCY
Review of the
Proposed Plan for the Lower Three Runs Integrator Operable Unit (IOU) (U)

SEMS Number: 35 (SRNS-RP-2019-00058), Revision 1, September 2020
Savannah River Site, Aiken, South Carolina

Comments Received: November 13, 2020

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Contact for all comments: Jim Kubar, (803) 507-8072, james.kubar@srs.gov

EPA COMMENTS

1. Section V. A brief summary statement should be added to this section where appropriate clarifying that surface water was not determined to be a media of concern and did not pose an unacceptable risk to the receptors evaluated.

Response: Agree. As documented in the RI/BRA, no constituents in surface water were identified as refined constituents of concern for human or ecological receptors that would require a remedial response. Therefore, surface water was determined to not be a media of concern. Please note that text was previously added to the Redline Revision 1 document in Section V Summary of Site Risks in response to EPA Comment #6 on the Revision 0 document (received 7/27/2020) to explain that the pathways of concern are external exposure to radionuclides in the contaminated sediment/soil for human receptors and contaminated sediment to benthic/aquatic organisms to fish and ultimately to the recreational fisherman.” The text in Section V, Summary Site Risks will be expanded to further clarify that surface water was not a media of concern as follows:

“For the entire Upper subunit of the LTR IOU, the IOU onsite worker was selected as the most likely receptor for exposure to contaminated sediment/soil. The primary pathway of concern is external exposure to radionuclides in the contaminated sediment/soil. Surface water was determined to not be a media of concern and did not pose an unacceptable risk to the IOU onsite worker. The IOU onsite worker...”

Additionally, further into the paragraph a statement on the contaminant pathway to fish will be expanded as follows:

“...Because it is known that some contaminants could bioaccumulate in fish and fish are a mobile medium, the hypothetical recreational fisherman was chosen as the most likely receptor for the ingestion of contaminated fish tissue. The pathway of concern is contaminated sediment/soil to benthic/aquatic organisms to fish and ultimately to the recreational fisherman. Surface water was determined to not be a media of concern and did not pose an unacceptable risk to the receptors evaluated. The recreational fisherman scenario was determined”

2. Page 12, Section V, Summary of Ecological Risk Assessment. Please insert the following text: “Fish in certain areas of the LTR IOU are contaminated with mercury and Cs-137”.

Response: Agree. In Section V, the following text will be added to the second to last paragraph within the Summary of Ecological Risk Assessment section:

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“...literature-based toxicity reference values. The results of the of the ecological risk assessment (ERA) showed that no ecological refined constituents of concern (RCOCs) were identified for any EA within the LTR IOU. Although fish in certain areas of the LTR IOU are contaminated with mercury and Cs-137, Therefore, there were no problems warranting action were identified from an ecological risk perspective.”

3. Page 12, Section V, Conclusion. Please insert the following text: “Surface water sampling was conducted as part of the RI and several metals including mercury exceeded SCDHEC ambient water quality criteria. Also, certain radionuclides such as Cs-137 exceeded screening levels including SDWA MCLs in some samples. However, based on the conceptual site model considerations of the high affinity of Cs-137 for soil/sediments and low solubility in water, it was determined that Cs-137 contamination is predominantly located in soil/sediments, as is mercury; therefore, surface water is not being directly addressed with the proposed remedial action. Instead, actions are proposed to address the sediment as the “source” of the contamination (excavation/dredging, reducing the chance of direct contact for humans and terrestrial ecological organisms by keeping the sediments covered by water, restricting access, posting signs, restricting fishing on DOE property, institutional controls).”

