



Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Native Soil Covers and/or Land Use Controls (U)

Aiken, South Carolina

| **SEMS Number: 00**

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U.S. Department of Energy
and
Savannah River Nuclear Solutions, LLC
Aiken, South Carolina**

Sixth Five-Year Remedy Review Report for SRS OUs
with Native Soils Covers and/or LUCs (U)
Savannah River Site
~~December 2018~~June 2019

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Redline Rev. 01

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SRS efficient and has allowed remediation at many OUs to be accomplished on an accelerated schedule.

The collaborative efforts of the USDOE, USEPA, and SCDHEC support a consistent approach to site characterization, human health and ecological risk analyses, remedy selection, establishment of remedial goals (RGs) and remedy implementation for individual OUs at SRS. Technical and administrative protocols have been established to promote the consistent implementation of USEPA guidance at OUs across SRS. An environmental database is used to track sampling, analysis, and results of environmental characterization and monitoring. An SRS Area Completion Strategy (WSRC 2006) was developed which allowed for the simultaneous characterization and cleanup of multiple OUs and potential sources of contamination in congested industrial areas.

Table 3 provides a summary of the LUC objectives for the OUs with native soil covers and/or LUCs.

Basis for Taking Action

The most prevalent soil contaminants at SRS are cesium-137 and organic chemicals (volatile or semi-volatile). Other radionuclides, metals, polychlorinated biphenyls, and pesticides are present, but less common, at levels that exceed human health risk-based standards at a variety of units.

Remedial actions which result in any hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure are reviewed every five years to ensure protection of human health and the environment. The specific contaminants and remedial actions for each OU in this five-year remedy review are described in greater detail in the OU-specific appendices (Appendix C through Appendix M).

Response Action Summary

Remedial actions may target source areas, soil, vadose zone, and/or groundwater. RGs are defined for individual OUs, but in general, remedial action objectives (RAOs) at SRS are:

- Prevent exposure of trespassers, industrial workers, and hypothetical residents to soils, surface water, or groundwater containing unacceptable levels of contaminants.
- Prevent exposure of ecological receptors to soils, surface water, or groundwater containing unacceptable levels of contaminants.
- Prevent or minimize the migration of contaminants to groundwater at levels that exceed maximum contaminant levels (MCLs).
- Prevent or minimize the discharge of contaminated groundwater to surface water at levels that exceed MCLs.

Additionally, LUCs are part of all remedial actions where hazardous substances, pollutants, or contaminants remain on-site above levels that allow for unlimited use and unrestricted exposure. The type of LUCs and implementation and reference to the OU-specific land use control implementation plan (LUCIP) are described in detail in Section VII of the OU-specific appendices. LUCs are defined for individual OUs, but in general, LUC objectives at SRS are:

- Prevent exposure to, or ingestion of, contaminated media.
- Prohibit residential use.
- Prevent unauthorized access.
- Prevent unauthorized intrusive activity.

Table 2 lists the remedial actions for each of the OUs in this five-year remedy review report. The remedial actions are described in greater detail in the OU-specific appendices (Appendix C through Appendix M). Table 3 provides a summary of the LUC objectives for the OUs with native soil covers and/or LUCs.

Status of Implementation

Except for In Situ Decommissioning (ISD) at the C-, K-, and L-Reactor Complexes, the remedial actions listed in Table 2 have been implemented. LUCs are ongoing at all OUs discussed in this five-year remedy review report. The status of all response actions or

Site Inspection Checklist included with the OU-specific reports located in Appendix C through Appendix M;

- Reviewed changes in standards and to-be-considered guidance including federal and state promulgated standards (i.e., chemical specific applicable or relevant and appropriate requirements [ARARs]) that would call into question whether the prescribed remedy was meeting the newer standards or guidance. Any problems or discrepancies are reported in Section VII (Technical Assessment), Section VIII (Issues), and Section IX (Recommendations and Follow-up Actions) of the OU-specific appendices; and
- Submitted a draft Fact Sheet to USEPA and SCDHEC for review with Revision 0 of the Sixth Five-Year Remedy Review Report for SRS OUs with Native Soil Covers and/or LUCs.

Community Notification and Involvement

USDOE will address any comments received from USEPA and SCDHEC and provide a Revision 1 report for USEPA and SCDHEC approval. After the USEPA and SCDHEC approve this report and USDOE, USEPA, and SCDHEC sign this report, a notice of its availability will be published in the *Aiken Standard* (Aiken, SC), *The Augusta Chronicle* (Augusta, GA), *The People Sentinel* (Allendale and Barnwell, SC), and *The State* (Columbia, SC) newspapers. Additionally, the availability of the report will be announced in *The Savannah River Site Environmental Bulletin*, which will be sent to the SRS mailing list. The report will be made available to the public at four information repositories. A briefing to the Citizens Advisory Board will be conducted prior to finalizing the report.

Data Review, Site Inspections, and Interviews

According to the data reviewed, the site inspections, and interviews, the remedies selected for the SRS OUs included in this report are functioning as intended by the decision documents. The exposure assumptions, toxicity data, cleanup levels, and RAOs used at

the time of remedy selection are still valid for all OUs included in this report. No new information has come to light that calls into question the protectiveness of the remedies.

USEPA and SCDHEC ~~are expected to perform~~performed site inspections of OUs with native soil covers and/or LUCs with issued RODs/IRODs/ESDs on March 19 and 21, in January 2019 and April 25, 2019. The Revision 0 report ~~will be~~was submitted on ~~or before~~ December 20, 2018.

V. TECHNICAL ASSESSMENT

The technical assessment of the environmental cleanup program at SRS in general and each of the OU-specific remedies evaluated in this report (Appendix C through Appendix M) is described by answers to the following three questions posed by the USEPA.

- Question A: Is the remedy functioning as intended by the decision documents?
- Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs still valid?
- Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Question A: Is the remedy functioning as intended by the decision documents?

Answer: Yes. SRS environmental remedies are functioning as intended as demonstrated below.

- Contaminated material has been excavated and consolidated or left in place under protective native soil covers breaking the pathway for worker exposure.
 - The cover system maintenance program and LUCs have been effective in maintaining the integrity of the cover systems at SRS OUs. The annual inspection reports indicate no significant deficiencies.
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Table 2. SRS OUs with LUCs

#	Appendix	Operable Unit	SEMS No.	Remedy Decision Document Year ^a	Remedial Action ^b	Area with Native Soil Cover (acres)	LUCs (acres)
1	C	C-Area Operable Unit	79	2015	LUCs	NA	93.86
2	D	C-, K-, and L-Reactor Complexes ^c	79, 90, 91, 95	2009	In situ Decommissioning (ISD), LUCs	NA	10.6
3	E	Early Construction and Operational Disposal Site (ECODS) L-1, N-2, P-2, and R-1A, R-1B, R-1C	22	2010	LUCs	1.22	6.4
4	F	F-Area Burning/Rubble Pits (231-F, 231-1F, and 231-2F)	14	1997	LUCs	1.18	3.8
5	G	Gunsite 012 (including ECODS G-3)	78	2011	LUCs	NA	8.9
6	H	Heavy Equipment Wash Basin (NBN) and Central Shops Burning/Rubble Pit (631-5G)	53	2005	LUCs	0.28	0.3
7	I	K-Area Bingham Pump Outage Pit (643-1G)	20	1998	LUCs	0.59	0.6
8	J	L-Area Bingham Pump Outage Pits (643-2G, 643-3G) and P-Area Bingham Pump Outage Pits (643-4G)	26, 39	2000	LUCs	1.18	1.2
9	K	PAR Pond (685-G) (Including the Pre-Cooler Ponds and Canals) and Lower Three Runs (LTR) Integrator Operable Unit (IOU) Tail Portion (Middle and Lower Subunits)	35	1995, 2012	Repair Dam and Maintain the Level at 58.5 m (195 ft) Elevation Minimum, Excavation, LUCs for LTR IOU	1340 (water) NA	5535.2
10	L	R-Area Bingham Pump Outage Pits (643-8G, 643-9G and 643-10G) and R-Area Unknown Pits #1, #2, and #3	38	2003	LUCs	1.75	3.1
11	M	Silverton Road Waste Unit (731-3A)	13	1997, 2005	LUCs	5.3	5.3

a Reflects year the decision document (i.e., RODs, IRODS, EARODs, and ESDs) was issued.

b LUCs are identified as the remedial action for SRS OUs with native soil covers in place prior to selection of the final remedy. ~~Maintenance of the native soil covers is a component of remedy implementation.~~

c The decision document included R-Reactor Complex. However, R-Reactor Complex is evaluated in R-Area Operable Unit (Phase 2: Groundwater OUs) and is not discussed in this phase.

NA Not applicable

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Table B-2. Comparison of Radiological Standards in Soil Media

Analyte ^c	2014 PRGs ^a		2018 PRGs ^b		SEMS Number(s) ^{ed}
	Resident Soil (pCi/g)	Industrial Worker Soil (pCi/g)	Resident Soil (pCi/g)	Industrial Worker Soil (pCi/g)	
Americium-241	1.89E+00	4.82E+00	2.27E+00 (5.19E-02)	4.67E+00 (8.40E-02)	79, 90, 91
Americium-243(+D)	1.57E-01	2.88E-01	9.47E-01 (3.56E-02)	1.62E+00 (5.67E-02)	79, 90, 91
Antimony-125	4.72E-01	6.88E-01	4.13E-01 (6.30E-02)	6.01E-01 (9.55E-02)	79, 90, 91
Barium-133	1.73E-01	2.69E-01	1.68E-01 (8.05E-02)	2.49E-01 (1.22E-01)	79, 90, 91
Carbon-14	2.79E+02	1.11E+03	3.17E+02 (3.16E+02)	1.11E+03 (1.11E+03)	79, 90, 91
Cesium-137(+D)	6.23E-02	1.03E-01	2.53E+01 (4.55E-02)	5.71E+01 (6.90E-02)	13, 14, 20, 35, 38, 79, 90, 91
Cobalt-60	3.90E-02	5.78E-02	3.30E-02 (9.35E-03)	4.83E-02 (1.42E-02)	35, 38, 79, 90, 91
Curium-243	3.33E-01	5.75E-01	3.50E-01 (3.85E-02)	5.41E-01 (6.16E-02)	79, 90, 91
Curium-244	7.25E+00	3.41E+01	8.76E+00 (9.79E-03)	3.30E+01 (1.52E-02)	79, 90, 91
Curium-245	3.95E-01	7.40E-01	3.87E-01 (4.57E-02)	6.15E-01 (7.39E-02)	79, 90, 91
Europium-152	4.06E-02	6.43E-02	3.87E-02 (2.14E-02)	5.74E-02 (3.24E-02)	79, 90, 91
Europium-154	4.80E-02	7.35E-02	4.73E-02 (1.98E-02)	6.97E-02 (2.99E-02)	79, 90, 91
Molybdenum-93	1.14E+02	2.99E+02	1.38E+02 (1.02E+02)	3.17E+02 (2.82E+02)	79, 90, 91
Nickel-59	1.08E+03	1.11E+04	7.44E+02 (7.44E+02)	2.10E+03 (2.10E+03)	79, 90, 91
Nickel-63	4.93E+02	4.99E+03	5.72E+02 (5.23E+02)	4.88E+03 (4.48E+03)	79, 90, 91
Niobium-94	1.60E-02	2.79E-02	1.60E-02 (1.60E-02)	2.43E-02 (2.43E-02)	79, 90, 91
Plutonium-238	3.23E+00	1.44E+01	4.28E+00 (1.26E-02)	1.41E+01 (2.02E-02)	79, 90, 91
Plutonium-239	2.82E+00	1.25E+01	3.79E+00 (4.53E-02)	1.22E+01 (7.27E-02)	79, 90, 91
Plutonium-240	2.83E+00	1.27E+01	3.81E+00 (9.80E-03)	1.23E+01 (1.52E-02)	79, 90, 91
Potassium-40	1.50E-01	2.65E-01	1.44E-01 (1.44E-01)	2.19E-01 (2.19E-01)	14, 79, 90, 91
Radium-226(+D)	1.27E-02	2.23E-02	1.03E+00 (1.27E-02)	3.05E+00 (2.03E-02)	79, 90, 91

Table B-2. Comparison of Radiological Standards in Soil Media (continued/end)

Analyte ^c	2014 PRGs ^a		2018 PRGs ^b		SEMS Number(s) ^d
	Resident Soil (pCi/g)	Industrial Worker Soil (pCi/g)	Resident Soil (pCi/g)	Industrial Worker Soil (pCi/g)	
Radium-228(+D)	3.19E-02	4.84E-02	1.47E+00 (9.87E-03)	7.50E+00 (1.53E-02)	79, 90, 91
Sodium-22	9.04E-02	1.32E-01	7.77E-02 (1.12E-02)	1.13E-02 (1.70E-02)	79, 90, 91
Strontium-90(+D)	3.71E+00	8.91E+00	1.34E+01 (3.13E+00)	3.84E+01 (6.76E+00)	14, 79, 90, 91
Thorium-228(+D)	1.54E-01	2.30E-01	2.80E+01 (1.56E-02)	1.07E+02 (2.38E-02)	79, 90, 91
Tritium (H-3)	9.34E-01	1.27E+00	2.37E-01 (1.25E-01)	2.99E-01 (1.61E-01)	79, 90, 91
Uranium-238(+D)	7.25E-01	1.49E+00	6.48E+00 (1.24E-02)	3.12E+01 (2.00E-02)	79, 90, 91

a Soil PRGs available in 2014 were the August 2010 USEPA Radiological PRGs for soil media.

b USEPA Radiological PRGs for soil media, May 2018. Top entry for each constituent is the PRG for the individual radionuclide (no progeny included, with decay). Bottom entry (in parenthesis) is the default secular equilibrium PRG that includes daughter products from the entire decay chain.

c Analytes listed were identified as COCs for the OUs discussed in Appendix C through Appendix M of this document.

d OUs and corresponding SEMS number(s) are identified in Appendix A, Table A-7.

pCi/g = picoCuries per gram

VI. FIVE-YEAR REVIEW PROCESS

The following tasks were performed as part of the review:

- Reviewed the documents listed in Section XII, References;
- Confirmed the implementation of the Remedial Actions;
- Inspected the OU, interviewed maintenance personnel and documented the results on the Inspection Checklist provided in Attachment C-1; and
- Reviewed changes in standards and to-be-considered guidance.

