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

APR 13 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 and Emergency Management 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 Effectiveness Monitoring Report (EMR) for the C-Area Groundwater (CAGW) Operable Unit Removal Action (U) July 2021 through June 2022 (SRNS-RP-2022-00530, Revision 0, September 2022) SEMS Number: 82

The U.S. Department of Energy (DOE) is submitting the subject comment responses for your review. The U.S. Environmental Protection Agency's (EPA) and the South Carolina Department of Health and Environmental Control's (SCDHEC) comments were received on December 2, 2022 and January 17, 2023, respectively. This report will not be revised; however, all comment responses will be included in the next EMR, as applicable. Please review these responses and provide your approval within 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, Karen Adams, at (803) 952-7871.

Sincerely,

Brian T. Hennessey Digitally signed by Brian T. Hennessey
Date: 2023.04.12 15:19:13 -04'00'

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

RDDD-23-004

Enclosures:
1. SRS Responses to EPA Comments on the Technical Review of the Effectiveness Monitoring Report (EMR) for the C-Area Groundwater (CAGW) Operable Unit Removal Action (U) July 2021 through June 2022 (SRNS-RP-2022-00530, Revision 0, September 2022) SEMS Number: 82
2. SRS Responses to South Carolina Department of Health and Environmental Control Comments on: Effectiveness Monitoring Report (EMR) for the C-Area Groundwater (CAGW) Operable Unit Removal Action (U) July 2021 through June 2022 (SRNS-RP-2022-00530, Revision 0, September 2022) SEMS Number: 82

cc w/o encl:
J. Blalock, SCDHEC-Columbia
S. French, SCDHEC-Columbia
M. Reece, SCDHEC-Columbia
G. K. Taylor, SCDHEC-Columbia
G. Stewart, SCDHEC-Columbia
T. R. Fuss, SCDHEC-Aiken Environmental Affairs Office
G. O'Quinn, SCDHEC-Aiken Environmental Affairs Office
B. A. Cameron, SCDHEC-Aiken Environmental Affairs Office
K. L. Beatty, SCDHEC-Aiken Environmental Affairs Office
H. L. Herlong, SCDHEC-Aiken Environmental Affairs Office

cc w/ encl:
M. McRae, TechLaw, Inc.

SRS Responses to South Carolina Department of Health and Environmental Control Comments on: Effectiveness Monitoring Report (EMR) for the C-Area Groundwater (CAGW) Operable Unit Removal Action (U) - July 2021 through June 2022, SEMS Number: 82 (SRNS-RP-2022-00530, Revision 0, September 2022)

Comments Received: January 17, 2023

GENERAL COMMENTS:

1. SCDHEC generally agrees with the interpretation presented in the document of the effectiveness of the injections performed under the NTCRA. Monitoring well CRW026C has shown the most positive influence from the injections, while most other wells have shown minimal long-term improvement of parameters that would indicate reductive dechlorination of TCE. Based on Figures 3 and 4, the downgradient edge of the distal TCE plume adjacent to Castor Creek has decreased in concentrations but remains above the MCL, while the distal plume upgradient of the wetlands area has shown minimal improvement. Please discuss whether any additional actions may need to be taken to ensure the RAOs for the NTCRA are met.

   Response: Clarification.

   At this time no additional actions are planned for the removal action (RA) area of the CAGW OU TCE plume. SRS plans to continue monitoring and reporting for two more years as specified in the CAGW OU Removal Action Design Plan with Effectiveness Monitoring Plan (SRNS-RP-2018-00807, Revision 1, October 2018). If after five years, the CAGW OU RA is unsuccessful in lowering TCE concentrations in the unnamed tributary and/or Castor Creek, then the TCE plume exceeding the MCL in surface water will be addressed in the final CAGW OU Record of Decision. No changes to the current report are proposed.

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

2. Please include separate tables listing all monitoring stations for the CAGW OU monitoring program and the NTC RA monitoring program.

   Response: Agree with Clarification.

   All monitoring stations within the CAGW OU and the NTC RA monitoring network are described in Section 2.2 CAGW OU Boundary and Monitoring Network, Section 4.1.1 *CAGW NTC RA Groundwater Monitoring Well Network*, and Section 4.1.2 *CAGW OU Groundwater Monitoring Well Network*. All monitoring wells, seepline stations, and surface water stations that are involved in each monitoring network will be included in a table in the next annual report. No changes to the current report are proposed.