Response: Agree with clarification. Cs-137 did not exceed the SDWA MCL of 200 pCi/L in any sample (e.g., the highest detected level was 176 pCi/L). For clarity, a new paragraph will be added to the beginning of Section V, Conclusion as follows:

“Surface water sampling was conducted as part of the RI and metals and radionuclides were detected in surface water. Several metals including mercury exceeded the SCDHEC ambient water quality criteria, while the highest detected concentration of Cs-137 in surface water was below the surface water maximum contaminant level. Based on the conceptual site model considerations of the high affinity of Cs-137 for sediment/soil and low solubility in water, it was determined that Cs-137 contamination is predominantly located in sediment/soil, as is mercury; therefore, surface water was determined to not be a media of concern and is not being directly addressed with the proposed remedial action. Instead, actions are proposed to address the sediment/soil as the “source” of the contamination (excavation/dredging, LUCs to reduce the chance of direct contact for humans and terrestrial ecological organisms by keeping the sediment/soil covered by water, restricting access, posting signs, restricting fishing on USDOE property, and MNR).”

4. Page 13, Section VI, Remedial Goal Options. Please change the title and text to cross reference and reflect that the RGOs are better referred to as Preliminary Remediation Goals (PRGs) and consistent with the NCP and EPA guidance, revise this subsection to state: "the PRGs for the selected remedy are documented as final remediation levels or cleanup levels in the ROD." Please
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note in future documents that EPA requests usage of the PRG and cleanup levels terminology to be more consistent with current guidance and the NCP.

Response: Agree. The title of Section VI, Remedial Goal Options will be revised to “Preliminary Remediation Goals”, and the text in this section revised to use the PRG terminology in place of the RGO acronym as follows:

“Preliminary remedial goals (PRGs), referred to as Remedial goal options (RGOs) in the RI/FS, serve to provide a range of cleanup goals for each constituent of concern and are typically identified along with the RAOs. These cleanup goals are either concentration levels that correspond to a specific risk or hazard or are based on Applicable or Relevant and Appropriate Requirements (ARARs). Following public comment and approval of the PP, the RGOs PRGs for the selected remedy are documented as final cleanup goals or remedial goals (RGs) in the ROD.

The FS for the LTR IOU (SRNS 2020) developed risk-based ~~RGOs~~ PRGs for the IOU onsite worker for sediment/soil media and recreational fisherman for fish tissue media developed to correspond to a risk of 1E-06 for carcinogens (i.e., Cs-137 and Co-60) and a hazard quotient of 1 for noncarcinogens (i.e., mercury). The ~~RGOs~~ PRGs for the sediment/soil and fish tissue media are shown in Table 1. The risk-based ~~RGOs~~ PRGs were obtained using the calculator function available at the USEPA PRG website (USEPA 2018a) for the radiological constituents and the USEPA RSL website (USEPA 2018b) for mercury. The most likely ~~RGOs~~ PRGs also consider a comparison to background levels. The SRS soil background (two times [2x] the 95th percentile concentration) is identified as the most likely ~~RGO~~ PRG for Cs-137 in sediment/soil media for the onsite worker since this is the generally accepted concentration for “typical” anthropogenic fallout, and has been accepted as the RG for other SRS projects, specifically the SRS Wetland Area at Dunbarton Bay In Support of Steel Creek Integrator Operable Unit (SRNS ~~2013b~~2013c).”

Table 1. Summary of the RGOs for the Upper Subunit of the LTR IOU, will also be revised to replace the RGO acronym with the PRG acronym in the title, table, footnotes and List of Tables. In addition, the RGO acronym will be removed from the acronym list. As requested, the PRG acronym and cleanup levels terminology will be used in future regulatory documents to be more consistent with current guidance and the NCP.

5. Page 24, Section X. As a sub section in this section or in a new section please add the following text: “**FIVE-YEAR REVIEW** - Because hazardous substances will remain at the site above levels that allow for unlimited exposure and unrestricted use, the DOE will review the remedial action no less than every 5 years per CERCLA Section 121(c) and the NCP at 40 CFR 300.430(f)(4)(ii) until
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the levels of COCs allow for unrestricted use and unlimited exposure of soil/sediment. If results of the 5-year reviews reveal that remedy integrity is compromised and protection of human health and the environment is insufficient, then additional remedial actions will be evaluated by the DOE, EPA and SDHEC."

Response: Agree. The following subsection will be added to Section X. Post-ROD Schedule below the key milestone table.

