Department of Energy
Savannah River Operations Office
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JUL 12 2023

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

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

Dear Ms. Fulmer and Mr. Richards:

SUBJECT: Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Operating Equipment (U) Aiken, South Carolina (SRNS-RP-2022-00468, Revision 1, June 2023) (Redline Pages), Sixth Five-Year Remedy Review Report for SRS Operable Units with Operating Equipment Fact Sheet (SRNS-RP-2022-00488, June 2023) (Redline), and Savannah River Site's Responses to the Regulatory Comments on the Revision 0 Document, SEMS Number: 00

In accordance with the terms of the Federal Facility Agreement, the U.S. Department of Energy is submitting the subject information for your review. The Savannah River Site (SRS submitted the Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Operating Equipment (U) Aiken, South Carolina (SRNS-RP-2022-00468, Revision 0, December 2022) and supporting documentation to the regulators on December 20, 2022. The U.S. Environmental Protection Agency (EPA) and South Carolina Department of Health and Environmental Control (SCDHEC) provided comments on the Revision 0 document on March 17, 2023, and March 21, 2023, respectively. SRS submitted the draft responses via email for regulatory review on May 26, 2023. The SCDHEC and EPA replied on June 7, 2023, and June 12, 2023, respectively, that the draft responses were acceptable. The final SRS responses to the SCDHEC's and EPA's comments on the Revision 0 were incorporated into the Redline Revision 1 pages changes for the report. The Fact Sheet was also revised based on the responses to the regulatory comments.

Please review the enclosed information and provide your response within forty-five (45) days of receipt. The effort and time that the SCDHEC and EPA have given on the subject report are greatly appreciated.

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

Sincerely,

Brian T. Hennessey Digitally signed by Brian T. Hennessey
Date: 2023.07.12 12:03:30 -04'00'

Brian T. Hennessey
FFA Project Manager, DOE-Savannah River
Remediation and Deactivation & Decommissioning Division

RDDD-23-018

Enclosures:
1. Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Operating Equipment (U) Aiken, South Carolina (SRNS-RP-2022-00468, Revision 1, June 2023) (Redline Pages)
2. Sixth Five-Year Remedy Review Report for SRS Operable Units with Operating Equipment Fact Sheet (SRNS-RP-2022-00488, June 2023) (Redline)
3. SRS Responses to SCDHEC's Comments on the Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Operating Equipment (U) Aiken, South Carolina (SRNS-RP-2022-00468, Revision 0, December 2022)
4. SRS Responses to EPA's Comments on the Sixth Five-Year Remedy Review Report for Savannah River Site Operable Units with Operating Equipment (U) Aiken, South Carolina (SRNS-RP-2022-00468, Revision 0, December 2022)

cc w/o encl:
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cc w/encl:
J. Dawson, EPA-Atlanta
D. Lloyd, EPA-Atlanta
M. McRae, TechLaw, Inc.

GENERAL COMMENTS

1) The FYR Report does not include sufficient data from the last five years at several operable units (OUs) to support the determinations of whether the remedies are functioning as designed to achieve remedial action objectives (RAOs). While all of the monitoring data is not required, sufficient data should be provided (e.g., in tables or figures) to support the conclusions made in the text. The following examples should be addressed:

   a. Appendix K (M-Area Inactive Process Sewer Lines OU [081-M]; MIPSL) states that soil results collected in 2019 showed that remedial goals in soil were achieved, but a table showing the recent data and figure of the sampling locations is not provided.

   Response: Agree with Clarification.

   The 2019 soil data and sampling locations were presented in the 2019 Performance Evaluation Report (PER) for the MIPSL. This report is incorrectly referenced in Section VI, Five-Year Review Process, *Data Review* subsection. The 2019 PER will be correctly referenced and the following text will be added in Section VI, Five-Year Review Process, *Data Review* subsection:

   "The 2019 soil sampling event collected vadose zone soil samples at MH-01, MH-11, MH-12, and MH-13 ~~(SRNS 2018b)~~ and the results revealed that the RGs for TCE and PCE have been met with the MIPSL SVE system. Recommendations to discontinue operation of the MIPSL SVE system were included in the 2019 PER (SRNS 2020). The soil sampling locations and the soil results are included in the 2019 PER (SRNS 2020). The highest PCE and TCE concentrations were observed at MISPL01SB1 which is located near MH-01. The maximum PCE concentration was 0.12 mg/kg and the maximum TCE concentration was 0.00701 mg/kg, which are less than the soil RGs of 0.307 mg/kg for PCE and 0.0408 mg/kg for TCE. In a meeting with the Core Team in June 2020, the proposal for permanent shutdown of the SVE system at MIPSL was presented."

   Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

   b. The recent groundwater and surface water sampling data and a figure showing the current groundwater plume configuration are not provided for the C-Area Burning/Rubble Pit (131-C) and Old Burning/Rubble Pit (No Building Number [NBN]) (CBRP) OU (Appendix F). Therefore, it is unclear how the groundwater remedy is progressing towards cleanup and if monitored natural attenuation (MNA) is successfully reducing constituent of concern (COC) concentrations. For example, the text states that concentrations are decreasing across most of the plume (i.e., except wells CRW 10C and CRW010CU) but trend graphs are not provided. It is also unclear if the plume is migrating. In addition, since data for the natural attenuation parameters are not discussed

and provided, it is unclear if conditions are favorable for biodegradation to occur across the entire plume or if other attenuation processes are likely to reduce COCs.

Response: Agree.

Figures F-10 and F-11 (attached to the comment responses) will be added to Appendix F. They depict the CBRP OU TCE plume in 2000 and 2020 and show the decrease in TCE groundwater concentrations over that time-period as the plume migrated from the CBRP OU Pit towards Fourmile Branch. The following sentence will be added to Data Review in Section VI:

"Figure F-10 and Figure F-11 demonstrate the decrease in TCE groundwater concentrations from 2000 to 2020 as the plume has migrated from the CBRP OU pit towards Fourmile Branch. The figures show that the TCE source to groundwater from the CBRP OU pit has been cut off."

Responsible Party: Terry Killeen, (803) 952-6850, terry.killeen@srs.gov

c. Information for the current tritium plume configurations at F-Area Groundwater OU and H-Area Groundwater OU (Appendices H and I) is not provided. Although tritium concentrations have decreased at the seeplines of both sites, the current status of the plumes at each site is unclear (e.g., if any plume migration or expansion has occurred causing portions of the tritium plume to bypass the barriers/gate system). The recent tritium concentrations at the site should be provided (i.e., on a plume map) to demonstrate that the remedy is progressing as expected and future compliance can be expected without additional action.

Response: Clarification.

The current contaminant plumes maps for each area are included in the annual RCRA corrective action report. The annual corrective action reports are referenced in the "Groundwater and Surface Water Data" in Section VI, Five Year Review Process in each appendix. No change to the document is proposed.

Responsible Party: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

d. Current data for the pH of site groundwater is not provided for the F-Area Groundwater OU and H-Area Groundwater OU (Appendices H and I). The groundwater pH in the target zone at H-Area is noted to have stabilized (see Section IV, Remedial Actions, Page I-6 of I-36); however, pH data for the site is not provided and the target zone is not defined or shown on a figure. Because the pH must be addressed to have success in reaching the RAOs and RCRA permit renewal requirements, pH data should be provided to support the technical assessment of the remedy.

Response: Agree.

The base injection systems at the F- and H-Area Groundwater OUs operate periodically as needed to add alkalinity to the aquifer where the injection wells are located. The injected solution alters the geochemistry by raising the pH of both the pore water and aquifer sediments to provide favorable conditions for sorption of cationic contaminants. At F Area, treatment areas occur within gates of the funnel and gate system and in the wetlands. At H Area, treatment occurs in the wetlands. The frequency of base injection is dependent on several variables and is different for each individual treatment area. The velocity and pH of the groundwater plume are two primary factors controlling the frequency of injections. For example, the central gate at F Area requires injection once per year, whereas the F Area western gate requires injection once every 2 – 3 years.

During injection, the aquifer receives base solution at a pH of approximately 10. This creates a zone to neutralize incoming acidic groundwater. As groundwater flows through the treatment zone the alkalinity is depleted, and the pH decreases over time. When the treatment zone pH approaches 5, more base solution is injected to replenish the buffering capacity. During the time between injection intervals the groundwater pH in the treatment area is constantly changing as the acidic plume reacts with the base solution.

Appendices H and I will be revised as stated below.

Appendix H

In Section IV, Remedial Actions, Remedy Implementation, the 1st paragraph under *Passive Control of Water Table Gradients and pH Treatment*, will be revised as follows:

"After successful completion of a small-scale pilot study to demonstrate that raising the pH value of the F-Area groundwater will immobilize metals and metallic radionuclides, a subsurface barrier and gate system and base (alkaline) solution injection system were constructed, replacing the groundwater pump-and-treat unit. In June 2005, the operation of the base injection system commenced. Base injection operations are currently ongoing and active injection occurs as needed to maintain desired pH levels greater than 5.0 in the treatment zones. During June 2008, the base injection system was expanded to treat groundwater beneath the wetlands by injecting base through a series of injection wells. The engineered groundwater barriers were expanded in 2010 to add an additional gate and footage of wall. Operations in the new gate commenced in 2011."

Appendix I

In Section IV, Remedial Actions, Remedy Implementation, the 2nd paragraph under *Passive Treatment with Subsurface Barrier System*, will be revised as follows:

"In June 2010, a base injection system, comprised of injection wells, pumping station, and chemical metering system, was constructed to inject an alkaline solution approximately at a pH of 10 into the aquifer to immobilize metals. Figure I-3 shows the locations of the injectors that are placed downgradient of the barrier walls and

upgradient of the seepline. The base injection system operates periodically as needed to add alkalinity to the aquifer where the injection wells are located. The injected solution alters the geochemistry by raising the pH of both the pore water and aquifer sediments to provide favorable conditions for sorption of cationic contaminants. The base injection system at H Area has operated for two separate injection campaigns. The initial campaign started in September 2010 and was completed in June of 2013. A second injection campaign began in July 2019 and was completed in May 2020. SRS is observing the effects of previous base injection at H Area, prior to potentially injecting additional base.

In Section IV, Remedial Actions, System Operations/Operation and Maintenance subsection, will be revised as follows:

Remedial activities are still in progress that require operations and maintenance (O&M).

- **Since operation of the base injection system began in 2010, the pH in the target zone has stabilized. Since 2010, pPeriodic injections ~~are ongoing to maintain~~ have been performed to adjust the pH in the target zone of the plume. H Area Base injection was not operated in 2017, 2018 or 2021 because pH levels remained within the target were greater than 5.0 in the injection well zone. Through the end of 2021, 227.9 million L (60.2 million gal) of base solution have been injected (Table I-3)."**

Responsible Party: Jeffrey Thibault, (803) 952-5911, jeffrey.thibault@srs.gov

e. Maximum detections in groundwater are provided in Table H-5 (Summary of Constituents from the F-Area Groundwater OU Seepline Groundwater Detected Above Standards) and Table I-6 (Summary of Constituents from the H-Area Groundwater OU Seepline Detected Above Standards) for wells located along the seeplines and are noted to demonstrate decreasing concentrations; however, it is unclear if concentrations at all seepline locations are decreasing. For example, although maximum concentrations at the seeplines are decreasing, it is unclear if seepline locations along the edges of the site may show steady or increasing trends.

Response: Agree with Clarification.

While Tables H-5 (F-Area Groundwater OU) and I-6 (H-Area Groundwater OU) present a list of contaminants detected above standards in groundwater at the seepline, the RCRA corrective action recognizes that there are four challenging contaminants of concern with respect to mitigating the migration/discharge of groundwater protection standard (GWPS) constituents outcropping in the surface water at the seepline. These contaminants include iodine-129, strontium-90, tritium, and uranium-238. For these contaminants time series were analyzed for concentration trends at all the seepline groundwater piezometers over the past 10 years. The H-Area Groundwater OU includes 10 piezometer locations and F-Area includes 17 locations. New tables will be added to

Appendices H (Table H-6) and I (Table I-7) to present the trend summary for each of the four contaminants listed above.

The following new text will be added at the end of Section VI, Five-Year Review Process, *Groundwater and Surface Water Data* subsection of Appendix H:

"While Table H-5 presents a list of contaminants detected above standards in groundwater at the seepline, the RCRA corrective action recognizes that there are four challenging contaminants of concern with respect to mitigating the migration/discharge of GWPS constituents from outcropping in the surface water at the seepline. These contaminants include iodine-129, strontium-90, tritium, and uranium-238. For these contaminants time series were analyzed for concentration trends at all 17 of the seepline groundwater piezometers over the past 10 years. Table H-6 presents the trend summary for each of the four contaminants listed above.

Groundwater concentrations for strontium-90 were non-detect at 7 locations and less than the GWPS at ten locations. The remaining locations had decreasing concentration trends except for one location where the trend was stable. Uranium-238 was not detected at seven locations and was less than the GWPS at 16 of the 17 locations. Only one location had an increasing trend for Uranium-238. Iodine-129 was below the GWPS and not detected at two locations. The trend for iodine-129 was increasing at only one location; the remaining locations had decreasing or stable trends. Tritium was decreasing at all seepline locations except for one which had a stable trend and was less than the GWPS at four locations."

Table H-6. Summary of Concentration Trends for Iodine-129, Strontium-90, Tritium, and Uranium-238 at the F-Area Groundwater OU Seepline Groundwater.

GWPS Concentration	20 pCi/mL	1 pCi/L	8 pCi/L	15 pCi/L
F Area Location	**Tritium**	**Iodine-129**	**Strontium-90**	**Uranium-238**
FPZ 2A	↔	↔	ND	ND
FPZ 3A	↓	↔	↓	ND
FPZ 4A	↓	↓	ND	↔
FPZ 6A	↓	↓	↓	↓
FPZ 6B	↓	↔	↓	↓
FPZ 7A	↓	↓	↓	↓
FPZ 7B	↓	↑	ND	↑
FPZ 8AR	↓	↓	↓	↓
FPZ 8BR	↓	↓	ND	↓
FSP 2A	↓	ND	ND	ND
FSP 2B	↓	ND	↔	ND
FSP 47A	↓	↓	ND	↔
FSP-12A	↓	↓	ND	↔
FSP204A	↓	↓	↓	↔
FSP226A	↓	↔	↓	ND
FSP249A	↓	↓	↓	ND
FSP249B	↓	↓	↓	ND

Notes:

ND indicates contaminant was not detected
↓ indicates a decreasing concentration trend
↑ indicates an increasing concentration trend
↔ indicates a stable concentration trend
Green shading indicates concentration is below the Groundwater Protection Standard (GWPS)

The following new text will be added to Section VI, Five-Year Review Process, *Groundwater and Surface Water Data* subsection of Appendix I:

"While Table I-6 presents a list of contaminants detected above standards in groundwater at the seepline, the RCRA corrective action recognizes that there are four challenging contaminants of concern with respect mitigating the migration/discharge of GWPS constituents outcropping in surface water at the seepline. These contaminants include iodine-129, strontium-90, tritium, and uranium-238. For these contaminants time series were analyzed for concentration trends at all 10 of the seepline groundwater piezometers over the past 10 years. Table I-7 presents the trend summary for each of the four contaminants listed above.

Groundwater concentrations for strontium-90 at all locations were non-detect and less than the GWPS. Uranium-238 concentrations were less than the GWPS at all locations and not detected at all but one location which had a stable trend. Iodine-129 was below the GWPS and not detected at 5 of the locations. At the remaining locations iodine-129 exhibited a decreasing trend at four locations and a stable trend at one location. Tritium was decreasing at all seepline locations and was less than the GWPS at two locations."

Table I-7. Summary of Concentration Trends for Iodine-129, Strontium-90, Tritium, and Uranium-238 at the H-Area Groundwater OU Seepline Groundwater.