Summary of Inspections and Interviews

Interviews were conducted with Richard Feagin, O&M staff member, on October 16, 2018, and George Joyner, O&M Site Manager, on October 16, 2018 at the O&M organization offices. No issues were identified during these interviews. The CAOU was inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area Completion Projects (EC&ACP) on October 29, 2018. No issues were identified during this inspection.

The CAOU was inspected by SRNS EC&ACP and USDOE personnel on December 3, 2018. No issues were identified for the CAOU during this inspection.

A site inspection ~~will be~~ was conducted by USEPA and SCDHEC personnel, accompanied by USDOE and SRNS personnel, on March 19, 2019 ~~prior to submittal of the Revision 1 of this document. It is anticipated that n~~ No significant problems regarding this OU ~~will be~~ were identified during the inspection.

Scheduled annual site inspections conducted from FY2017 to FY2018 identified overgrown vegetation. These findings were documented on the field inspections checklists and resolved soon after discovery.

Disturbance of the ECODS C-1

On January 21, 2016, SRS initially notified USEPA and SCDHEC of a soil disturbance discovered on January 12, 2016 at the ECODS C-1 including a statement that additional details would be provided in a follow-up notification no later than February 1, 2016

(SRNS 2016a). The soil disturbance occurred prior to the installation of the access control warning signs. As part of the follow-up notification on February 1, 2016, SRS included a description of the discovery, photos of the subunit, map of the area disturbed, and an explanation of how the disturbance would be managed going forward (SRNS 2016b). The U.S. Department of Agriculture – Forest Service (USFS) planted pine seedlings in and around the ECODS C-1 during the month of December 2015. During clearing and grubbing of the vegetation in preparation for the planting activities, the USFS disturbed the top foot of soil at the ECODS C-1 based on a misunderstanding of the previous site use permit conditions applicable to this planting activity. The SCDHEC and USEPA responded to the notification with a request for a meeting to discuss the protocols for the site use permits, implementation of LUCs, and the plan for soil sampling (SCDHEC 2016, USEPA 2016). A walkdown of ECODS C-1 occurred on March 1, 2016 to discuss the details of the discovery. USDOE agreed to perform additional sampling to determine the extent of soil disturbance and responded to the SCDHEC’s and USEPA’s comments (USDOE 2016). Subsequent sampling indicated benzo(a)pyrene exceeded the 1E-06 residential risk level at one surface soils location beyond the proposed LUC boundary on the western portion of the ECODS C-1. The LUC boundary was modified to include this area of disturbance (Figure C-4). No activities inconsistent with the CAOU LUCs have occurred since the resolution of this discovery.

VII. TECHNICAL ASSESSMENT

Is the Remedy Functioning as Intended by the Decision Document?

The selected remedy of LUCs for the CAOU is effective in preventing human health exposure to the RCOCs and is functioning as intended.

The above remedial activities are meeting the RAOs established for the CAOU, as discussed in Section IV, by eliminating or controlling all routes of exposure to human health.

The Early Action Land Use Control Implementation Plan for CAOU governs LUC implementation, maintenance, monitoring, reporting, and enforcement (SRNS 2015a). The LUCs that are in place include physical access controls to prevent unauthorized entry to

ensure worker safety include work controls, worker training, and worker briefings of health and safety requirements;

- SRS access controls to prevent exposure to trespassers, as described in the 2013 RCRA Permit Renewal Application, Volume I, Section F.1, which describes the security procedures and equipment, 24-hour surveillance system, artificial or natural barriers, control entry systems, and warning signs in place at the SRS boundary; and
- In the long term, if the property, or any portion thereof, is ever transferred from USDOE, notice of the type and quantity of any hazardous substances that were known to have been stored (for more than one year), released, or disposed of on the property will be provided. In addition, if the property, or any portion thereof, is ever transferred by deed, the U.S. Government will also satisfy the requirements of CERCLA 120(h)(3) to include a description of the remedial action taken, a covenant, and an access clause.

System Operations/Operation and Maintenance

Inspection activities are performed annually to verify that the existing warning signs are in acceptable condition and to verify that required access controls to the Reactor Complexes are in place and functioning.

The operation and maintenance (O&M) costs associated with the selected remedy for CKL Rx include annual inspections and periodic repair/replacement of roofs and covers. Table D-3 compares the actual O&M cost over the last four years to the estimated cost from the EAROD for the CKL Rx. The EAROD estimated a direct O&M cost of \$700,000 for 200 years of maintenance activities for a single reactor complex. The estimated direct O&M cost for the three reactor complexes from fiscal year (FY) 2015 to FY2018 is \$42,000 as compared to the actual O&M cost of \$25,318 for project support and other post-construction expenses for the same period. The EAROD estimate had O&M starting in FY2008 instead of the actual of FY2011.

V. Progress Since Last Review

This is the third five-year review for the CKL Rx. The previous protectiveness statement concluded that because the remedial actions of LUCs and in situ decommissioning are

protective, the site is protective of human health and the environment. However, for the remedy to be protective in the long-term, the remainder of the remedy for implementing ISD for the CKL Rx must be completed.

There were no recommendations or follow-up actions from the last five-year review.

VI. Five-Year Review Process

The following tasks were performed as part of the review:

- Reviewed the documents listed in Section XII, References; and
- Inspected the CKL Rx, interviewed maintenance personnel, and documented the results on the Inspection Checklist provided in Attachment D-1 with the purpose of assessing the protectiveness of the remedy and the functionality of the access controls.

Data Review

Characterization activities for the CKL Rx have not begun. The information to support the early action remedial decision for the CKL Rx was based on a range of expected conditions for the reactor complexes due to similar designs and operational histories with the P- and R-Reactor Complexes.

Summary of Inspections and Interviews

Interviews were conducted with Richard Feagin, O&M staff member, and George Joyner, O&M Site Manager, on October 16, 2018 at the O&M organization offices. No issues were identified for the CKL Rx during these interviews. The CKL Rx were inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area Completion Projects (EC&ACP) on September 26, 2018. No issues were identified during these inspections.

The CKL Rx were inspected by SRNS EC&ACP and USDOE personnel on December 3, 2018. No issues were identified for the CKL Rx during the inspection.

A site inspection ~~will be~~ was conducted by USEPA and SCDHEC personnel, accompanied by USDOE and SRNS personnel, on March 19, 2019 ~~prior to submittal of the Revision 1~~

~~of this document. It is anticipated that n~~No significant problems regarding this OU will ~~be~~ identified during the inspection.

Scheduled annual site inspections conducted from FY2014 through FY2018 did not identify any findings that needed to be addressed.

VII. Technical Assessment

Is the Remedy Functioning as Intended by the Decision Document?

The selected remedy of LUCs for the CKL Rx is effective in preventing the exposure of industrial receptors to contaminated media or structures. The remainder of the remedy selected in the EAROD, to implement ISD, will be completed upon closure of the Reactor Building Complexes to address all threats associated with the Reactor Building Complexes.

The Early Action Land Use Control Implementation Plan for the CKL Rx governs LUC implementation, maintenance, monitoring, reporting, and enforcement of LUCs (SRNS 2010). The LUCs that are in place include physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), use restriction to prevent unauthorized contact, removal, or excavation of subsurface soils, and restrictions to prevent disturbance of the CKL Rx. Warning signs are in good condition, and no activities were observed that would have violated the LUCs. All LUC objectives are being met.

Are Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives still valid?

The exposure assumptions, toxicity data, and cleanup levels used at the time of remedy selection are still valid. There have been no changes in standards or physical conditions of the CKL Rx that would affect the protectiveness of the remedy.

Since the CKL Rx have not begun characterization activities, a final list of constituents of concern (COCs) and RGs have not been determined. The methods to calculate preliminary remediation goals, COCs, and RGs will be determined prior to conducting the formal remedial investigation/baseline risk assessment and issuing the final ROD. The USEPA standards and toxicity values have been updated since the last five-year remedy review as shown in Appendix B. ~~The changes to the values for COCs at CKL Rx were not significant,~~

~~and the RAOs, continue to be met by the remedial action.~~ No new standards or to-be-considered guidance have been identified that call into question the protectiveness of the remedy. The RAOs at CKL Rx continue to be met by the remedial action.

Fact sheets provided on the USEPA webpage regarding emerging contaminants were reviewed for applicability to this site. None of the listed emerging contaminants were identified as applicable to this unit.

Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No new information has come to light that could call into question the protectiveness of the remedy.

VIII. Issues

There are no issues related to current site conditions or activities that would prevent the remedy from being protective once it is implemented.

IX. Recommendations and Follow-up Actions

There are no recommendations or follow-up actions for CKL Rx.

X. Protectiveness Statement(s)

The selected remedies for CKL Rx are currently protective of human health and the environment.

Exposure pathways that could result in unacceptable risks are being controlled by LUCs to prevent exposure to or ingestion of contaminated soil and concrete media. All threats to CKL Rx are being addressed through physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), administrative controls that maintain CKL Rx for industrial use only, and warning signs and use restrictions via the Site Use/Site Clearance Program. However, for the remedy to be protective in the long-term, the remainder of the remedy in the EAROD to implement ISD for the Reactor Complexes must be completed.

metals, and potentially friable asbestos. ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C were subsequently transferred to Appendix C of the FFA as a RCRA/CERCLA OU for further evaluation. An abbreviated RCRA Facility Investigation (RFI) /Remedial Investigation (RI), Baseline Risk Assessment (BRA), and Corrective Measures Study/Feasibility Study (CMS/FS) were prepared for each of the ECODs and presented in a Statement of Basis/Proposed Plan.

Basis for Taking Action

The RFI/RI/BRA/CMS/FS evaluations determined that there were no refined constituents of concern (COCs) that warranted a remedial action for human health (i.e., industrial worker and residential receptors), ecological receptors, contaminant migration concerns, or principal threat source material. However, asbestos is likely present in the buried waste and there is the potential for friable asbestos exposure to human receptors if buried debris below 0.3-m (1-ft) depth were brought to the surface. Soil, dust, or air samples were not taken for asbestos; however, the USDOE exercised the option to proceed directly to a response action because there is a potential threat of release and exposure to friable asbestos (USEPA 2008). Therefore, there are no risks or remedial goals associated with ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU.

IV. Remedial Actions

Remedy Selection

As stated in the Record of Decision (ROD) (SRNS 2009), the remedial action objective (RAO) developed for the ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU is as follows:

- Prevent human exposure to contaminants including buried asbestos present in the subsurface soils that may present a risk to a future industrial worker or resident.

As stated in the ROD, the selected remedy for the ECODS is land use controls (LUCs) (i.e., institutional controls) to limit access to the areas.

Remedy Implementation

Following waste disposal activities, the trenches were backfilled with soil to create a native soil cover. Implementation of the ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU remedial action included the following:

- Establishing LUCs for 2.6 hectares (6.43 acres) [0.71 hectares (1.76 acres) for ECODS R-1A, R-1B, and R-1C; 0.98 hectares (2.42 acres) for ECODS P-2; 0.53 hectares (1.31 acres) for ECODS N-2; and 0.38 hectares (0.94 acres) for ECODS L-1] to prevent land disturbance activities and to prevent exposure to subsurface soils that may contain friable asbestos. LUCs will consist of signage at the waste unit and use restrictions via the Site Use/Site Clearance program.
- Implementation of existing access controls to prevent exposure to trespassers, as described in the 2013 RCRA Permit Renewal Application, Volume I, Section F.1, which describes the security procedures and equipment, 24-hour surveillance system, artificial or natural barriers, control entry systems, and warning signs in place at the SRS boundary.