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

SPECIFIC COMMENTS:

1. Figures 3, CAGW OU NTC RA Area (2019 Baseline Conditions), page 35 and Figure 4, CAGW OU NTC RA Area (4Q21), page 36. For figures with groundwater elevation contours, please add numbers next to the contour lines indicating the groundwater elevation represented.

   Response: Agree.

   These figures will be updated to include groundwater elevation contours in the next annual report. No changes to the current report are proposed.

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

2. Figure 19, Post-RA TOC Surface Water Trends, page 52. The x-axis of the figure is labeled "Tributary TOC Groundwater Concentrations," but should apparently be revised to "Tributary TOC Surface Water Concentrations." Please correct.

   Response: Agree.

   The figure will be updated with a graph title of "Tributary TOC Surface Water Concentrations" in the next annual report. No changes to the current report are proposed.

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

3. Table 3, CAGW OU and CAGW OU NTC RA Maximum Concentrations, page 80. There are several discrepancies between the station IDs, well types and maximum detections listed in Table 3, Appendix A, and Appendix F.

   a. Table 3 lists a maximum PCE detection of 0.77 µg/L at CRW010CU for the CAGW OU monitoring program; Appendix F shows a detection of 1.44 µg/L at this well. Appendix F also shows a detection of 2.49 µg/L at CRW010C, which appears to be the true maximum for PCE.

   b. Table 3 lists a maximum cis- 1,2-dichloroethylene detection of 0.88 µg/L at surface water station CCT 03 for the NTC RA monitoring program. The maximum detection listed in Appendix A appears to be at seepline station CCSL-11 (1.82 µg/L).

   c. Table 3 lists a maximum PCE detection of 0.85 µg/L at seepline station CCSL-14 for the CAGW OU monitoring program; however, Appendix A indicates a detection below the EQL for this station. The maximum detection listed in Appendix A appears to be at monitoring well CRW030C (0.86 µg/L).

   d. Table 3 lists surface water station CCT 03 as a monitoring well twice.

e. Table 3 lists a maximum TCE detection of 38.4 µg/L at CSB020C. According to Appendix A, this detection occurred at CSB15D.

These were just a few discrepancies that were noted and may not be comprehensive. Please correct and revise any sections that require revision based on the corrections.

Response: Agree with Clarification

A. The maximum PCE concentration (2.49 µg/L) occurred at monitoring well CRW 10C.

B. The correct maximum cis-1,2-dichloroethylene concentration is 1.82 µg/L at seepline station CCSL-11.

C. The maximum PCE detection (0.86 µg/L) within the CAGW OU NTC RA monitoring program occurred at monitoring well CRW030C.

D. CCT 03 is a surface water station. The duplicate entry was in error.

E. The maximum TCE detection (38.4 µg/L) within the CAGW OU NTC RA monitoring program occurred at monitoring well CSB15D.

Table 3, Appendix A, and Appendix F will be reviewed more thoroughly to ensure that these and similar discrepancies will be corrected in future annual reports. No changes to the current report are proposed.

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

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SRS Responses to EPA Comments on the Technical Review of the Effectiveness Monitoring Report (EMR) for the C-Area Groundwater (CAGW) Operable Unit Removal Action (U) July 2021 through June 2022, SEMS Number: 82; SRNS-RP-2022-00530, Revision 0, September 2022

Comments Received: December 2, 2022

GENERAL COMMENTS:

1. The EMR does not discuss the mass of trichloroethylene (TCE) present in the plume or the amount that this mass has been reduced since the 2019 baseline conditions. According to Section 2.1 (Removal Action Characterization, Objectives, and Implementation; Page 3 of 110), the remedial action objective (RAO) for the non-time critical removal action (NTC RA) is to protect human health and the environment by reducing the mass of TCE in groundwater. While the EMR discusses the average TCE concentrations within the plume, an estimate of the mass of TCE present before and after the NTC RA is not discussed. Please revise the EMR to discuss the mass of TCE present in groundwater and how the reduction of TCE mass in groundwater will be evaluated to determine that the RAO has been met.

   Response: Clarification.

