



Department of Energy
Savannah River Operations Office
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Aiken, South Carolina 29802

MAR 16 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: Savannah River Site's Responses to the Regulatory Comments on the 2021 Annual Comprehensive TNX Area Groundwater Monitoring and Remedial Action Effectiveness Interim Report (U) (SRNS-RP-2022-00627, Revision 0, August 2022) SEMS Numbers: 21, 29

In accordance with the terms of the Federal Facility Agreement, the U.S. Department of Energy (DOE) is submitting the subject comment responses for your review. The U.S. Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) provided comments on the report on December 12, 2022 and December 20, 2022, respectively. The report will not be revised; however, all comment responses will be included and/or addressed in the next report, as applicable. Please review these responses and provide your approval thirty (30) days from receipt. The time and effort that the SCDHEC and the EPA have given on the subject operable unit are greatly appreciated.

Questions from you or your staff may be directed to me at (803) 952-8365, or the DOE Operable Unit Manager, Mr. Philip Prater, at (803) 952-9333.

Sincerely,

Brian T. Hennessey Digitally signed by Brian T. Hennessey
Date: 2023.03.16 06:53:58 -04'00'

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

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Ms. Susan Fulmer
Mr. Jon Richards

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Enclosures:

1. SRS Responses to the SCDHEC Comments on the 2021 Annual Comprehensive TNX Area Groundwater Monitoring and Remedial Action Effectiveness Interim Report (U) (SRNS-RP-2022-00627, Revision 0, August 2022) SEMS Numbers: 21, 29
2. SRS Responses to the EPA Comments on the 2021 Annual Comprehensive TNX Area Groundwater Monitoring and Remedial Action Effectiveness Interim Report (U) (SRNS-RP-2022-00627, Revision 0, August 2022) SEMS Numbers: 21, 29

cc w/o encl:

J. Blalock, SCDHEC-Columbia
S. French, SCDHEC-Columbia
M. Reece, SCDHEC-Columbia
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G. O'Quinn, SCDHEC-Aiken Environmental Affairs Office
B. A. Cameron, SCDHEC-Aiken Environmental Affairs Office
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D. Lloyd, EPA-Atlanta
M. McRae, TechLaw, Inc.

**SRS Responses to SCDHEC Comments on the
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SCDHEC COMMENTS:

General Comment

1. Section 8.2, Recommendations, page 60 provides recommendations regarding a potential new monitoring well located between TNX 28D and the TNX 72 cluster, in response to a previous DHEC comment on the 2017 Annual Comprehensive TNX Area Groundwater Monitoring and Remedial Action Effectiveness Interim Report. DHEC recommends scheduling a meeting with DOE and EPA prior to the submittal of the 2022 report to further discuss the possibility of a new monitoring well in this area (or well cluster, as needed). As discussed in the 2021 report and in DHEC's comments on the 2017 report, TNX 72S and TNX 72M have a history of being dry, which has limited the ability to monitor potential contaminant discharge into the wetland area adjacent to the Savannah River. TNX 28D has demonstrated generally increasing contaminant concentrations over several past monitoring events, indicating that the plume may be migrating downgradient toward the wetland area and the Savannah River. Additionally, DHEC generally agrees with the evaluation and recommendations provided by EPA in General Comment 1 of their comments on the 2021 report. DHEC recommends that a new well or well cluster near the edge of the wetlands, downgradient from TNX 28D, upgradient from the TNX 72 cluster, and cross-gradient from TNX 16D, be further evaluated and discussed by DHEC, EPA, and DOE.

Response: Agree with Clarification.

The recommendations to install an additional well located between TNX 28D and TNX 72D are to be included in the 2022 annual report. Since SRS plans on installing the requested well, a meeting with Core Team to discuss the topic is not needed before the submittal of the 2022 annual report.

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

Specific Comments

1. Section 3.3, Edible Oil Treatment, page 11. For the discussion on the 2015 edible oil treatment injections, please reference Figure A-11 in the sentence that mentions the ten (10) existing monitoring wells that were used for the injections.

Response: Agree with Clarification.

A reference to Figure A-11 will be added to the text, as suggested, in the 2022 annual report. No change to the current report is proposed.

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

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2. Section 3.5, Radiologically Contaminated Groundwater, page 12. Please include a figure that shows the locations of the two localized areas where groundwater monitoring wells indicate exceedances of MCLs for radionuclides as discussed in this section.

Response: Agree with Clarification.

A new figure will be added to the 2022 annual report and appropriately referenced in Section 3.5. See Attachment 1 for an example of the new figure. The figure will depict the TNX OU with all waste units clearly defined. In addition to adding the new figure, the following text will be revised for the 2022 annual report: “The two areas are ~~downgradient~~southwest of the TBG and in the wetlands ~~downgradient~~southwest of the OTSB, near the TNX OD.” No change to the current report is proposed.

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

3. Section 5.4, Analytical Results, pages 24-26 and Tables B-1 and B-2. There are a few apparent discrepancies between the number of detections for some constituents discussed in Section 5.4 and those listed in Tables B-1 and B-2. Specifically, Section 5.4 states the number detections for TCE 2Q2021, ethylene 2Q2021, uranium 2Q2021, and uranium 4Q2021 as 18, 7, 18 and 21, respectively. Tables B-1 and B-2 list the number of detections for those same constituents as 17, 6, 17 and 19. Please clarify or correct these discrepancies.

Response: Agree.

The number of detections were inaccurately stated in the text as mentioned in the comment. SRS will be more diligent with reporting the accurate number of detections in the 2022 annual report so the text matches Tables B-1 and B-2. No change to the current report is proposed.

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

4. Appendix F, Proposal to Evaluate the Soil Vapor Extraction Wells at the TNX Operable Unit, pages F-1 through F-14. Please provide additional information on the sampling and analysis procedures for the proposed SVE evaluation unless already summarized in a separate document. Specifically, please specify the following: the type and volume of containers that will be used to collect samples for VOC analysis (e.g., Tedlar bags, Summa canisters); if samples will be collected in Summa canisters or similar containers, the time duration over which the sample will be collected; any QA/QC samples to be collected (e.g., equipment blanks, trip blanks, duplicates); and the analytical method to be used for analysis of the VOCs listed in Table F-1.

Response: Agree with Clarification.