Discussions pertaining to these elements are provided in the Corrective Measures Implementation Report/Remedial Action Completion Report for the ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU (SRNS 2011). Figure E-7 includes photographs of the ECODS in 2018.

System Operations/Operations & Maintenance

There are no system operational requirements.

Maintenance requirements consist of annual site inspections and site maintenance (if needed to repair erosion damage, filling depressions [i.e., subsidence] and upkeep of warning signs).

The operation and maintenance (O&M) cost associated with the selected remedy for the ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU includes the annual inspections and LUCs. Table E-2 compares the actual O&M cost over the last four years to the estimated cost from the ROD for the four ECOD areas. The ROD estimated direct O&M cost is

\$2,500 per year for 30 years for a single ECOD area. The estimated O&M cost for the four ECOD areas from fiscal year (FY) 2015 until the end of FY2018 is \$55,000 as compared to the actual O&M cost of \$93,697 for the same period. The difference between estimated and actual costs can be attributed to inspection and maintenance costs for the ECODS being underestimated. Based on inspections, maintenance activities completed on the ECODs include additional trimming of the areas surrounding the ECODs, addressing active ant mounds on the ~~natural~~-native soil covers, repairing a depression within the ECODs R-1A, R-1B, and R-1C unit boundary, clearing trees from access roads and trails, and removing vegetation that was blocking the signs.

V. Progress Since Last Review

This is the third five-year review for the ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU. The previous protectiveness statement concluded that because the remedial actions of LUCs are protective, the sites are protective of human health and the environment.

There were no recommendations or follow-up actions from the last five-year review.

VI. Five-Year Review Process

The following tasks were performed as part of the review:

- Reviewed the documents listed in Section XII, Documents Reviewed;
- Confirmed the implementation of the remedial action;
- Inspected the OU, interviewed maintenance personnel and documented the results on the Inspection Checklist provided in Attachment E-1; and
- Reviewed changes in standards and to-be-considered guidance.

Summary of Inspections and Interviews

Interviews were conducted with Richard Feagin, O&M staff member, and George Joyner, O&M Site Manager, on October 16, 2018 at the O&M organization offices. No issues were identified for the ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU during these interviews. The ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU was inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area

Completion Projects (EC&ACP) on October 13, 2018 (ECODS L-1), September 17, 2018 (ECODS N-2), and September 27, 2018 (ECODS P-2, R-1A, R-1B, and R-1C). No issues were identified during these inspections.

The ECODS L-1 and P-2 were inspected by SRNS EC&ACP and USDOE personnel on November 29, 2018; the ECODS N-2, R-1A, R-1B, and R-1C OU were inspected on December 3, 2018. No issues were identified for the ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU during this inspection.

A site inspection ~~will be~~was conducted by U.S. Environmental Protection Agency (USEPA) and South Carolina Department of Health and Environmental Control personnel, accompanied by USDOE and SRNS personnel, on March 19, 2019~~prior to submittal of the Revision 1 of this document. It is anticipated that n~~No significant problems regarding this OU ~~will be~~were identified during the inspection.

Scheduled annual site inspections conducted from FY2015 through FY2018 identified the presence of down trees, overgrown vegetation near signs, and ant mounds on native soil covers. These findings were documented on the field inspection checklist and resolved soon after discovery.

VII. Technical Assessment

Is the Remedy Functioning as Intended by the Decision Document?

The selected remedy of LUCs for the ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU, is effective in preventing human exposure to buried asbestos and is functioning as intended.

The above remedial activities are meeting the RAOs established for the ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU, as discussed in Section IV, by eliminating or controlling all routes of exposure to human health.

The Land Use Control Implementation Plan for ECODS L-1, N-2, P-2, R-1A, R-1B, and R-1C OU governs LUC implementation, maintenance, monitoring, reporting, and enforcement of LUCs (SRNS 2010). The LUCs that are in place include physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), use restrictions to prevent unauthorized contact, removal or excavation of subsurface soils, and

soil borings were taken within the pits (four in each pit) and four deep soil borings (geohydrologic data) were completed. Seven temporary monitoring wells and six permanent monitoring wells were installed. Approximately 228 soil and water samples were taken for analyses.

Basis for Taking Action

The RFI/RI Report (WSRC 1996a) determined that most contaminants in the FBRP OU are in the interval from 1.2 m (4 ft) bgs to the bottom of Pits 231-F and 231-1F (3 m [10 ft] bgs). Detailed information regarding the development of constituents of potential concern, the fate and transport of contaminants, and the risk assessment can be found in the RFI/RI Report (WSRC 1996a) and the baseline risk assessment (BRA) (WSRC 1996b).

The final constituents of concern (COCs) for soil at Pits 231-F and 231-1F were arsenic, benzo(a)pyrene, heptachlorodibenzo-p-dioxin (HpCDD), cesium-137, and potassium-40 (Figure F-3). The risks for future residential land use were 2E-05 for soil ingestion and 3E-05 for direct radiation. For future industrial land use, the risks were 5E-06 for soil ingestion and 3E-06 for direct radiation.

The final COCs for soil at Pit 231-2F were Aroclor 1254, cesium-137, potassium-40, and strontium-90. The risks for future residential land use were 2E-05 for soil ingestion and 5E-06 for direct radiation. For future industrial land use, the risks were 4E-06 for soil ingestion and 2E-06 for direct radiation.

There were no final ecological COCs.

Groundwater Assessment

Contaminant transport modeling included in the BRA (WSRC 1996b) demonstrated that the soil contaminants constitute little or no risk to groundwater. However, groundwater contamination was present downgradient of the FBRP OU at a total risk (future resident) of 1E-04 and a hazard index of 3 for all exposure pathways and contaminants. A technical memorandum and summary for the groundwater (WSRC 1998b) demonstrated that the FBRP OU is not the source of the groundwater contamination that was detected both

upgradient and downgradient. Currently, the groundwater in this area is being addressed as part of the GSA Western Groundwater OU.

IV. Remedial Actions

Remedy Selection

The remedial action objectives (RAOs) for this unit are as follows:

- Protect human health (future residents) from exposure to Aroclor-1254, cesium-137, potassium-40, and strontium-90 in Pit 231-2F soil above the 1E-06 risk level and from exposure to Aroclor-1254 in Pit 231-2F soil above a hazard index of 1 (WSRC 1997);
- Protect human health (future residents) from exposure to arsenic, benzo(a)pyrene, HpCDD, cesium-137, and potassium-40 in Pits 231-F and 231-1F soil above the 1E-06 risk level (WSRC 1997); and
- Protect human health (future industrial worker) from exposure to arsenic, HpCDD, benzo(a)pyrene, cesium-137 and potassium-40 in Pits 231-F and 231-1F and from exposure to Aroclor-1254 in Pit 231-2F above the 1E-06 risk level (WSRC 1997).

The selected remedial action for the FBRP OU consists of:

- Institutional controls (i.e., LUCs) that will restrict the land to future industrial use (WSRC 1997).

Remedy Implementation

Following waste disposal activities, the pits were covered with soil to create a native soil cover. The final remedial action for FBRP OU was institutional controls consisting of:

- Establishing LUCs for 1.56 hectares (3.83 acres).
 - Installing warning signs to indicate that this area was used to manage hazardous materials;
 - Existing SRS access controls (SRS site security) will be used to maintain the use of this site for industrial use only;
-

- Institutional controls (i.e., administrative measures) and use restrictions for on-site workers via the Site Use/Site Clearance Program. Other administrative controls to ensure worker safety include work controls, worker training, and worker briefings of health and safety requirements; and
- In the long-term, if the property is ever transferred to non-federal ownership, the U.S. Government would create a deed for the new property owner in compliance with Section 120(h) of CERCLA that includes notification disclosing former FBRP waste management and disposal activities, results from groundwater monitoring, and remedial actions taken on the site. The deed would also include deed restrictions precluding residential use of the property.

Discussions pertaining to these elements are provided in the Final Remediation Report for the FBRP OU (WSRC 1998a). Figures F-5 and F-6 are photographs of FBRP OU in 2018.

System Operations/Operations and Maintenance

There are no system operational requirements.

The following activities are ongoing:

- Annual site inspections for general site conditions and site maintenance; and
- Groundwater assessment based on data from the ongoing monitoring associated with the GSA Western Groundwater OU.

The Record of Decision (ROD) (WSRC 1997) estimated direct operating and maintenance (O&M) cost associated with the selected remedy for FBRP OU as \$500 per year for 30 years and five-year remedy review cost of \$3,000 every five years. Table F-2 compares the actual O&M cost over the last four years to the estimated cost from the ROD. The estimated direct O&M cost from fiscal year (FY) 2015 to FY2018 are \$5,000 as compared to the total actual O&M cost of \$41,390 for the same period. The actual cost is higher than the estimated cost because periodic inspections and site maintenance (e.g., mowing) were not included in the estimated cost. Additionally, repairs to the native soil cover were

conducted to fix damage from feral hogs rutting and active ant mounds on the native soil cover.

V. Progress Since Last Review

This is the sixth five-year review for the FBRP OU. The previous protectiveness statement concluded that because the remedial actions of institutional controls at FBRP OU are protective, the site is protective of human health and the environment.

There were no recommendations or follow-up actions from the last five-year review.

VI. Five-Year Review Process

The following tasks were performed as part of the review:

- Reviewed documents listed in Section XII, Documents Reviewed,
- Reviewed the groundwater monitoring data presented in Table F-4 to verify that FBRP OU is not the source of groundwater contamination;
- Confirmed implementation of the remedial action;
- Inspected the OU, interviewed maintenance personnel, and documented the results on the Inspection Checklist provided in Attachment F-1; and
- Reviewed changes in standards and to-be-considered guidance.

Data Review

Groundwater data, as reported in the annual GSA Western Groundwater OU Scoping Summaries (SRNS 2015, SRNS 2016, SRNS 2017 and SRNS 2018), was reviewed. As shown in Figures F-7 and F-8, groundwater contaminants present at the FBRP OU are part of larger plumes that originate upgradient of this OU. Table F-4 provides a summary of groundwater data for the GSA Western Groundwater OU West Plume, which includes the FBRP OU. The data show the highest contaminant concentrations emanate from the F-Area facilities with the plumes moving through the subsurface below the FBRP OU. Though tetrachloroethylene and trichlorofluoromethane concentrations are highest in FBP series wells, these wells are located upgradient of the FBRP OU indicating these

constituents are emanating from the F-Area facilities. The data also indicate that concentrations are decreasing or remaining constant for all the constituents of interest.

Initially, radionuclides (including iodine-129, strontium-90, technetium-99, etc.) were analyzed for as part of the FBRP OU monitoring. However, sampling from 2002 through 2006 in the FBP wells indicated radionuclide results were non-detect, which demonstrated that the FBRP is not a source of these constituents. After five years of non-detects, analyses for specific radionuclide constituents were discontinued; analyses for gross alpha, nonvolatile beta, and tritium continues.

The ongoing monitoring associated with the GSA Western Groundwater OU provides data supporting the conclusion that the FBRP is not a source of groundwater contamination.

Summary of Inspections and Interviews

Interviews were conducted with Richard Feagin, O&M staff member and George Joyner, O&M Site Manager, on October 16, 2018 at the O&M organization offices. No issues were identified for the FBRP OU during these interviews. The FBRP OU was inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area Completion Projects (EC&ACP) on August 29, 2018. No issues were identified during this inspection.

The FBRP OU was inspected by SRNS EC&ACP and USDOE personnel on November 29, 2018. No issues were identified for the FBRP OU during the inspection.

A site inspection ~~will be~~ was conducted by U.S. Environmental Protection Agency (USEPA) and South Carolina Department of Health and Environmental Control personnel, accompanied by USDOE and SRNS personnel, on March 19, 2019 ~~prior to submittal of the Revision 1 of this document. It is anticipated that n~~ No significant problems regarding this OU ~~will be~~ were identified during the inspection.

Scheduled annual site inspections conducted from FY2015 through FY2018 identified the presence of downed trees, overgrown vegetation near signs, evidence of hog rutting and ant mounds on the native soil covers, and a small area of subsidence. These findings were documented on the field inspection checklist and resolved soon after discovery.

VII. Technical Assessment

Is the Remedy Functioning as Intended by the Decision Document?

The selected remedy, institutional controls (i.e., LUCs), is effective in preventing human exposure to contaminants above the 1E-06 risk level and is functioning as intended.

The above remedial activities are meeting the remedial goals established for the FBRP OU, as discussed in Section IV, by eliminating or controlling all routes of exposure to human health.