GWPS Concentration	20 pCi/mL	1 pCi/L	8 pCi/L	15 pCi/L
H Area Location	**Tritium**	**Iodine-129**	**Strontium-90**	**Uranium-238**
HPZ 1A	↓	↓	**ND**	**ND**
HPZ 3A	↓	**ND**	**ND**	**ND**
HPZ 3B	↓	**ND**	**ND**	**ND**
HPZ 5A	↓	**ND**	**ND**	**ND**
HPZ 5B	↓	↓	**ND**	↔
HPZ 6AR	↓	↔	**ND**	**ND**
HSP 60A	↓	↓	**ND**	**ND**
HSP 60B	↓	↓	**ND**	**ND**
HSP 76A	↓	**ND**	**ND**	**ND**
HSP 76B	↓	**ND**	**ND**	**ND**

Notes:
ND indicates contaminant was not detected
↓ indicates a decreasing concentration trend
↑ indicates an increasing concentration trend
↔ indicates a stable concentration trend
Green shading indicates concentration is below the Groundwater Protection Standard (GWPS)

Responsible Party: Jeffrey Thibault, (803) 952-5911, jeffrey.thibault@srs.gov

f. The iodine data for the most recent injection of silver chloride at the central gate of F-Area (Appendix H) should be provided to support the statement that the injections were demonstrated to be effective at sequestering iodine-129 in situ. This includes data for monitoring points closest to the injection that show the greatest reduction in concentration and includes wells further away that show less of an impact.

Response: Agree.

The text in Section IV, Remedial Actions, 3rd paragraph of System Operation/Operation and Maintenance subsection will be revised to read:

"…sequestering iodine-129 in situ. Variations in the degree of reduction have been observed during each deployment. Monitoring data at several well locations have shown that the 2018 silver chloride injection campaign was effective in reducing iodine-129 concentrations. In one of the wells (FSB 146D) close to the injection points, a reduction of approximately 58 – 75 percent in iodine-129 concentration occurred after the injection period and has persisted for over two years (Figure H-3). Wells FSB 143D and FSB 130D also saw attenuation of iodine-129 after the injection period with reductions in iodine concentration between 63 – 69 percent and 58 – 69 percent, respectively (Figure H-3). Monitoring points closest to the injection show the greatest reduction in concentration and wells further away show less of an impact (Figure H-4). SRS is continuing to evaluate the effectiveness of the permeable in situ treatment zone and continues to evaluate the need for additional silver chloride injection(s) in the future."

Figures H-3 and H-4 are included with these comment responses. Additionally, this information is available in the annual RCRA Corrective Action Report.

Responsible Party: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

Please revise the FYR Report to include the recent data that supports the assessments of the site remedies and conclusions of protectiveness.

2) The Site Chronologies as presented in the site-specific appendices do not include the initial discovery of the contamination at the OUs and initial response actions prior to the Records of Decision (RODs). As indicated in Appendix E (Five-Year Review Report Template) of the Comprehensive Five-Year Review Guidance, EPA 540-R-01-007, dated June 2001 (FYR Guidance), the site chronologies should include all important site events. For example, Appendix G, Table G-1 (Chronology of OU Events) should include the initial response actions taken at the D-Area Asbestos Pit (080-20G), including when it was closed and backfilled with soil to cover the waste (i.e., in 1975) and the maintenance action in 2011 that removed woody material and implemented land use controls (LUCs). Also, the excavation performed at site 489-D CPRB in 2000 should be noted on the Site Chronology in Appendix G. *Please revise the Site Chronologies to include the initial actions that were performed at each of the OUs.*

Response: Clarification.

Due to the large number of OUs evaluated by the five phases of SRS five-year remedy reviews and complexity of each, the purpose of the Chronology of OU Event is to include the major events that support the remedial action(s) associated with the OU. Additional activities such as maintenance actions are more appropriately discussed in the text. In the example provided for Appendix G, LUCs were implemented at the D-Area Asbestos Pit (080-20G) by the 2011 Early Action Record of Decision which is already listed in Table G-1. No change to the document is proposed.

Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov

3) The operations and maintenance (O&M) activities discussed in the FYR Report do not always address the soil vapor extraction (SVE) systems. The O&M requirements (e.g., inspections, monitoring, etc.) for all systems should be provided, as noted in the FYR Guidance. For example, Appendix E, Section IV (Remedial Actions, System Operation/Operation and Maintenance) of the FYR Report does not discuss the O&M activities for the passive SVE system that operated between June 14, 2017 and April 30, 2021. According to the Five-Year Review Site Inspection Checklist (i.e., Attachment E-1, Page E-38), the O&M procedures adequately maintained the integrity of the SVE system, but it is unclear what procedures were implemented. *Please revise discussions of the O&M activities at each OU to include the required maintenance activities performed for SVE systems.*

Response: Agree with clarification.

SVE system maintenance activities ensure continual operation of the SVE systems (MicroBlower™ and BaroBall™). The SVE systems are inspected during operational rounds per the sampling frequency specified in the regulatory documents. If the MicroBlower™ or BaroBall™ is non-operable, the unit is replaced.

In the Section II, Response Action Summary, System Operation and Maintenance, 1st paragraph, the following text will be added as the last sentence in the paragraph for the A/M Groundwater, ABRP/MCB, AMRP, CBRP, DAOU, MAOU, MIPSL, PBRP, and TNX GW:

"The O&M of the SVE systems consist of ensuring continual operation (e.g., non-operational units are replaced)."

Responsible Party: Eric Schiefer, (803) 952-6273, eric.schiefer@srs.gov

4) The protectiveness statements in Section X (Protectiveness Statement[s]) of the OU-specific appendices do not always include the current status of the remedies at each OU that are being used to control unacceptable risks. The current remedies that are operating at each OU should be provided as supporting rationale for the protectiveness determination. The following examples should be addressed:

a. **Appendix E, Page E-12 of E-38:** The protectiveness statement identifies the SVE system and LUCs that will prevent exposure to or ingestion of contaminated media; however, the passive SVE system was removed in 2021. Also, this statement does not include the soil cover installed at the Trenches subunit. *Please revise the protectiveness statement to remove references to the SVE system to control unacceptable risks and to include the soil cover.*

Response: Agree with Clarification.

The first sentence of the 2nd paragraph in Section X, Protectiveness Statement(s) will be rewritten as: "Exposure pathways that could result in unacceptable risks were ~~are being~~ controlled by the SVE system and are being controlled by the soil cover/liner over the Trenches Area and ~~institutional controls (i.e.,~~ LUCs to prevent exposure to or ingestion of contaminated media".

Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn @srs.gov

b. **Appendix F, Page F-13 of F-38:** The protectiveness statement indicates that a soil cover and LUCs are used to control exposure pathways, but it is unclear why MNA of the groundwater is not included. *Please revise the protectiveness statements to include the MNA used at this OU to meet the RAOs*.

Response: Agree with Clarification.

The acronym "MNA" will be added to Section X, Protective Statement(s), 2nd paragraph, 2nd sentence.

Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn @srs.gov

c. **Appendix K, Page K-10 of K-32:** The protectiveness statement notes that threats to the contaminated vadose zone at MIPSL OU are being addressed through SVE systems; however, the SVE system was removed in 2020. *Please revise the protectiveness statement to remove references to the SVE systems to control unacceptable risks.*

Response: Agree.

The words "SVE system and" will be removed from the Section X, Protective Statement(s), 2nd paragraph, 2nd sentence.

Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn @srs.gov

SPECIFIC COMMENTS

1. **Section III, Progress Since Last Review, Page 10 of 40; Appendix E, Section V, Progress Since Last Review, Page E-8 of E-38; Appendix G, Section V, Progress Since Last Review, Page G-17 of G-60:** Section III identifies two recommendations from the Fifth Five-Year Remedy Review Report for the A-Area Miscellaneous Rubble Pile (731-6A) OU and D-Area OU, respectively; however, the status of the recommended actions and the results of any implemented actions are not discussed. In addition, the site-specific discussions in Appendix E (A-Area Miscellaneous Rubble Pile [731-6A] OU) and Appendix G (D-Area Operable Unit) do not include these recommendations from the previous five-year review. For example, Appendix E states that there were no recommendations or follow-up actions from the last five-year review for A-Area Miscellaneous Rubble Pile (731-6A) OU. Please revise Section III to include the status of the recommendations from the previous five-year remedy review, the follow-up actions taken, and if these actions were successful and achieved the intended effect (e.g., as presented in Table 3, Actions Taken Since the Last Five-Year Review, in Appendix E of the FYR Guidance). *Please also revise Appendices E and G to be consistent with the recommendations noted in Section III*.

   Response: Agree/Clarification.

   Section III, Progress Since Last Review, will be updated to provide a summary of the status of the recommendations from the Fifth Five-Year Remedy Review Report for the A-Area Miscellaneous Rubble Pile (731-6A) OU and the D-Area OU. For the A-Area Miscellaneous Rubble Pile OU, soil sampling and an updated modeling effort were completed. Based on the sampling and modeling results, on December 16, 2020, the USDOE, USEPA, and SCDHEC agreed to discontinue operation of the passive SVE system and to monitor two groundwater wells (AOB 1 and MSB 31C) to verify there are no impacts to the groundwater associated with the discontinued operation of the SVE system. The passive SVE system was shut down in 2021 and the data from the two wells is reported in the five-year remedy review reports. The recommendation for the D-Area OU from the Fifth Five-Year Remedy Review Report was revised in the Sixth Five-Year Remedy Review Report to include conversion of the MicroBlower™ SVE system to a passive BaroBall™ SVE system until soil samples can be collected (refer to Section VI, Issues/Recommendations and Appendix G).

   Appendix E, Section V, Progress Since Last Review, will be revised to include the recommendation from the previous five-year review and additional actions that were taken based on the soil sampling results. Supporting text will also be added to Appendix E, Section VI, *Data Review*, to provide references to the soil sampling and revised model.

   Appendix G contains the most recent Recommendations and Follow-up Actions for the D-Area OU in Table G-5. No changes to Appendix G are proposed.

   Responsible Parties: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov and Ashley Shull, (803) 952-7090, ashley.shull@srs.gov

2. **Appendix C, Section IV, Remedial Actions, Page C-7 of C-58, and Table C-2, Summary of Remedial Action Objectives and Remedial Goals for Soil, Page C-46 of C-58:** The RAOs listed in Section IV are inconsistent with the RAOs specified in Table C-2. For example, the text does not identify the RAO for the prevention of migration of trichloroethene (TCE) and tetrachloroethene (PCE) to groundwater in the Miscellaneous Chemical Basin (MCB) Vadose Zone, which is listed in Table C-2. Instead, the text identifies the RAO for the MCB/MBP Surface and Vadose Zone Soils as preventing direct contact with contaminated surface/subsurface soils. However, this RAO is not included in Table C-2. In addition, Table C-2 does not include the A-Area Rubble Pit (731-2A) or MBP surface soil RAOs. *Please revise Appendix C to consistently define the RAOs.*

   Response: Agree with Clarification.

   Table C-4 of Appendix C is accurate. Text in Section IV of Appendix C will be revised to be consistent with Table C-4 and state all of the RAOs and selected remedial alternatives identified in the ROD for ABRP/MCB/MBP OU.

   The text in Section IV will also be revised to clearly identify RAOs and selected remedies identified in the IRODs for the ABRP (731-A/1A and Rubble Pits (731-2A) and the MCB/MBP (731-4A/5A). These RAOs are considered complete and are therefore not included in Table C-4.

   Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

3. **Appendix C, Section IV, Remedial Actions, MCB/MBP Surface Soil (completed during the interim action phase), Page C-10 of C-58:** The discussion of the remedial actions implemented does not discuss excavation of the soil contaminated with Octachlorodibenzo-p-dioxin (OCDD) at MCB and the aluminum contaminated soil at MBP to meet the RAO identified in the beginning of this section (i.e., prevent direct contact with aluminum, OCDD, Aroclor 1254, and Aroclor 1260 contaminated surface/subsurface soils; Page C-7). In addition, a maintenance program for 1.45 acres of native soil cover is listed for these areas, but this is not identified as a LUC component of the selected remedial actions bulleted on Pages C-8 and C-9. As such, it is unclear if OCDD and aluminum soil contamination was excavated from MCB/MBP as planned. *Please revise Section IV to discuss if the OCDD and aluminum contamination was excavated from MCB/MBP Surface Soil and clarify the purpose of the soil cover maintenance program.*

   Response: Agree.

   The text in Sections III and IV will be revised to identify which contaminants were targeted during excavation activities and which units have LUC requirements. The soil concentrations for OCDD did not pose a risk to the industrial worker, so it was not targeted during excavation activities. Soil contaminated with PCBs and aluminum were targeted during excavation activities and removed. Figure C-3 shows the units with LUC requirements.

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

4. **Appendix C, Section IV, Remedial Actions, Remedy Implementation, MCB Vadose Zone (completed during the interim action phase), Pages C-10 to C-11 of C-58:** The last bullet point on Page C-10 states that the active SVE was discontinued in 2004 at MCB Vadose Zone and active SVE wells were transitioned to passive SVE wells; however, the next bullet point on Page C-11 states that additional passive SVE wells were installed to supplement the active SVE system. As such, it is unclear if active SVE at the MCB Vadose Zone was completely discontinued in 2004. *Please revise the text to clarify when the active SVE system was discontinued relative to the installation of the additional passive SVE wells.*

   Response: Agree with Clarification.

   The active SVE system at MCB was discontinued in 2004.

   The text in Section IV, Remedial Actions, Remedy Implementation, *MCB Vadose Zone (completed during the interim action phase)* will be revised to state, "Installed additional passive SVE wells to continue removing solvent mass from the vadose zone ~~supplement the active SVE system~~. The current SVE system…"

   Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

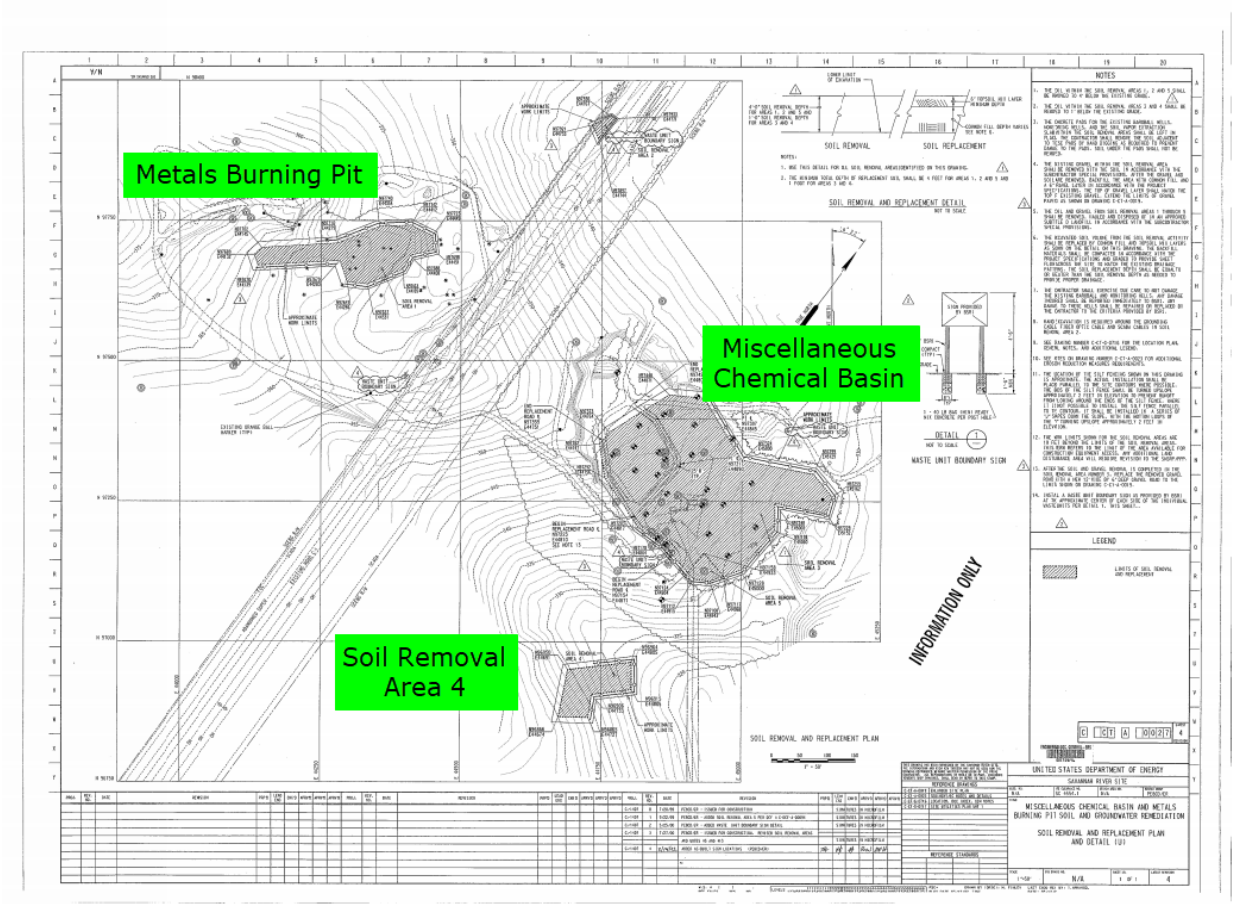
5. **Appendix C, Section VI, Five-Year Review Process, Summary of Inspections and Interviews, Page C-15 of C-58:** The text states, "Since the MBP [Metals Burning Pit (731-5A)] and SRA 4 subunits are outside of the established LUC boundary and no further problems warranting action exist in the MBP surface soil subunit and SRA 4 (WSRC 2008), inspections were discontinued in 2022;" however, the location of soil removal area (SRA) 4 is not provided (e.g., on Figure C-3, ABRP/MCB/MBP OU Subunits Layout). In addition, Section IV (Remedial Actions) identifies the remedy for MBP Surface and Subsurface Soil as excavation and LUCs, so it is unclear why it is noted that this area falls outside the LUCs boundary. *Please revise the FYR Report to clarify the remedy for MBP, including if LUCs are necessary at this area. Please also provide the location of SRA 4.*

   Response: Agree with Clarification.