   Reductions in plume contaminant mass are inherently difficult to estimate due to the small volume of groundwater sampled as compared to the contaminant plume volume. The estimated plume volume is about 2.2M liters, of which less than one liter combined is sampled from the existing CAGW OU RA monitoring wells. SRS uses trend data from the wells and surface water stations to qualitatively estimate TCE mass, as quantitative plume mass estimates would be subject to large uncertainties. In June 2022, the average TCE concentration for the seven primary groundwater monitoring wells was 8.80 µg/L, which is about a 28% decrease from the June 2019 baseline average TCE concentration (12.32 µg/L) (Section 4.4.1.1, MAZ). This is the basis for estimating a 28% decrease in TCE mass within the CAGW OU plume due to the NTC RA and all other monitored natural attenuation mechanisms (e.g., sorption, volatilization, diffusion, dilution, dispersion, decay). Text will be added to future annual reports that qualitatively relates the concentration data to the TCE mass. No changes to the current report are proposed.

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

2. The EMR notes that groundwater concentrations of TCE at downgradient wells CRW027C and CRW028C are increasing; however, the EMR does not discuss why TCE may be increasing at these wells or if additional wells in this area may be necessary. For example, it is unclear if injections in the first transect may have pushed the plume downgradient. Also, since downgradient wells CRW027C and CRW028C are located on the southeastern edge of the plume, it is unclear if additional monitoring wells would be useful for determining if the TCE plume is migrating. Please revise the EMR to discuss potential reasons for increasing concentrations of TCE at downgradient wells CRW027C and CRW028C and if any additional actions may be necessary.

   Response: Clarification.

   There could be several reasons for the increased TCE groundwater concentrations at wells CRW027C and CRW028C. In June 2020, the water table rose for all the wells in the CAGW

OU RA monitoring network (Attachment 1: Water Table in CAGW OU RA Area), and there was a corresponding increase in the average TCE groundwater concentration. It is likely the elevated water table entrained TCE that had been stranded in the vadose zone at a previously high-water elevation, and/or from vapor intrusion into the vadose zone. Wells CRW027C and CRW028C are downgradient of the injection areas and very near the unnamed tributary; therefore, it is possible the groundwater with elevated TCE from 2020 is now impacting these wells.

Alternatively, the oil injections in 2019 could have pushed the TCE plume toward these wells in 2020. A combination of the oil injections moving the TCE plume toward these wells and increased TCE groundwater concentrations from a rising water table may be responsible for increased TCE concentrations at CRW027C and CRW028C.

It is unlikely the TCE groundwater plume has moved farther to the east as the unnamed tributary stations (CCT-01, CCT-02 and CCT-03) TCE concentrations have remained relatively stable in 2021 and 2022, most notably CCT-03 (Attachment 2: Unnamed Tributary TCE Trends). Text will be added to future reports to provide possible explanations for increasing concentrations at downgradient wells, as applicable. No changes to the current report are proposed.

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

3. The surface water stations at the unnamed tributary (i.e., CCT-01, CCT-02, and CCT-03) and Castor Creek (i.e., CC-06, CC-07, CC-08) are shown in different locations in the EMR figures. For example, Figure 3 (CAGW OU NTC RA Areas [2019 Baseline Conditions]; Page 35 of 110) shows the location of CCT-03 as across the unnamed tributary from monitoring well CRW028C, while Figure 4 (CAGW OU NTC RA Areas [4Q21]) shows CCT-03 as located on the same side of the tributary and closer to monitoring well CRW027C. Surface water stations CCT-01 and CCT-02 exhibit similar inconsistencies in location between Figures 3 and 4. As such, it is unclear if these samples were collected from different locations in the 2019 baseline and current sampling period. Please revise the EMR to clarify if these surface water samples were collected at the same locations and if so, ensure the figures are consistent.

Response: Agree.

The locations of the surface water stations (CCT-01, CCT-02, CCT-03, CC-06, CC-07 and CC-08) in Figure 3 are correct. The locations where the samples are collected are the same for Figures 3 and 4. Future reports will ensure that all figures show the surface water stations in the correct locations. No changes to the current report are proposed.