The Land Use Control Implementation Plan for FBRP OU is discussed in Section 2.0 of the Final Remediation Report and governs institutional controls (i.e., LUCs) implementation, maintenance, monitoring, reporting, and enforcement of LUCs (WSRC 1998a). The LUCs that are in place include physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), use restriction to prevent unauthorized contact, removal or excavation of subsurface soils, and restrictions to prevent disturbance of the FBRP OU. Warning signs are in good condition, and no activities were observed that would have violated the LUCs. All LUC objectives are being met.

Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Still Valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid. There have been no changes in standards or physical conditions of FBRP OU that would affect the protectiveness of the remedy.

The USEPA standards and toxicity values have been updated since the last five-year remedy review as shown in Appendix B. The changes to the values for COCs at the FBRP OU were not significant, and the RAOs continue to be met by the remedial action. No new standards or to-be-considered guidance have been identified that call into question the protectiveness of the remedy.

Fact sheets provided on the USEPA webpage regarding emerging contaminants were reviewed for applicability to this site. None of the listed emerging contaminants were identified as applicable to this unit.

Attachment F-1. Five-Year Review Site Inspection Checklist – F-Area Burning/Rubble Pits (231-F, 231-1F, and 231-2F) Operable Unit (*continued*)

IV. O&M COSTS	
1. O&M Organization:	
<input type="checkbox"/> State In-House	<input type="checkbox"/> Contractor for State
<input type="checkbox"/> PRP In-House	<input type="checkbox"/> Contractor for PRP
<input checked="" type="checkbox"/> Other: <u>SRS</u>	
2. O&M Cost Records:	
<input type="checkbox"/> Readily Available	<input type="checkbox"/> Up to Date
<input type="checkbox"/> Funding mechanism/agreement in place	
<input checked="" type="checkbox"/> Other: <u>Project cost data is summarized in Section IV of this OU-specific review.</u>	
3. Unanticipated or Unusually High O&M Costs During Review Period	
Describe costs and reasons: <u>N/A</u>	
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
A. Fencing	
1. Fencing Damage: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Gates secured <input checked="" type="checkbox"/> N/A	
Remarks: <u>OU-specific fencing is not required by the remedial action.</u>	
B. Signs	
1. Signs and Other Security Measures: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A	
Remarks: <u>Signs are in good condition.</u>	
C. Institutional Controls	
1. Implementation and Enforcement	
Site conditions imply ICs are not properly implemented:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Site conditions imply ICs are not being fully enforced:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Type of monitoring (e.g., self-reporting, drive-by, etc.) <u>Walkdown</u>	
Frequency: <u>Once in five years</u>	
Responsible Party/Agent: <u>USDOE Savannah River Field Office</u>	
Contact:	<u>Phil Prater</u> <u>DOE Program Manager</u> <u>11/29/18</u> <u>803-952-9333</u> (Name) (Title) (Date) (Phone No.)
Reporting is up-to-date:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Reports are verified by the lead agency:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Specific requirements in deed of decision document have been met:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Violations have been reported:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Problems/Suggestions: <input type="checkbox"/> Report Attached	
<hr/>	
2. Adequacy: <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A	
Remarks: _____	

Attachment F-1. Five-Year Review Site Inspection Checklist – F-Area Burning/Rubble Pits (231-F, 231-1F, and 231-2F) Operable Unit (*continued*)

V. ACCESS AND INSTITUTIONAL CONTROLS (<i>Continued</i>)	
D. General	
1. Vandalism/Trespassing:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism is evident Remarks: _____
2. Land use changes onsite:	<input checked="" type="checkbox"/> N/A Remarks: _____
3. Land use changes offsite:	<input checked="" type="checkbox"/> N/A Remarks: _____
VI. GENERAL SITE CONDITIONS	
A. Roads	<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A
1. Roads damaged:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
B. Other Site Conditions: Annual site inspections conducted from 2015 through 2018 identified the presence of down trees, overgrown vegetation near signs, evidence of hog rutting and ant mounds on the native soil covers, and a small area of subsidence. These findings were documented on the field inspection checklist and resolved soon after discovery. Remarks: <u>Site vegetation is mowed regularly.</u>	
VII. LANDFILL COVER/CONTAINMENT <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
X. OTHER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emissions, etc.). <u>The remedial action for the FBRP OU is institutional controls (i.e., LUCs) to prevent exposure to contaminants in soil. The remedy is fully established and functioning as designed.</u>	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>The O&M procedures consisting of annual (2015-2018) site inspections and site maintenance (verify no invasive activities have occurred and warning signs) and site controls (SRS Site Use and Site Clearance Programs, which restrict invasive and permanent installation activities at the waste unit) have been implemented. The O&M procedures are adequately maintaining the FBRP OU and the condition of its warning signs is good. There are no issues requiring corrective actions</u>	
C. Early Indicators of Potential Remedy Failure	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. <u>N/A</u>	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>N/A</u>	

End of Checklist

- Access controls to prevent exposure to trespassers, as described in the 2013 RCRA Permit Renewal Application, Volume I, Section F.1, which describes the security procedures and equipment, 24-hour surveillance system, artificial or natural barriers, control entry systems, and warning signs in place at the SRS boundary.

Remedial Implementation

Implementation of the Gunsite 012 OU remedial action included the following activities:

- Establishing LUCs for 3.6 hectares (8.85 acres).
- Installing warning signs at the LUC boundaries of the Building Pad and Parking Area subunits in October 2011.
- Implementing access controls at the SRS boundary to control and restrict public and trespasser access to Gunsite 012 OU.

Figure G-4 presents current (2018) photographs of this OU.

System Operations/Operations and Maintenance

There are no system operational requirements. Maintenance activities consist of annual site inspections and site maintenance (i.e., warning signs and verification that no invasive activities have occurred).

The ROD estimated direct operation and maintenance (O&M) cost associated with the selected remedy as \$2,500 each year for 30 years. The five-year remedy review cost is estimated at \$15,000 every five years. Table G-3 compares the actual O&M cost over the last four years to the estimated cost from the ROD. The estimated direct O&M cost from fiscal year (FY) 2015 to FY2018 is \$25,000 as compared to the actual O&M cost of \$76,686 for the same period. The difference in estimated verses actual costs is attributed to the maintenance costs being underestimated. Based on inspections, maintenance activities completed on Gunsite 012 include addressing active ant mounds, trimming of vegetation within LUC boundary and access roads.

V. Progress Since Last Review

This is the third five-year review for the Gunsite 012 OU. The previous protectiveness statement concluded that because the remedial action of LUCs is protective, the Gunsite 012 OU are protective of human health and the environment.

There were no recommendations or follow-up action from the last five-year review.

VI. Five-Year Review Process

The following tasks were performed as part of the review:

- Reviewed the documents listed in Section XII, Documents Reviewed;
- Confirmed implementation of the remedial action;
- Inspected the OU, interviewed maintenance personnel, and documented the results on the Inspection Checklist provided in Attachment G-1; and
- Reviewed changes in standards and to-be-considered guidance;

Summary of Inspections and Interviews

Interviews were conducted with Richard Feagin, O&M staff member, and George Joyner, O&M Site Manager, on October 16, 2018 at the O&M organization offices. No issues were identified for the Gunsite 012 OU during these interviews. The Gunsite 012 OU was inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area Completion Projects (EC&ACP) on September 12, 2018. No issues were identified during this inspection.

The Gunsite 012 OU was inspected by SRNS EC&ACP and USDOE personnel on November 26, 2018. No issues were identified for the Gunsite 012 OU during these inspections.

A site inspection ~~will be~~ was conducted by South Carolina Department of Health and Environmental Control and U.S. Environmental Protection Agency (USEPA) ~~and South Carolina Department of Health and Environmental Control~~ personnel, accompanied by

USDOE and SRNS personnel, on March 21, 2019 and April 25, 2019, ~~prior to submittal of the Revision 1 of this document~~ respectively. ~~It is anticipated that a~~ No significant problems regarding this OU ~~will be~~ were identified during the inspection.

Scheduled annual site inspections conducted from FY2015 through FY2018 identified the presence of overgrown vegetation and ant mounds ~~on soil covers~~. These findings were documented on the field inspection checklist and resolved soon after discovery.

VII. Technical Assessment

Is the Remedy Functioning as Intended by the Decision Document?

The selected remedy of LUCs for the Gunsite 012 OU is effective in preventing future residents from exposure to PAHs and antimony and is functioning as intended.

The above remedial activities are meeting the RGs established for the Gunsite 012 OU, as discussed in Section IV, by eliminating or controlling all routes of exposure to human health.

The Land Use Control Implementation Plan for Gunsite 012 OU governs LUC implementation, maintenance, monitoring, reporting, and enforcement of LUCs (SRNS 2011b). The LUCs that are in place include physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), use restriction to prevent unauthorized contact, removal or excavation of, and restrictions to prevent disturbance of the Gunsite 012 OU. Warning signs are in good condition, and no activities were observed that would have violated the LUCs. All LUC objectives are being met.

Are Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs still valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid. There have been no changes in standards or physical conditions of the Gunsite 012 OU that would affect the protectiveness of the remedy.

The USEPA standards and toxicity values have been updated since the last five-year remedy review as shown in Appendix B. The changes to the values for COCs at the Gunsite

012 OU were not significant, and the RAOs continue to be met by the remedial action. No new standards or to-be-considered guidance have been identified that call into question the protectiveness of the remedy.

Fact sheets provided on the USEPA webpage regarding emerging contaminants were reviewed for applicability to this site. None of the listed emerging contaminants were identified as applicable to this unit.

Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Strategy?

No other information has come to light that could call into question the protectiveness of the remedy.

VIII. Issues

There are no issues related to current site conditions or activities that currently prevent the remedy from being protective.

IX. Recommendations and Follow-up Actions

There are no recommendations or follow-up actions for Gunsite 012 OU.

X. Protectiveness Statement(s)

The remedy at the Gunsite 012 OU is protective of human health and the environment.

Exposure pathways that could result in unacceptable risks are being controlled with LUCs to prevent exposure to or ingestion of contaminated soil. All threats the Gunsite 012 OU are being addressed through physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), administrative controls that maintain the Gunsite 012 OU for industrial use only, and warning signs and use restrictions via the SRS Site Use/Site Clearance Program.

Attachment G-1. Five-Year Review Site Inspection Checklist – Gunsite 012 Operable Unit (NBN) (continued)

IV. O&M COSTS				
1. O&M Organization:				
<input type="checkbox"/> State In-House	<input type="checkbox"/> Contractor for State			
<input type="checkbox"/> PRP In-House	<input type="checkbox"/> Contractor for PRP			
<input checked="" type="checkbox"/> Other: <u>SRS</u>				
2. O&M Cost Records:				
<input type="checkbox"/> Readily Available	<input type="checkbox"/> Up to Date	<input type="checkbox"/> Funding mechanism/agreement in place		
<input checked="" type="checkbox"/> Other: <u>Project cost data is summarized in Section IV of this OU-specific review</u>				
3. Unanticipated or Unusually High O&M Costs During Review Period				
Describe costs and reasons: <u>N/A</u>				
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A				
A. Fencing				
1. Fencing Damage: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Gates secured <input checked="" type="checkbox"/> N/A				
Remarks: <u>OU-specific fencing is not required by the remedial action.</u>				
B. Signs				
1. Signs and Other Security Measures: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A				
Remarks: <u>Signs are in good condition.</u>				
C. Institutional Controls				
1. Implementation and Enforcement				
Site conditions imply ICs are not properly implemented:		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> N/A
Site conditions imply ICs are not being fully enforced:		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> N/A
Type of monitoring (e.g., self-reporting, drive-by, etc.) <u>Field Walkdown</u>				
Frequency: <u>Once every five years</u>				
Responsible Party/Agent: <u>USDOE Savannah River Field Office</u>				
Contact:	<u>Brian Hennessey</u>	<u>Federal Project Manager</u>	<u>11/26/18</u>	<u>803-952-8365</u>
	(Name)	(Title)	(Date)	(Phone No.)
Reporting is up-to-date:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Reports are verified by the lead agency:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Specific requirements in deed of decision document have been met:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Violations have been reported:		<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> N/A
Problems/Suggestions: <input type="checkbox"/> Report Attached				
<hr/>				
2. Adequacy: <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A				
Remarks: _____				

Attachment G-1. Five-Year Review Site Inspection Checklist – Gunsite 012 Operable Unit (NBN) (continued/end)

V. ACCESS AND INSTITUTIONAL CONTROLS (Continued)	
D. General	
1. Vandalism/Trespassing:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism is evident Remarks: _____
2. Land use changes onsite:	<input checked="" type="checkbox"/> N/A Remarks: _____
3. Land use changes offsite:	<input checked="" type="checkbox"/> N/A Remarks: _____
VI. GENERAL SITE CONDITIONS	
A. Roads	<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A
1. Roads damaged:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
B. Other Site Conditions: Annual site inspections conducted from 2015 through 2018 identified the presence of overgrown vegetation and ant mounds on soil covers. These findings were documented on the field inspection checklist and resolved soon after discovery. Remarks: Site vegetation is mowed routinely.	
VII. LANDFILL COVER/CONTAINMENT <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
X. OTHER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emissions, etc.). <u>The Gunsite 012 OU consists of two subunits that warrant remediation. The remedy for the Building Pad and the Parking Area Subunits is LUCs. Warning signs have been posted at either end of the subunits and administrative controls have been put in place to prevent unauthorized invasive activities at the subunits. The remedy, LUCs, is fully established and functioning as designed.</u>	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>The O&M procedures consisting of annual (2015-2018) site inspections and site maintenance (verify no invasive activities have occurred and warning signs) and site controls (SRS Site Use and Site Clearance Programs, which restrict invasive and permanent installation activities at the OU) have been implemented. The O&M procedures are adequately maintaining Gunsite 012 and the condition of its warning signs is good. There are no issues requiring corrective actions.</u>	
C. Early Indicators of Potential Remedy Failure	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. N/A	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. N/A	

End of Checklist

was no longer directed to the HEWB. Since 1981, the HEWB has not received water from Central Shops and the associated facilities. The HEWB only collects stormwater now.