“Five-Year Remedy Reviews

Because hazardous substances will remain at the site above levels that allow for unlimited exposure and unrestricted use, the USDOE will review the remedial action no less than every five years per CERCLA Section 121(c) and the NCP at 40 CFR 300.430(f)(4)(ii) until the levels of COCs allow for unrestricted use and unlimited exposure of soil/sediment. If results of the five-year reviews reveal that remedy integrity is compromised and protection of human health and the environment is insufficient, then additional remedial actions will be evaluated by the USDOE, USEPA and SCDHEC.”

6. Page 27, Section XII, ARARs. Please add the following language: "Reference 40 CFR 300.5 Definitions of ‘Applicable requirements’ and ‘relevant and appropriate requirements’".

Response: Agree. The suggested text will be added to Section XII. Glossary, for the ARARs definition as follows:

“ARARs: Applicable or Relevant and Appropriate Requirements. Refers to the federal and state requirements that a selected remedy will attain. These requirements may vary from site to site. Refer to 40 CFR 300.5 Definitions, “Applicable requirements” and “Relevant and appropriate requirements” for more detail.”



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Proposed Plan for the Lower Three Runs Integrator Operable Unit (U)

SEMS Number: 35

SRNS-RP-2019-00058

Revision 1.1 Redline

September-December 2020

LIST OF ABBREVIATIONS AND ACRONYMS

~	approximate, approximately
ac	acre
ARF	Administrative Record File
ARAR	Applicable or Relevant and Appropriate Requirement
BMP	Best Management Practices
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
EA	Exposure Area
EALUCIP	Early Action Land Use Control Implementation Plan
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ESD	Explanation of Significant Difference
FFA	Federal Facility Agreement
ft	feet
FS	Feasibility Study
ha	hectare
HHRA	Human Health Risk Assessment
IOU	Integrator Operable Unit
IROD	Interim Record of Decision
K	thousand (\$)
km	kilometer
LLC	Limited Liability Company
LUCs	Land Use Controls
LUCIP	Land Use Control Implementation Plan
LTR	Lower Three Runs
m	meter
M	million (\$)
mg/kg	milligram per kilogram
MNR	Monitored Natural Recovery
msl	mean sea level
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
O&M	Operations & Maintenance
OU	Operable Unit
pCi/g	picocurie per gram
PP	Proposed Plan
PRG	Preliminary Remedial Goal
PTSM	Principal Threat Source Material
RAO	Remedial Action Objective
RCOC	Refined Constituent of Concern
RCRA	Resource Conservation and Recovery Act
RG	Remedial Goal
RG	Remedial Goal Option
RI	Remedial Investigation
ROD	Record of Decision
RSL	regional screening level
RWS	River Water System

at levels that exceed 1E-06 risk to an onsite worker (Figure 3).

EA8: Ponds 4 and 5 – Including Canal from Ponds 4 and 5 to Pond C

EA8 includes Ponds 4 and 5 and the canal from Pond 5 to Pond C (EA9). Pond 4 received water from the canal leading from Pond 2 (EA7) and subsequently discharged to Pond 5. Pond 5 discharged to Pond C via a canal. Pond 4 is ~14.3 ha (35.3 ac). Pond 5 is ~4.0 ha (9.9 ac) and received water from Pond 4 and subsequently discharged to the canal from Pond 4 to Pond C is ~1,887-m (6,190.9-ft) long. The canal is ~3.0-m (9.8-ft) across the base of the canal. Water levels fluctuate from year to year in Pond 4, Pond 5, and the canal based on the amount of precipitation. Cs-137 is present in sediment/soil in EA8 at levels that exceed 1E-06 risk to an onsite worker (Figure 3).

EA9: Pond C

Pond C is a ~53.5 ha (132.4 ac) pre-cooler pond that received water from P-Reactor and R-Reactor. Pond C is hydraulically connected to PAR Pond (EA6) through a reverse riser conveyance at the Pond C dam that allows water to flow from Pond C into PAR Pond. The riser uses hydraulic pressure to stabilize water elevation between the two ponds. Pond C maintains its water level from year to year. Cs-137 and Co-60 are present in sediment/soil in EA9 at levels that exceed 1E-06 risk to an onsite worker (Figure 3). In addition, Cs-137 and mercury are present in fish tissue that exceed the risk-based screening levels for the recreational fisherman.