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

4. The concentrations of methane over time in monitoring well CRW023C are not consistently presented in the ERM. The text of Section 4.4.1.6 (Methane; Page 17 of 110) indicates there was an increase in methane concentrations at CRW023C; however, Appendix A (CAGW OU NTC RA Data) reports the concentrations of methane in CRW023C as not-detected below the sample quantitation limit (SQL) of 25 micrograms/liter (µg/L) in 4Q21 and detected at 23 µg/L in 2Q22, which is below the SQL. Further, Figure 15 (CRW023C Post-RA Groundwater Trends) indicates concentrations of methane were 10 µg/L since June of 2020, and two data points are included for the June 2022 sample, even though only one result is reported for this sampling event in Appendix A. Please revise the EMR to consistently present the concentrations of methane measured in monitoring well CRW023C.

   Response: Agree with clarification.

   The text in Section 4.4.1.6 accurately discusses the monitoring stations where methane concentrations have increased over baseline conditions. The result at CRW023C during 4Q2022 was J-qualified as an estimated value and is considered useable data.

   Figure 15 displays methane concentrations over time for CRW023C since baseline conditions. During 2020, a different analytical laboratory was contracted and the method detection limit (MDL) was increased from 0.046 µg/L to 10 µg/L for methane. The MDL is used for trend analysis when the concentration of the constituent is non-detect.

   The two data points presented in Figure 15 for June 2022 are a regular sample and a field duplicate sample for CRW023C. The inclusion of the field duplicate result was in error. Figure 15 will be revised appropriately in the next annual report. Attachment 3 provides an updated Figure 15. No changes to the current report are proposed.

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

SPECIFIC COMMENTS:

1. Section 4.4.1.1, Trichloroethylene, Pages 12 to 13 of 110: The second paragraph of Section 4.4.1.1 discusses the highest concentrations of TCE measured in 18 effectiveness monitoring stations in 4Q21 and 2Q22; however, the text later notes there are 20 monitoring stations for the 2021-2022 sampling period (third paragraph of Section 4.4.1.1). In addition, the text states that 12 of the 20 monitoring stations had concentrations of TCE that exceeded the maximum contaminant level (MCL), but according to the data presented in Appendix A (CAGW OU NTC RA Data), TCE concentrations exceeded the MCL at 13 stations during the 4Q21 and 2Q22 sampling events. Please

revise the text to confirm the number of effectiveness monitoring stations and exceedances of the TCE MCL measured in 4Q21 and 2Q22.

Response: Agree with clarification.

Originally there were 18 NTC RA monitoring stations. In February 2022 an additional 2 monitoring wells were installed (CRW029C and CCRW030C) and are included in the primary monitoring station network. These wells were sampled in 1Q and 2Q of 2022 and included in the 2021 to 2022 analytical data. Therefore, the second paragraph of Section 4.4.1.1 should have listed 20 monitoring stations for 2Q22. The third paragraph of Section 4.4.1.1 should have stated 13 of the 20 monitoring stations exceeded the MCL for TCE. Future reports will appropriately identify the number of effectiveness monitoring wells and exceedances. No changes to the current report are proposed.

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

2. Section 4.4.1.6, Methane, Page 18 of 110: The text discusses trends in concentrations of methane in site media, but trend graphs are not provided for all wells. For example, the text states, "An increase in methane concentrations is observed in the post-RA samples, up to 126 µg/L at CCT-01 in 2Q22." However, methane concentrations with time are shown for only two monitoring wells (i.e., CRW023C and CRW026C; see Figures 15 and 16) and time-series plots for methane are not included in Appendix C (Time-Series Plots). Please revise the EMR to include trend graphs for the methane concentrations discussed in this section.

   Response: Agree with clarification.

   Although the methane observations are discussed thoroughly in Section 4.4.1.6 Methane, trend graphs were only included for monitoring stations that had detectable results in post RA samples. Monitoring stations CRW023C and CRW026C show the best representation of MNA parameters for the post RA samples and are subsequently used in the groundwater trend graphs. Time series plots of methane for the 20 RA monitoring stations will be included in Appendix C in future annual reports. No change to the current report is proposed.

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

3. Figure 11, TCE Trends Near CAGW OU RA, Page 44 of 110: The note at the bottom right appears to discuss non-detected results but the text has been cut off. As such, it is unclear how non-detected results are shown in the trend graph. Please revise this figure to include the full note for how non-detected results are shown on the trend graph.

Response: Agree with clarification.

The note on Figure 11 should state "Results below detection limit use the MDL for chart data." Attachment 4 provides the corrected Figure 11. All figures and tables will be reviewed in future annual reports to ensure that complete notes are present. No changes to the current report are proposed.