The HEWB Overflow Discharge Area historically received permitted discharges from the HEWB via a high overflow discharge culvert installed under the berm at the northern end of the HEWB. Portions of the releases either infiltrated the soil or traveled surficially to the intermittent stream. This same floodplain served as a conduit for occasional excess stormwater flow.

The CSBRP-5G pit received waste materials including asbestos, used batteries and empty paint cans along with ash, paper, and glass at various times from 1951 until 1973. Waste was also burned periodically at CSBRP-5G from 1951 until 1973 when a layer of soil was placed over the ashes. The pit continued to receive rubble such as paper, empty paint cans, lumber, and empty galvanized steel barrel until 1973.

Initial Response

After operations ceased, the HEWB and the HEWB Overflow Discharge Area were abandoned in place. When the CSBRP-5G reached capacity in 1973 waste disposal ceased and was covered with 0.6 m to 0.9 m (2 ft to 3 ft) of soil and brought to grade.

Basis for Taking Action

Characterization data was collected and evaluated in the RCRA Facility Investigation (RFI)/Remedial Investigation (RI) Report with Baseline Risk Assessment (WSRC 2003) to identify refined constituents of concern (RCOCs) which are constituents warranting remedial action. There were no RCOCs identified for the industrial worker scenario. There were no RCOCs identified for the CSBRP-5G or the Overflow Discharge Area based on unrestricted (residential) land use. There were six RCOCs identified for the HEWB based on unrestricted (residential) land use including benzo(a)pyrene, alpha chlordane, gamma chlordane, heptachlor epoxide, dichlorodiphenyldichloroethane (DDD), and dichlorodiphenyltrichloroethane (DDT). The contamination is isolated to the surface soil in the HEWB.

The hypothetical risk to the future resident for exposure to surface soil contamination in the HEWB was 2.7E-05. This presents a condition that warrants institutional controls (i.e.,

land use controls [LUCs]) to prevent unrestricted land use as documented in the ROD for the HEWB/CSBRP-5G and consistent with the LUCAP for the SRS.

Based on the unit characterization data and risk assessment results, the risks associated with the CSBRP-5G and HEWB Overflow Discharge Areas subunits are negligible. No RCOCs for human health or ecological receptors were identified at the two subunits. No Action was the selected response for these two subunits and they remain in their present conditions with no restrictions or LUCs. The HEWB/CSBRP-5G OU does not contain contaminated soil that could act as a source of future contamination to the groundwater through leaching. Therefore, this OU is not a “source control” unit.

IV. Remedial Actions

Remedy Selection

Six RCOCs are present at concentrations representing a combined risk greater than 1E-06 at the HEWB subunit and residential exposure must be prevented. Therefore, the following remedial action objective (RAO) was identified for the HEWB subunit:

- Prevent residential exposure to contaminated soil at the HEWB subunit.

The human health RCOCs and remedial goals (RGs) for the HEWB subunit are listed in Table H-2.

Remedy Implementation

Following waste disposal activities, CSBRP-5G was covered with soil to create a native soil cover. The selected remedy for the HEWB/CSBRP-5G OU is institutional controls (i.e., LUCs) which include access controls (SRS site security), access control signs posted around the HEWB subunit, periodic inspections, and deed restrictions.

Implementation of the HEWB OU remedial action included the following activities:

- Establishing LUCs for the HEWB subunit for 0.11 hectares (0.26 acres);
 - Installing warning signs at the boundaries of the HEWB subunit (Figure H-5); and
 - Implementing access controls at the SRS boundary to control and restrict public and trespasser access to HEWB subunit.
-

Discussions pertaining to these elements are provided in the Corrective Measures Implementation Report/Final Remediation Report for the HEWB/CSBRP-5G OU (WSRC 2005a).

System Operations/Operations and Maintenance

There are no system operational requirements.

The following maintenance activities are ongoing:

- Annual site inspections and site maintenance (repair of access road and warning signs) for HEWB subunit only. No inspections or maintenance are required for CSBRP-5G or the Overflow Discharge Area.
- Site controls and land use restrictions via the SRS Site Use and Site Clearance Programs, which restrict invasive and permanent installation activities at the HEWB/CSBRP-5G OU. Institutional controls (i.e., LUCs) will be maintained until the identified RCOCs no longer pose a threat under the residential (unrestricted) land use scenario.

The operation and maintenance (O&M) cost associated with the selected remedy for the HEWB/CSBRP-5G OU includes the annual inspections and site maintenance, institutional controls (i.e., LUCs) and five-year remedy reviews. Table H-3 compares the actual O&M cost over the last four years to the estimated cost from the ROD. The ROD estimated direct O&M cost associated with the selected remedy as \$2,000 each year for 30 years. The five-year remedy review cost is estimated at \$15,000 every five years. The estimated direct O&M cost from fiscal year (FY) 2015 to FY2018 are \$23,000 as compared to the actual O&M cost of \$50,053 for the same period. The actual O&M costs (Table H-3) are slightly higher than expected due to underestimation of maintenance costs. Additional maintenance activities completed included cutting vegetation at signs.

V. Progress Since Last Review

This is the fourth five-year review for the HEWB/CSBRP-5G OU. The previous protectiveness statement concluded that because the remedial action of institutional

controls (i.e., LUCs) at HEWB/CSBRP-5G OU is protective, the site is protective of human health and the environment.

There were no recommendations or follow-up actions from the last five-year review.

VI. Five-Year Review Process

The following tasks were performed as part of the review:

- Reviewed the documents listed in Reference XII, Documents Reviewed;
- Confirmed the implementation of the remedial action;
- Evaluated whether the RCOCs still pose a threat under the residential (unrestricted) land use scenario to determine if institutional controls (i.e., LUCs) are still required;
- Inspected the OU, interviewed maintenance personnel, and documented the results on the Inspection Checklist provided in Attachment H-1; and
- Reviewed changes in standards and to-be-considered guidance.

Summary of Inspections and Interviews

Interviews were conducted with Richard Feagin, O&M staff member, and George Joyner, O&M Site Manager, on October 16, 2018 at the O&M organization offices. No issues were identified for the HEWB OU during these interviews. The HEWB OU was inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area Completion Projects (EC&ACP) on September 12, 2018. No issues were identified during this inspection.

The HEWB OU was inspected by SRNS EC&ACP and USDOE personnel on November 26, 2018. No issues were identified for the HEWB OU during this inspection.

A site inspection ~~will be~~ conducted by South Carolina Department of Health and Environmental Control and U.S. Environmental Protection Agency (USEPA) and South Carolina Department of Health and Environmental Control personnel, accompanied by USDOE and SRNS personnel, on March 21, 2019 and April 25, 2019, respectively ~~prior to~~ ~~submission of the Revision 1 of this document.~~ It is anticipated that ~~n~~ No significant problems regarding this OU ~~will be~~ identified during the inspection.

the surrounding soil horizons; however, horizontal migration is limited to the boundaries of the pit, and vertical migration is limited to the upper clayey zones.

The geotechnical and geologic data indicate that a less permeable zone is present underneath the pit that will inhibit less mobile constituents from migrating vertically and potentially impacting the groundwater. Groundwater sampling results support that the KBPOP OU has not impacted the groundwater and that the metal constituents detected are naturally occurring.

A total of six groundwater samples were collected from the water table aquifer near the KBPOP in January 1995. These include two background samples (KH1 and KH4), an additional upgradient sample (KH3), and three down- or side-gradient samples (KH2, KH5, and KH6) (Figure I-2). Based on the conclusion of the KBPOP RI/BRA Report, there are no groundwater COCs and no soil contaminant migration COCs. Therefore, no groundwater remedial actions were required.

Table I-2 presents the refined COCs (RCOCs) and remedial goals (RGs) for the future industrial worker based on a risk of 1×10^{-6} .

IV. Remedial Actions

Remedy Selection

As stated in the Record of Decision (ROD) (WSRC 1998b), the remedial action objectives (RAOs) for the KBPOP OU soils are as follows:

- Reduce risks to human health via external exposure to radiological constituents (i.e., cesium-137) in the soil; and
- Achieve RGs established for unit soil.

There were no RAOs required for ecological receptors or contaminant migration COCs.

As stated in the ROD, the selected remedial action at the KBPOP OU is as follows:

- Land Use Controls (LUCs) (access and deed restrictions/notifications) for soil; and
- No remedial action for groundwater was identified in the ROD because the RI/BRA concluded that KBPOP is not impacting groundwater.

Remedy Implementation

Following waste disposal activities, the pit was covered with backfill to create a native soil cover. The implementation of the selected remedy included the following:

- Establishment of LUCs for 0.24 hectares (0.59 acres);
- Posting of warning signs at appropriate locations in sufficient numbers to be seen from any approach; and

Figure I-3 is a current photo (2018) of the KBPOP OU.

Systems Operations/Operations and Maintenance

There are no system operation requirements for KBPOP OU.

The following maintenance activities are being performed to maintain the native soil cover as long as the waste remains a threat to human health or environment:

- Visual inspections are being performed annually for evidence of damage to the native soil cover due to erosion or intrusion by burrowing animals. The inspection also addresses upkeep of the vegetative cover and the warning signs.
 - Necessary repairs (e.g., replacing eroded or disturbed soil, sign repair, etc.) and vegetation management (e.g., mowing, removal of larger vegetation, etc.) are being performed when required.
 - LUCs (i.e., institutional controls) are being enforced to preclude unauthorized access or intrusive activities through the SRS Site Use / Site Clearance program and SRS site security.
-

Cost associated with the selected remedy for the KBPOP OU includes operation and maintenance (O&M) cost of LUCs. Table I-3 compares the actual O&M cost over the last four years to the estimated cost from the ROD. The ROD estimated O&M cost associated with the selected remedy are \$2,600 annually for maintenance activities and \$3,036 every five years for remedy reviews. The estimated direct O&M cost for fiscal year (FY) 2015 to FY2018 is \$13,436 as compared to the actual O&M cost of \$36,237 for the same period. The actual O&M costs are higher than the estimated O&M costs due to five-year remedy review and maintenance costs being underestimated. Additional maintenance activities completed included cutting vegetation at OU perimeter.

V. Progress Since Last Review

This is the fifth five-year review for the KBPOP OU. The previous protectiveness statement concluded that because the remedial actions of LUCs are protective, the site is protective of human health and the environment.

There were no recommendations of follow-up actions from the last five-year review.

VI. Five-Year Review Process

The following tasks were performed as part of the review:

- Reviewed documents listed in Section XII, Documents Reviewed;
- Confirmed implementation of the remedial action;
- Inspected the OU, interviewed maintenance personnel and documented the results on the Inspection Checklists provided in Attachment I-1; and
- Reviewed changes in standards and to-be-considered guidance.

Summary of Inspections and Interviews

Interviews were conducted with Richard Feagin, O&M staff member, and George Joyner, O&M Site Manager, on October 16, 2018 at the O&M organization offices. No issues

were identified for the KBPOP OU during these interviews. The KBPOP OU was inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area Completions Projects (EC&ACP) on September 26, 2018. No issues were identified during these inspections.

The KBPOP OU was inspected by SRNS EC&ACP and USDOE personnel on December 3, 2018. No issues were identified for the KBPOP OU during this inspection.

A site inspection ~~will be~~was conducted by U.S. Environmental Protection Agency (USEPA) and South Carolina Department of Health and Environmental Control personnel, accompanied by USDOE and SRNS personnel, ~~prior to submittal of the Revision 1 of this document on March 19, 2019. It is anticipated that n~~No significant problems regarding this OU ~~will be~~were identified during the inspection.

Scheduled annual site inspections conducted from 2015 through 2018 identified three signs that needed to be replaced. These findings were documented on the field inspection checklist and resolved soon after discovery.