V. SUMMARY OF SITE RISKS

This section identifies the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial actions. Additional information pertaining to the risk assessment can be found in the RI/BRA (SRNS 2017).

Summary of Human Health Risk Assessment

The human health risk assessment evaluates the potential for adverse effects associated with exposure to constituents present at the LTR IOU. The assessment for each subunit estimates the risk potential in the absence of any remedial action and provides a basis for determining whether or not a remedial action is necessary. A streamlined approach that considered both standardized and site-specific receptor scenarios/exposure assumptions was used for this evaluation. The receptors evaluated for the HHRA included a future industrial worker, onsite worker, and recreational fisherman. As a point of comparison, a HHRA for the hypothetical future resident was also evaluated in the RI/BRA as a point of comparison (SRNS 2017).

For the entire Upper subunit of the LTR IOU, the IOU onsite worker was selected as the most likely receptor for exposure to contaminated sediment/soil. The primary pathway of concern is external exposure to radionuclides in the contaminated sediment/soil. Surface water was determined to not be a media of concern and did not pose an unacceptable risk to the IOU onsite worker. The IOU onsite worker is based on an SRS wetland researcher scenario and is also protective of an adolescent trespasser. The risk for the onsite worker conservatively assumes no shielding of radionuclides from water coverage. The IOU onsite worker scenario is applicable to the entire Upper

subunit. Because it is known that some contaminants could bioaccumulate in fish and fish are a mobile medium, the hypothetical recreational fisherman was chosen as the most likely receptor for the ingestion of contaminated fish tissue. The pathway of concern is contaminated sediment/soil to benthic/aquatic organisms to fish and ultimately to the recreational fisherman. Surface water was determined to not be a media of concern and did not pose an unacceptable risk to the receptors evaluated. The recreational fisherman scenario was determined to only be viable for EAs that can sustain populations of consumable fish specifically EA3, EA6, and EA9.

EA1: Pond A – Including R-Area Discharge Canal

As documented in the RI/BRA (SRNS 2017), Cs-137 and Co-60 were identified as human health refined constituents of concern (RCOCs) in sediment/soil for the IOU onsite worker receptor. RCOCs are contaminants that are considered for remedial action. Concentrations in EA1 pose a Total Cumulative Risk (TCR) of 8.2E-04 to the IOU onsite worker (decay corrected to 6.4E-04 to account for radioactive decay from the time the sample was collected). The risk to the IOU onsite worker from Cs-137 (Exposure Point Concentration [EPC] = 148 pCi/g) is 8.2E-04 (decay corrected to 6.4E-04). The risk to the IOU onsite worker from Co-60 (EPC = 0.144 pCi/g) is 1.7E-06 (decay corrected to <1E-06).

Using maximum concentrations [max] and maximum activity concentrations of detected constituents, the only constituent that exceeds the PTSM threshold (i.e., risk $\geq 1\text{E-}03$) in EA1 is Cs-137 (max = 685.8 pCi/g) at one location. The single submerged location (Figure 3) had five separate samples above the PTSM

threshold for the IOU onsite worker and was taken into consideration for the remedial alternative evaluation.

EA2: Canal from Pond A to Pond B

As documented in the RI/BRA (SRNS 2017), Cs-137 was identified as a human health RCOC in sediment/soil for the IOU onsite worker receptor. Cs-137 in sediment/soil (EPC = 48.8 pCi/g) poses a 2.7E-04 risk to the IOU onsite worker (decay corrected to 2.3E-04).

Results of the PTSM evaluation for EA2 indicated no PTSM RCOCs were present.

