Department of Energy
Savannah River Operations Office
P.O. Box A
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MAR 2 2 2018

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
Acting 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: Sampling and Analysis Plan Addendum for the C-Area Groundwater (CAGW) Operable Unit (OU) (U) (SRNS-RP-2017-00100, Revision 1 Redline, March 2018) and Savannah River Site's Responses to the Regulatory Comments on the Revision 0 Document, CERCLIS Number 82

The U. S. Department of Energy (DOE) is submitting the subject document for your review and approval. The South Carolina Department of Health and Environmental Control (SCDHEC) and the U. S. Environmental Protection Agency (EPA) provided comments on the Revision 0 document on July 6, 2017 and July 19, 2017 respectively. Please review the enclosures and provide your comments or approval within thirty (30) days of receipt. The effort and time 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 Federal Project Director, Ms. Karen Adams, at (803) 952-7871.

Sincerely,

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

IACD-18-142

MAR 2 2 2018

Enclosures:
1. Sampling and Analysis Plan Addendum for the C-Area Groundwater (CAGW) Operable Unit (OU) (U) (SRNS-RP-2017-00100, Revision 1, March 2018) CERCLIS Number 82, (Redline Copy)
2. SRS Responses to U.S. Environmental Protection Agency Comments on: Sampling and Analysis Plan Addendum for the C-Area Groundwater (CAGW) Operable Unit (OU) (U) (SRNS-RP-2017-00100, Revision 0, April 2017) CERCLIS Number 82
3. SRS Responses to South Carolina Department of Health and Environmental Control Comments on: Sampling and Analysis Plan Addendum for the C-Area Groundwater (CAGW) Operable Unit (OU) (U) (SRNS-RP-2017-00100, Revision 0, April 2017) CERCLIS Number 82

cc w/o encl:
D. Scaturo, SCDHEC-Columbia
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cc w/encl:
J. Tufts, EPA-Atlanta
M. McRae, TechLaw, Inc.

SRS Responses to U.S. Environmental Protection Agency Comments on: Sampling and Analysis Plan Addendum for the C-Area Groundwater (CAGW) Operable Unit (OU) (U), CERCLIS Number: 82, SRNS-RP-2017-00100, Revision 0, dated April 2017, Savannah River Site, Aiken, South Carolina.

Comments Received: July 19, 2017

General Comments

1. The Sampling and Analysis Plan (SAP) Addendum for the C-Area Groundwater (CAGW) Operable Unit (OU) (U), Revision 0, April 2017 (SAP Addendum) provides conflicting information about the main purpose and goals of the project. For example, Section 1.1 (C-Area Groundwater Operable Unit Monitoring) states that the SAP Addendum is prepared to capture additional characterization required for Corrective Measures Study/Feasibility Study (CMS/FS; update monitoring of the CAGW OU, and include additional groundwater characterization focused on the Trichloroethylene (TCE) plume discharging to an unnamed tributary of Castor Creek. However, Section 3.2 (CAGW OU Sampling Objectives) states characterization is needed to determine the extent and magnitude of the tritium and TCE groundwater plumes discharging into Castor Creek and its tributary, east of well CRW020C, near C Reactor (TCE only), and to establish a groundwater monitoring station downgradient of the Fuel Unloading Facilities Power (108-3C). Table 7 Data Quality Objectives for CAGW OU Groundwater and Surface Water) describes the objectives as determining the changing size of the TCE and tritium groundwater plumes, determining the total petroleum hydrocarbon (TPH) diesel range organics impact to groundwater, and assessing the change in surface water tritium concentrations. As such, Sections 1.1, 3.2, and Table 7 all contain incomplete or conflicting information regarding the objectives of the SAP addendum when compared to the other sections. For clarity and completeness, please revise the SAP Addendum to provide consistent objectives/data quality objectives throughout all the sections of the document.

   Response: Agree.

   Sections 1.1, 3.2, and Table 7 of the SAP for the CAGW OU Addendum will be revised to be complete and consistent with each other as indicated below.