VII. Technical Assessment

Is the Remedy Functioning as Intended by the Decision Document?

The selected remedy for the KBPOP OU of LUCs is effective in preventing human exposure to cesium-137 in the soil and is functioning as intended.

The Land Use Control Implementation Plan for KBPOP OU is discussed in Section 2.0 of the Final Remediation Report and governs LUC implementation, maintenance, monitoring, reporting, and enforcement of LUCs (WSRC 1998a). The LUCs that are in place include physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), use restrictions to prevent unauthorized contact, removal or excavation of subsurface soils, and restrictions to prevent disturbance of the KBPOP OU. Warning signs are in good condition, and no activities were observed that would have violated the LUCs. All LUC objectives are being met.

dibenzo(a,h)anthracene, and polychlorinated biphenyls (PCBs) (i.e., Aroclor 1254 and Aroclor 1260) were retained as RCOCs in subsurface soil at PBPOP for the hypothetical on-unit resident scenario. Benzo(a)pyrene was identified as the only RCOC in the subsurface soil at PBPOP for the future industrial worker scenario and is confined to a small area around intra-pit boring P-46 with a maximum concentration of 1,430 µg/kg. No ecological RCOCs or contaminant migration (CM) COCs were identified for either LBPOPs or PBPOP.

Table J-2 presents the RCOCs and remedial goals (RGs) for the future industrial worker and residential adult receptors based on a risk of 1E-06.

Groundwater is included as a subunit for the LBPOP/PBPOP OU. However, no CMCOCs were identified as potential sources of groundwater contamination, and no COCs were identified in the groundwater. Therefore, groundwater monitoring and reporting is not required for the LBPOP/PBPOP OU.

IV. Remedial Actions

Remedy Selection

As stated in the Record of Decision (ROD) (WSRC 1999b), the remedial action objectives (RAOs) for the LBPOP/PBPOP OU soils are as follows:

- Reduce the potential for exposure to buried waste at each unit and exposure to PAHs and PCBs in subsurface soil at the PBPOP.

As stated in the ROD, the remedial action at the LBPOP/PBPOP OU is as follows:

- Land Use Controls (LUCs) (access and deed restrictions/notifications) for soil to prohibit residential use and unauthorized excavation of the waste; and
 - No action for groundwater.
-

Remedy Implementation

Following waste disposal activities, the pits were covered with backfill to create native soil covers. The implementation of the selected remedy for the LBPOP/PBPOP included the following:

- Established LUCs for 0.3 hectares (0.73 acres) for LBPOPs and 0.17 hectares (0.41 acres) for PBPOP as documented in the survey plats provided in the Final Remediation Report (WSRC 2000);
- Posted warning signs at the units at appropriate locations in sufficient numbers to be seen from any approach to prohibit unauthorized excavation and disturbance of the cover system;
- Existing SRS access controls (including security gates and guards) prohibit residential use; and
- Existing SRS Site Use/Site Clearance Program controls work in the areas of the OUs and prevents unauthorized disturbance of the LBPOP/PBPOP while under ownership of the government.

Systems Operations/Operations and Maintenance

There are no system operational requirements.

The following maintenance activities are being performed to maintain the native soil cover as long as the waste remains a threat to human health or environment:

- Visual inspections are being performed annually for evidence of damage to the native soil cover due to erosion or intrusion by burrowing animals. The inspection also addresses upkeep of the vegetative cover and the warning signs.
 - Necessary repairs (e.g., replacing eroded or disturbed soil, sign repair, etc.) and vegetation management (e.g., mowing, removal of larger vegetation, etc.) are being performed when required.
-

- LUCs (i.e., institutional controls) are being enforced to preclude unauthorized access or intrusive activities through the SRS Site Use / Site Clearance program and SRS site security.

Costs associated with the selected remedy for the LBPOP/PBPOP OU includes operation and maintenance (O&M) costs of LUCs. Table J-3 compares the actual O&M costs over the last four years to the estimated costs from the ROD. The ROD estimated O&M costs associated with the selected remedy is \$2,700 annually for maintenance activities for L- and PBPOPs, and \$16,667 every five years for remedy reviews. The estimated direct O&M cost from fiscal year (FY) 2015 to FY2018 is \$27,467 as compared to the actual O&M cost of \$59,270 for the same period. The actual O&M are higher than the estimated O&M costs because the five-year remedy review and maintenance costs were underestimated. Additional maintenance activities completed included addressing active ant mounds, removing dead trees, and repairing native soil cover damaged from feral hog rutting.

V. Progress Since Last Review

This is the fifth five-year review for the LBPOP/PBPOP. The previous protectiveness statement concluded that because the remedial action of LUCs is protective, the sites are protective of human health and the environment.

There were no recommendations or follow-up actions from the last five-year review.

VI. Five-Year Review Process

The following tasks were performed as part of the review:

- Reviewed documents listed in Section XII, Documents Reviewed;
 - Confirmed implementation of the remedial action;
 - Inspected the OUs, interviewed maintenance personnel, and documented the results on the Inspection Checklists provided in Attachment J-1; and
 - Reviewed changes in standards and to-be-considered guidance.
-

Summary of Inspections and Interviews

Interviews were conducted with Richard Feagin, O&M staff member, and George Joyner, O&M Site Manager, on October 16, 2018 at the O&M organization offices. No issues were identified for the LBPOP/PBPOP OU during these interviews. The LBPOP/PBPOP OU were inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area Completion Projects (EC&ACP) on August 27, 2018. No issues were identified during these inspections.

The LBPOP/PBPOP were inspected by SRNS EC&ACP and USDOE personnel on December 3, 2018 and November 29, 2018, respectively. No issues were identified for the LBPOP/PBPOP OU during the interviews.

A site inspection ~~will be~~ was conducted by U.S. Environmental Protection Agency (USEPA) and South Carolina Department of Health and Environmental Control personnel, accompanied by USDOE and SRNS personnel, on March 19, 2019 ~~prior to submittal of the Revision 1 of this document. It is anticipated that n~~ No significant problems regarding this OU ~~will be~~ were identified during the inspection.

Scheduled annual site inspections conducted from 2015 through 2018 identified the presence of fallen trees and new tree growth near cap, evidence of soil disturbance by feral hogs, and ant mounds on the native soil covers. These findings were documented on the field inspection checklist and resolved soon after discovery.

VII. Technical Assessment

Is the Remedy Functioning as Intended by the Decision Document?

The selected remedy of LUCs for the LBPOP/PBPOP is effective in preventing human exposure to contaminated media and is functioning as intended.

The above remedial activities are meeting the RGs established for the LBPOP/PBPOP, as discussed in Section IV, by eliminating or controlling all routes of exposure to human health.

Attachment J-1. Five-Year Review Site Inspection Checklist – L-Area Bingham Pump Outage Pits (643-2G and 643-3G) and P-Area Bingham Pump Outage Pits (643-4G) (continued)

IV. O&M COSTS			
1. O&M Organization:			
<input type="checkbox"/> State In-House			<input type="checkbox"/> Contractor for State
<input type="checkbox"/> PRP In-House			<input type="checkbox"/> Contractor for PRP
<input checked="" type="checkbox"/> Other: <u>SRS</u>			
2. O&M Cost Records:			
<input type="checkbox"/> Readily Available	<input type="checkbox"/> Up to Date	<input type="checkbox"/> Funding mechanism/agreement in place	
<input checked="" type="checkbox"/> Other: <u>Project cost data is summarized in Section IV of this OU-specific review</u>			
3. Unanticipated or Unusually High O&M Costs During Review Period			
Describe costs and reasons: <u>N/A</u>			
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
A. Fencing			
1. Fencing Damage: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Gates secured <input checked="" type="checkbox"/> N/A			
Remarks: <u>OU-specific fencing is not required by the remedial action.</u>			
B. Signs			
1. Signs and Other Security Measures: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A			
Remarks: <u>Signs are in good condition.</u>			
C. Institutional Controls			
1. Implementation and Enforcement			
Site conditions imply ICs are not properly implemented:		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Site conditions imply ICs are not being fully enforced:		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Type of monitoring (e.g., self-reporting, drive-by, etc.) <u>Walkdown</u>			
Frequency: <u>Once every five years</u>			
Responsible Party/Agent: <u>USDOE Savannah River Field Office</u>			
Contact:	<u>Phil Prater</u>	<u>DOE Program Manager</u>	<u>11/29/18</u> <u>803-952-9333</u>
	(Name)	(Title)	(Date) (Phone No.)
Reporting is up-to-date:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
Reports are verified by the lead agency:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
Specific requirements in deed of decision document have been met:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
Violations have been reported:		<input type="checkbox"/> Yes	<input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Problems/Suggestions: <input type="checkbox"/> Report Attached			
2. Adequacy: <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A			
Remarks: _____			

Attachment J-1. Five-Year Review Site Inspection Checklist – L-Area Bingham Pump Outage Pits (643-2G and 643-3G) and P-Area Bingham Pump Outage Pits (643-4G) (continued)

V. ACCESS AND INSTITUTIONAL CONTROLS (Continued)	
D. General	
1. Vandalism/Trespassing:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism is evident Remarks: _____
2. Land use changes onsite:	<input checked="" type="checkbox"/> N/A Remarks: _____
3. Land use changes offsite:	<input checked="" type="checkbox"/> N/A Remarks: _____
VI. GENERAL SITE CONDITIONS	
A. Roads	<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A
1. Roads damaged:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks: _____
B. Other Site Conditions: <u>Scheduled annual site inspections conducted from 2015 through 2018 identified the presence of fallen trees and new tree growth near cap, evidence of soil disturbance by feral hogs, and ant mounds on the native soil covers. These findings were documented on the field inspection checklist and resolved soon after discovery.</u> Remarks: <u>Site vegetation is mowed routinely.</u>	
VII. LANDFILL COVER/CONTAINMENT <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
X. OTHER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emissions, etc.). <u>The remedy for this OU is LUCs with a no action for groundwater. This remedy is fully established and functioning as designed.</u>	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>The O&M procedures consisting of annual (2015-2018) site inspections and site maintenance (repair of erosion damage, and warning signs), and site controls (SRS Site Use and Site Clearance Programs, which restrict invasive and permanent installation activities at the waste unit) have been implemented. The O&M procedures are adequately maintaining the L- and PBPOP OU and the condition of warning signs is good. There are no issues requiring corrective actions.</u>	
C. Early Indicators of Potential Remedy Failure	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. N/A	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. N/A	

End of Checklist

approximately \$20,500. Every fifth year, the O&M costs for maintenance activities is \$128,536 when the entire LTR Tail Portion is inspected and maintained. Table K-2-3 compares the actual O&M cost over the last four years to the estimated cost from the IROD. The estimated direct O&M cost from fiscal year (FY) 2015 to FY2018 is \$190,036 as compared to the actual O&M cost of \$62, 136 for the same period. The costs for maintaining the water level in PAR Pond was included in the estimated direct O&M costs. However, the actual costs do not include maintaining the water level in PAR Pond as this activity is conducted as part of Site Infrastructure maintenance.

V. Progress Since Last Review

This is the sixth five-year review for the PAR Pond. This is the third five-year review for the LTR IOU Tail Portion. The previous protectiveness statement concluded that because the remedial actions at PAR Pond and LTR IOU Tail Portions are protective, the site is protective of human health and the environment.

There were no recommendations or follow-up actions from the last five-year review.

VI. Five Year Review Process

The following tasks were performed as part of the review:

- Reviewed the documents listed in Section XII, Documents Review;
- Confirmed implementation of the TCRA;
- Inspected the LTR IOU Tail Portion signs and fences;
- Reviewed PAR Pond reservoir data;
- Inspected PAR Pond, interviewed maintenance personnel, and documented the results on the Inspection Checklist provided in Attachment K-1; and
- Reviewed changes in standard and to-be-considered guidance

Data Review

The interim action remedy of refilling and maintaining the PAR Pond reservoir level at a minimum of 58.5 m (195 ft) msl is effective at preventing exposure to contaminated

shoreline sediments. The periodic monitoring of pool levels indicate that the minimum pool level has not dropped below the minimum level required by the *Shutdown of the River Water System at the Savannah River Site* ROD (USDOE 1998). Water levels are measured twice weekly. A review of the data from January 2014 through October 1, 2018 indicates a pool level minimum of 60.6 m (198.74 ft) msl on August 17, 2015 and a pool level high of 61.1 m (200.32 ft) msl on January 23, 2017 (Figure K-6).

The TCRA and implementation of LUCs (i.e., signage and fencing) in the middle and lower tail portions of the LTR IOU was completed in August 2012. Inspections are conducted as discussed under System O&M (Section IV).

Summary of Inspections and Interviews

Interviews were conducted with James Wood, O&M staff member, on October 3, 2018 at the PAR Pond OU, and Richard Swygart, O&M Site Manager, on October 4, 2018 by phone. No issues were identified for the PAR Pond OU during these interviews. The LTR IOU Tail Portion was inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area Completion Projects (EC&ACP) on March 29, 2018. No issues were identified during this inspection.