   Per the Land Use Control Implementation Plan for the A-Area Burning/Rubble Pits (731-A, -1A) and Rubble Pit (731-2A) and the Miscellaneous Chemical Basin/Metals Burning Pit (731-4A and -5A) Operable Unit, the final selected remedy for MBP surface soils was excavation of contaminated soils. Confirmatory sampling was performed to verify that remedial goals were met. The excavation was backfilled with clean soil. No further problems warranting action exist at the MBP subunit, therefore LUCs are not required.

   In a similar fashion, Soil Removal Area (SRA) -4 was also being inspected when there was no requirement to do so. Per the *Interim Post-Construction Report (IPCR) for the Miscellaneous Chemical Basin/Metals Burning Pit (731-4A/5A) Operable Unit (U)* (WSRC-

RP-2002-4038, Rev. 1.1, December 2002), SRA-4 was associated with the MCB soil excavation activities but is not within the footprint of the LUC boundaries for MCB nor is it considered a waste unit. Therefore, the two mentions of SRA-4 will be removed from Appendix C. A map depicting the location for the SRA-4 is provided below. No changes to maps in Appendix C is warranted.



Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov

6. **Appendix D, Section IV, Remedial Actions, Pages D-5 and D-9 of D-50 and Figure D-2, A/M Area Groundwater OU Plume and Treatment Systems Locations, Page D-32 of D-50:** The text indicates the locations and spatial relationship of the areas covered by each of the three interim record of decisions (IRODs) are illustrated on Figure D-2; however, this figure shows the boundaries of several groundwater sectors (e.g., Central Sector) that are not discussed in the text and it is unclear which IROD and remedy apply to each sector. For example, the Remedy Implementation portion of Section IV discusses a Western Sector Treatment System, but Figure D-2 does not show a treatment system in the Western Sector. Please also note that the plume extent in the Western Sector is cut off by the Legend in Figure D-2. *Please revise Section IV and Figure D-2 to clarify the sectors addressed by each*

IROD and the locations of the selected and implemented remedies. Please also include a figure that shows the full extent of the groundwater plumes.

Response: Agree with Clarification.

The IROD for A/M Area Groundwater OU was focused on the pump and treat system known as the M-1 Air Stripper and 11 recovery wells. This interim action continues to operate effectively. Additional corrective action, managed under the RCRA Permit Renewal, has also been conducted associated with the M-Area and Metallurgical Laboratory Hazardous Waste Management Facilities (HWMFs). To administratively manage corrective action in the M-Area HWMF, the contaminated area has been divided into six sectors: Vadose zone, Central, Northern, Southern, Western, and ABRP/MCB/MBP OU. The text in Section IV, Remedial Actions will be revised to clarify this point. The sector specific corrective action is discussed in Section IV, Remedy Implementation. The revised text should help identify where corrective action has taken place throughout A/M Area.

Figure D-2 does not show all corrective action discussed in Section IV. Figure D-2 only displays the full-scale corrective action projects that have been implemented at A/M. The RCRA temporary authorizations (TA) discussed in Section IV are small, field scale studies utilized to demonstrate the applicability of a technology for a given area of the A/M Area contaminant plume. The TAs will not be displayed on Figure D-2.

Figure D-2 will be revised to show the entire groundwater plume.

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

7. **Appendix D, Section IV, Remedial Actions, Remedy Implementation, A/M-Area Groundwater OU, Page D-8 of D-50:** The text identifies a greater than 1,000 µg/L TCE plume that falls outside the A-2 Air Stripper capture zone and states that additional corrective actions may be needed to address this plume; however, it is unclear if the RAO to prevent plume migration will be met if this plume is not addressed. In addition, the text states that this TCE plume extends southwest toward the Savannah River National Laboratory (SRNL); however, the location of the plume (e.g., monitoring wells ASB 8C and MSB113B and recovery well RWM 14C) and the SRNL are not included on a site figure. *Please revise the FYR to clarify the location of this TCE plume, relevant monitoring wells and SRNL on a figure and include a discussion justifying why this issue was not identified in Section VIII (Issues) of Appendix D.*

Response: Agree with Clarification.

The greater than 1,000 µg/L TCE plume in the Northern Sector of A/M area is depicted on Figure D-2. The corrective action that will be applied to remediate this section of the plume will be identified in a future Corrective Measures Study and Corrective Action Plan. The schedule for these activities were approved in the 2014 RCRA Permit Renewal.

Since a plan is in place to address the elevated VOC plume, it is not deemed an issue under RCRA and will not be identified in Section VIII. The text in Section IV, Remedy Implementation will be revised to lay out the plans for future corrective actions.

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

8. **Appendix D, Section IV, Remedial Actions, Remedy Implementation, A/M-Area Groundwater OU, Page D-9 of D-50:** The first complete sentence on this page states the A-2 Air Stripper was permanently shut down on December 15, 2021; however, according to Table D-3 (Summary of Remediation Performance form 2018-2022 [lbs of VOCs Removed]), 12 pounds (lbs) of volatile organic compounds (VOCs) were removed by the A-2 Air Stripper in 2022. *Please revise Appendix D to clarify when the A-2 Air Stripper was permanently removed and if this system was operated in 2022.*

   Response: Agree.

   The date the A-2 Air Stripper was permanently shut down is accurate. In Table D-3, the annual pounds removed for the A-2 Air Stripper are inaccurate and will be revised to accurately display the pounds removed from 2018 through 2022. In the revised table, the total pounds of VOC removed in 2022 will equal zero.

   Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

9. **Appendix D, Section IV, Remedial Actions, Page D-9 of D-50:** Additional technologies that complement the groundwater recovery well systems selected in the IROD are discussed, but it is unclear if these remedies are or will be included in a separate decision document (e.g., Final ROD). For example, SVE systems are used to address known source areas in the vadose zone, thermal heating using the Dynamic Underground Stripping (DUS) process to address dense non-aqueous phase liquid (DNAPL), and in-situ chemical oxidation (ISCO) was used at the Western plume, but these remedies are not included in the IRODs. *Please revise Section IV to discuss if the additional technologies that are not in the IRODs will be documented in a CERCLA decision document (e.g., Final ROD).*

   Response: Agree with clarification.

   Due to the size of the plumes associated with the A/M Area Groundwater OU, characterization activities and selection of final corrective action technologies are ongoing under the South Carolina Department of Health and Environmental Control (SCDHEC) Resource Conservation and Recovery Act (RCRA) Permit Renewal. As stated in the A/M Area Operable Unit IROD, a final ROD for the groundwater OU will be prepared after completion of the characterization activities and evaluation of risk associated with the OU. The timing for submittal of the final ROD has not yet been determined due to ongoing activities under RCRA.

   The second paragraph in Section IV, Remedial Actions, will be revised as follows:

"The final actions for the A/M Groundwater OU will be documented by modifications to the RCRA permit renewal. These final actions will also be documented in a final ROD for the A/M Groundwater OU at the appropriate time."

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

10. **Appendix D, Section VII, Technical Assessment, Page D-22 of D-50:** The assessment of the MCB/MBP Subunit notes that the airlift recirculation wells (ARWs) were shut down in 2011 and abandoned in 2019; however, it is unclear if RAOs were met by the implemented actions. As noted in Section IV (Remedial Actions), the RAOs in the 1999 IROD were to treat contaminated groundwater to prevent further VOC plume growth, to demonstrate the effectiveness of in-situ air stripping wells, and to determine a final remedial goal. It is unclear if these RAOs were met and the in-situ air stripping wells (i.e., ARWs) were effective or if additional action is necessary to achieve these goals. Since the remedy at the MCB/MBP Subunit is no longer operating as specified in the IROD, *please revise the assessment of the MCB/MBP Subunit to discuss if the RAOs in the IROD were met and provide any supporting groundwater performance or monitoring data.*

    Response: Agree.

    Agreement was reached with SCDHEC RCRA personnel in 2019 to abandon the in-situ air stripping wells due to declining VOC concentrations and low mass removal rates (i.e., 46 pounds of VOCs removed during 9 years of operation). The wells had not achieved the RAOs specified in the IROD prior to their abandonment, and groundwater monitoring and characterization activities are ongoing under the RCRA Permit Renewal. The results from these activities are reported annually in the M-Area and Metallurgical Laboratory Hazardous Waste Management Facilities Groundwater Monitoring and Corrective Action Report and will aid in identifying new corrective actions for the groundwater plume associated with the MCB/MBP subunit.

    Section VII, Technical Assessment, MCB/MBP Subunit, will be revised as follows:

    "The recirculation wells were placed…The ARWs were abandoned in 2019 based on agreements with SCDHEC RCRA personnel due to declining VOC concentrations and low mass removal rates. The ARWs had not achieved the RAOs specified in the IROD (WSRC 1999b) prior to their abandonment, and groundwater monitoring and characterization are ongoing under the RCRA Permit Renewal. The results from these activities are reported annually in the M-Area and Metallurgical Laboratory Hazardous Waste Management Facilities Groundwater Monitoring and Corrective Action Report and will aid in identifying new corrective actions for the groundwater plume associated with the MCB/MBP subunit."

    Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

11. Appendix D, Section VIII, Issues, Page D-24 of D-50: No issues related to current site conditions are identified in this section; however, according to the text in Section VI (Technical Assessment, ABRP Subunit), additional characterization is needed to define the distal portion of the 1,4-dioxane plume and delineate the source of high concentration at ARP 1A. In addition, Section X (Protectiveness Statement[s]) notes that the remedies at the A/M-Area Groundwater OU are protective in the short-term, because the M-1 Air Stripper recovery system is not able to capture all of the high concentration plume. *Please revise Section VIII to note these issues of plume containment that may impact long-term protectiveness.*

Response: Clarification.

Groundwater monitoring, characterization, and corrective action activities for the A/M Area Groundwater OU plumes are conducted under RCRA as discussed throughout Appendix D. Until final corrective actions are determined for the OU, protectiveness for human health and the environment is achieved through the SRS facility security and administrative controls that restrict unauthorized access. The additional characterization activities discussed in Section VI do not affect long-term protectiveness under RCRA.

Section IX, Recommendations and Follow-up Actions, will be revised as follows:

"There are no recommendations or follow-up actions for this OU under CERCLA. Groundwater monitoring, characterization, and corrective actions are conducted under RCRA. SRS has submitted corrective action schedules…"

Section X, Protectiveness Statement(s), will also be revised as follows:

"…controlled through institutional controls (i.e., LUCs). However, ~~for the remedy to be protective in the long-term,~~ optimization of the M-1 Air Stripper recovery system and/or other corrective action technologies must be implemented to treat the high concentration part of the plume located outside of the recovery well system zone of capture.

Currently, long-term protectiveness is achieved through controls to prevent exposure to or ingestion of contaminated groundwater includinge physical access controls to prevent unauthorized entry to SRS (fences, guards, security patrols, etc.), administrative controls that maintain the A/M-Area Groundwater OU for industrial use only (SRS is a secured government facility with land use restrictions) and use restrictions via the SRS Site Use/Site Clearance Program."

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

12. Appendix E, Section VI, Five-Year Review Process, Pages E-8 to E-9 of E-38: The third bullet point notes that the review includes a technical assessment of whether the SVE system is functioning as intended by the ROD and the shutdown criteria have been achieved, but this

assessment is not sufficiently detailed. As noted on the next page, "a favorable modeling effort" determined there was no longer a threat to groundwater; however, it is unclear what this modeling effort included. For example, the concentrations of PCE and TCE in fill material were predicted to impact groundwater above maximum contaminant levels (MCLs) in 504 and 226 years, respectively (i.e., see Section III, Background, of Appendix E), but it is unclear if confirmation sampling of the fill has been performed to ensure groundwater will not be impacted. *Please revise Section VI to discuss the shutdown criteria that were achieved and how it was determined that groundwater would not be impacted by TCE and PCE in fill material.*

Response: Agree.

The following text will be added to Section VI, Five-Year Review Process, *Data Review*:

"In accordance with the approved Sampling and Analysis Plan for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit (U) (SRNS 2015), additional characterization of the ash layer and vadose zone soils located beneath the Trenches Area soil cover was conducted in July 2018 to evaluate if the VOCs are partitioned in the hydraulic/cutting oils and to provide information on the remaining VOC concentration in soil and ash. The soil results were included in the *Performance Evaluation Report for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit: April 2019 to April 2020 (U)* (SRNS 2020). In 2019, the nearly 20-year old fate and transport model for the AMRP OU was updated using the 2018 characterization data. Conclusions from the modeling effort identified longer contaminant transport times through the vadose zone and indicates that TCE and PCE at the AMRP OU Trenches Area no longer pose a threat to human health and the environment (SRNS 2019b)."

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

13. **Appendix E, Section VI, Five-Year Review Process, Data Review, Page E-9 of E-38:** Two monitoring wells, AOB 1 and MSB 31C, are noted to be sampled after shutdown of the passive SVE system; however, it is unclear why these two wells were selected, particularly since MSB 31C is impacted by the groundwater contaminant plume associated with the discharges to the A-014 Outfall. It is also unclear if groundwater monitoring has been added as a remedy component for soil at the A-Area Miscellaneous Rubble Pile (731-6A) (AMRP) OU. The FYR should discuss this change in the remedy and if an Explanation of Significant Differences (ESD) is necessary. *Please revise Section VI to discuss the purpose and rationale for the two wells selected for monitoring and clarify if this monitoring is a significant change to the soil remedy at AMRP OU.*

Response: Agree.

On December 16, 2020, the USDOE, USEPA, and SCDHEC reached agreement to discontinue operation of the passive soil vapor extraction system based upon the yearly empirical data reported in the annual Performance Evaluation Reports, as well as the

favorable modeling analysis as reported in the *Evaluation of Contaminant Migration and Remedial Goals for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit Trenches Area (U)* (SRNS-RP-2019-00621, Revision 0, September 2019). As part of this agreement, monitoring data from groundwater wells AOB 1 and MSB 31C will be reported in the five-year remedy review reports in support of this decision. The groundwater data is used to verify the effectiveness of the SVE remedial action by observing potential impacts to groundwater beneath the AMRP. The addition of groundwater monitoring data to the five-year remedy review reports does not change the remedy.