   The second paragraph in Section 1.1 will be modified as follows:

   "<u>The objectives of</u> this SAP Addendum ~~is prepared~~ are to ~~capture~~ collect additional ~~characterization~~ data to support the CMS/FS, ~~update the established monitoring of~~ <u>determine changes in</u> the CAGW OU <u>TCE and tritium plumes discharging to Castor Creek and its tributary</u>, ~~and to~~ provide ~~plans~~ <u>data</u> ~~for additional groundwater focused on~~ <u>to implement a removal action on the</u> TCE plume discharging to an unnamed tributary of Castor Creek<u>, determine changes in the TCE groundwater plume near the C-Reactor Building (105-C), and</u> ~~to~~ <u>establish a</u>

groundwater monitoring station downgradient of the Fuel Unloading Facilities Power (108-3C)."

The last paragraph in Section 3.2 will be modified as follows:

"The specific goal for this SAP is to provide sufficient data to address the following:

1) **Collect additional data to support the CMS/FS;**

2) **Determine changes in ~~the current extent and magnitude of~~ the tritium and TCE groundwater plumes discharging into Castor Creek and its tributary;**

3) **~~Determine the current extent and magnitude of the tritium and TCE groundwater plumes east of well CRW020C along Road 3 to provide empirical data to help predict the future trend of these contaminants as they near Castor Creek and establish a permanent well(s) to monitor groundwater upgradient of the unnamed tributary~~ Provide data to implement a removal action on the CAGW OU TCE plume discharging to an unnamed tributary of Castor Creek;**

4) **Determine the current extent and magnitude of the elevated portion of the TCE groundwater plume near the C Reactor from soil samples to provide empirical data to help estimate the scope of an alternative to treat that portion of the plume; and**

5) **Establish a groundwater monitoring station downgradient of the Fuel Unloading Facilities Power (108-3C) to determine any impacts to groundwater by TPH related contaminants."**

Table 7 will be modified as indicated in the attached table.

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

2. Section 5.0 (Data Validation) discusses the need for research and development (R&D) of an analytical method to analyze samples for TPH aliphatic compounds. However, the text does not specify when the development will be initiated or when it is anticipated the

work will be completed and the methods will be ready to implement. Additionally, the text does not state what types of quality control samples or measures may be used to ensure the results provide meaningful data, even if it is not verified and validated data quality level. Please revise the SAP Addendum to provide additional information as to when the aliphatic compounds analysis will be developed, what instrumentation will be used for the analysis, and what types of quality control measures may be used which would indicate the data are usable for the intended purpose. In addition, please ensure that Table 6 (Analytical Specification for VOCs, SVOCs and tritium in water) and Table 8 (Preservation, Holding Times, and Sample Containers) are updated as necessary to include all analytical specifications (i.e. quantitation limit, instrument used, quality control measures used, acceptance criteria for any QC samples/measures, etc.) once the aliphatic hydrocarbon analytical method is developed. Finally, the reporting of such data should include an explanation as to the reliability of the data. Revised the SAP Addendum to address these issues.

Response: Agree.

Instead of modifying Section 5.0, SRS recommends modifying the last paragraph in Section 3.5, Table 6 and Table 8 as follows.

"The high, medium and low aromatic compounds can be analyzed by EPA methods for VOCs (EPA 8260B) and SVOCs (EPA 8270D), but none of the commercial laboratories under contract to SRS are currently certified to perform analyses for any of the TPH aliphatic compounds in groundwater samples for Phase 1 of this SAP Addendum. SRS proposes to have the Savannah River National Laboratory (SRNL) develop screening level research and development (R&D) methods using gas chromatography - mass spectrometry (GC-MS) instrumentation and analyze for the following low and medium aliphatic compounds: heptane, nonane, decane, undecane, dodecane. <u>The development effort occurred in 2017.</u> SRNL cannot currently develop a method to analyze for the aliphatic high category compounds, but the compounds in this category have the lowest solubility, so they are unlikely to migrate into the groundwater, and these compounds have the lowest associated health risks (USDHHS 1999). The MDLs and SQLs for the low and medium aliphatic compounds will not be known until the methods have been developed by