The PAR Pond OU was inspected by SRNS EC&ACP and USDOE personnel on November 26, 2018. No issues were identified for the PAR Pond OU, including the LTR IOU Tail Portion (Middle and Lower Subunits), during the inspections and interviews.

A site inspection ~~will be~~was conducted by South Carolina Department of Health and Environmental Control and U.S. Environmental Protection Agency (USEPA)~~and South Carolina Department of Health and Environmental Control~~ personnel, accompanied by USDOE and SRNS personnel, on March 19, 2019 and April 25, 2019, respectively~~prior to submittal of the Revision 1 of this document~~. It is anticipated that ~~n~~No significant problems regarding this OU ~~will be~~were identified during the inspection.

Scheduled annual site inspections conducted from 2015 through 2018 identified the presence of downed trees, overgrown vegetation near signs, and ant mounds ~~on soil covers~~. These findings were documented on the field inspection checklist and resolved soon after discovery.

**Attachment K-1. Five-Year Review Site Inspection Checklist – PAR Pond (685-G)
(Including the Pre-Cooler Ponds and Canals) and LTR IOU Tail
Portion (Middle and Lower Subunits) (continued)**

IV. O&M COSTS				
1. O&M Organization:				
<input type="checkbox"/> State In-House	<input type="checkbox"/> Contractor for State			
<input type="checkbox"/> PRP In-House	<input type="checkbox"/> Contractor for PRP			
<input checked="" type="checkbox"/> Other: <u>SRS</u>				
2. O&M Cost Records:				
<input type="checkbox"/> Readily Available	<input type="checkbox"/> Up to Date	<input type="checkbox"/> Funding mechanism/agreement in place		
<input checked="" type="checkbox"/> Other: <u>Project cost data is summarized in Section IV of this OU-specific review.</u>				
3. Unanticipated or Unusually High O&M Costs During Review Period				
Describe costs and reasons: <u>N/A</u>				
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A				
A. Fencing				
1. Fencing Damage: <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A				
Remarks: _____				
B. Signs				
1. Signs and Other Security Measures: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A				
Remarks: <u>Signs at this site are in good condition.</u>				
C. Institutional Controls				
1. Implementation and Enforcement				
Site conditions imply ICs are not properly implemented:		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> N/A
Site conditions imply ICs are not being fully enforced:		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> N/A
Type of monitoring (e.g., self-reporting, drive-by, etc.) <u>Field Walkdown</u>				
Frequency: <u>Once in five years</u>				
Responsible Party/Agent: <u>USDOE Savannah River Field Office</u>				
Contact:	<u>Brian Hennessey</u>	<u>FFA Project Manager</u>	<u>11/26/18</u>	<u>803-952-8365</u>
	(Name)	(Title)	(Date)	(Phone No.)
Reporting is up-to-date:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Reports are verified by the lead agency:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Specific requirements in deed of decision document have been met:		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Violations have been reported:		<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> N/A
Problems/Suggestions: <input type="checkbox"/> Report Attached				
<u>PAR Pond is in an Interim ROD and LUCs for PAR Pond are not currently applicable. The ESD for the removal action at the LTR IOU Tail Portion (Middle and Lower Subunits) did incorporate LUCs for the LTR IOU Tail Portion. The removal action implementation/construction was completed August 2012. The warning and no trespassing signs were installed in the LTR IOU Tail Portion as part of the action.</u>				
2. Adequacy: <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A				
Remarks: <u>PAR Pond: Survey wooden stakes were located. LTR IOU Tail: Signage is in good condition.</u>				

**Attachment K-1. Five-Year Review Site Inspection Checklist – PAR Pond (685-G)
(Including the Pre-Cooler Ponds and Canals) and LTR IOU Tail
Portion (Middle and Lower Subunits) (continued/end)**

V. ACCESS AND INSTITUTIONAL CONTROLS (Continued)	
D. General	
1. Vandalism/Trespassing: <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism is evident Remarks: _____	
2. Land use changes onsite: <input checked="" type="checkbox"/> N/A Remarks: _____	
3. Land use changes offsite: <input checked="" type="checkbox"/> N/A Remarks: _____	
VI. GENERAL SITE CONDITIONS	
A. Roads <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1. Roads damaged: <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A	
B. Other Site Conditions: <u>Scheduled annual site inspections conducted from 2015 through 2018 identified the presence of downed trees, overgrown vegetation near signs, and ant mounds. These findings were documented on the field inspection checklist and resolved soon after discovery.</u> Remarks: _____	
VII. LANDFILL COVER/CONTAINMENT <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
X. OTHER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emissions, etc.). <u>The remedy for PAR Pond is controlled pumping to and discharge from PAR Pond to maintain the water level at a minimum of 195 ft msl and institutional controls to prevent exposure to contaminants in sediments. The remedy for the LTR Tail Portion (Middle and Lower Subunits) is LUCs for the LTR IOU Tail Portion. The remedy is fully established and functioning as designed.</u>	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>The O&M procedures consisting of maintaining PAR Pond level at a minimum 195 ft msl and site controls (SRS Site Use and Site Clearance Programs, which restrict invasive and permanent installation activities) have been implemented. The O&M procedures are adequately maintaining the pool level and the condition of the warning signs is good. The O&M procedures for inspection/maintenance of signs and access controls are adequately maintaining the LTR IOU Tail Portion and the condition of the warning signs is good. There are no issues requiring corrective actions.</u>	
C. Early Indicators of Potential Remedy Failure	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. N/A	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. N/A	

End of Checklist

activity waste was buried in the RBPOPs and higher activity waste was sent to the SRS Burial Ground Complex in E Area.

RUNK-2 received construction debris based upon a magnetic survey, ground penetrating radar (GPR) surveys, and soil sampling in the pit. No debris has been identified in RUNK-1 and RUNK-3. It is possible that no debris was ever placed in these two RUNKS. A historical photograph indicates that liquid wastes were also introduced into RUNK-2, but no containerized liquids were discovered during characterization.

Initial Response

After the pits were filled in 1958, the debris was covered by 1.2 m (4 ft) of backfill as shown in Figure L-3 (WSRC 2003). The cover material was placed at a time preceding the preparation of the formal CERCLA documentation and investigation.

Investigations began at this OU in 1987 with a radiological survey of vegetation, and continued in 1991 (radiological screening of surface soils), 1992 (soil gas survey), 1993 (GPR survey to delineate vertical boundaries of the pits) and 1995 (magnetic survey to identify magnetic debris) (WSRC 2001). Characterization of RBPOPs and RUNKS was performed starting in 1996 through a series of sampling events.

Basis for Taking Action

The unit investigation confirmed that miscellaneous debris remains buried in the unit. Soil contaminants, identified as refined constituents of concern (RCOCs) for the residential receptor, include polycyclic aromatic hydrocarbons (benzo[a]anthracene, benzo[b]fluoranthene, benzo[a]pyrene, dibenzo[a,h]anthracene, and indeno[1,2,3-c,d]pyrene) and radionuclides (cobalt-60 and cesium-137). These contaminants are primarily in the RBPOPs and RUNK-2. Benzo(a)pyrene, benzo(a)anthracene, cobalt-60, and cesium-137 were RCOCs for the future industrial worker.

Table L-2 presents the soil RCOCs and remedial goals (RGs) for the future industrial worker based on a risk of 1E-06.

The RCOCs pose a carcinogenic risk of 5.24E-06 for the future industrial worker. The amount of unit-related contamination in the perimeter soils, if any, was minimal and not readily discernible from ambient background levels. There is no Resource Conservation and Recovery Act (RCRA) listed or characteristic wastes at the unit. The combined volume of the six pits, from land surface to the base of the pits, is 10,710 m³ (14,000 yd³) (WSRC 2002). There is no principal threat source material at the RBPOP and RUNK OU; the waste is categorized as a low-level threat.

IV. Remedial Actions

Remedy Selection

As stated in the ROD (WSRC 2002), the remedial action objective (RAO) for the RBPOPs and RUNKs OU is as follows:

- Prevent exposure of future industrial workers to benzo(a)pyrene, dibenzo(a,h)anthracene, cesium-137, and cobalt-60 at concentrations that exceed RGs.

As stated in the ROD, the selected remedial action for the RBPOPs and RUNKs OU is institutional controls (i.e., land use controls [LUCs]).

Remedy Implementation

Following waste disposal activities, the pits were covered with backfill to create native soil covers. The implementation of the selected remedy included the following:

- Establishing LUCs for 1.24 hectares (3.05 acres) including: 1) posting warning signs at appropriate locations in sufficient numbers to be seen from any approach; 2) requiring a SRS Site Use and Site Clearance Permit for any proposed use of land within the OU area, which is applicable to all activities and personnel on site; 3) maintaining the site access controls (24-hour surveillance system, artificial and natural barriers, control entry systems, and warning signs) in place at the SRS boundary to comply with the security requirements for a RCRA-permitted facility; and 4) in the long-term, if the property ever is transferred to non-federal ownership, the US
-

A site inspection ~~will be~~was conducted by USEPA and SCDHEC personnel, accompanied by USDOE and SRNS personnel, ~~on March 19, 2019 prior to submittal of the Revision 1 of this document. It is anticipated that n~~o significant problems regarding this OU ~~will be~~were identified during the inspection.

Scheduled annual site inspections conducted from 2015 through 2018 identified the presence of dead trees near the ~~ea~~native soil covers, overgrown vegetation near the road, and active ant mounds on the native soil covers. These findings were documented on the field inspection checklist and resolved soon after discovery.

VII. Technical Assessment

Is the Remedy Functioning as Intended by the Decision Document?

The selected remedy of LUCs for the RBPOPs and RUNKS OU is effective in preventing exposure of the future industrial workers to soil contaminants and is functioning as intended.

The above remedial activities are meeting the RGs established for the RBPOPs and RUNKS OU, as discussed in Section IV, by eliminating or controlling all routes of exposure to human health.

The Land Use Control Implementation Plan for the RBPOPs and RUNKS OU is included as Appendix B of the Final Remediation Report and governs LUC implementation, maintenance, monitoring, reporting, and enforcement of LUCs (WSRC 2003). The LUCs that are in place include physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), use restrictions to prevent unauthorized contact, removal or excavation of soils, and restrictions to prevent disturbance of the RBPOPs and RUNKS OU. Warning signs are in good condition, and no activities were observed that would have violated the LUCs. All LUC objectives are being met.

Are Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs still valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. There have been no changes in standards or physical

conditions of the RBPOPs and RUNKs OU that would affect the protectiveness of the remedy.

The USEPA standards and toxicity values have been updated since the last five-year remedy review as shown in Appendix B. The changes to the values for RCOCs at the RBOPs and RUNKs OU were not significant, and the RAOs continue to be met by the remedial action. No new standards or to-be-considered guidance have been identified that call into question the protectiveness of the remedy.

Fact sheets provided on the USEPA webpage regarding emerging contaminants were reviewed for applicability to these sites. None of the listed emerging contaminants were identified as applicable to these units.

Has any Other Information come to Light that could call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VIII. Issues

There are no issues related to current site conditions or activities that currently prevent the remedy at the RBPOPs and RUNKs OU from being protective.

IX. Recommendations and Follow-up Actions

There are no recommendations or follow-up actions for this RBPOPs and RUNKs OU.

X. Protectiveness Statement(s)

The remedy at RBPOPs and RUNKs OU is protective of human health and the environment.