Vapor samples will be collected two ways during the evaluation. During the sampling events where all of the individual SVE wells will be sampled, a portable vacuum unit will be connected to the SVE well to extract vapor from the subsurface. During the high

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frequency sampling events, the SVE wells will be connected to a MicroBlower™ and vapor will be extracted through the MicroBlower™.

The vapor samples will be collected in 20 mL vials with crimp-seal caps using a modified EPA Method 18 and EPA Method 5021A. The process of filling the bottles involves tubing from the vacuum pump or the MicroBlower™, a sealable plastic bag, vial, cap, and crimping tool as shown in Attachment 2. With the vial and cap inside the sealable plastic bag, vapor is allowed to fill the bag. The bag is purged at least three times to ensure the vapor in the bag is representative of soil vapor from the well and not atmospheric air. Once the bag has been purged, the bag is sealed, the cap is placed on the vial, and the cap is sealed through the bag with the crimper tool. This is the sample method currently used to collect vapor samples from all SVE wells at SRS. It was developed by Savannah River National Laboratory in the mid-1990's.

For QA/QC samples, field blanks will be collected daily, and duplicates will be collected at 5% of the total samples. Once collected, the samples will be analyzed using EPA Method 5021A at a contracted laboratory.

No change to the current report is proposed. Text describing the sampling methodology and the QA/QC sampling will be included in the final white paper scheduled to be submitted in August 2025.

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

5. Appendix F, Section 3.0, Proposal, page F-5. Please address the following comments regarding soil gas sampling procedures for the SVE wells.

a. It is unclear how the sample delivery line will be connected to each SVE well head, and how the sampling train will be laid out regarding fittings, connections to the pump and sampling container, etc. Please describe the general soil vapor sampling train layout and how this will be connected to the well head to ensure a leak-free connection.

Response: Agree with Clarification.

Attachment 3 represents the configuration between the SVE well, the vacuum pump, and the sampler when a vacuum pump is used to sample the SVE wells. Attachment 4 represents the configuration between the SVE well, MicroBlower™, and sample port when a vapor sample is collected from a MicroBlower™.

No change to the current report is proposed. Text describing the sampling methodology will be included in the final white paper scheduled to be submitted in August 2025.

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b. While monitoring with a carbon dioxide meter may give a general indication that vapor is being pulled from the subsurface and not ambient air, it does not appear that this method will

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ensure a leak-free seal at the well head and confirm that no ambient air is being introduced into the sample. Please ensure that a leak test or other appropriate test is performed prior to sampling to ensure no ambient air is introduced into the sample, and please provide additional details regarding these procedures.

Response: Clarification.

Because MicroBlowers™ and their systems operate below 15 pounds per square inch, the American Standard of Mechanical Engineers (ASME) B31.3 for Process Piping code does not apply. Therefore, leak testing in compliance with B31.3 is not required. However, an In-Service Leak Test is always performed at operating pressure after initial construction which includes a visual inspection for leaks. Any leaks observed are repaired before starting normal operations. MicroBlowers™ are designed to have an air-tight connection with the well and within its process piping. The design, using rubber hose connections with hose clamps, as well as threaded or glued socket fittings, ensures that air moving through the system is being extracted from the subsurface and expelled through a vent at the top of the system. When a sample is desired, the proper valves are turned to divert the soil vapor to the sample port. Samples are only collected from a MicroBlower™ when the MicroBlower™ is in operation.

Using the vacuum pump to sample SVE wells does not meet requirements of the ASME B31.3 for Process Piping and therefore does not apply. Measuring carbon dioxide is one way SRS performs a leak test on the temporarily installed equipment that use a vacuum pump to collect a sample. The carbon dioxide concentration provides an indication that all connections, especially the connection between the SVE well and the well head, are secure and are not leaking. If carbon dioxide concentrations are not representative of the subsurface, then all connections are checked and adjusted as needed.

No change to the current report is proposed. Text describing the sampling methodology will be included in the final white paper scheduled to be submitted in August 2025.

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

c. Soil gas sampling procedures typically call for purging the sample delivery line prior to sample collection. Please include in Appendix F a brief description of the purging procedures to be followed prior to sampling.

Response: Agree with Clarification.

A MicroBlower™ is only sampled when it is operational and therefore actively purging. When a MicroBlower™ is not operational, a BaroBall™ seals atmospheric or ambient air out of the system preventing it from entering the subsurface. Therefore, all gas exiting the MicroBlower™ when operational should consist of soil vapor.

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When a vacuum pump is used, the site procedure recommends a minimum of a 15-minute purge before measuring the carbon dioxide concentration. After carbon dioxide concentrations are confirmed to be representative of subsurface soil vapor, the sample is collected. If carbon dioxide concentrations are considered low, then connections at the well head and with the vacuum pump are checked and adjusted before starting a second 15-minute purge. If a tight connection cannot be made, then the carbon dioxide concentration is recorded, and a soil vapor sample is not collected.

No change to the current report is proposed. Text describing the sampling methodology will be included in the final white paper scheduled to be submitted in August 2025.

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d. As discussed in a previous comment, the method by which the sampling train will be connected to each SVE well head is unclear. In addition to this comment, if the SVE well is required to be uncapped to connect the soil vapor sampling assembly, please consider the possibility that ambient air could be introduced into the well, especially if the MicroBlowers are still operating or if any residual vacuum is present in the well. If this is the case, please also evaluate whether additional purging of the SVE well will be needed to ensure that no ambient air is introduced into the sample.

Response: Agree with Clarification

Atmospheric or ambient air will enter an SVE well if it remains open and uncapped. Because there is no way to fully eliminate ambient air from entering the subsurface through an open SVE well, the SVE wells will be uncapped for the shortest duration possible. Wells connected to a MicroBlower™ are equipped with BaroBalls™ that prevent ambient air from entering the MicroBlower™ when not in operation. All SVE wells connected to a BaroBall™ are to be capped after the initial sampling event to prevent ambient air from entering the SVE well. An SVE well will be considered open to ambient air when a vacuum pump or MicroBlower™ is being connected or disconnected to an SVE well. A 15-minute purge time is employed following the connection of a vacuum pump or MicroBlower™ to remove any ambient air prior to sample collection.

No change to the current report is proposed. Text describing the sampling methodology will be included in the final white paper scheduled to be submitted in August 2025.