SRNL, but anticipate an MDL of approximately 1,000 µg/L. ~~However, t~~The EPA RSLs for the TPH low~~,~~ and medium ~~and high~~ aliphatic compound categories are 1,300 µg/L~~,~~ and 100 µg/L~~, and 60,000 µg/L, which SRS believes are achievable for SQLs for the R&D methods for Phase 1 of this SAP Addendum~~. Also the solubility of the aliphatic compounds is much lower than that of the aromatic compounds, making them less likely to migrate into the groundwater, but requiring lower MDLs to detect their presence in groundwater (USDHHS 1999). A method blank, laboratory control standard, and a laboratory duplicate sample will be run with each batch of samples. If the analytical development method is unsuccessful, and/or these data are not deemed of reliable quality and reproducibility, then these data will not be used or reported as part of this project, and monitoring options will be discussed with the core team."

Table 6 will be modified as follows:

R&D Analyses Aliphatic Compounds				
N-Heptane	142-82-5	TBD	GC-MS	~1,000 ~~TBD~~
N-Nonane	111-84-2	TBD	GC-MS	~1,000 ~~TBD~~
N-Decane	124-18-5	TBD	GC-MS	~1,000 ~~TBD~~
N-Undecane	1120-21-4	TBD	GC-MS	~1,000 ~~TBD~~
N-Dodecane	112-40-3	TBD	GC-MS	~1,000 ~~TBD~~

Table 8 will be modified as follows:

Parameter	Preservatives[2]		Holding Time		Containers[3]	
	Aqueous	Solid	Aqueous	Solid	Aqueous	Solid
SRNL Aliphatic Compounds						
Headspace analysis for Aliphatic organic compounds by gas chromatography/ mass spectrometry.	Aqueous samples with no residual chlorine present: Cool to 0 - 6 °C.	N/A	Samples extracted within 7 days and extracts analyzed within 40 days following extraction.	N/A	2 x-20 mL glass vial, PTFE septa cap	N/A

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

3. The SAP Addendum does not contain any information on the required number of field or laboratory quality control samples. While this information may be included in the main CAGW SAP, for completeness, please revise the SAP Addendum to include this information or to reference the document(s) that contain this information.

Response: Agree.

The first paragraph in Section 3.2 (CAGW OU Sampling Objectives) and the first paragraph in Section 3.5 (Develop the Analytical Approach) will be modified as indicated below.

Section 3.2

"The objective of this sampling activity is to collect representative groundwater and surface water data of sufficient quality that will be used to support the selection of remediation alternatives and remedial/removal decisions. To help ensure data quality, the CAGW OU SAP addendum includes 1 split sample for every 20 regular samples, 1 duplicate sample for every 20 regular samples, and 1 trip blank with each shipment of VOC samples as part of the field QC program. Despite the CAGW OU having extensive historical data (WSRC 2004a, WSRC 2004b, WSRC 2004c, WSRC 2004d, WSRC 2007, SRNS 2012, SRNS 2013, SRNS 2014, SRNS 2015, and SRNS 2016), additional monitoring data are required to assist a focused decision-making process."

Section 3.5

"Samples will be analyzed by laboratories that have passed the USDOE Consolidated Audit Program (DOECAP) qualification audit and using USEPA SW846 methods, or approved equivalents, which have been certified by SCDHEC. The EPA methods for TPH (EPA8015), VOCs (EPA8260) and SVOCs (EPA8270) specify the required laboratory QC samples that must be included in every analytical batch. At a minimum, laboratory QC samples required to be analyzed with each batch of samples for VOC and SVOC analyses include a method blank, laboratory control sample (AKA standard), laboratory duplicate sample, matrix spiked sample, and the addition of surrogate compound(s) to each regular sample and QC sample. Radiological analyses will be performance based and evaluated by the USDOE Mixed Analyte Performance Evaluation Program. Laboratory developed radionuclide methods are typically based on USEPA or USDOE methods, and specify the laboratory quality control standards to be included in each analytical batch. Typical laboratory QC samples analyzed with each batch of samples for tritium analyses include a method blank, laboratory control sample (AKA standard), laboratory duplicate sample, and a matrix spiked sample."