The 2nd paragraph in Section VI, Five-Year Review Process, *Data Review,* will be revised as follows:

"On December 16, 2020, the USDOE, U. S. Environmental Protection Agency (USEPA), and South Carolina Department of Health and Environmental Control (SCDHEC) reached agreement to discontinue operation of the passive SVE system based upon the yearly empirical data reported in the annual PERs, as well as the favorable modeling analysis as reported in the *Evaluation of Contaminant Migration and Remedial Goals for the A-Area Miscellaneous Rubble Pile (731-6A) Operable Unit Trenches Area (U)* (SRNS 2019b). As part of this agreement, monitoring data from groundwater wells AOB 1 and MSB 31C will be reported in the five-year remedy review reports in support of this decision. The groundwater data is used to verify the effectiveness of the SVE remedial action by observing potential impacts to the groundwater beneath the AMRP. In 2021, passive SVE operations was shut down…An ~~second~~ addendum to the Post-Construction Report (SRNS 2018b) documented the shutdown of the passive SVE wells…"

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

14. **Appendix F, Section IV, Remedial Actions, System Operations/Operations and Maintenance, Page F-8 of F-38:** The text states that the actual O&M costs exceeded the costs estimated in the 2008 ROD due to the increased cost associated with MNA monitoring and reporting; however, it is unclear why costs were higher than what was estimated for MNA in the ROD. Based on Table F-3 (Actual versus Estimated O&M Costs), actual costs exceeded the estimated costs by more than 200 to 400 percent (%) every year. *Please revise this section to specify the costs for MNA that resulted in these increases compared to what was estimated in the ROD.*

    Response: Agree with Clarification.

    To better evaluate the MNA process, all monitoring wells in the CBRP OU MNA program retained annual sampling rather than moving to biennial sampling after 2013, as estimated in the 2009 MNA Effectiveness Monitoring Plan for the CBRP OU (WSRC-RP-2008-4049, Rev. 1, January 2009). Two additional monitoring wells were added to the CBRP OU MNA monitoring effort to better delineate the CBRP OU TCE plume from the CAGW OU TCE plume. Ethylene was added to the analyte list to help determine if complete biodegradation was occurring for TCE, and ethylene is a separate analytical

method/cost than the other VOCs. Sampling, analytical, data management, and validation costs are all increased from these additions.

The last sentence in Section IV, Remedial Actions, Systems Operations/Operations and Maintenance will be rewritten as follows: "The O&M costs from FY2018 to FY2022 are higher than estimated due to the increased cost associated with MNA monitoring, including retaining annual sampling, adding additional monitoring wells and contaminant analyses, and reporting. Sampling, analytical, data management, and validation additions caused the increase in costs."

Responsible Party: Terry Killeen, (803) 952-6850, terry.killeen@srs.gov

15. **Appendix F, Section VI, Five-Year Review Process, Data Review, Page F-10 of F-38:** The text states, "The MNA wells and surface water sampling show decreasing contaminants over time except for two wells (CRW 10C and CRW010CU), and CRW010CU displays concentrations exceeding the TCE trigger level;" however, the trends at these two wells are not discussed (i.e., if TCE shows steady or increasing concentrations). Further, since TCE concentrations exceed the trigger level at well CRW010CU, it is unclear if any actions are necessary to ensure protectiveness. *Please revise Section VI to discuss the trends in concentrations at CRW 10C and CRW010CU, including if any actions are necessary at these wells to ensure the groundwater plume at this location meets RAOs.*

Response: Clarification.

The two monitoring wells screened in the Lower Aquifer Zone with MCL exceedances are LUC boundary wells: CRW 10C and CRW010CU. At well CRW 10C, the TCE groundwater concentrations have been slowly declining since November 2017 (TCE = 12.3 µg/L). In November 2022, the TCE concentration was 8.19 µg/L at well CRW 10C, which does not exceed the trigger value (13.6 µg/L). Likewise, well CRP010CU has also been slowly declining since May 2014 from a maximum of 19.3 µg/L to 12.6 µg/L in November 2022, which did not exceed the trigger level of 13.6 µg/L for the CBRP OU.

CRW010CU has exceeded the trigger level almost every year since the well was installed in 2009. However, several lines of evidence indicate that contamination in CRW010CU and CRW 10C is not associated with CBRP OU, but rather with the CAGW OU northern VOC plume. Figure 1 (attached to the comment responses) is a contamination map, showing the maximum historic TCE concentration between 1985 and 2016 for every station sampled during that time. There are two distinct plumes, separated by an uncontaminated zone represented by wells CRP 4, CRP 6DR, and CRP 8D, as well as three 1998 DPT multi-level groundwater sample locations (CRSB-88, CRSB-89, and CRSB-90). Well CRP 4 had a maximum TCE groundwater concentration of 11.0 µg/L in January 1991, but all groundwater samples have been below detection limits or less than the MCL (5 µg/L) between August 1991 and November 2005, when monitoring of CRP 4 ceased. Well CRP 8D had a maximum TCE groundwater concentration of 1.24 µg/L in August 2003, and the eight groundwater samples collected between June 2005

and November 2022 have all been below detection limits. All groundwater samples from well CRP 6DR have been below detection limits from 1996 to 2022.

Figure 1 shows the 2003 water table contours. The water table contours indicate that groundwater at the CRW 10 cluster originates from the reactor area, rather than from the CBRP area. The CBRP OU groundwater modeling particle tracks also indicate the predominant flow path from the CBRP OU is towards Fourmile Branch (Figure 2). Monitoring well CRP 8D is located between the CBRP OU and CRW 010CU. The maximum TCE concentration at CRP 8D was only 1.24 µg/L, in 2003, which suggests that it is very unlikely that a flow path exists connecting CRW010CU with a source at the CBRP OU.

The USDOE, USEPA, and SCDHEC met and decided to resume sampling at wells CRP 6DR (2011) and CRP 8D (2014) to better delineate the two groundwater plumes. No change to text is required.

Responsible Party: Terry Killeen, (803) 952-, Terry.Killeen@srs.gov

16. **Appendix F, Section VII, Technical Assessment, Page F-11 of F-38:** The second bullet point notes that concentrations of TCE in groundwater and surface water are decreasing, but the previous section (i.e., Data Review) states that TCE concentrations are not decreasing at two wells (i.e., wells CRW 10C and CRW010CU). The Technical Assessment should discuss the efficacy of the MNA remedial action at these two wells and if cleanup levels will be achieved. *Please revise Section VII to discuss the wells where TCE concentrations are not decreasing and if the MNA remedy is progressing as expected*.

    Response: Clarification

    As stated in the response to Specific Comment 15 above, the TCE groundwater concentrations have been slowly declining since November 2017 at well CRW 10C, and since May 2014 at well CRW010CU. More importantly, these wells are being impacted from the CAGW OU TCE plume rather than the CBRP OU TCE plume. These wells do not factor into the technical assessment of the CBRP OU MNA remedial action. No changes to the document are proposed.

    Responsible Party: Terry Killeen, (803) 952-, Terry.Killeen@srs.gov

17. **Appendix G, Table G-4, Summary of Confirmatory Sampling for On-Site Thermal Detritiation Treatment of Soils and Concrete associated with the Moderator Processing Subunit (SRNS 2011d), Page G-35 of G-60:** The remedial goal (RG) for soil is noted to be 120 picoCuries per gram (pCi/g) for tritium (see Section VI, Five-Year Review Process, Page G-18 of G-60); however, maximum concentrations for two sampling events (DAOU-HR-TS4 and DAOU-HR-TS9) exceed this RG (i.e., 133 and 142 pCi/g, respectively). It is unclear how the data for the maximum concentrations were used and if additional treatment was performed after these confirmation samples were collected. *Please revise Table G-4 to*

clarify what actions were taken for the treatment cells with maximum tritium soil concentrations that exceeded the 120 pCi/g soil RG.

Response: Agree.

According to the Removal Action Report (SRNS 2011d), ultimately all the treated concrete and soil media were confirmed to be below the contaminant migration thresholds (i.e., 120 pCi/g for soil and 68,000 pCi/g concrete). During the tritium removal process, if analytical results of treated material were above the contaminant migration thresholds, the material was reheated and reanalyzed until treatment thresholds were achieved. In Table G-4, the maximum results for DAOU-HR-TS4 and DAOU-HR-TS9 (i.e., 133 and 142 pCi/g, respectively) represent material above the treatment threshold that was subsequently reheated (and reanalyzed) until tritium levels were below 120 pCi/g. Table G-4 will be revised to include the final maximum concentrations for DAOU-HR-TS4 and DAOU-HR-TS9 (i.e., 109 and 102 pCi/g, respectively). In addition, the number of records for DAOU-HR-TS4 for soil will be revised from five to four records.

Responsible Party: Jeff Thibault, (803) 952-5911, jeffrey.thibault@srs.gov

18. **Appendix H, Section IV, Remedial Actions, Remedy Selection, Page H-4 of H-36:** The Phase 2a objective of reducing the concentration of the remaining Appendix IVB-A constituents in Fourmile Branch (except tritium and iodine-129) to levels that are less than groundwater protection standards (GWPS) is stated to be met; however, it is unclear what constituents are included in Appendix IVB-A. Based on Table H-4 (Summary of Constituents from the F-Area Groundwater OU Surface Waters of Fourmile Branch Detected Above Standards), two constituents in addition to tritium and iodine-129 exceed their GWPS or MCLs (i.e., carbon-14 and cobalt). *Please revise the text to identify the Appendix IVB-A constituents and to clarify which constituents are currently less than the GWPS in Fourmile Branch.*

Response: Agree with Clarification.

The constituents included in Appendix IVB-A are listed in Table H-2. For clarity, Table H-2 will be referenced in the text instead of Appendix IVB-A of the RCRA Permit Renewal when referring to the monitored constituents for the F Area Groundwater OU.

Table H-4 includes maximum concentrations for all the of the groundwater protection standard (GWPS) constituents that exceeded the GWPS limit during each of the five-year review periods. Because the table only includes maximum concentrations, anomalous results can occur that cause the constituent to appear like it is over the GWPS, when the constituent concentrations are typically below the GWPS.

When this occurs, as is the case for carbon-14 for the sixth five-year review period, SRS adds a footnote in the table to explain that the maximum result is anomalous and concentrations are typically below the GWPS.

Cobalt has a GWPS that is close to background concentrations in Fourmile Branch. Because of this, cobalt sporadically exceeds the GWPS in the surface water of Fourmile Branch. There were 47 total measurements taken for cobalt at surface water stations FM-2BD, FMC-002F, FMC-002H and FMC-002HD. Of the 47 measurements, only 5 were above the MCL with only one of those results (12 ug/L at FM-2BD) being above the PQL. All results in 2021 were below the MCL. The sporadic results above the MCL are believed to be attributable to naturally occurring cobalt in surface waters of Fourmile Branch.

The following footnote will be added to cobalt in Table H-4 and the other footnotes renumbered as needed.

"3. Exceedances are sporadic. Of the 47 measurements taken, only 5 were above the MCL."

Responsible Party: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

19. **Appendix H, Section VI, Five-Year Review Process, Data Review, Page H-11 of H-36:** The text states that except for iodine-129, constituent concentrations in Fourmile Branch surface water are decreasing or are below the GWPS and/or MCL based on Table H-4; however, this table reports maximum concentrations of cobalt as increasing from 1.22 ug/L in the 4th Remedy Review period (2007–2011) to 12 ug/L in the current 6th Remedy Review period (2017-2021). *Please revise the text to discuss this increase in cobalt concentrations.*

Response: Agree with Clarification.

Cobalt has a GWPS that is close to background concentrations in Fourmile Branch. Because of this, cobalt sporadically exceeds the GWPS in the surface water of Fourmile Branch. There were 47 total measurements taken for cobalt at surface water stations FM-2BD, FMC-002F, FMC-002H and FMC-002HD. Of the 47 measurements, only 5 were above the MCL with only one of those results (12 ug/L at FM-2BD) being above the PQL. All results in 2021 were below the MCL. The sporadic results above the MCL are believed to be attributable to naturally occurring cobalt in surface waters of Fourmile Branch.

The following footnote will be added to cobalt in Table H-4 and the other footnotes renumbered as needed.

"3. Exceedances are sporadic. Of the 47 measurements taken, only 5 were above the MCL."

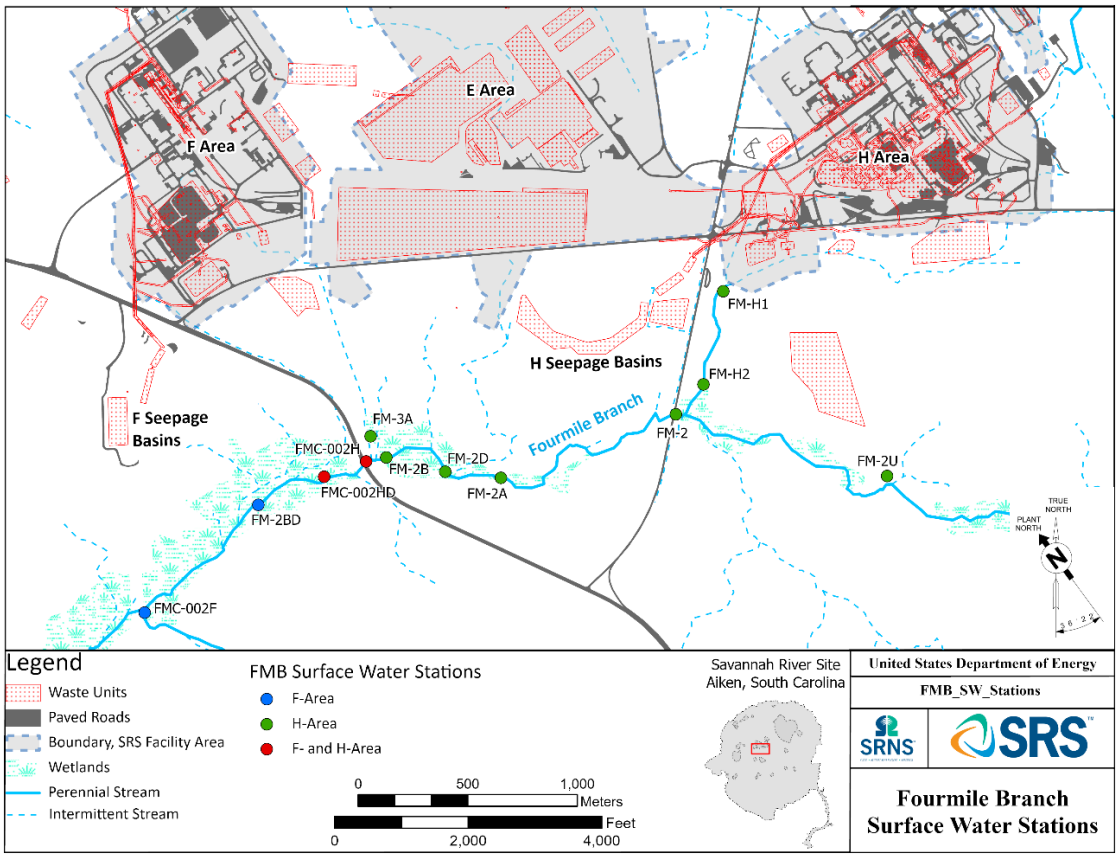
Responsible Party: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

20. **Appendix H, Section VI, Five-Year Review Process, Data Review, Pages H-10 to H-11 of H-36 and Appendix I, Section, Five-Year Review Process, Data Review, Page I-9 of I-36:** The identifications of the surface water stations used in the data review for evaluating

impacts to Fourmile Branch in each appendix do not correlate to the surface water stations at the sites, and it is unclear why site-specific surface water data were not reviewed. In Appendix H, the surface water data are provided for four stations (i.e., FMC002H, FMC002HD, FM2BD, and FMC002F) but these stations do not appear to be shown on Figure H-2 (F-Area Groundwater OU Treatment Systems Locations; note that the low resolution of Figure H-2 makes it difficult to determine the sample identifications). In Appendix I, data from ten surface water locations are discussed, but Figure I-3 (Treatment Systems for the H-Area Groundwater OU) identifies five different surface water stations. *Please revise Appendix H and Appendix I to show the locations of the surface water stations used for the data review, and to include site-specific surface water data if available*.

Response: Agree with Clarification.

The site-specific surface water data was reviewed for both F-and H-Area Groundwater OUs. The following figure showing the location of the surface water stations for both areas will be added to both appendices. The figure will be numbered and titled appropriately.