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e. The description of the initial sampling event with the MicroBlowers operating is unclear, since the report text indicates that the five MicroBlowers are rotated between SVE wells. During the initial sampling event prior to shutdown of the MicroBlowers, please clarify whether the MicroBlowers will stay connected to the same five SVE wells throughout the event (and specify

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which wells the MicroBlowers are connected to), or if the MicroBlowers will be connected to each SVE well prior to sampling to evaluate the effect on VOC concentrations while the MicroBlowers are operating at each individual well.

Response: Agree with Clarification.

The five MicroBlowers™ are currently connected to TVM 1M, TVM 3M, TVM 4U, TVX004U, and TVX007U. There are no plans to move the MicroBlowers™ from these five wells until after the three-month shutdown period of the SVE evaluation.

During the initial sampling event of individual SVE wells, a vacuum pump will be connected to each SVE well to collect a soil vapor sample. To do this, the BaroBall™ or MicroBlower™ connected to that SVE well will be disconnected. After sampling is complete, the well will be capped. At the end of the initial sampling period, all wells will have been sampled and capped, and the three-month shutdown period will begin. MicroBlowers™ will only be used after the three-month shutdown period and the second individual sampling event have been completed. Once that sampling event is completed, MicroBlowers™ will be connected to the first well group defined in Table F-2 of Appendix F to start the one-month high frequency sampling regime while the MicroBlower™ is operating. The MicroBlowers™ will continue to be rotated to the next well group and sampled until all well groups have been sampled. For the third and final individual SVE well sampling event, the MicroBlowers™ will be disconnected, the wells capped, and sampling will be conducted with a vacuum pump.

No change to the current report is proposed. Text describing the sampling methodology will be included in the final white paper scheduled to be submitted in August 2025.

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

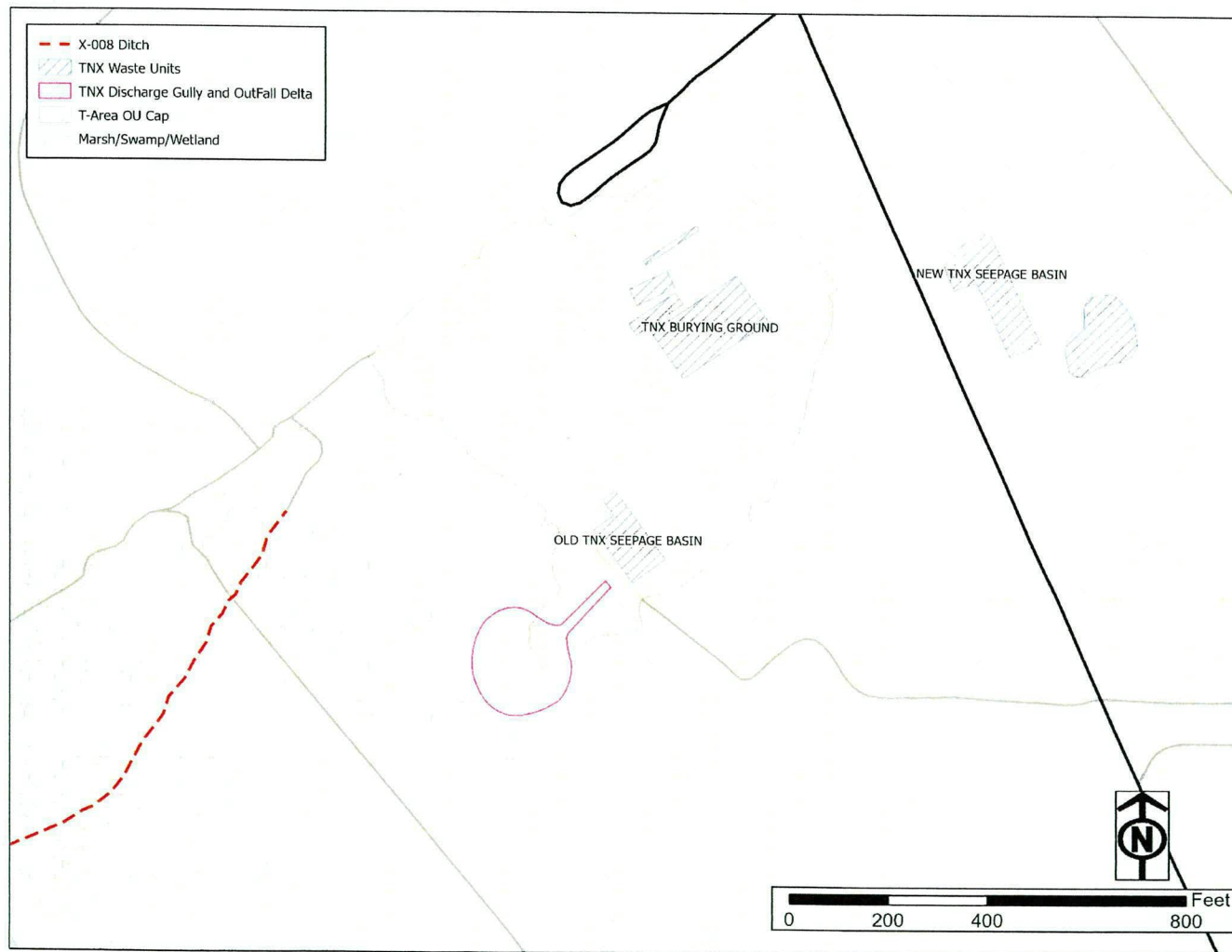
f. The report text indicates that SVE wells not connected to the MicroBlowers are equipped with BaroBalls which allow for venting of subsurface vapors. Please identify which SVE wells to be sampled for the evaluation will be equipped with BaroBalls and explain whether this will have any effect on the ability to collect a representative soil vapor sample from each SVE well or if this will factor in to the final SVE evaluation.

Response: Agree with Clarification

As mentioned in the response to EPA's comment #5e, the BaroBalls™ will be removed as part of the initial sampling event and the SVE well connected to them will be capped. With the BaroBalls™ disconnected, there will be no interference during the SVE evaluation. The BaroBalls™ will not be reconnected until after the SVE evaluation has been concluded. No change to the current report is proposed.