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

4. Figure 20 (Phase 2 Castor Creek Proposed DPT Groundwater Samples and Wells) presents tritium and TCE concentration results from 2011 and 2012, but does not include 2016 data. For clarity figure 20 should be revised to address this issue.

Response: Agree.

Figure 20 will be revised to show 2016 data and some limited 2017 data (see attached figure).

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

SRS Responses to South Carolina Department of Health and Environmental Control Comments on: Sampling and Analysis Plan Addendum for the C-Area Groundwater (CAGW) Operable Unit (OU) (U), CERCLIS Number: 82 (SRNS-RP-2017-00100, Revision 0, April 2017) received May 15, 2017.
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Table 1. Data Quality Objectives for CAGW OU Groundwater and Surface Water

Pathway (Media)	Probable Conditions	Exposure Pathway and/or Release Mechanisms	Data Needs and DQOs Including Engineering/ Physical Processes	Field Activities Including Removal and Characterization	Parameters	Potential Remedial Action Alternatives
Groundwater and surface water	TCE and Tritium exceeds MCLs in groundwater. TPH diesel range organics exceed 100 µg/L in the groundwater Tritium and TCE exceeds MCL in surface water.	Ingestion, inhalation, absorption, or direct exposure with water.	**Collect data to support the CMS/FS.** Determine the changing size and concentrations of the TCE and Tritium groundwater plumes **discharging to Castor Creek and its tributary**. **Provide data to implement a removal action on the TCE plume discharging to the unnamed tribuatary of Castor Creek.** **Determine changes in the TCE plume near the C-Reactor Building (105-C)** **Establish a groundwater monitoring station downgradient of the Fuel Unloading**	Collect ground-water and surface water samples at 69 locations with existing history throughout C-Area. Establish groundwater monitoring well at Fuel Unloading Facility (108-3C). Establish 3 Seepline stations along Castor Creek based on 2011 temporary seepline stations. Establish 1-2 monitoring well locations upgradient of the unnamed tributary to Castor Creek based on new DPT groundwater samples. Collect soil cores for VOC analyses in the UAZ downgradient of C-Reactor (105-C) to determine variations in the TCE plume near the	TCL-VOC and tritium for ground-water and surface samples. TCL VOC, TCL SVOC and R&D analyses for aliphatic compounds. All data validated to SRS electronic V&V level.	No Action. Monitored Natural Attenuation (MNA) with Land Use Controls. Phytoremediation (evapotranspiration) for TCE and tritium in groundwater. Anaerobic bioremediation of TCE

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			Facilities Power (108-3C) ~~Determine TPH diesel range organics impact to groundwater.~~ ~~Determine the change in surface water tritium concentrations.~~	former source area.		