Responsible Party: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

21. Appendix I, Section IV, Remedial Actions, Remedy Selection, Page I-4 of I-36: The Phase 2a objective of reducing the concentration of the remaining Appendix IVC-A constituents in Fourmile Branch (except tritium and iodine-129) to levels that are less than GWPS is stated to be met; however, it is unclear what constituents are included in Appendix IVC-A. Based on Table I-5 (Summary of Constituents from the H-Area Groundwater OU Surface Waters of Fourmile Branch Detected Above Standards), several constituents in addition to tritium and iodine-129 exceed their GWPS or MCLs (i.e., arsenic, carbon-14, strontium-90, thallium, and vanadium). *Please revise the text to identify the Appendix IVC-A constituents and to clarify which constituents are currently less than the GWPS in Fourmile Branch.*

Response: Agree with Clarification

The constituents included in Appendix IVB-A are listed in Table I-2. For clarity, Table I-2 will be referenced in the text instead of Appendix IVB-A of the RCRA Permit Renewal when referring to the monitored constituents for the H Area Groundwater OU.

Table I-4 includes maximum concentrations for all the of the groundwater protection standard (GWPS) constituents that exceeded the GWPS limit during each of the five-year review periods. Because the table only includes maximum concentrations, anomalous results can occur that cause the constituent to appear like it is over the GWPS, when the constituent concentrations are typically below the GWPS.

The following footnotes will be added to Table I-5 to explain that the maximum result is anomalous, and concentrations are typically below the GWPS.

Constituent	Unit	GWPS or MCL[1]	Maximum Concentration [# of Samples]				
			2nd Remedy Review (1997-2001)	3rd Remedy Review (2002-2006)	4th Remedy Review (2007-2011)	5th Remedy Review (2012-2016)	6th Remedy Review (2017-2021)
Antimony	µg/L	6	10 [49]	2.7 [93]	0.21 [65]	All ND [38]	All ND [63]
Arsenic	µg/L	10	6 [55]	3.12 [105]	27.1 [65]	8.54 (J) [38]	11.7 (J) [63] 1
Carbon-14	pCi/L	50	11.2 [66]	162 [142]	1140 [88]	59.7 (J) [72]	57.8 [62] 1
Cobalt	µg/L	3	6.27 [52]	15.7 [93]	5.69 [65]	8.25 [77]	1.22 [147]
Gross alpha	pCi/L	15	46.8 [68]	7.06 [174]	128 [207]	12.5 [129]	4.7 (J) [197]
Iodine-129	pCi/L	1	All ND [59]	4.69 [70]	9 [206]	3.44 (J) [134]	3.32 (J) [201]
Non-volatile Beta	pCi/L	50	192 [68]	142 [174]	268 [207]	42 [129]	30.7 [197]
Total radium	pCi/L	5	13.5 [64]	4.16 [94]	7.44 [82]	4.95 [38]	2.4 [62]
Radium-226	pCi/L	5	12 [65]	2.68 [134]	5.55 [85]	4.97 (J) [58]	1.12 [65]
Radium-228	pCi/L	5	3.22 [66]	6.05 [113]	8.4 [69]	1.74 (J) [29]	0.97 (J) [45]
Strontium-90	pCi/L	8	9.54 [67]	7.96 [57]	18.1 [135]	9.45 (J) [53]	10.1 [87] 2
Thallium	µg/L	2	10 [43]	7.95 [93]	2.52 [65]	0.2 (J) [38]	15.3 (J) [152] 1
Tin	µg/L	2.6	10 [57]	8.37 [87]	0.62 [65]	All ND [31]	All ND [63]
Tritium	pCi/L	20,000	312,000 [66]	4,810,000 [455]	2,760,000 [585]	179,000 [266]	890,000 [543]
Vanadium	µg/L	4	10.8 [52]	4.09 [93]	30.9 [65]	14.6 (J) [38]	17.9 (J) [63] 1

1 All other records were below the GWPS or MCL.
2 Of the 87 records, only 2 were above the GWPS/MCL and only 1 was above the PQL.

Responsible Party: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

22. **Appendix I, Section VI, Five-Year Review Process, Groundwater and Surface Water Data, Page I-10 of I-36:** The text states "Of the three constituents identified in the ecological studies as potential threats to wildlife, only mercury was detected above standard with concentrations decreasing to below the GWPS during the fifth five-year review cycle;" however, it is unclear if current mercury concentrations were compared to ecological screening values for surface water. *Please revise the text to discuss if comparison of the current mercury data to the GWPS was performed for an evaluation of ecological risk.*

    Response: Agree with clarification.

    Ecological impacts within the Fourmile Branch stream system have been assessed through the Integrator Operable Unit (IOU) program. Past ecological screening has identified various exceedances of ecological thresholds in SRS streams that indicated further evaluation was warranted. To address the exceedances, the IOU program periodically assesses the health of the stream systems, including Fourmile Branch, primarily using fish and macroinvertebrate assemblage assessments. The assessment of biota (bioassessment) currently evaluates the health of the major stream systems on SRS on a 7-yr basis. The next evaluation will be completed in 2025.

    The current ecological threshold for mercury is 0.0013 µg/L (USEPA Region 4 Ecological Risk Assessment Supplemental Guidance, 2018). Exceedances of this threshold are evaluated to determine if further action should be considered from an ecological perspective.

    Current mercury concentrations were not compared with ecological screening values for surface water; however, results were below the groundwater MCL (2 µg/L). The IOU program will continue to assess the health of SRS stream system on a periodic basis.

    No changes to the document are proposed.

    Responsible Party: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

23. **Appendix I, Section VIII, Issues, and Section IX, Recommendations and Follow-up Actions, Page I-13 of I-36:** Section VIII (Issues) does not identify any issues related to current site operations, conditions or activities that currently prevent the remedy from being protective; however, Section VI (Five-Year Review Process, Page I-10 of I-36) notes that iodine-129 will not be treated by the base injection system and other approaches to remediate iodine-129 are being investigated. Since the current groundwater remedy does not address iodine-129 and iodine-129 is still being discharged to the Fourmile Branch at elevated levels (i.e., see reported exceedances in Table I-5, Summary of Constituents from the H-Area Groundwater OU Surface Waters of Fourmile Branch Detected Above Standards and Table I-6, Summary of Constituents from the H-Area Groundwater OU Seepline Detected Above Standards), this issue should be identified in Section VIII. In addition, Section IX

(Recommendations and Follow-up Actions) should provide recommendations for how the iodine-129 will be addressed. *Please revise Section VIII to note that iodine-129 will not be treated by the base injection system and revise Section IX to include recommendations for how iodine-129 will be addressed to ensure future protectiveness*.

Response: Agree with clarification.

The following two new paragraphs will be added to Section VI, Five-Year Review Process after the 4th paragraph in *Groundwater and Surface Water Data*:

"While SRS acknowledges that base injection is not effective for treating iodine-129, the migration of iodine-129 from the source area beneath the basins is being controlled by the low permeability caps and the subsurface engineered barriers at basin H-4. There are no industry standard technologies available for the treatment of iodine-129 in groundwater. Since 2011, SRS has been implementing and evaluating a new technology at the F-Area Groundwater OU to immobilize iodine-129 in situ using an injectable silver chloride amendment. The permeable reactive treatment zone has been effective at reducing the concentration of iodine-129 in groundwater. It is appropriate to establish this technology at F Area because iodine-129 groundwater concentrations are an order of magnitude higher than at H Area.

Concurrently with the development of silver chloride technology, SRS has been investigating materials that can effectively sorb iodine-129 and are safe to implement in the ecologically sensitive wetland environment. If an appropriate material or combination of materials is identified, SRS will evaluate whether implementation at the H Area wetlands is both feasible and warranted. At H Area, current concentrations of iodine-129 in surface water in Fourmile Branch are non-detect and in surface water at the seepline less than 20 pCi/L. Sorbent development progress is summarized in the annual RCRA corrective action report."

No changes to Sections VIII and IX are proposed.

Responsible Party: Kevin Boerstler, (803) 952-6766, kevin.boerstler@srs.gov

24. **Appendix L, Section IV, Remedial Actions, System Operations/Operation and Maintenance, Page L-7 of L-36:** The text states that groundwater sampling will continue until MCLs have been attained for three consecutive years; however, it is unclear if three years of sampling is sufficient to ensure the groundwater will continue to meet the contaminant cleanup level for each COC in the future. As noted in EPA's *Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions*, dated November 2013, and the *Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well and the Groundwater Statistics Tool*, dated August 11, 2014, a minimum of eight data points is recommended for the attainment monitoring phase to support the statistical test used to make the final attainment determination. Therefore, the performance metrics from the previous planning

documents for this OU should be updated in accordance with the 2013 and 2014 EPA guidance for determining when the attainment of cleanup levels has been achieved. *Please revise the FYR Report to indicate that eight rounds of groundwater monitoring will be used to determine when attainment of the cleanup levels has been achieved in accordance with the 2013 and 2014 EPA guidance.*

Response: Clarification.

The USDOE, USEPA, and SCDHEC approved a ROD for the PBRP OU states that groundwater sampling will continue until MCLs have been attained for three consecutive years, and SRS does not believe the criteria specified in the ROD should be changed. However, SRS believes that the guidance should be taken into consideration when evaluating final cleanup. Therefore, the second bullet under the System Operations/ Operation and Maintenance subsection of Section IV will be revised as follows:

"Groundwater monitoring for three wells (PRP 5, PRP 6, and PRP 7) (Figure L-6). As stated in the approved Record of Decision (WSRC 2002), groundwater s~~S~~ampling will continue until MCLs have been attained for three consecutive years. The 2013 and 2014 USEPA guidance (USEPA 2013, USEPA 2014) will also be taken into consideration when evaluating groundwater cleanup. The results were reported via annual Environmental Monitoring Reports since 2004."

The following two references will also be added to Section XII, Documents Reviewed.

USEPA, 2013. *Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions*, Office of Solid Waste and Emergency Response (OSWER) 9355.0-129, Washington D.C.

USEPA, 2014. Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Groundwater Monitoring Well and the Groundwater Statistics Tool, Office of Solid Waste and Emergency Response (OSWER) 9283.1-44, Washington D.C.

Responsible Party: Justin Steadman, (803) 952-7346, justin.steadman@srs.gov

25. **Appendix L, Section V, Progress Since Last Review, Page L-8 of L-36 and Section VI, Five-Year Review Process, Page L-9 of L-36:** Section V indicates there is uncertainty in the extent of 1,4-dioxane contamination and additional surface-water sampling is necessary; however, this data gap is not further discussed in Appendix L. For example, Section VI does not discuss the 1,4-dioxane data or provide the time-series graph (e.g., in the Data Review) so it is unclear if concentrations of 1,4-dioxane are increasing similar to TCE. In addition, Section VII (Technical Assessment) states that groundwater monitoring continues to be effective in assessing groundwater contamination beneath the PBRP OU. Furthermore, Section VIII (Issues) does not identify the uncertainty in the extent of 1,4-dioxane contamination as an issue at the site. *Please revise Appendix L to discuss any trends in the*

data for 1,4-dioxane and include the uncertainty in the extent of 1,4-dioxane contamination in all applicable sections.

Response: Agree with clarification.

With respect to the uncertainty in the extent of contamination, 1,4-dioxane is being sampled in nearby Steel Creek surface water to provide data that can be evaluated to determine any impact that may occur from the unit. This additional sampling was recently added, and SRS is awaiting results from the sampling to determine if 1,4-dioxane is present in surface water that may be attributed to the OU. Additionally, TCE and 1,1-DCE data are already collected at the surface water locations along Steel Creek due to a large VOC plume emanating across Steel Creek from within the P Area Groundwater OU. TCE concentrations are elevated within the creek and 1,1-DCE concentrations have been non-detect. Collecting 1,4-dioxane samples from the same surface water locations will aid in determining impact, if any, from the PBRP OU to Steel Creek.

In reference to the lack of 1,4-dioxane data, Section VI states that 1,4-dioxane, 1,1-DCE and TCE data and graphs are included in the latest groundwater monitoring report. However, Section VII does not discuss the 1,4-dioxane data as was discussed for 1,1-DCE and TCE. The 1,1-DCE and TCE data discussion was in reference to the recent increase in concentrations of the constituents. 1,4-Dioxane was not discussed because concentrations continue to be at a steady state over the last five years.

Time-Series Plots for 1,1-DCE and TCE were included in Figure L-8; therefore, Time-Series Plots for 1,4-Dioxane will be added as Figure L-10 and referenced in the revised text in Section VII as shown below. Figure L-10 is included at the end of this document.

"…will be increased to semi-annual at PRP 6 and PRP 7. 1,4-Dioxane concentrations continue to be at a steady state in all wells indicating no observed trend of increasing or decreasing concentrations but exhibit concentrations above the RSL (Figure L-10). The background well, PRP 5, remains non-detect for all VOC analyses."

In reference the effectiveness of the groundwater monitoring in assessing the groundwater contamination, groundwater monitoring has not proven to be ineffective as it has indicated a rise in concentrations. Specific changes in the monitoring effort were made to address the increase in concentrations and the monitoring is believed to remain effective. No change to the document is proposed to address groundwater monitoring effectiveness.

Responsible Party: Justin Steadman, (803) 952-7346, justin.steadman@srs.gov

26. Appendix L, Section VIII, Issues, Page L-12 of L-36: It is unclear why the increasing concentrations of COCs are not identified as an issue at PBRP OU. The Technical Assessment attributed the elevated concentrations of COCs in groundwater to increased water levels mobilizing residual contamination within the capillary fringe of the water table.

However, according to Figure L-8 (Time-series plots of 1,1-DCE and TCE at wells PRP 5, PRP 6, and PRP 7), concentrations of TCE in well PRP 6 during 2020 and 2021 were the highest reported since monitoring began in 2001. Therefore, it is unclear if these unexpected concentrations could be an early indicator of potential remedy problems. *Please revise Section VIII to identify the elevated concentrations of COCs in groundwater as an issue.*

Response: Clarification.

The increased concentrations are being further assessed. As shown in Figure L-8, TCE concentrations are not consistently high. However, there was a spike in concentrations in 2020 followed by a decrease in 2021. It would be premature to indicate the increase in concentrations as a potential remedy problem at this time. If continual monitoring indicates an increasing trend, then a potential problem may arise. Precautionary additional sampling has been initiated to understand if there are any impacts from the current concentrations.

SRS believes the elevated levels were associated with a rise of water table levels that resaturated vadose zones sediments beneath the OU which might have contained low residual concentrations of contaminants. This would have resulted in remobilization of those dilute concentrations as exhibited by nearby PRP 6 well. SRS is continuing to monitor the situation for any data that may indicate a potential ongoing issue. However, at this time, it does not appear to be long-term issue as the latest sampling event indicated a decrease in concentrations. No change to the document is proposed.

Responsible Party: Justin Steadman, (803) 952-7346, justin.steadman@srs.gov

27. **Appendix L, Figure L-7, 2022 PBRP OU Optimized Monitoring Network, Page L-21 of L-36:** This figure shows upper aquifer zone (UAZ) potentiometric surface contour lines; however, the groundwater elevations that the contour lines represent are not defined. In addition, the groundwater elevations used to generate these contours are not provided and it is unclear when the groundwater elevation data were collected. *Please revise Figure L-7 to include the UAZ potentiometric surface contour elevations, the groundwater elevations measured at the wells depicted, and note in the Legend when the data were collected*.

Response: Agree.

Figure L-7 will be revised to include the UAZ potentiometric surface contour elevations, and the groundwater elevations measured at the wells depicted on the figure. The figure is shown at the end of this document. Text will also be added to indicate the data were collected in 3Q2022.

Responsible Party: Justin Steadman, (803) 952-7346, justin.steadman@srs.gov

28. **Appendix M, Section VII, Technical Assessment, Page M-15 of M-44:** The third bullet point mentions a detached plume that is present downgradient of the treatment area (i.e., at wells TNX 28D and TRW 2), but the text does not indicate how this plume is being

addressed. It is unclear if additional treatment may be necessary for the detached plume (e.g., if edible oil injections or SVE should be considered in this area) to address plume migration. *Please revise Section VII to discuss how the detached plume will be addressed to ensure RAOs are met*.

Response: Agree.

In 2013, a second ESD to the ROD identified edible oil as the remedial action at TNX and established a condition to inject additional edible oil. That condition is defined in Section IV, Remedy Selection, as a sustained rebound lasting over 1 year in excess of 75 µg/L of TCE, PCE, or carbon tetrachloride. The detached portion of the plume does not trigger that condition.