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Attachment 1. Location of TNX Waste Units



Place vial and crimp seal caps into plastic resealable bag



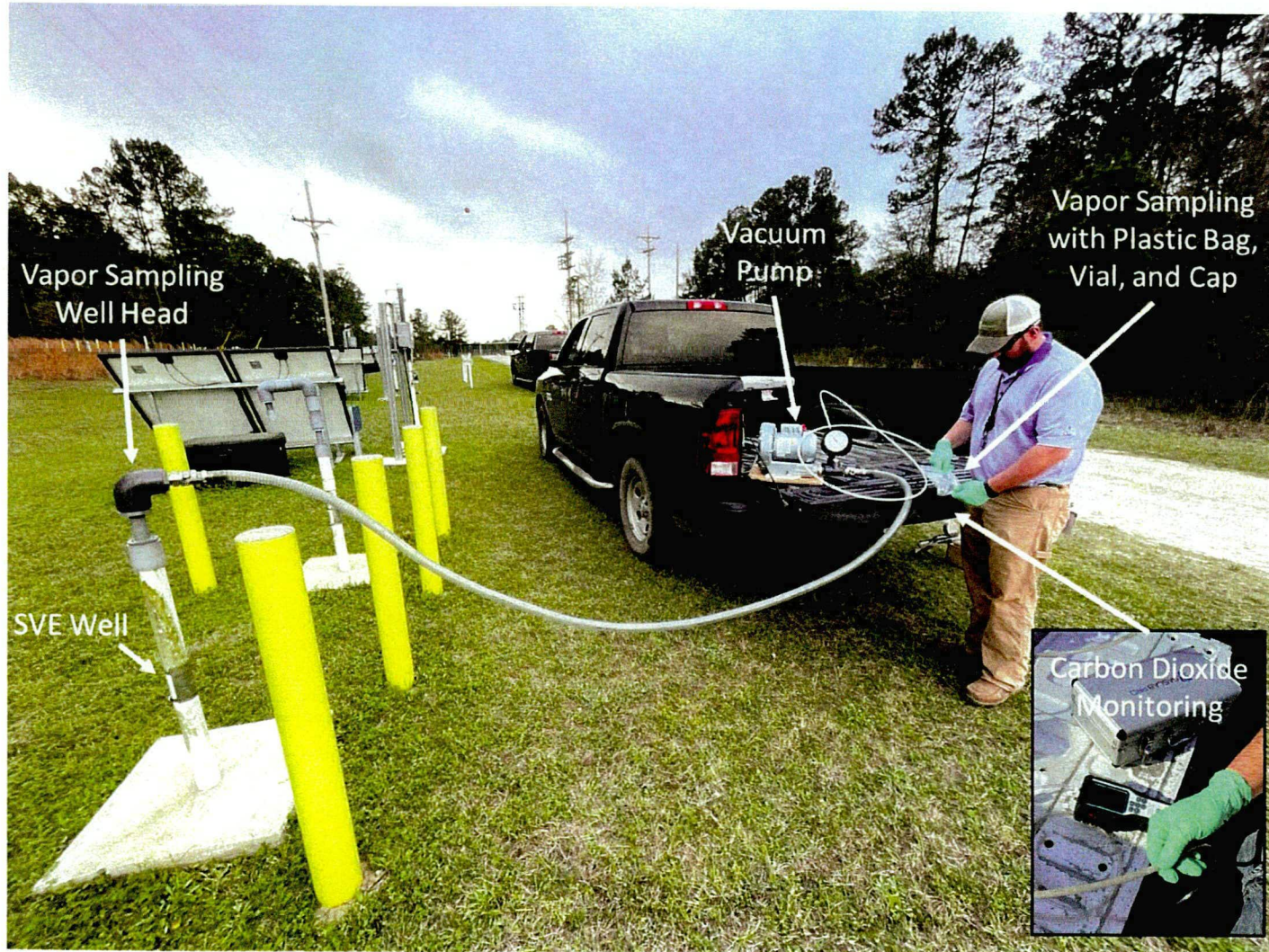
Insert tubing from MicroBlower™ or vacuum pump and purge three times