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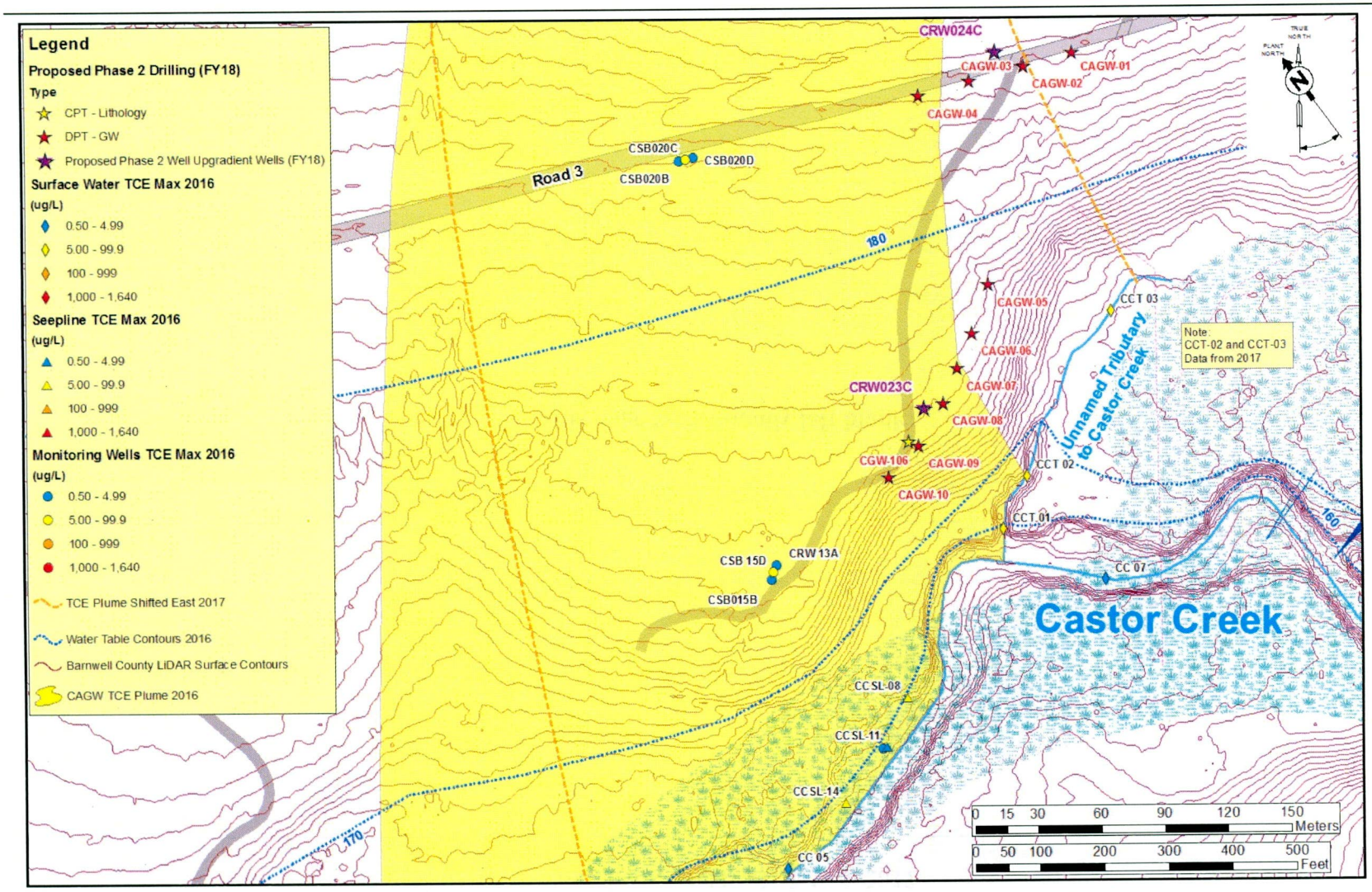

Figure 1. Phase 2 Castor Creek Proposed DPT Groundwater Samples and Wells

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Comments Received: July 6, 2017

General Comments

1. The Sampling and Analysis Plan (SAP) Addendum is not clear and consistent with its sampling strategy with regards to the five DPT locations at the elevated TCE area near the C Reactor Building. Several areas (i.e., Sections 1.1, 4.0, 6.1, and Figure 19) state that soils will be sampled at these DPT locations; however, other areas (Sections 1.3, 3.2, and 3.7) completely omit soils as a sampling medium at this area. The SAP Addendum should be revised to clearly state the sampling strategy at this area and be consistent in doing so.

   Response: Agree.

   Sections 1.3, 3.2, and 3.7 of the SAP for the CAGW OU Addendum will be revised to include soil sampling near the C-Reactor Building (105-C) as indicated below.

   Section 1.3: The first paragraph will be revised as follows:

   "The primary ~~goal~~ monitoring objective of the CAGW OU SAP addendum is to evaluate the changes to the TCE and tritium groundwater plumes near Castor Creek. Changes both in groundwater plume concentrations and flow path will be evaluated to provide data relative to the increasing TCE and tritium concentrations observed in ~~a tributary and~~ Castor Creek and its tributary from 2011 to 2016. The second objective of the CAGW OU SAP addendum is to evaluate changes in the TCE groundwater plume near the C-Reactor Building (105-C) via the collection of soil sample plugs in the UAZ for VOC headspace analyses. The ~~other main~~ third and final monitoring objective of the ~~monitoring plan~~ CAGW OU SAP addendum is to assess any current impacts to the groundwater from the Fuel Unloading Facilities Power (108-3C). These objectives will be accomplished during two phases of field work."