Exposure pathways that could result in unacceptable risks are being controlled by LUCs to prevent exposure to, or ingestion of, contaminated soil. All threats to the RBPOPs and RUNKs OU are being addressed through implementation of physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), administrative

**Attachment L-1. Five-Year Review Site Inspection Checklist – R-Area Bingham Pump
Outage Pits (643-8G, 643-9G, and 643-10G) (RBPOPs) and R-Area
Unknown Pits #1, #2, and #3 (RUNKs) OU (continued)**

IV. O&M COSTS	
1. O&M Organization:	
<input type="checkbox"/> State In-House	<input type="checkbox"/> Contractor for State
<input type="checkbox"/> PRP In-House	<input type="checkbox"/> Contractor for PRP
<input checked="" type="checkbox"/> Other: <u>SRS</u>	
2. O&M Cost Records:	
<input type="checkbox"/> Readily Available	<input type="checkbox"/> Up to Date
<input type="checkbox"/> Funding mechanism/agreement in place	
<input checked="" type="checkbox"/> Other: <u>Project cost data is summarized in Section IV of this OU-specific review.</u>	
3. Unanticipated or Unusually High O&M Costs During Review Period	
Describe costs and reasons: <u>N/A</u>	
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
A. Fencing	
1. Fencing Damage: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Gates secured <input checked="" type="checkbox"/> N/A	
Remarks: <u>OU-specific fencing is not required by the remedial action.</u>	
B. Signs	
1. Signs and Other Security Measures: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A	
Remarks: <u>Signs are in good condition.</u>	
C. Institutional Controls	
1. Implementation and Enforcement	
Site conditions imply ICs are not properly implemented:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Site conditions imply ICs are not being fully enforced:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Type of monitoring (e.g., self-reporting, drive-by, etc.) <u>Walkdowns</u>	
Frequency: <u>Once in five years</u>	
Responsible Party/Agent: <u>USDOE Savannah River Field Office</u>	
Contact:	<u>Phil Prater</u> <u>DOE Program Manager</u> <u>11/29/18</u> <u>803-952-9333</u>
	(Name) (Title) (Date) (Phone No.)
Reporting is up-to-date:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Reports are verified by the lead agency:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Specific requirements in deed of decision document have been met:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Violations have been reported:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Problems/Suggestions: <input type="checkbox"/> Report Attached	
<hr/>	
2. Adequacy: <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A	
Remarks: _____	

Attachment L-1. Five-Year Review Site Inspection Checklist – R-Area Bingham Pump
Outage Pits (643-8G, 643-9G, and 643-10G) (RBPOPs) and R-Area
Unknown Pits #1, #2, and #3 (RUNKs) OU (continued/end)

V. ACCESS AND INSTITUTIONAL CONTROLS (Continued)	
D. General	
1. Vandalism/Trespassing:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism is evident Remarks: _____
2. Land use changes onsite:	<input checked="" type="checkbox"/> N/A Remarks: _____
3. Land use changes offsite:	<input checked="" type="checkbox"/> N/A Remarks: _____
VI. GENERAL SITE CONDITIONS	
A. Roads	<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A
1. Roads damaged:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
B. Other Site Conditions: Annual site inspections conducted from 2015 through 2018 identified the presence of dead trees near the native soil covers, overgrown vegetation near the road, and active ant mounds on the native soil covers. These findings were documented on the field inspection checklist and resolved soon after discovery. Remarks: <u>Site vegetation is mowed routinely.</u>	
VII. LANDFILL COVER/CONTAINMENT <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
X. OTHER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emissions, etc.). <u>The remedial action for this OU is institutional controls (i.e., LUCs) to prevent human exposure to contaminants in soil. The remedy is fully established and functioning as designed.</u>	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>The O&M procedures consisting of annual (2015-2018) site inspections (repair of warning signs), and site controls (SRS Site Use and Site Clearance Programs, which restrict invasive and permanent installation activities at the OU) have been implemented. The O&M procedures are adequately maintaining the RBPOPs and RUNKs OU and the condition of warning signs is good. There are no issues requiring corrective actions.</u>	
C. Early Indicators of Potential Remedy Failure	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. <u>N/A</u>	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>N/A</u>	

End of Checklist

Initial Response

After operations ceased, the area was bulldozed, graded, covered with native soil, and planted with grasses. The cover material was placed prior to the CERCLA investigation and preparation of the formal CERCLA documentation.

SRWU OU was designated as an excavated area (filled). Soil borings were conducted in 1993 to identify the extent of waste buried beyond the excavated area. Since characterization data indicated contamination of the surface soils, the entire area within the orange balls is included in the SRWU OU.

Basis for Taking Action

Nonradiological contaminants and cesium-137 were present in soil that exceeded a 1E-06 risk for future human receptors. Low levels of contaminants were detected in the M-Area groundwater aquifer, which minimally and infrequently exceeded maximum contaminant levels (MCLs). SRWU OU was probably not the source of contamination in the M-Area groundwater aquifer. The basis for taking a remedial action at the SRWU OU was due to potential exposure of future occupational workers and residents to contaminants in groundwater exceeding MCLs, and contaminants in soils above 1E-06 risk levels (WSRC 1996a and WSRC 1996b). The presence of contamination in surface soil prohibits this waste unit for residential use (i.e., unrestricted land use) (WSRC 1997).

The constituents of concern (COCs) and remedial goals (RGs) for future receptors were identified in the SRWU OU Record of Decision (ROD) (WSRC 1997). The RG values based on a 1E-06 risk to future occupational workers are shown in Table M-2. Although RGs for groundwater were presented in the ROD, the groundwater in the lower aquifers is addressed separately as part of the RCRA Permit Renewal for the M-Area and Metallurgical Laboratory Hazardous Waste Management Facilities Western Sector Corrective Action Program.

IV. Remedial Actions

Remedy Selection

As stated in the ROD (WSRC 1997), the remedial action objectives (RAOs) developed for the SRWU OU are as follows:

- For the future on-unit resident (adult/child and child): Prevent ingestion of soil and produce, and dermal contact with soil from arsenic, benzo(a)pyrene, dibenzo(a,h)anthracene, and benzo(b)fluoranthene; and
- For the future on-unit resident (adult/child and child) and occupational worker: Prevent ingestion, dermal contact, and inhalation of groundwater from constituents with concentrations that minimally and infrequently exceed MCLs.

The preferred alternative for the SRWU OU consisted of institutional controls (i.e., land use controls [LUCs]) with groundwater monitoring (WSRC 1997). The confirmatory groundwater monitoring program was established in 1998 to ensure that chosen remedy was appropriate for this OU. Sampling was conducted semiannually. The groundwater monitoring program was discontinued in 2003 after no COCs were detected above MCLs between 2000 and 2003. Per the Explanation of Significant Difference (ESD) (WSRC 2005), the groundwater monitoring program was discontinued in 2003.

A 2018 photograph of the SRWU OU is provided in Figure M-4.

Remedy Implementation

Following waste disposal activities, the pit was covered with native soil and graded to create a native soil cover. Implementation of the SRWU OU remedial action included:

- Installation of two new and one replacement groundwater monitoring wells;
 - Posting of four warning signs; and
 - Establishment of LUCs for 2.2 hectares (5.5 acres) to include: 1) use of existing SRS access controls to maintain the use of this site for industrial use only; 2) in the long-term if the property ever is transferred to non-federal ownership, the U.S. Government would create a deed for the new property owner, which would include information
-

needed for compliance with Section 120(h) of CERCLA, and would prepare, certify, and record a survey plat of the area.

System Operations/Operations & Maintenance

There are no system operational requirements.

The following maintenance activity has been discontinued:

- Confirmatory groundwater-monitoring program.

The following maintenance activities are ongoing:

- Annual site inspections and site maintenance (repair of erosion damage, maintenance of native soil cover, mowing, and warning signs); and
- Site controls (SRS Site Use and Site Clearance Programs, which restrict invasive and permanent installation activities at the OU).

The operation and maintenance (O&M) costs associated with the selected remedy for the SRWU OU includes the annual inspections and institutional controls (i.e., LUCs). Table M-3 compares the actual O&M costs over the last four years to the estimated costs for the SRWU OU. The ROD estimated O&M cost associated with the selected remedy are \$500 annually for maintenance and inspections and \$3,000 every five years for remedy reviews. The estimated direct O&M cost from fiscal year (FY) 2015 to FY2018 is \$5,000 as compared to the actual O&M cost of \$55,764 for the same period. The actual O&M costs (Table M-3) over the last four years are higher than the estimated O&M costs because five-year remedy reviews, inspection, and maintenance costs were underestimated.

V. Progress Since Last Review

This is the sixth five-year review for the SRWU OU. The previous protectiveness statement concluded that because the remedial action of LUCs is protective, the site is protective of the human health and the environment.

The original remedy has been modified through an ESD (WSRC 2005) to discontinue the confirmatory groundwater monitoring program. An evaluation of the groundwater monitoring program has indicated that the monitoring is no longer required as the RGs for

groundwater have been reached. Per the ESD, the groundwater portion of the OU will not be included in the five-year review (WSRC 2005). The institutional controls (i.e., LUCs), included in the original remedy, will still be required for the SRWU OU soils. There were no recommendations or follow-up actions from the last five-year review.

VI. Five-Year Review Process

The following tasks were performed as part of the review:

- Reviewed the documents listed in Section XII, Documents Reviewed;
- Confirmed the implemented remedial action is being maintained;
- Inspected the OU, interviewed maintenance personnel, and documented the results on the Inspection Checklist provided in Attachment M-1; and
- Reviewed changes in standards and to-be-considered guidance.

Summary of Inspections and Interviews

Interviews were conducted with Richard Feagin, O&M staff member, and George Joyner, O&M Site Manager, on October 16, 2018 at the O&M organization offices. No issues were identified for the SRWU OU during these interviews. The SRWU OU was inspected by Savannah River Nuclear Solutions, LLC (SRNS) Environmental Compliance and Area Completion Projects (EC&ACP) on August 22, 2018. No issues were identified during this inspection.

The SRWU OU was inspected by SRNS EC&ACP and USDOE personnel on December 3, 2018. No issues were identified for the SRWU OU during the inspection.

A site inspection ~~will be~~ was conducted by U.S. Environmental Protection Agency (USEPA) and South Carolina Department of Health and Environmental Control personnel, accompanied by USDOE and SRNS personnel, ~~prior to submittal of the Revision 1 of this document on March 19, 2019. It is anticipated that n~~ No significant problems regarding this OU ~~will be~~ were identified during the inspection.

Scheduled annual site inspections conducted from 2015 through 2018 identified the presence of dead trees near the native soil cover, overgrown vegetation, and active ant

Attachment M-1. Five-Year Review Site Inspection Checklist – Silverton Road Waste Unit (731-3A) Operable Unit (continued)

IV. O&M COSTS	
1. O&M Organization:	
<input type="checkbox"/> State In-House	<input type="checkbox"/> Contractor for State
<input type="checkbox"/> PRP In-House	<input type="checkbox"/> Contractor for PRP
<input checked="" type="checkbox"/> Other: <u>SRS</u>	
2. O&M Cost Records:	
<input type="checkbox"/> Readily Available	<input type="checkbox"/> Up to Date
<input type="checkbox"/> Funding mechanism/agreement in place	
<input checked="" type="checkbox"/> Other: <u>Project cost data is summarized in Section IV of this OU-specific review.</u>	
3. Unanticipated or Unusually High O&M Costs During Review Period	
Describe costs and reasons: <u>N/A</u>	
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
A. Fencing	
1. Fencing Damage: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Gates secured <input checked="" type="checkbox"/> N/A	
Remarks: <u>OU-specific fencing is not required by the remedial action.</u>	
B. Signs	
1. Signs and Other Security Measures: <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A	
Remarks: <u>Signs are in good condition.</u>	
C. Institutional Controls	
1. Implementation and Enforcement	
Site conditions imply ICs are not properly implemented:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Site conditions imply ICs are not being fully enforced:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A
Type of monitoring (e.g., self-reporting, drive-by, etc.) <u>Walkdowns</u>	
Frequency: <u>Once in five years</u>	
Responsible Party/Agent: <u>USDOE Savannah River Field Office</u>	
Contact:	<u>Karen Adams</u> <u>Federal Project Director</u> <u>12/03/2018</u> <u>803-952-7871</u> (Name) (Title) (Date) (Phone No.)
Reporting is up-to-date:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Reports are verified by the lead agency:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Specific requirements in deed of decision document have been met:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Violations have been reported:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Problems/Suggestions: <input type="checkbox"/> Report Attached	
2. Adequacy: <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A	
Remarks: _____	

Attachment M-1. Five-Year Review Site Inspection Checklist – Silverton Road Waste Unit (731-3A) Operable Unit (continued)

V. ACCESS AND INSTITUTIONAL CONTROLS (Continued)	
D. General	
1. Vandalism/Trespassing: Remarks:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism is evident
2. Land use changes onsite: Remarks:	<input checked="" type="checkbox"/> N/A
3. Land use changes offsite: Remarks:	<input checked="" type="checkbox"/> N/A
VI. GENERAL SITE CONDITIONS	
A. Roads	<input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A
1. Roads damaged:	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
B. Other Site Conditions: Annual site inspections conducted from 2015 through 2018 identified the presence of dead trees near the native soil cover, overgrown vegetation, and active ant mounds on the native soil covers. These findings were documented on the field inspection checklist and resolved soon after discovery.	
Remarks: <u>Site vegetation is mowed routinely.</u>	
VII. LANDFILL COVER/CONTAINMENT <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
X. OTHER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emissions, etc.). <u>The remedy for this OU is institutional controls (i.e., LUCs) with a period of groundwater monitoring (ceased in 2003) to prevent human exposure to contaminated media. The remedy is fully established and functioning as designed.</u>	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>The O&M procedures consisting of annual (2015-2018) site inspections (repair of warning signs), and site controls (SRS Site Use and Site Clearance Programs, which restrict invasive and permanent installation activities at the OU) have been implemented. The O&M procedures are adequately maintaining the SRWU OU and the condition of warning signs is good. There are no issues requiring corrective actions.</u>	
C. Early Indicators of Potential Remedy Failure	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. <u>N/A</u>	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>N/A</u>	

End of Checklist