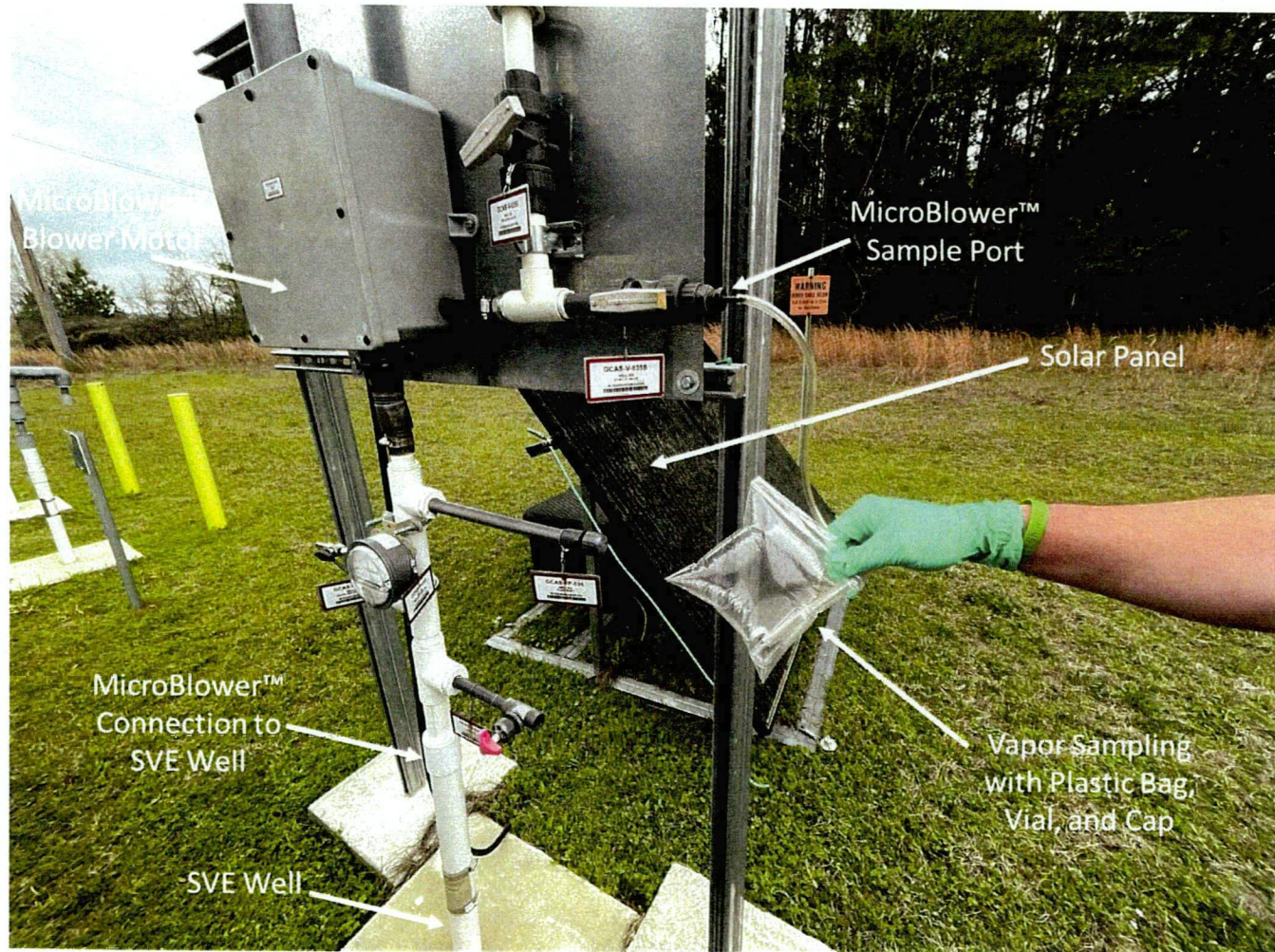
Soil vapor sample is now sealed



Seal the bag, put the cap on the vial, and crimp the cap through the bag



Attachment 3. Diagram of Collecting a Soil Vapor Sample from an SVE Well using a Vacuum Pump



Attachment 4. Diagram of Collecting a Soil Vapor Sample from a MicroBlower™

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EPA COMMENTS:

GENERAL COMMENTS

1. The Annual Report does not discuss the overall increasing trend in trichloroethylene (TCE) and uranium concentrations at monitoring well TNX 28D and what this means regarding plume migration and expansion. As noted in Section 6.3 (VOC Constituents (i.e., PCE, TCE, Cis-1,2-DCE, VC, Ethylene, and CCl₄), concentrations of TCE were elevated from 2016 to 2018, but review of Appendix E (Time Series Plots) shows that concentrations of TCE have been increasing at this well since the edible oil (EO) injections began (see pdf page 499). Concentrations of uranium also appear to be increasing (see pdf page 527). These trends and potential plume migration should be discussed in the Annual Report, and Section 8.0 (Summary/Recommendations) should indicate whether additional treatment may be necessary for the groundwater plume at TNX 28D and TRW 2 that is detached from the source (e.g., if EO injections should be considered). Additionally, these trends support the need for an additional well between TNX 28D and the TNX 72 well cluster. Please revise the Annual Report to discuss the increasing trends in TCE and uranium concentrations and potential plume migration at monitoring well TNX 28D.

Response: Agree with Clarification.

The combination of edible oil, pump and treat, and soil vapor extraction (SVE) has removed a significant amount of mass from the source area at TNX. Based on the non-detect to low TCE concentrations observed in the TNX source area, SRS believes the source is depleted and is no longer introducing mass to the aquifer. As a result, the TCE plume defined by TNX 28D and TRW 2 represents dissolved TCE mass located downgradient of the TNX source area and is interpreted to be detached from the source. The significance of being a detached plume is that no new mass is being introduced. If this interpretation is accurate, as the detached TCE plume migrates downgradient from TRW 2, the TCE concentrations within the plume should not exceed the 20-50 µg/L observed at TRW 2 over the last three years. With that assumption in mind, the criteria established in the 2013 ESD to the ROD (i.e., sustained increase of TCE, PCE, or carbon tetrachloride of 75 µg/L for one year) are likely not going to be triggered.

Additional text discussing the TCE trend at TNX 28D and the migration of the detached plume defined by TRW 2 and TNX 28D will be included in the next annual report. The text discussing the TCE trend and detached plume in Section 6.3 will be revised in the 2022 annual report to include the following:

“...TNX 28D is in the wetlands and has experienced TCE concentrations that have been above and below the MCL. TCE concentrations started increasing at TNX 28D in 2009, exceeded the MCL in 2014, and aA slug of elevated TCE concentrations was observed at TNX 28D from 2016 to 2018. Since 2019, TCE concentrations at TNX 28D have fluctuated above and below the MCL. In 2021 that trend continued with a 2Q2021 TCE concentration of 3.32 µg/L and a 4Q2021 TCE concentration of 6.71 µg/L. The TCE concentrations at TRW 2 and TNX 28D are located downgradient of the EO treatment zone and represent a groundwater plume that is detached

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from the source. This detached plume is migrating downgradient with groundwater flow to the southwest. No change to the current report is proposed.

The text discussing the need for additional EO treatment in Section 7.2 will be revised in the 2022 annual report to include the following:

“...The detached TCE plume will continue to experience TCE concentrations above or near the MCL but without a connection to the source ~~concentrations~~, concentrations are expected to decrease with time. The plume may change shape as it migrates away from the source, but the lower concentrations will likely not trigger the criteria established in the 2013 ESD to the ROD for additional EO injection. The concentrations observed at TVM 1M also do not trigger the ~~criteria established in the 2013 ESD to the ROD~~ for additional EO injections.” No change to the current report is proposed.

The following sentence will be added to the end of the second paragraph in Section 8.1 in the 2022 annual report if still accurate: “The need for additional EO is not recommended at this time.”

The uranium concentration at TNX 28D does have a slowly increasing trend since 2003, but the uranium concentration has not exceeded the MCL (30 ug/L). The maximum 2021 uranium concentration at TNX 28D was 12.8 µg/L. The upgradient source of uranium concentrations at TNX 28D is not obvious. This well is located side-gradient to the OTSB and TCM 5. Potential sources of uranium include uranium contamination associated with the Outfall Delta and naturally occurring uranium in fluvial sediments. Hot spots near the Outfall Delta were excavated and treated with apatite; however not all uranium contaminated sediment was removed. Discussion of this well with respect to uranium will be included in the 2022 annual report. No change to the current report is proposed.

The recommendations to install an additional well located between TNX 28D and TNX 72D are to be included in the 2022 annual report. Since SRS plans on installing the requested well, a meeting with Core Team to discuss the topic is not needed before the submittal of the 2022 annual report.