   The third item under the primary CAGW OU SAP Addendum Phase 2 field activities will be revised as follows:

   "3) Better define the area of elevated TCE in the UAZ groundwater near the C-Reactor Building (105-C) with 5 DPT soil sampling locations."

   Section 3.2: The specific goal information listed in Section 3.2 will be revised as

follows:

1) Collect additional data to support the CMS/FS;

2) Determine changes in ~~the current extent and magnitude of~~ the tritium and TCE groundwater plumes discharging into Castor Creek and its tributary;

3) ~~Determine the current extent and magnitude of the tritium and TCE groundwater plumes east of well CRW020C along Road 3 to provide empirical data to help predict the future trend of these contaminants as they near Castor Creek and establish a permanent well(s) to monitor groundwater upgradient of the unnamed tributary~~ Provide data to implement a removal action on the CAGW OU TCE plume discharging to an unnamed tributary of Castor Creek;

4) Determine the current extent and magnitude of the elevated portion of the TCE groundwater plume near the C Reactor from soil samples to provide empirical data to help estimate the scope of an alternative to treat that portion of the plume; and

5) Establish a groundwater monitoring station downgradient of the Fuel Unloading Facilities Power (108-3C) to determine any impacts to groundwater by TPH related contaminants.

Section 3.7: This paragraph will be revised as follows:

"The SAP addendum has been developed based on evaluation of data collected during 2011-2016 from the monitoring network at the CAGW OU. Groundwater samples will be collected from established monitoring wells that comprise the CAGW OU monitoring network. DPT groundwater samples will provide data on changes in the TCE and tritium plumes near Castor Creek, which will be used to install two new monitoring wells. Surface water stations with an established monitoring history will continue to be sampled as part of the CAGW OU monitoring network. DPT soil samples will be collected near the C-Reactor

Building (105-C), which will be used to determine changes in the TCE groundwater plume for future remediation efforts. The specific characterization plan for groundwater and surface water are provided in Section 4 of this SAP addendum for both Phase 1 and Phase 2."

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

Specific Comments

1. Section 3.2, CAGW OU Sampling Objectives, page 9. The second specific goal listed in this section refers to sampling east of well CRW020C. Section 1.3 and Figure 20 refer to well CSB020C(B/D). Please correct.

   Response: Agree.

   Section 3.2: This item under the specific objectives for this SAP will be revised as follows:

   3) ~~Determine the current extent and magnitude of the tritium and TCE groundwater plumes east of well CRW020C along Road 3 to provide empirical data to help predict the future trend of these contaminants as they near Castor Creek and establish a permanent well(s) to monitor groundwater upgradient of the unnamed tributary.~~ Provide data to implement a removal action on the CAGW OU TCE plume discharging to an unnamed tributary of Castor Creek;

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

2. Figure 11, CAGW OU TCE Plume (2016), page 35. The top-right insert on this figure which depicts the ERH-SVE Remediation Area is shaded in red, which can be confused with groundwater locations at which TCE concentrations were greater than 1,000 µg/L in 2016. Please depict this area using a different color or method to avoid confusion.

   Response: Agree.

   Figure 11 will be revised to show the ERH-SVE Remediation Area in a different color/pattern (see attached figure).

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

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3. Figure 20, Phase 2 Castor Creek Proposed DPT Groundwater Samples and Wells, page 45. Please label Road 3 on this figure, as referred to on page 9 of Section 3.2.

   Response: Agree.

   Figure 20 will be revised to show Road 3 (see attached figure).