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

4. Table 2, MCLs for Groundwater Constituents, Page 79 of 110: An asterisk is noted for 1,2-dichloroethylene in the table; however, this notation is not defined. Please revise Table 2 to define this asterisk for 1,2-dichloroethylene.

Response: Agree.

The following footnote should have been included on Table 2.

Table 2 Notes:
*** = All stations had results less than the MDL.**

If the condition remains the same in future annual reports, then the footnote will be added to Table 2. No changes to the current report are proposed.

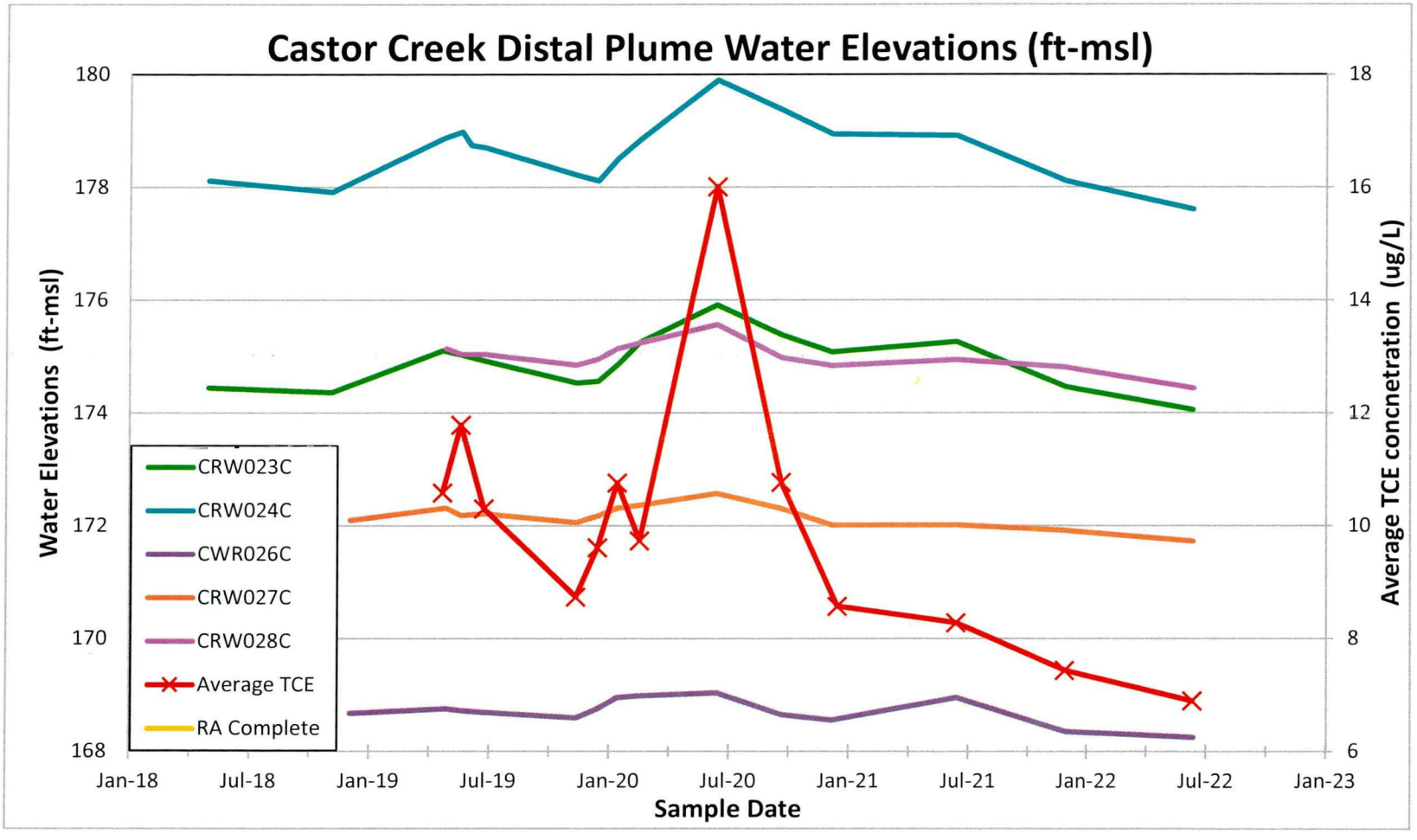
Responsible Party: Terry Killeen, (803) 952-6850, terry.killeen@srs.gov

5. Appendix A, CAGW OU NTC RA Analytical Data 2021-2022, Pages A-3 to A-5 of A-6: The table does not identify all concentrations that exceed the MCLs. For example, the TCE result for monitoring well CRW023C collected June 13, 2022 (6.16 µg/L) is not highlighted red to indicate an exceedance of the MCL (5 µg/L). Instead, this result is indicated to be an estimated value; however, an estimated result is useable and should be identified as an exceedance. Please revise this table to identify all exceedances of the MCLs.