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

2. The current locations of the five MicroblowersTM are not identified on Figure A-9 (Location of TNX Area SVE [Soil Vapor Extraction] Monitoring Well System; pdf page 94) and the rationale for the placement of the MicroblowersTM is not discussed. The text in Section 3.2 (Soil Vapor Extraction) states that five MicroblowersTM are rotated between the SVE wells and references Figure A-9 for the current SVE well network, but it is unclear how the five current locations were selected. Based on Section 7.1 (Soil Vapor Extraction Operations), during 2021, the MicroblowersTM were connected to wells TVM 1V, TVM 3V, TVM 4U, TVX 4U (identified as “TVX004 U” on Figure A-9), and TVX 7U (identified as

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“TVX007 U” on Figure A-9); however, it is unclear if these locations will change in the next year. Please revise the Annual Report to identify the five current locations of the Microblowers™ on Figure A-9 and to discuss the rationale for selecting these locations, including when these locations will be changed.

Response: Agree with Clarification

The five Microblowers are currently connected to SVE wells TVM-1V, TVM-3V, TVM-4U, TVX004U, and TVX007U. The MicroBlowers™ have previously been rotated based on declining soil vapor concentration at a given well. As the MicroBlower™ operates and vapor concentrations decline, the MicroBlower™ was rotated to a new SVE well to maximize mass removal. As vapor concentrations have declined at most SVE wells, time between rotations have increased. The five SVE wells currently connected to a MicroBlower™ have not changed since 2018 and will not be changed until the SVE evaluation defined in Appendix F of the 2021 annual report is executed. After the SVE evaluation, recommendations will be included on the future operational status of the MicroBlowers™.

Text in Section 3.2 will be revised in the 2022 annual report as follows, “The five Microblowers™ are rotated between any of the SVE wells to optimize VOC vapor removal and are currently located on TVM-1V, TVM-3V, TVM-4U, TVX004U, and TVX007U.” No change to the current report is proposed.

Figure A-9 will not be revised to identify the 5 wells connected to MicroBlowers™. The list of those five well names will be listed in both Sections 3.2 and 7.1 and can be easily identified on Figure A-9. The well names in the text, on Figure A-9, and in Tables 7-1 and 7-2, will be revised for consistency.

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

3. The exceedances of the combined radium maximum contaminant level (MCL; 5 picocuries per liter [pCi/L]) are not consistently presented in the Annual Report. Section 5.4 (Analytical Results) notes that the combined radium concentrations exceeded the MCL at wells TNX 5D and TIR 1U; however, Figure A-21 (TNX Area Combined Ra-226/228 Activity in Groundwater, 4Q2021) does not show a plume at the location of TNX 5D. Additionally, Table B-2 (Groundwater Monitoring Results for TNX Area Wells, Fourth Quarter, 2021) does not indicate that the combined radium results at wells TNX 5D and TIR 1U (i.e., 8.2 pCi/L and 7.539 pCi/L, respectively) exceed the MCL. Figure A-21 notes that the result is “NDD” defined as Not Decision Data in the figure legend, and Table B-2 indicates the value is estimated. However, according to Appendix C, (Data Review Key, page C-7 of C-12) the NDD result is still useable even if it is an estimated value. Please revise Figure A-21 and Table B-2 to note these exceedances of the combined radium MCL at wells TNX 5D and TIR 1U.

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Effectiveness Interim Report (U), SEMS Number 21, 29, SRNS-RP-2022-00627, Revision 0, Dated
August 2022, Savannah River Site, Aiken, South Carolina**

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Response: Agree with Clarification.

The text in Section 5.4 for Combined Radium (pages 26 and 27 of 64) accurately discusses the wells where combined radium activity exceeded the MCL. Of those wells, the results at TIR 1U and TNX 5D were qualified as estimated or “J.” As the comment states, Appendix C identifies “J” qualified data as usable, but with the understanding that there are some uncertainties associated with the result. Estimated results are labeled with an “NDD” on Figures in Appendix A and are color coded with a purple cell in Appendix B.

For Figure A-21, there should have been a greater than 5 pCi/L contour encircling TNX 5D. Figure A-21 has been revised and included in these comment responses as Attachment 1. No change to the current report is proposed.

For Table B-2, the results for combined radium at TIR 1U and TNX 5D are color coded properly for J qualified results. The reporting software used to create Table B-1 and B-2 is limited and currently does not have the ability to color code results that are both J qualified and that exceed an MCL. SRS will look into uniquely identifying results that are both J qualified and exceed an MCL for future reports. No change to the current report is proposed.

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

SPECIFIC COMMENTS

1. Section 3.2, Soil Vapor Extraction, Page 10 of 64: The second paragraph mentions “V” and “U” screen horizons, but these horizons are not defined in the text. Also, several wells on Figure A-9 (Location of TNX Area SVE Monitoring Well System) have “L” in the identifications, but it is unclear what these letters signify. Please revise the text to define all the letters and screen horizons used in the SVE wells nomenclature.

Response: Agree with Clarification

Within the TNX OU SVE well network, there are twenty wells that are utilized for SVE operations. The TVM series were originally installed during phase II of the TNX characterization for use as monitoring wells associated with the recirculation well (i.e., TVR 1A). TVM wells have screen intervals designated with “M”, “L”, “V”, and “U.” The “M” and “L” screen intervals were installed within the aquifer and are not used as SVE wells. The “V” and “U” screen intervals were installed in the vadose zone and are used as SVE wells. In the TVM series, the “V” screens are typically installed at shallower depths in the vadose zone and the “U” screens are deeper. The TVX series were installed specifically for SVE activities and were installed within the vadose zone, “U” wells are screened within the upper vadose zone, and “L” wells are screened within the lower vadose zone.

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The following sentence will be added to the end of the fourth paragraph in Section 3.2 of the 2022 annual report, **“The TVX series of wells were installed specifically for SVE activities and were installed within the vadose zone; “U” wells are screened within the upper vadose zone, and “L” wells are screened within the lower vadose zone.”** No change to the current report is proposed.

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2. Section 3.5, Radiologically Contaminated Groundwater, Pages 12-13 of 64: The text notes that there are two localized areas in the wetlands where the groundwater monitoring wells exceed the MCLs, but only one monitoring well (i.e., TCM 5) is identified in the text. According to Section 5.4 (Analytical Results), groundwater exceedances were noted for adjusted gross alpha at well TNX 72D and for combined radium at wells TIR 1M/U, TNX 5D, and TNX 8D. Please revise the text to clarify the locations within the wetlands where radiological exceedances can be found.