EA3: Pond B – Including Canal to Pond C

As documented in the RI/BRA (SRNS 2017), Cs-137 was identified as a human health RCOC in sediment/soil for the IOU onsite worker receptor. Cs-137 in sediment/soil (EPC = 98.3 pCi/g) poses a 5.5E-04 risk to the IOU onsite worker (decay corrected to 3.3E-04).

Cs-137 and mercury were identified as human health RCOCs in fish tissue for the recreational fisherman receptor. Cs-137 in fish tissue (max = 113 pCi/g) exceeded the USEPA preliminary remedial goal (PRG) of 0.054 pCi/g (USEPA 2018a). Mercury (max = 1.83 mg/kg) exceeded the USEPA regional screening level (RSL) of 0.154 mg/kg for the recreational fisherman (USEPA 2018b).

Two locations (Figure 3) had sample results above the PTSM threshold (i.e., risk $\geq 1\text{E-}03$) for the IOU onsite worker and were conservatively taken into consideration for the remedial alternative evaluation. Based on an evaluation of the exposure area in its entirety (decay corrected risk = 3.3E-04) and the

Results of the PTSM evaluation for EA8 indicated no PTSM RCOCs were present.

EA9: Pond C

Cs-137 and Co-60 were identified as human health RCOCs in sediment/soil for the IOU onsite worker receptor as documented in the RI/BRA (SRNS 2017). Concentrations pose a TCR of 1.2E-04 to the IOU onsite worker (decay corrected = 6.7E-05). Risk to the onsite worker from Cs-137 (EPC = 20.9 pCi/g) is 1.2E-04 (decay corrected to 6.7E-05). Risk to the onsite worker from Co-60 (EPC = 0.114 pCi/g) is 1.4E-06 (decay corrected to <1E-06).

Cs-137 and mercury were identified as human health RCOCs in fish tissue for the recreational fisherman receptor. Cs-137 (max = 42.5 pCi/g; PRG = 0.054 pCi/g) and mercury (max = 0.214 mg/kg; RSL = 0.154 mg/kg) in fish tissue exceed risk-based screening levels for the recreational fisherman.

Results of the PTSM evaluation for EA9 indicated no PTSM RCOCs were present.

Summary of Ecological Risk Assessment

The habitats within the LTR IOU support both terrestrial and aquatic/semi-aquatic receptors. A conservative screening-level effects evaluation used literature-based ecological threshold levels to assess (i.e., screen) sediment/soil and surface water data from potentially contaminated exposure areas for these receptors. The thresholds were derived from several published sources and were used in a tiered approach to evaluate No- and Low-Adverse Effect Levels. The screening-level ecological effects evaluation concluded that more information was needed for some constituents to more thoroughly assess the risk

potential to wildlife receptors. Trophic-level modeling used site-specific data to address the uncertainty associated with relying strictly on literature-based toxicity values and exposure assumptions. More specifically, aluminum, iron, cyanide, lead, manganese, mercury, dichlorodiphenyldichloroethane (DDD), dichlorodiphenyldichloroethylene (DDE) and dichlorodiphenyltrichloroethane (DDT) were identified as constituents of potential concern.

Risks posed by these contaminants to mammalian and avian receptors (river otter, raccoon, belted kingfisher, and blue heron) that represent the ecological niches of concern were assessed using contaminant exposure models that estimated contaminant intake resulting from ingestion of food, water, and sediment/ soil and compared these intakes with literature-based toxicity reference values. The results of the of the ecological risk assessment (ERA) showed that no ecological refined constituents of concern (RCOCs) were identified for any EA within the LTR IOU. Although fish in certain areas of the LTR IOU are contaminated with mercury and Cs-137, therefore, there were no problems warranting action were identified from an ecological risk perspective.

No ecological RCOCs were identified for either the sediment/soil or surface water medium.

Summary of Contaminant Fate and Transport Analysis

Fate and transport of contaminants from source units was previously evaluated in the individual OU assessments. With respect to the IOU, remedial alternatives were considered that would mitigate transport of soil/sediments downstream and prevent harm to receptors and the public. The alternative

evaluation included the use of best management practices (BMPs) to reduce sediment/soil migration during the implementation stage that may cause disturbance of contaminated media.