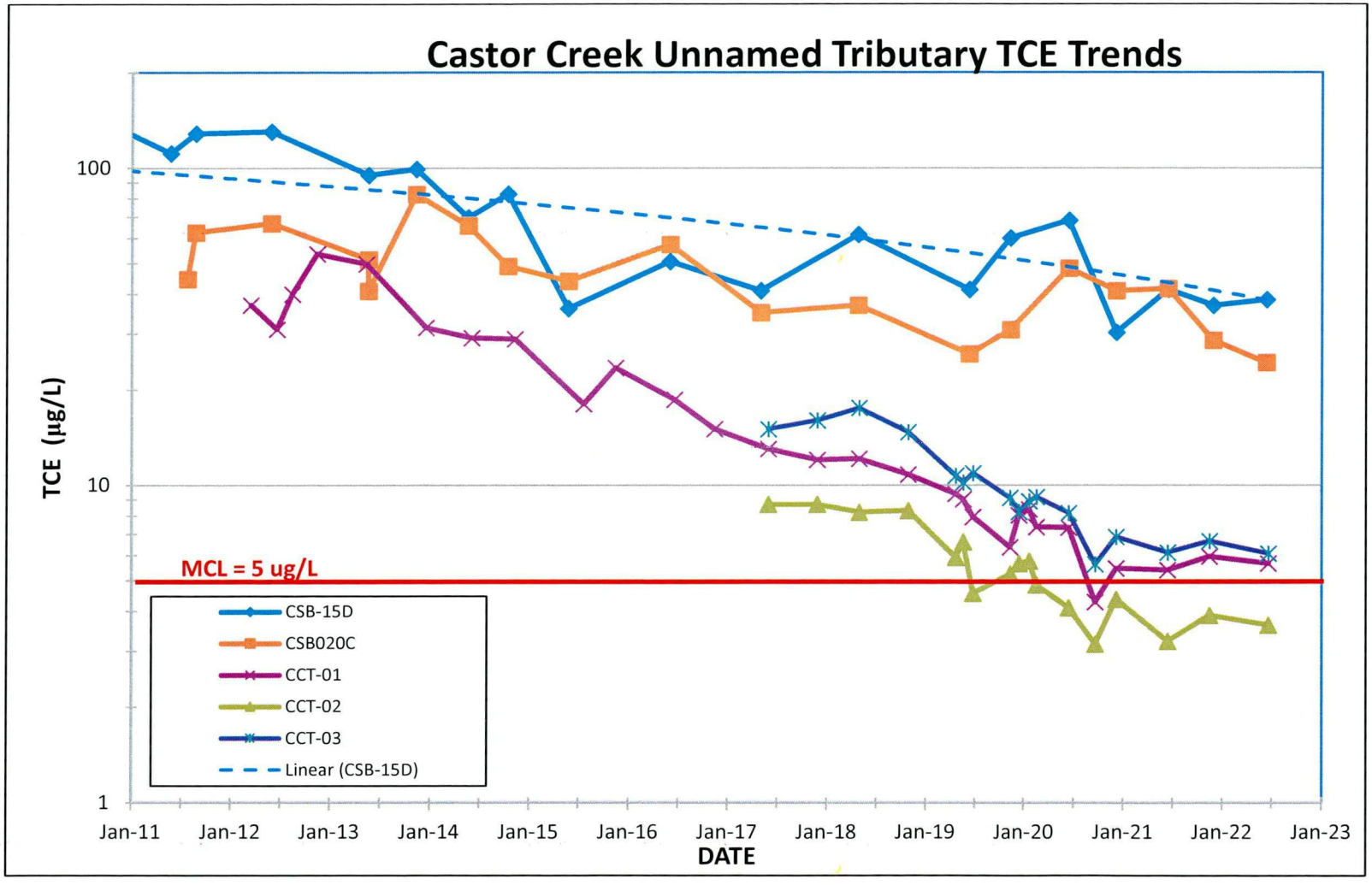
Response: Agree with Clarification.