Response: Agree with Clarification

Section 3.5 describes the remedial actions that have occurred and the general location of the radiologically contaminated groundwater at TNX Area OU based on previous observations. This section does not discuss results identified for the current reporting period as those are discussed later in Section 5.4. If radiological trends in the groundwater become more discernable, they will be discussed in Section 3.5. For clarity, Section 3.5 in the 2022 annual report will be revised to state, “There are two localized areas where the groundwater monitoring wells have previously exceeded the MCLs for the respective radionuclide constituents.” No change to the current report is proposed.

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3. Section 4.1.1, Sampling Issues, Page 18 of 64: The first bullet point notes that there is a history of TNX 72S being dry due to the shallow screen depth but does not discuss if a data gap exists from this missing sample and result. Please revise this section to state whether a data gap exists due to the missing sample result at TNX 72S and if additional actions are necessary.

Response: Clarification.

There is no data gap present when a groundwater sample cannot be collected from TNX 72S because there are two more wells that are screened deeper in the TNX 72 well cluster. TNX 72S has a very shallow screen depth in comparison to other wetland wells which is why it is typically dry or if water is present, the volume of water is so low that no water can be pumped to the surface. The shallow screen depth in combination with a topographic high in the wetlands cause the screen at TNX 72S to be located just above the water table surface. For this reason, only

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water levels have been collected from TNX 72S. TNX 72M and TNX 72D located in the same well cluster are screened deeper than TNX 72S. TNX 72D has the deepest screen interval at the cluster, is screened at an equivalent horizon as other “D” wells installed in the wetlands, and can typically be sampled with no issues. TNX 72M has a screen depth between TNX 72S and TNX 72D and has been sampled intermittently as water levels within the screen zone fluctuate.

TNX 72S has been recommended for removal from the the TNX well network in previous annual reports, but has been retained at the request of the USEPA and SCDHEC. It is expected that this well will continue to be reported as dry or can not be sampled. No additional actions can be done to collect a sample at TNX 72S. A discussion of the shallow screen interval at TNX 72S will be added to Section 4.0 of the 2022 annual report. No change to the current report is proposed.

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4. Table 4-1, TNX Monitoring Well Network, Page 21 of 64: The text in Section 4.1 (Sampling Events) notes there are 43 wells in the monitoring well network, but this table lists 44 wells. It appears well TVR 1A is listed twice with two separate screen depth intervals, but the results in Appendix B (Groundwater Monitoring Results [Matrix Tables]) only list one result for well TVR 1A. Please revise this table to clarify why TVR 1A is listed twice and note which screen depth interval was sampled in 2021.

Response: Agree with Clarification

TVR 1A was originally installed as a recirculation well that is constructed with two screens within the same well to perform in-well vapor stripping. The upper screen (15-40 ft bgs) is installed within the vadose zone and the lower screen (65-75 ft bgs) is installed within the water table. In well TVR 1A, groundwater can only be collected from the lower screen that is within the water table.

For clarity on which screen is being used for groundwater analyses at TVR 1A, Table 4-1 “TNX Monitoring Well Network” will be updated in the 2022 report to remove the upper screen construction details for TVR 1A. No change to the current report is proposed.

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5. Section 5.4, Analytical Results, Combined Radium, Page 26 of 64: The text in the second paragraph incorrectly references 2Q2020 and not 2Q2021 as the date the combined radium activity did not exceed the MCL. Please revise the text to reference the 2021 date for the discussion of the current combined radium data.

Response: Agree with Clarification.

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This was an inadvertent mistake that will be revised appropriately in the 2022 annual report. No change to the current report is proposed.

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6. Section 5.4, Analytical Results, Edible Oil Parameters, Pages 29-30 of 64: Oxygen Reduction Potential (ORP) is discussed as decreasing after EO injections with sustained low concentrations at three wells (i.e., TBG 4, TBG 5, TNX 3D) through 2021; however, the bullet point for well TBG 4 notes an increase in ORP in 2021 and the bullet point for well TNX 3D states that ORP in this well has steadily increased since 2009. Please revise the initial statement that describes ORP in these three wells to be consistent with the trends discussed in the bullet points.

Response: Agree with Clarification

Although there was an increase in ORP concentration during the 2021 sampling events, the overall ORP trends at TBG 4, TBG 5, and TNX 3D have sustained lower than background concentrations since the deployment of EO during 2008, 2010, and 2015. The current text does not adequately describe the difference between the long-term and short-term ORP trends. For example, the long-term trend of ORP at TBG 4 declined below background concentration in 2010 and has remained less than background conditions since 2010. However, there have been short-term periods of time when ORP results have increased since 2010.

Text in the 2022 annual report will be revised to discuss both long and short-term trends of ORP and other EO parameters as appropriate. No change to the current report is proposed.

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7. Section 6.3, VOC Constituents (i.e., PCE, TCE, Cis-1,2-DCE, VC, Ethylene, and CCl₄), Page 39 of 64: The text states that variable TCE concentrations at well TRW 2 are likely due to treated groundwater flowing from upgradient sources based on the changing EO parameters and references decreasing dissolved oxygen [DO], decreasing ORP, increasing methane, and denitrification; however, some of the trends shown in Appendix E do not support this statement. The Time Series Plots for Station TRW 2 show increasing DO concentrations (pdf page 369) and decreasing methane concentrations (pdf page 394) since 2015. It is also noted in Section 5.4 that ORP concentrations at TRW 2 have been variable from 2018 to 2021. Please revise the discussion of the EO parameters at TRW 2 in Section 6.3 to be consistent with the recent data presented in the Annual Report.

Response: Agree with Clarification.

The text in question was added to the report after the 2015 EO injections and have not been adequately updated as trends have changed since 2015. The text in Section 6.3 will be revised in the 2022 annual report to better clarify observations made at TRW 2 with respect to the EO

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parameters. For example, the long-term trend of methane at TRW 2 has increased above background from 2013 to present. The short-term trend has methane concentrations decreasing from 2016 to present. The decreasing methane concentrations are an indication that EO or the effects of EO are degrading but are still present. The text in the next annual report will be revised to discuss both long and short-term trends at TRW 2 for the appropriate EO parameters. No change to the current report is proposed.

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8. Section 6.4, Edible Oil Parameters, Page 42 of 64: The text states, “ORP results at injection wells (i.e., TBG 4, TBG 5, TNX 3D, TRW 3, TRW 4R, and TVM 1M) decreased to values of < -100 mV [millivolts] after each injection of EO;” however, based on the time series plots in Appendix E, injection well TRW 3 (pdf page 434) did not have ORP less than -100 mV after each injection of EO. Please revise Section 6.4 to indicate that well TRW 3 did not reach ORP values less than -100mV after each of the EO injections.