Conclusion

Surface water sampling was conducted as part of the RI and metals and radionuclides were detected in surface water. Several metals including mercury exceeded the SCDHEC ambient water quality criteria, while the highest detected concentration of Cs-137 in surface water was below the surface water maximum contaminant level. Based on the conceptual site model considerations of the high affinity of Cs-137 for sediment/soil and low solubility in water, it was determined that Cs-137 contamination is predominantly located in sediment/soil, as is mercury; therefore, surface water was determined to not be a media of concern and is not being directly addressed with the proposed remedial action. Instead, actions are proposed to address the sediment/soil as the “source” of the contamination (excavation/dredging, LUCs to reduce the chance of direct contact for humans and terrestrial ecological organisms by keeping the sediment/soil covered by water, restricting access, posting signs, restricting fishing on USDOE property, and MNR).

As determined in the RI/BRA (SRNS 2017), Cs-137 was identified as a human health RCOC in sediment/soil for all nine EAs for the IOU onsite worker. Co-60 was identified as a human health RCOC in EA5, EA6, EA7 and EA9. In addition, Cs-137 and mercury were identified as human health RCOCs in fish tissue for the recreational fisherman in EA3, EA6, and EA9.

Because Co-60 was collocated with Cs-137, any remedial action selected for Cs-137 in sediment/soil will also address the Co-60 contamination. The presence of mercury is the result of atmospheric deposition (i.e., regional issue/problem) and from the use of the elevated levels of mercury in Savannah River water as part of the river water distribution system for reactor cooling. Therefore, mercury was introduced into the LTR system not as a result of site operations but rather a combination of atmospheric deposition and the use of Savannah River water.

No PTSM RCOCs are identified for any EA within the LTR IOU. This determination is based on an evaluation of each exposure area as a whole and the associated decay-corrected risks that are $<1E-03$, not individual sample results. However, EA1, EA3, and EA5 had specific locations where Cs-137 levels were above the PTSM threshold (i.e., risk $\geq 1E-03$) and were taken into consideration for the remedial alternative evaluation. No ecological RCOCs were identified for either the sediment/soil or surface water medium.

Actual or threatened releases of hazardous substances from this waste unit, if not addressed by the Preferred Alternative(s) or one of the other active measures considered, may present a current or potential threat to public health, welfare, or the environment.

VI. REMEDIAL ACTION OBJECTIVES

RAOs are media- or OU-specific objectives for protecting human health and the environment. RAOs usually specify potential receptors and exposure pathways, and are identified during project scoping once the conceptual site model is understood. RAOs describe what the remediation must accomplish and are used as a framework for developing remedial

alternatives. The RAOs are based on the nature and extent of contamination, threatened resources, and the potential for human and environmental exposure.

The future land use of the LTR IOU is anticipated to be non-residential and primarily used for environmental/ecological research with USDOE maintaining control of the land. The following RAOs have been identified for the LTR IOU to support the future land use.

- Protect IOU onsite workers from exposure to Cs-137 and Co-60 in sediment/soil that exceed 1E-06 risk threshold or background levels. The primary exposure route of concern is the external radiation pathway.
- Protect the recreational fisherman from exposure to Cs-137 and mercury in fish tissue. The primary route of exposure is the ingestion of fish pathway.

Remedial Goal Options Preliminary Remedial Goals

~~Preliminary remedial goals (PRGs), referred to as Remedial goal options (RGOs) in the RI/FS,~~ serve to provide a range of cleanup goals for each constituent of concern and are typically identified along with the RAOs. These cleanup goals are either concentration levels that correspond to a specific risk or hazard or are based on Applicable, or Relevant and Appropriate Requirements (ARARs). Following public comment and approval of the PP, the ~~RGOs-PRGs~~ for the selected remedy are documented as final cleanup goals or remedial goals (RGs) in the ROD.