The following sentence will be added to the 3rd bullet under *Is the Remedy Functioning as Intended by the Decision Document?* in Section VII, "<u>There are currently no TCE concentrations in the detached plume that trigger the condition to deploy additional edible oil.</u>"

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

ATTORNEY COMMENTS

<u>GENERAL COMMENT:</u>

1. There are several places in the document where the phrase "institutional controls (i.e. LUCs)" is used when not necessary. Excessive use of this phrase creates confusion considering the explanation on Page A-2: "LUCs involve institutional controls (i.e., administrative controls) and engineering controls and can include monitoring, maintenance, reporting, access restrictions, signage, fencing, and land use restrictions. In older SRS remedy documents, the term 'institutional controls' was often used in place of the broader LUC term."
   a. Therefore, the phrase "institutional controls (i.e. LUCs)" is only necessary when specifically referencing use of the term "institutional control" from an older SRS remedy document. For example, on Page J-6: "As stated in the ROD (WSRC 2008a), the remedial action selected to meet the RAOs for the MAOU is as follows: Passive Soil Vapor Extraction (SVE) and Institutional Controls (i.e., LUCs)."
   b. However, it is not necessary to continue using that phrase when discussing current actions or conditions. For example, the protectiveness statements on pages E-12, F-13, K-11, L-12 could be revised to state: "Exposure pathways that could result in unacceptable risks are being controlled by…~~institutional controls (i.e.,~~ LUCs~~)~~ to prevent exposure…." The protectiveness statement on page J-12 is currently worded consistent with this recommendation.

Response: Agree.

The words "institutional controls (i.e., LUCs), or some close variation, will be replaced with "LUCs" in the appendices/sections listed below:

- **Appendix C (ABRP/MCB/MBP) – Section IV (System Operations), Section V, and Attachment C-1, Section XI**
- **Appendix D (A/M Groundwater) – Section IV (System Operations), Section X, and Attachment D-1, Section XI**
- **Appendix E (AMRP) – Section V, Section X, and Attachment E-1, Section XI**
- **Appendix F (CBRP) – Section IV (System Operations), Section V, Section X, and Attachment F-1, Section XI**
- **Appendix G (DAOU) - Section IV (System Operations), Section V, and Attachment G-1, Section XI**
- **Appendix H (F-Area Groundwater) - Section IV (System Operations), Section X**
- **Appendix I (H-Area Groundwater) - Section IV (System Operations), Section X**
- **Appendix J (MAOU) - Section IV (System Operations), and Attachment J-1, Section XI**
- **Appendix K (MIPSL) - Section IV (System Operations), Section V, Section X**
- **Appendix L (PBRP) - Section IV (System Operations), Section V, Section X**
- **Appendix M (TNX Area) - Section IV (System Operations), Section V, Section X**

Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov

SPECIFIC COMMENTS:

1. **Page 14 of 40, Response to Question B**: Currently the text reads: "An evaluation of changes in chemical and radiological standards that were in place when the last five-year remedy review was initiated in 2012 to the standards applicable in 2017 was conducted to determine if there were any changes that would affect the protectiveness of the selected remedies." *Please revise to indicate that federal and state promulgated standards, i.e., chemical-specific ARARs were reviewed*.

Response: Agree.

Section VI, Technical Assessment, Question B: Are the assumptions, toxicity data, cleanup levels, and RAOs still valid?, 2nd sentence will be rewritten as follows:

"An evaluation of changes in chemical and radiological standards including federal and state promulgated standards (i.e., chemical specific ARARs) that were in place when the last five-year remedy review was initiated in 2017 to the standards applicable in 2022 was conducted to determine if there were any changes in chemical and radiological specific standards that would affect the protectiveness of the remedies."

Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov

2. **Page 16 of 40, Section VII, 3rd paragraph**: As was done in the Fifth FYR, in lieu of summarizing LUC types in this section, *recommend* cross referencing the section of the OU-specific appendices that discusses the type of LUCs and implementation and reference to the OU-specific LUCIPs.

   Response: Agree.

   In Section VII, Protectiveness Statement(s), 3rd paragraph, the following text will be added as the 2nd sentence in the paragraph:

   "The type of LUCs and implementation and reference to the OU-specific LUCIP is described in detail in Section VII of the OU-specific appendices."

   Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov

3. **Appendix A, Page A-2 of A-30, 3rd paragraph under *Phase 1***: The following statement in the LUC discussion is inconsistent with the NCP and should be revised: "LUCs may be implemented as a stand-alone remedy or combined with other remedial actions." *Recommend* using language from 40 CFR 300.430(a), e.g. "LUCs may be implemented as a stand-alone remedy *when active measures are determined not to be practicable*, or combined with other remedial actions."

   Response: Agree.

   In Appendix A, the second sentence in the third paragraph under Phase 1: Native Soil Covers and/or LUCs will be revised to state "LUCs may be implemented as a stand-alone remedy <u>when active measures are determined not to be practicable or</u> combined with other remedial actions."

   Responsible Party: Shelia McFalls, (803) 952-6819, shelia.mcfalls@srs.gov

4. **Appendix C, Section IV, Page C-7 of C-58, Remedial Actions**: In addition to issues noted in TechLaw Specific Comment #2, "Treat or Remove TCE to the extent practical" is not listed as an RAO for the A-Area Trench Subunit in the ABRP/MCB/MBP OU ROD (WSRC 2007b) (see p. 26 of 80 in ROD). This was also not included as an RAO in the 5th FYR. *Please review RAOs from appropriate decision documents and revise App. C as needed to ensure accuracy*.

   Response: Agree.

   The RAO, "Treat or Remove TCE to the extent practical" was not present in the ABRP/MCB/MBP OU ROD and the text will be revised to remove that RAO from Section IV, Remedial Actions.

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

5. **Appendix G, Page G-10 of G-60**: The following RAO for the 488-4D Ash Landfill, from the Second EAROD, is *missing from the RAO list*: "Maintain the engineered cover system to prevent migration of contaminants to groundwater that could exceed groundwater protection standards."

   Response: Agree.

   The RAO list for the EAROD (SRNS 2011a) and Second EAROD (SRNS 2020a) will be revised to add the text below as the 3rd bullet.

   "Maintain the engineered cover system at the 488-4D Ash Landfill to prevent migration of contaminants to groundwater that could exceed groundwater protection standards,"

   Responsible Party: Ashley Shull, 803) 952-7090, ashley.shull@srs.gov

EPA HQ COMMENTS:

1	25	Table 1: The date of Site inspections are shown as July 2022 - November 2022. Note that this should not be a range of time, but should list the specific date(s) of the inspection(s). **Response: Clarification.** **This report supports the remedy review for 11 operable units (OUs). The Site inspection date for each of the OUs varies and depends on the SRS group inspecting the units. Therefore, the range of dates for completed inspections of all 11 OUs is listed in Table 1. The specific dates for the inspections are listed in the OU-specific appendices. No change to the document is proposed.** **Responsible Party: Eric Schiefer, (803) 952-6237, eric.schiefer@srs.gov**	Triggers and Inspections
2	25	Table 1: The due date (five years after triggering Action Date) is identified as January 21, 2024 (includes all 5 phases). Does this mean that this date is based on the original statutory due date from when FYRs began at SRS? Is the Region saying that during these 5 phases of rolling FYRs, that they may come it on varying dates but need to be completed for the Due Date? Please clarify. **Response: Clarification.** **The First Five-Year Remedy Review Report did not contain a signature page. USEPA signed the Second Five-Year Remedy**	Triggers and Inspections

		Review Report, Third Five-Year Remedy Review Report and Fourth Five-Year Remedy Review Report on February 12, 2004, January 21, 2009, and January 16, 2014, respectively. USEPA signed the Fifth Five-Year Remedy Review Report early on November 5, 2018. SRS has consistently used January 21 as the trigger date to ensure that the remedies in the five phases are reviewed and the subsequent reports signed by USDOE, SCDHEC, and USEPA and returned to SRS for issuance to the public. The five phases of the rolling five-year remedy review reports may be signed prior to January 21, but all phases need to be completed by this date. Consistently using this date allows for the development of a Revision 1.1 remedy review report at any phase, if needed, without impacts to the date. No change to the document is proposed. **Responsible Party: Shelia McFalls, (803) 952-6819, shelia.mcfalls@srs.gov**	
3	3	The text states "The trigger date for submittal of the next five-year remedy review report to the regulatory agencies is based on the USEPA signature date of the previous report.". Does this language consider the event of a FYR being provided late (after the previously defined due date) and how that may push out the time between FYRs for a set of remedies beyond 5 years? Should the date be set based on when the first of the rolling FYRs for that grouping was issued? **Response: Clarification.** **SRS develops implementation schedules to ensure that each phase of the five-year remedy review reports are submitted in a timely manner to ensure that the that the trigger date is met. For additional information on the trigger date, please refer to the response to EPA HQ Comment #2. No change to the document is proposed.** **Responsible Party: Shelia McFalls, (803) 952-6819, shelia.mcfalls@srs.gov**	Triggers and Inspections
4	13	The statements for each remedy made under Question A of the Technical Assessment and a statement on LUCs where used should be added to Table 1 to succinctly explain why a protective status has been selected without having to send the reader to the main text. **Response: Clarification.**	Protectiveness Statement

		Table 1 is the Five Year Review Summary Form and does not include a section to provide the protectiveness statement for each OU. Table 8 provides the protectiveness determination and protectiveness statement for each OU. During the development of the SRS five year remedy review document template, agreement was reached with the Core Team (i.e., representatives from USDOE, USEPA, and SCDHEC) to include a description of the actions needed to ultimately achieve long term protectiveness for those OUs with short term or deferred protectiveness determinations. The Sixth Five-Year Remedy Review Report for SRS OUs with Operating Equipment is consistent with this agreement. Additionally, the LUC objectives are listed in Table 3. No change to the document is proposed. **Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov**	
5	ES-1-ES 2	In the Executive Summary, paragraph 2, should it state that this five-year review report covers the fifth phase, operating equipment? **Response: Agree.** **The last sentence of the second paragraph will be revised as follows:** **"The Sixth Five-Year Remedy Review Report will be conducted in five phases based on remedy type. ~~with t~~<u>This report addresses the fifth</u> phase <u>that</u> evaluate<u>s</u>~~ing~~ selected remedial actions with operating equipment as the final remedy."** **Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov**	General
6	39	Table 8, it would be helpful under each of the protectiveness statements to describe the elements of the remedy that protective human health and the environment. The statement can be cut and paste from the document. **Response: Clarification.** **The protectiveness statements are included in Section X within the appendices of the document. No change to the document is proposed.** **Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov**	Protectiveness Statement

7	A-10	For Table A.2, for the operating equipment are the issuance year and submittal date correct? **Agree.** **The dates of issuance and submittal date are correct for the operating equipment submittals. No change to text is required.** **Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov**	Triggers and Inspections

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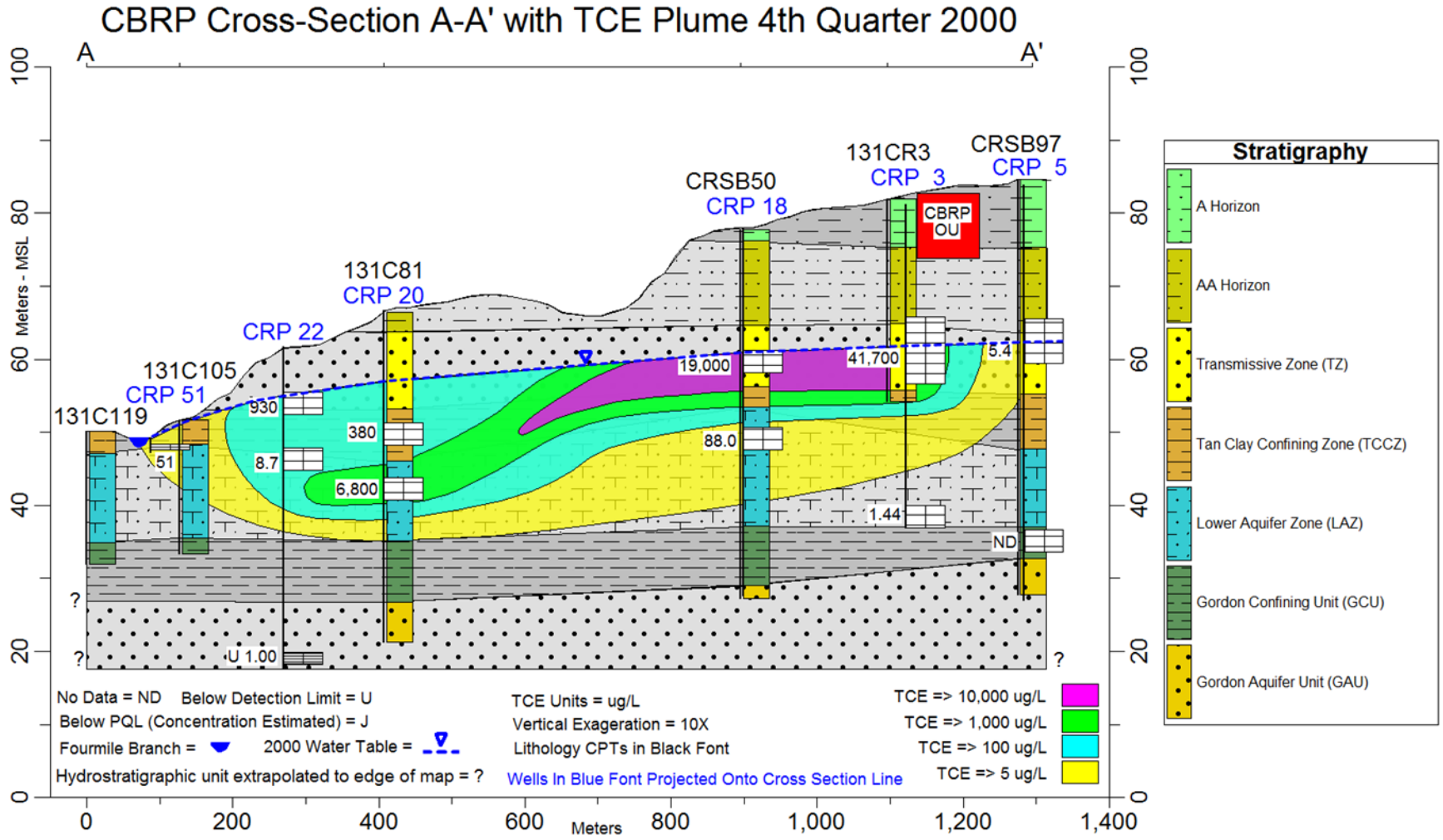