For the table in Appendix A, the results for TCE at CRW023C collected on June 13, 2022 is color coded properly for a J qualified result. The reporting software used to create this table 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.

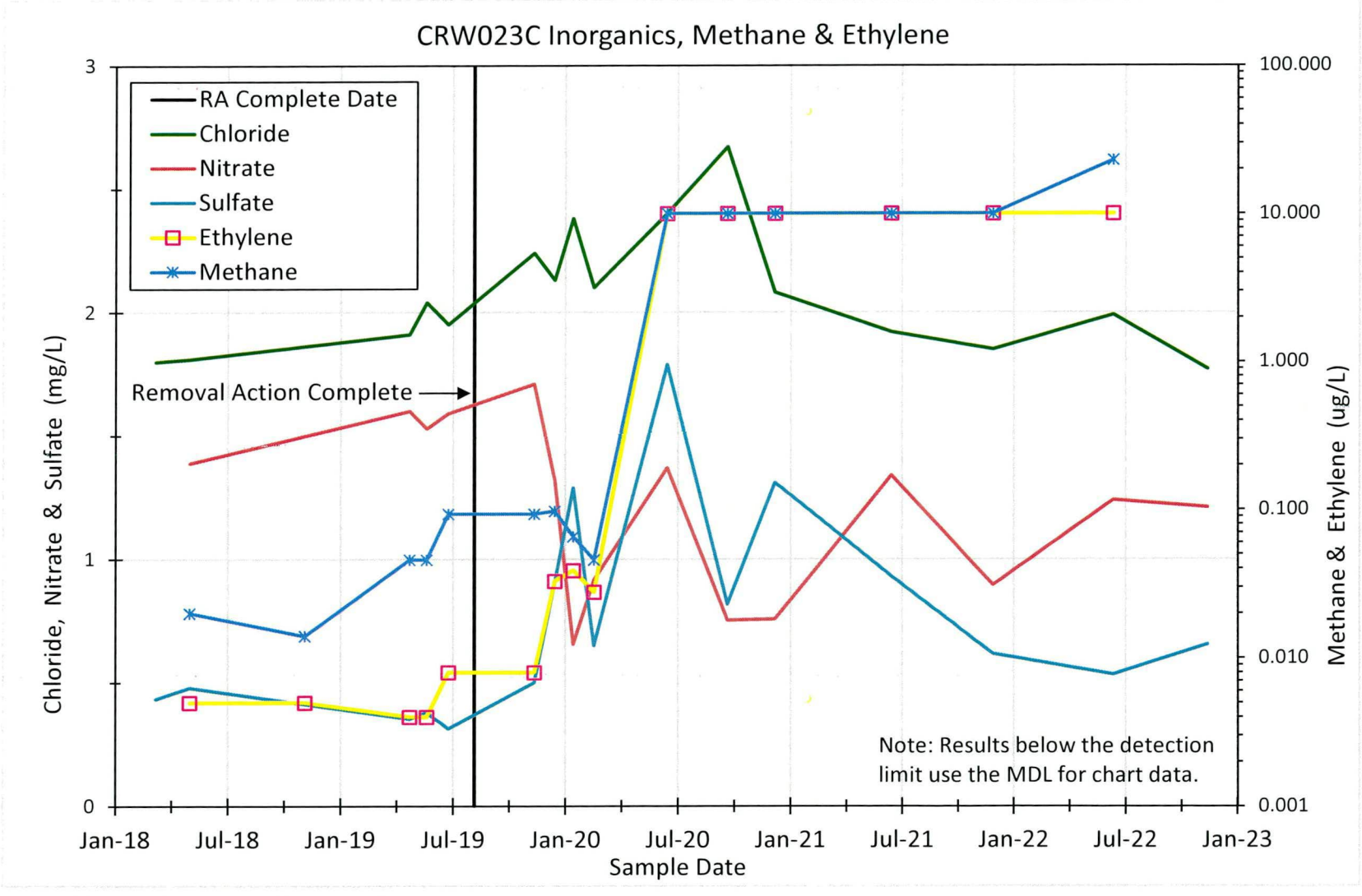
Responsible Party: Terry Killeen, (803) 952-6850, terry.killeen@srs.gov