Response: Agree with Clarification.

TRW 3 was only used as an injection well during the 2015 injection campaign. To make the text more accurate, it will be revised in the 2022 annual report to state, “ORP results at injection wells (i.e., TBG 4, TBG 5, TNX 3D, TRW 3, TRW 4R, and TVM 1M) decreased to values of < -100 mV after the 2008, 2010, and/or 2015 each injection of EO.” No change to the current report is proposed.

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9. Appendix B, Groundwater Monitoring Results (Matrix Tables), Pages B-3 and B-4: There are five results listed for total organic carbon (TOC) at each well, but it is unclear why these multiple results are reported. Please revise this table to note why five results are listed for TOC at each well and clarify which result is used in the Annual Report text and figures (e.g., Appendix E, Time Series Plots).

Response: Agree with Clarification.

There are five TOC results reported at each well. The five results come from the laboratory running each TOC sample in quadruplicate, plus the laboratory provides an average result of those four results. SRS reports all five results in Appendix B. The maximum result from those five are used for Figure A-33 in Appendix A and time series plots in Appendix E.

Text will be added to Section 4.0 to document details about the TOC results and that maximum values are used for maps and graphs. This section will be updated in the 2022 annual report. No change to the current report is proposed.

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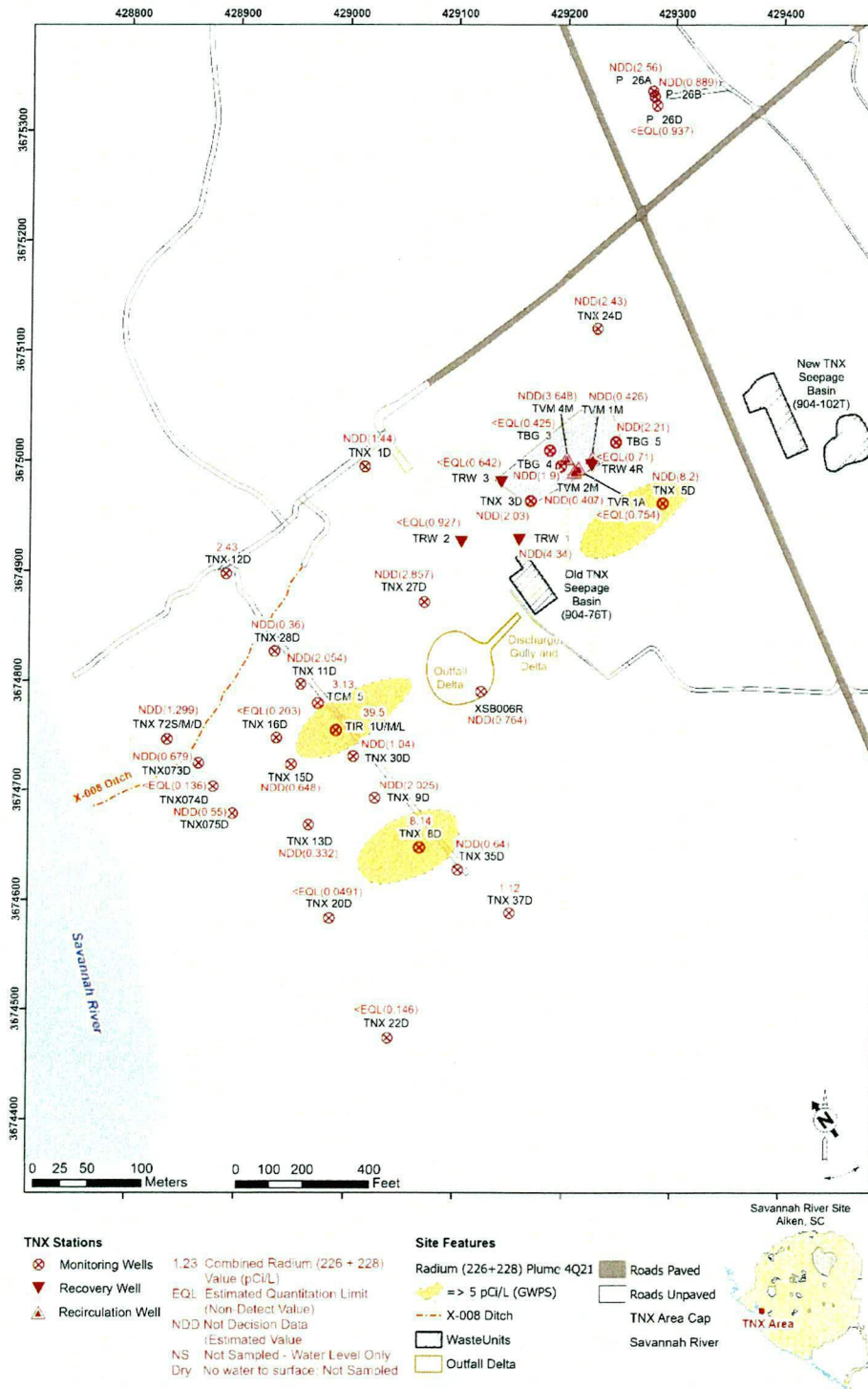
10. Appendix D, Hydrographs, and Appendix E, Time Series Plots: Some of the graphs show vertical lines marking when the different remedial actions were taken, but the color coding does not always match the colors in the key. For example, in Appendix D the red line in the hydrographs appears to mark the SVE start date of 2002, but this line does not appear red in the key. In Appendix E, the green vertical lines in the time series graphs appear to represent when the EO injection occurred, but the EO injections are also labeled as black lines in the key. Please revise the graphs in these appendices to show the correct color coding for the lines or provide a key for both appendices to clarify the dates noted on the hydrographs and time series graphs.

Response: Agree with Clarification.

The degraded quality of the time series plots in Appendix D and E was the outcome of reducing the original file size so it could be emailed to USEPA and SCDHEC. The original pdf file was reduced from 270 MB to approximately 20 KB. In this reduction, some of the figures became pixelated and the coloration of the legend on the graphs was no longer legible. SRS will evaluate a better way to send the electronic file to prevent this from happening in the future.

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Attachment 1. Revised Figure A-21