Figure F-10. CBRP Plume Cross Section, Fourth Quarter 2000

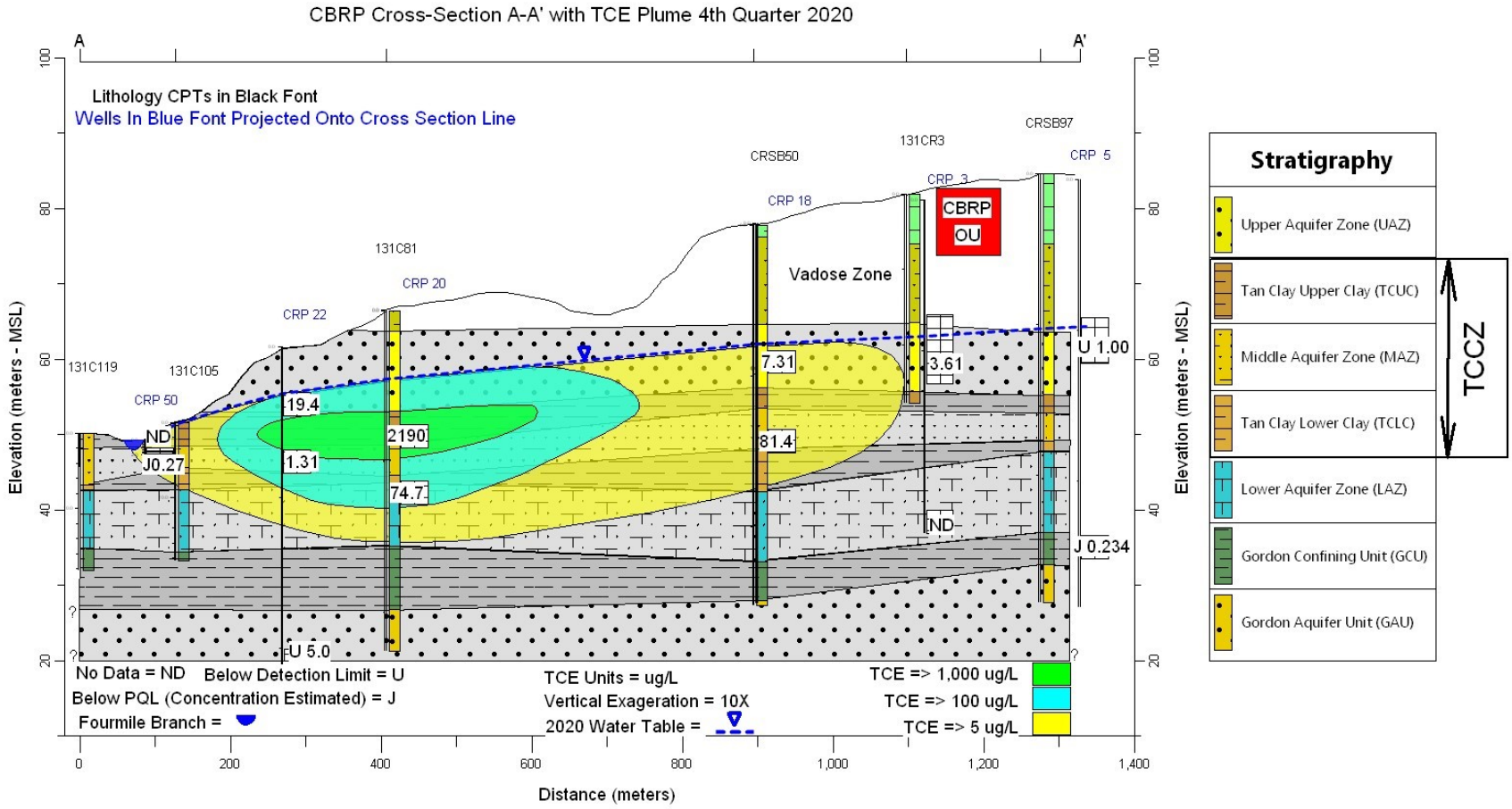

Figure F-11. CBRP Plume Cross Section, Fourth Quarter 2020

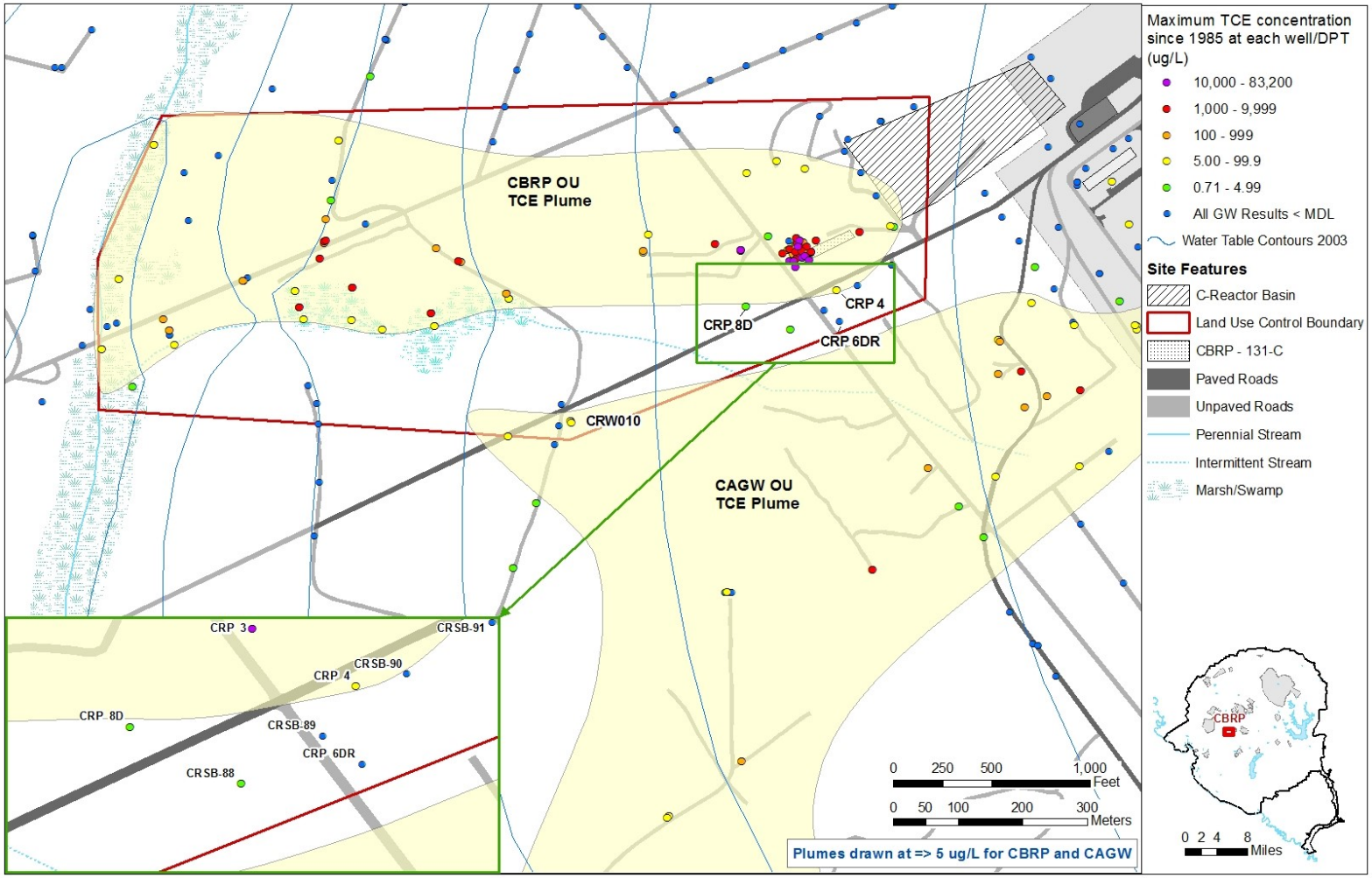

Figure 1. Maximum TCE concentrations for C-Area (1985- 2016)

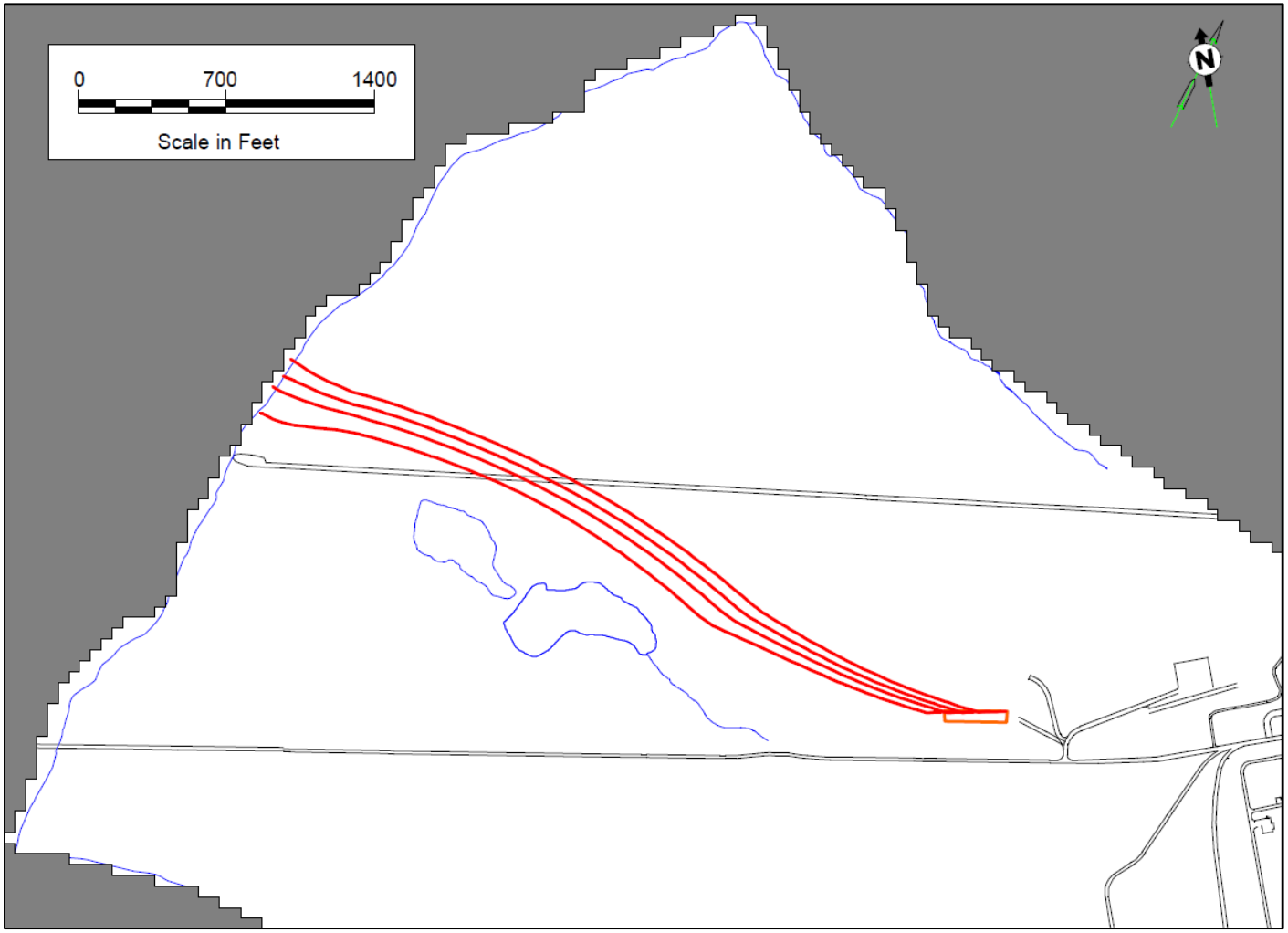

Figure 2. CBRP OU Groundwater Model Particle Tracks (WSRC-TR-2001-00298)

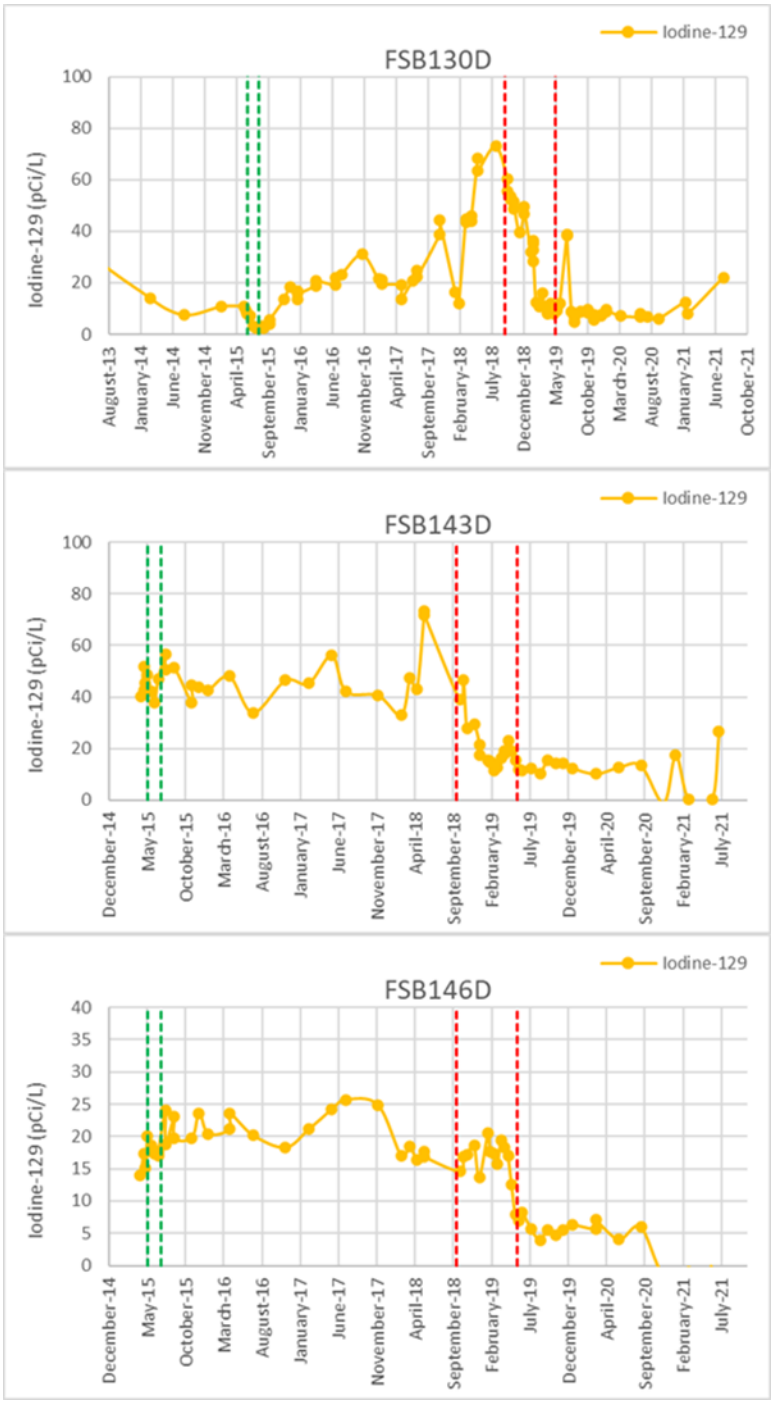

Figure H-3. Time trends of Iodine-129 concentrations at wells FSB 146D, FSB 143D and FSB 130D.

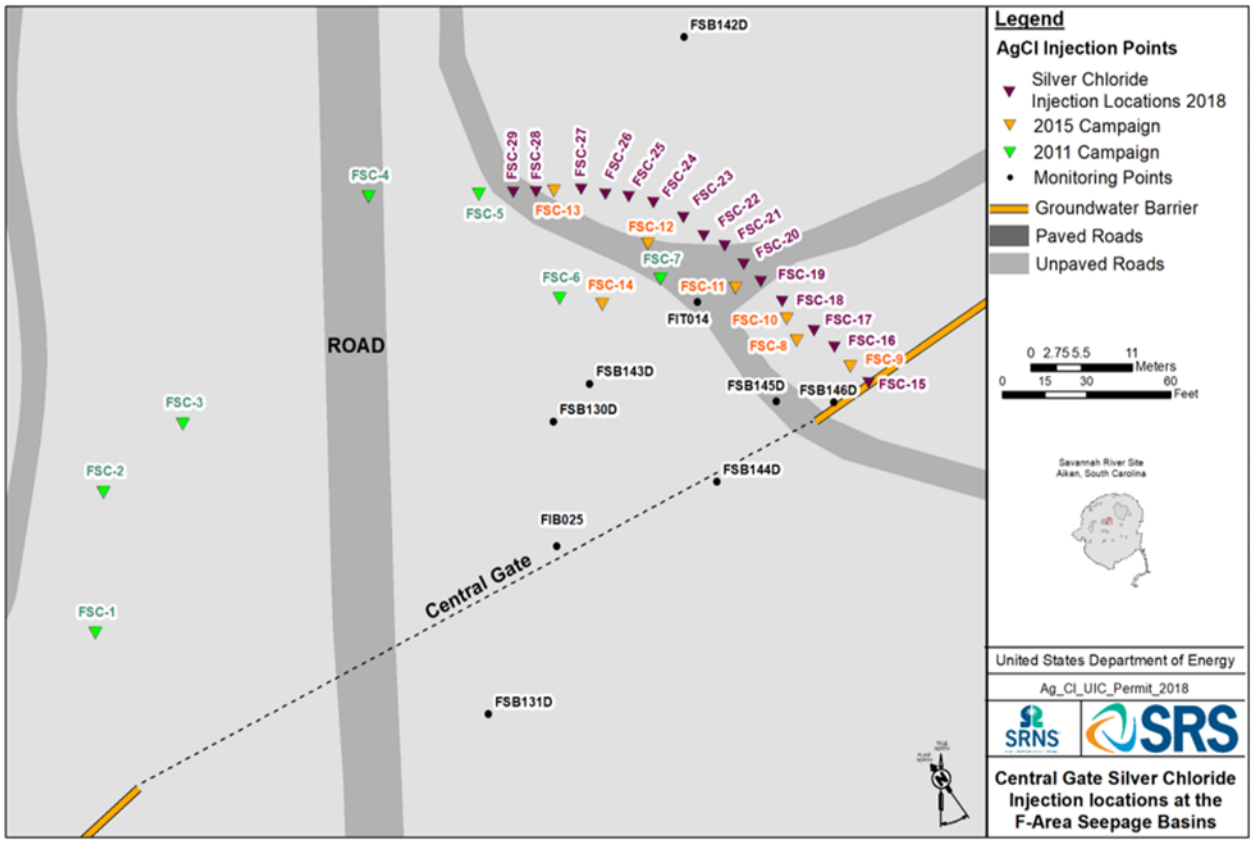

Figure H-4. F-Area Hazardous Waste Management Facility Silver Chloride Injection Layout