The FS for the LTR IOU (SRNS 2020) developed risk-based ~~RGOs-PRGs~~ for the IOU onsite worker for sediment/soil media and recreational fisherman for fish tissue media developed to correspond to a risk of

1E-06 for carcinogens (i.e., Cs-137 and Co-60) and a hazard quotient of 1 for noncarcinogens (i.e., mercury). The ~~RGOs-PRGs~~ for the sediment/soil and fish tissue media are shown in Table 1. The risk-based ~~RGOs-PRGs~~ were obtained using the calculator function available at the USEPA PRG website (USEPA 2018a) for the radiological constituents and the USEPA RSL website (USEPA 2018b) for mercury.

The most likely ~~RGOs-PRGs~~ also consider a comparison to background levels. The SRS soil background (two times [2x] the 95th percentile concentration) is identified as the most likely ~~RGO-PRG~~ for Cs-137 in sediment/soil media for the onsite worker since this is the generally accepted concentration for “typical” anthropogenic fallout, and has been accepted as the RG for other SRS projects, specifically the *SRS Wetland Area at Dunbarton Bay In Support of Steel Creek Integrator Operable Unit* (SRNS 2013c).

Applicable or Relevant and Appropriate Requirements

ARARs are cleanup standards, standards of control and other substantive requirements, criteria or limitations promulgated under federal, state, or local environmental laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Section 121(d) of CERCLA, as amended by the Superfund Amendments Reauthorization Act, requires that remedial actions comply with requirements and standards set forth under federal and state environmental laws.

Three categories of ARARs are identified to clarify how to identify and comply with environmental

Assurance Plan (WSRC 1999) to ensure that land use restrictions are maintained and periodically verified. The unit-specific Land Use Control Implementation Plan (LUCIP) for the Upper subunit of the LTR IOU will be referenced in the ROD and will provide the details and specific measures required for the LUCs selected as part of this preferred remedy. The approved LUCIP will establish implementation, monitoring, maintenance, reporting, and enforcement requirements for the unit. LUCIP modification will only occur through appropriate CERCLA documentation and require approval by USEPA and SCDHEC required for any modification or termination of the LUCs.

Based on the information currently available, the lead agency believes that Alternative A-2 LUCs with MNR for the entire Upper subunit (EA1 thru EA9), in addition to Alternative A-5 Excavation, Treatment and Disposal of PTSM Sediment/Soil for EA1, and Alternative A-6 Maintain Water in Ponds for both EA3 and EA6 provide the best balance of tradeoffs among the alternatives with respect to the evaluation criteria (Table 3). The USDOE expects the Preferred Alternatives to satisfy the statutory requirements in CERCLA Section 121(b) to: 1) be protective of human health and the environment, 2) comply with ARARs, 3) be cost-effective, 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and 5) satisfy the preference for treatment as a principal element.

A detailed cost estimate, representative of an order of magnitude estimate with an assumed accuracy in the range of +50/-30%, for the preferred alternative is provided in Appendix A.

X. POST-ROD SCHEDULE

Key milestones include the following:

Deliverable	Submittal Date
Submit Revision 0 ROD	December 7, 2020
Issuance of ROD	August 20, 2021
Submit Revision 0, Remedial Action Implementation Plan	October 29, 2021
Submit Revision 0, LUCIP	October 29, 2021
Remedial Action Start	November 18, 2022
Submit Revision 0, Post-Construction Report/Remedial Action Completion Report	August 20, 2024

Five-Year Remedy Reviews

Because hazardous substances will remain at the site above levels that allow for unlimited exposure and unrestricted use, the USDOE will review the remedial action no less than every five years per CERCLA Section 121(c) and the NCP at 40 CFR 300.430(f)(4)(ii) until the levels of COCs allow for unrestricted use and unlimited exposure of soil/sediment. If results of the five-year reviews reveal that remedy integrity is compromised and protection of human health and the environment is insufficient, then additional remedial actions will be evaluated by the USDOE, USEPA and SCDHEC.