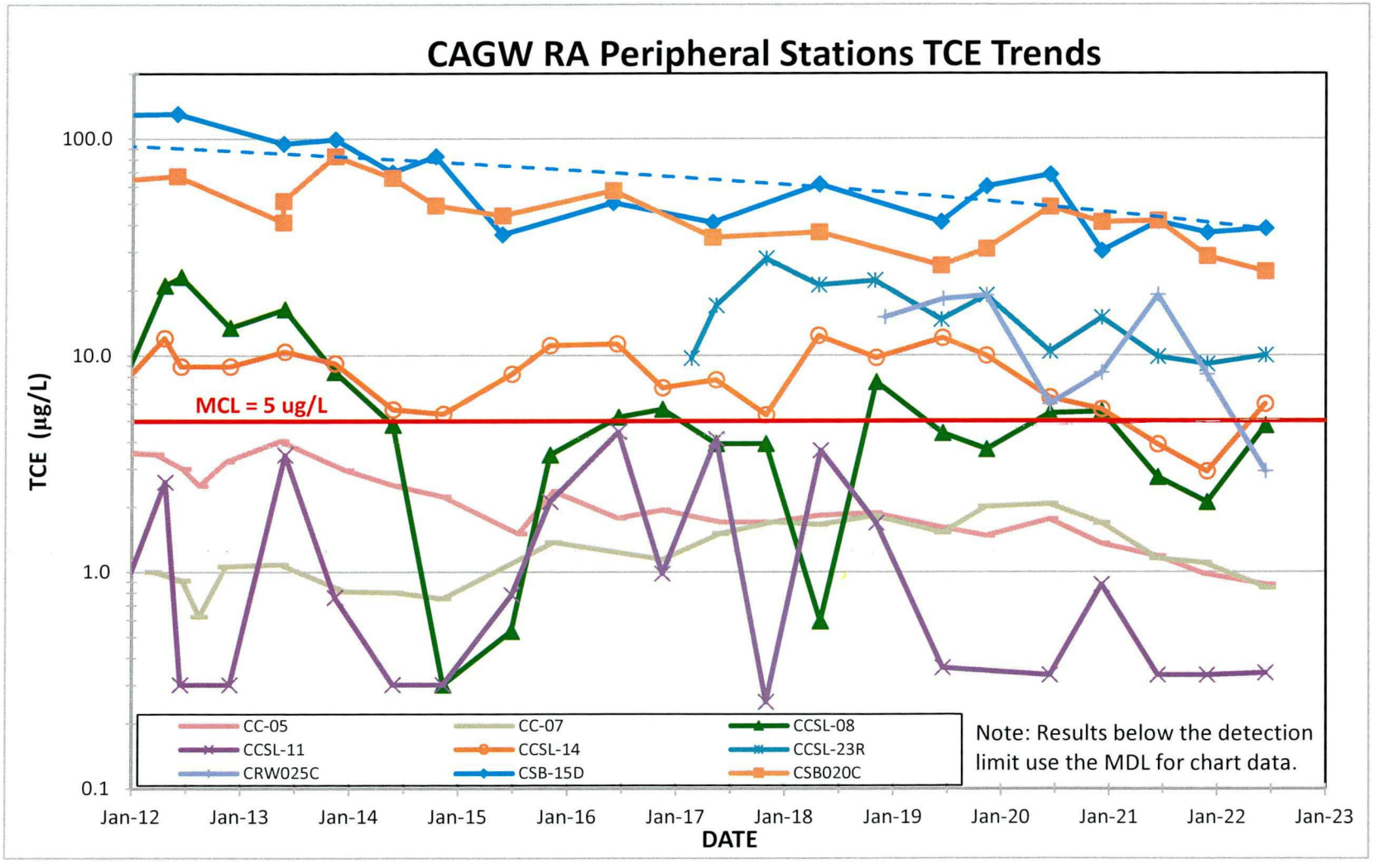
Attachment 1: Water Table in CAGW OU RA Area



Attachment 2: Unnamed Tributary TCE Trends



Attachment 3: Updated Figure 15 from EMR



Attachment 4: Updated Figure 11 from EMR

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