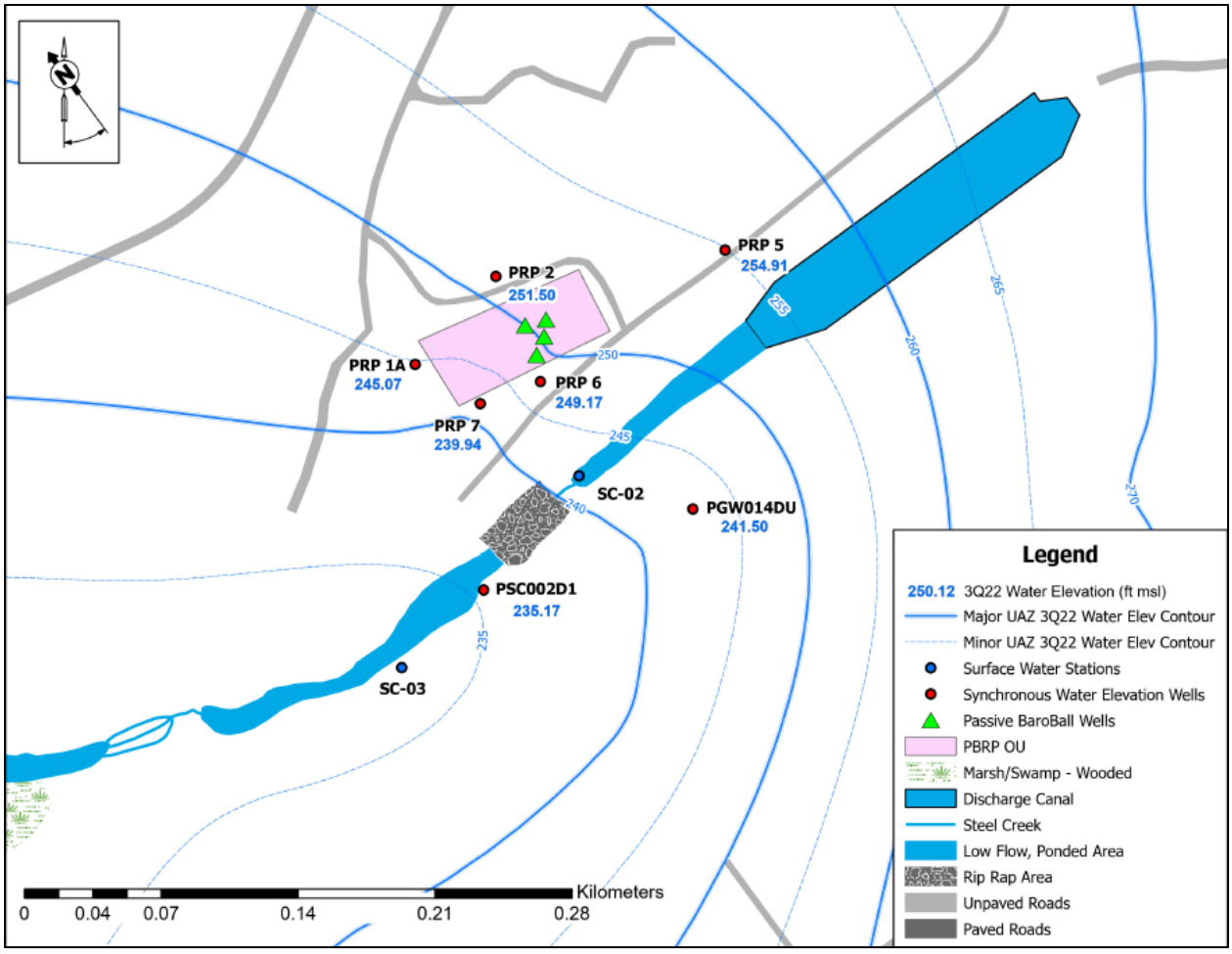

Figure L-7. 2022 PBRP OU Optimized Monitoring Network

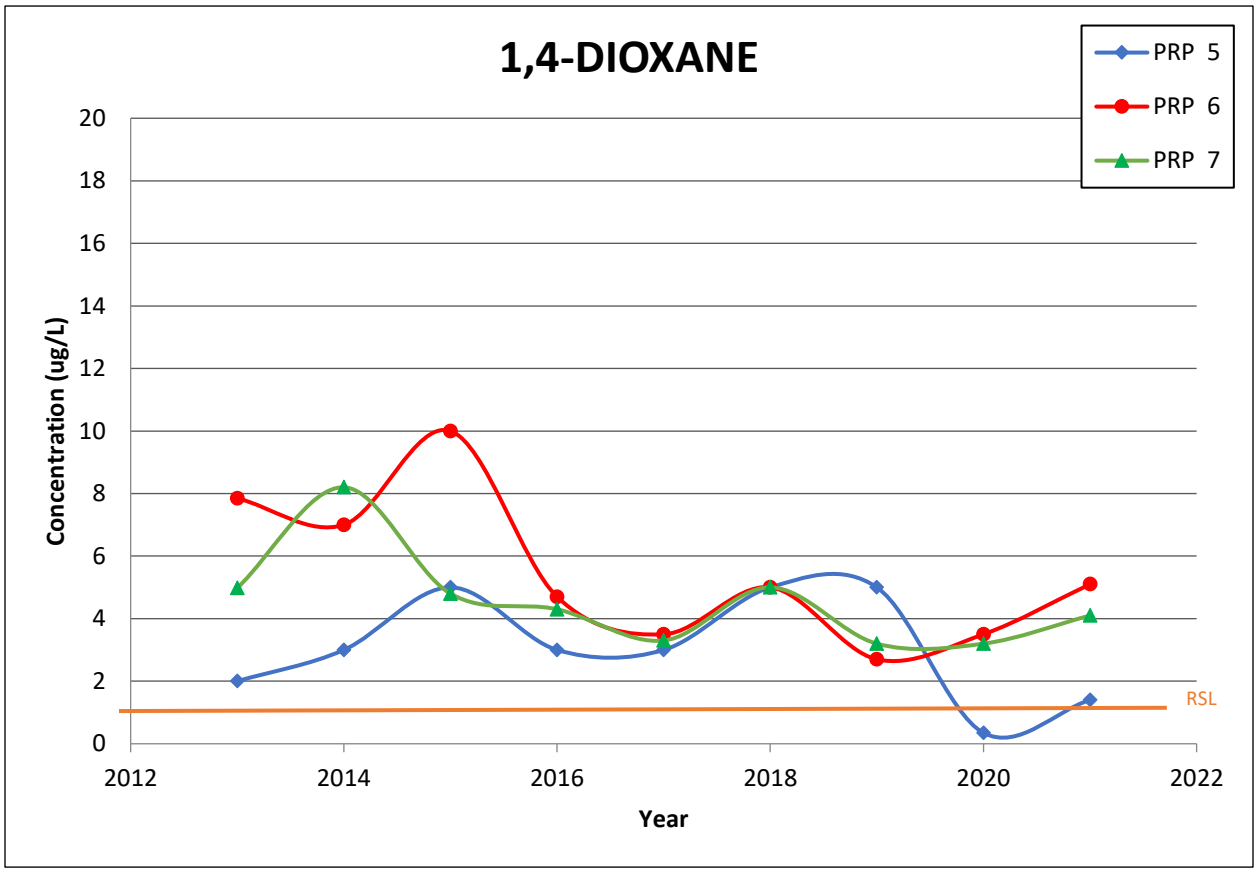

Figure L-10. Time Series plot of 1,4-Dioxane at Wells PRP 5, PRP 6, PRP 7

SPECIFIC COMMENTS

1. Savannah River Site Summary, Section II. Response Action Summary, Systems Operation and Maintenance, page 9. The Department recommends that prevention of disturbance from hog activities be included in the components listed under the O&M activities listed in the first paragraph of this subsection.

   Response: Agree.

   The 1st paragraph, 2nd sentence in *Systems Operation and Maintenance* will be modified as follows:

   "The operation and maintenance (O&M) of cover systems consist of, but is not limited to, growing grass, mowing, managing surface stormwater drainage, inspections, and repair of erosion or subsidence as necessary. In addition, hog fencing was installed at various OUs as an SRS maintenance action to reduce/minimize the damage caused by feral hogs. Identifying signs must remain legible."

   Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov

2. Table 4. Operation and Maintenance Cost comparison for SRS OUs with Operating Equipment, pages 33-34. The third column, "Remedy Decision Document Year" indicates that there is a footnote "a". However, no such footnote is listed at the end of the table. Please clarify and/or correct.

   Response: Agree.

   The reference to footnote "a" will be deleted.

   Responsible Party: Sadika O'Quinn, (803) 952-6697, sadika.oquinn@srs.gov

3. Appendix A, Table A-7 List of OU Subunits with Remedial Actions, page A-7. For the ABRP/MCB/MBP OU subunits listed in this table, Burning/Rubble Pits 731-1A and -A should not be included since according to page C-5 in Appendix C no COCs were identified for these subunits and there were no problems warranting action. Additionally, the A-Area Ash Pile subunit 788-2A is not included in this table. Please correct.

   Response: Agree.

   The ABRP/MCB/MBP OU subunits, Burning/Rubble Pits 731-1A and -A, will be removed from Appendix A, Table A-7 since according to page C-5 in Appendix C no COCs were identified for these subunits and there were no problems warranting action. These OUs will be added to Appendix A, Table A-6. Summary of No Remedial Actions at SRS OUs, *No Action/No Further Action OUs Associated with OUs Requiring Remedial Action* section. Additionally, the A-Area Ash Pile subunit 788-2A will be included in Appendix A, Table A-7. The changes to Appendix A, Tables A-6 and A-7 will be included in Revision 1 of this document.

   Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

4. Attachment D-1. Five-Year Review Site Inspection Checklist – A/M-Area Groundwater. XI. D. Opportunities for Optimization, page D-49. The IROD issued in 1992 stated that the remedy was to prevent further groundwater plume migration. To date, the distal portion of the plume has migrated quite a distance. Savannah River Site needs to address optimization for the leading edges of the plume.

Response: Agree.

The IROD issued in 1992 was for the M-1 Air Stripper and associated recovery wells to prevent migration of the high concentration VOC plume. The M-1 Air Stripper continues to work at achieving that objective. Optimization of the M-1 recovery well network has increased mass removal rates by adding additional recovery wells while removing lower producing recovery wells. There is some contaminant mass that has migrated outside of the zone of capture of the M-1 recovery wells. These areas are being characterized, monitored, and evaluated for additional corrective action under the South Carolina Department of Health and Environmental Control (SCDHEC) Resource Conservation and Recovery Act (RCRA) Permit Renewal. Corrective action schedules have been developed under the RCRA Permit Renewal to continue to remove mass from the high concentration portions of the VOC plume, as well as in the lower concentrations of the distal plumes.

Text in Attachment D-1, Section XI. D. will be revised to state, "SRS has submitted corrective action schedules in the 2013 RCRA Permit Renewal Application for M-Area and Met Lab HWMFs Postclosure (SRNS-IM-2012-00002, Volume III), which proposes to optimize the M-1 Air Stripper recovery <u>well</u> system to treat the higher concentration parts of the plume<u>, as well as corrective actions for the lower concentrations of the distal plumes</u>."

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

5. Appendix E, Table E-2 Remedial Goals for OU Soil under Industrial Land Use, page E-27. Please include arsenic as a RCOC for the Trenches Area subunit.

Response: Agree.

Arsenic will be included as a RCOC for the Trenches Area subunit in Appendix E, Table E-2 Remedial Goals for OU Soil under Industrial Land Use. The change to Appendix E, Table E-2 will be included in Revision 1 of this document.

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

6. Appendix F, Attachment F-1 Section III Onsite Documents & Records Verified, item 7 Groundwater Monitoring Records, page F-31. This section of Attachment F-1 is marked "N/A" although groundwater monitoring is ongoing and part of the remedy selected for CBRP OU. Please correct.

Response: Agree.

Item 7 in Section III of Attachment F-1 will be marked as "Readily Available" and "Up to Date" with the following remark:

"<u>The last Biennial Effectiveness Monitoring Report for MNA at the CBRP OU was submitted to USEPA and SCDHEC in June of 2021. The next report is scheduled for June 2023.</u>"

Responsible Party: Terry Killeen, 803-952-6850, terry.killeen@srs.gov

7. Appendix K, Section VII – Technical Assessment, page K-9. This section states that the remedial goals for soil were achieved in 2019 and the soil vapor extraction system was shut down in 2020. Land use controls remain in effect to prevent access to soils and groundwater. At the Core Team meeting held on March 15, 2023, it was mentioned that the MIPSL Operable Unit (OU) and the M Area Operable Unit (MAOU) boundaries overlap. Since both operable units have similar land use controls, it would make sense to incorporate the MIPSL OU into the MAOU eliminating the O&M cost for the smaller operable unit. The Department recommends that the Core Team consider this administrative action rather than moving the operable unit to the Seventh Five-Year Remedy Review Report for the SRS OUs with Native Soil Covers and/or Land Use Controls.

Response: Agree.

SRS agrees with the recommendation and would like to have a Core Team meeting to discuss the appropriate regulatory path forward. During the June 24, 2020, meeting to discuss the *Proposal to Discontinue the Remedial Action for the M-Area Inactive Process Sewer Lines (081-M) Operable Unit (U)*, SRS stated that a Corrective Measures Implementation Report/Remedial Action Completion Report (CMIR/ RACR) would be submitted once dismantlement and removal and abandonment of the soil vapor extraction equipment was completed. These activities were completed in January 2021 and it is now appropriate to prepare the CMIR/RACR. SRS proposes to document the incorporation of the MIPSL OU into the M-Area OU in the CMIR/RACR report. In addition, SRS proposes to submit an addendum to the *Land Use Control Implementation Plan (LUCIP) for the M-Area Operable Unit (MAOU)* (WSRC-RP-2008-4067, Revision 1, April 2009) to incorporate the MIPSL OU into the M-Area OU to eliminate the O&M cost for the smaller OU. SRS will schedule a meeting with the Core Team to discuss the proposed regulatory path for the MIPSL OU. Table K-4. Recommendations and Follow-up Actions for MIPSL OU Issue will be revised in Revision 1 of this document as shown below.

The Fact Sheet, Executive Summary, Section VI. Issues/Recommendations, and Table 7 will also be revised to reflect this change in the MIPSL OU recommendation and follow-up actions.

Responsible Party: Branden Kramer, (803) 952-6378, branden.kramer@srs.gov

Table K-4. Recommendations and Follow-up Actions for the MIPSL OU

Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
MIPSL OU no longer has equipment operating **as** a remedial system.	Since the **MIPSL** SVE system has been taken offline **and removed, and the LUC boundaries of the MIPSL OU and M-Area OU overlap**, SRS recommends ~~moving from the Operating Equipment group to the Native Soil Cover and/or LUCs group~~ **incorporating the MIPSL OU into the M-Area OU to eliminate the O&M cost for the smaller OU. A meeting to discuss the appropriate regulatory path forward for this recommendation is needed.** ~~This recommendation would take effect during the Seventh Five-Year Remedy Review Report for the SRS OUs.~~	USDOE	SCDHEC/ EPA	December 2023	N	N