XII. GLOSSARY

Administrative Record File: A file that is maintained and contains all information used to make a decision on the selection of a response action under the Comprehensive Environmental Response, Compensation and Liability Act. This file is to be available for public review, and a copy is to be established at or near the Site, usually at one of the information repositories. Also a duplicate file is held in a central location, such as a regional or state office.

ARARs: Applicable or Relevant and Appropriate Requirements. Refers to the federal and state requirements that a selected remedy will attain. These requirements may vary from site to site. Refer to 40 CFR 300.5 Definitions, "Applicable requirements" and "Relevant and appropriate requirements" for more detail.

Baseline Risk Assessment: Analysis of the potential adverse health effects (current or future) caused by hazardous substance release from a site in the absence of any actions to control or mitigate these releases.

Characterization: The compilation of all available data about the waste units to determine the rate and extent of contaminant migration resulting from the waste site, and the concentration of any contaminants that may be present.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 1980: A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act.

Corrective Action: A USEPA requirement to conduct remedial procedures under RCRA 3004(u) at a facility when there has been a release of hazardous waste or constituents into the environment. Corrective action may be required beyond the facility boundary and can be required regardless of when the waste was placed at the facility.

Exposure: Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, digestive tract, etc.) and available for absorption.

Exposure Point Concentration (EPC): Risk and hazard calculations are based on the RME (reasonable maximum exposure) exposure point concentrations, which is defined as the lesser of the maximum detected concentration and the 95% upper confidence level (UCL) of the mean concentration. The 95% UCL is a statistically derived number based on the sampling data for each exposure area.

Federal Facility Agreement (FFA): The legally binding agreement between regulatory agencies (USEPA and SCDHEC) and regulated entities (USDOE) that sets the standards and schedules for the comprehensive remediation of the SRS.

Land Use Controls: Legal and/or administrative mechanisms as well as physical installations that modify or guide human behavior at operable units where residual contamination remains in place. Institutional controls and engineering controls are types of land use controls.

Table 1. Summary of the ~~RGs~~PRGs for the Upper Subunit of the LTR IOU

Media	RCOC	Units	IOU Onsite Worker RG ¹ <u>PRG</u> ¹	Recreational Fisherman RG ¹ <u>PRG</u> ¹	SRS BKGRD 95th %tile ²	2X SRS BKGRD 95th %tile ²	SRS BKGRD Max ²	IOU BKGRD Max ³	Most Likely RG ¹ <u>PRG</u> ¹
Sediment/ Soil	Cesium-137 (+D)	pCi/g	0.144	NA	0.34	<i>0.68</i>	3.3	0.623	0.68
	Cobalt-60	pCi/g	<i>0.0295</i>	NA	NA	NA	NA	0.011	0.0295
Fish Tissue	Cesium-137 (+D)	pCi/g	NA	<i>0.0544</i>	NA	NA	NA	0.488	0.0544
	Mercury	mg/kg	NA	<i>0.154</i>	NA	NA	NA	0.24	0.154

Notes:

The IOU onsite worker scenario is based on the most likely human receptor for the Upper Subunit: an SRS worker/researcher (exposure assumptions: 20 years, 150 days/year, 8 hours/day). Because it is known that some contaminants could bioaccumulate in fish, and fish are a mobile media, the evaluation of human exposure also included a hypothetical recreational fisherman scenario for the ingestion of fish (exposure assumptions: 26 years, 350 days/year, 54 g/day).

Sources of the most likely ~~RG~~PRG are italicized

NA = not applicable

¹ Risk-based ~~RGs~~PRGs obtained using the calculator function available at the USEPA Preliminary Remediation Goals website (USEPA 2018a) for the radiological constituents and the USEPA Regional Screening Levels website (USEPA 2018b) for mercury.

² SRS background concentrations obtained from the *Background Soils Statistical Summary Report for the Savannah River Site*, Table B-1 (WSRC 2006) and the IOU Background Dataset (SRNS 2017), as available.

³ IOU Background maximum concentrations from the *Remedial Investigation/Baseline Risk Assessment for the Lower Three Runs Integrator Operable Unit* (SRNS 2017).