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

SRS Responses to South Carolina Department of Health and Environmental Control Comments on: Sampling and Analysis Plan Addendum for the C-Area Groundwater (CAGW) Operable Unit (OU) (U), CERCLIS Number: 82 (SRNS-RP-2017-00100, Revision 0, April 2017) received May 15, 2017.
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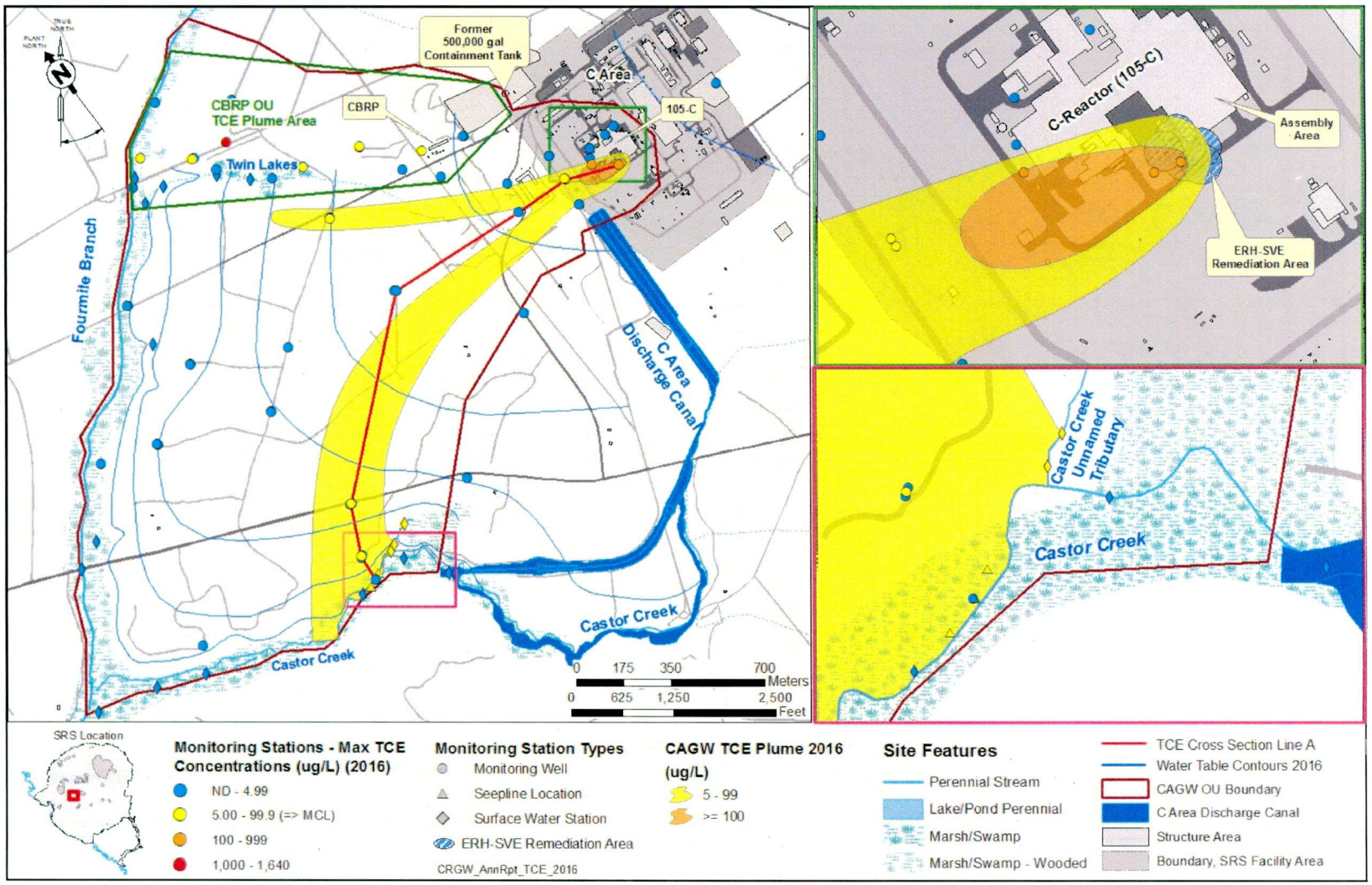

Figure 11. CAGW OU TCE Plume (2016)

SRS Responses to South Carolina Department of Health and Environmental Control Comments on: Sampling and Analysis Plan Addendum for the C-Area Groundwater (CAGW) Operable Unit (OU) (U), CERCLIS Number: 82 (SRNS-RP-2017-00100, Revision 0, April 2017) received May 15, 2017.
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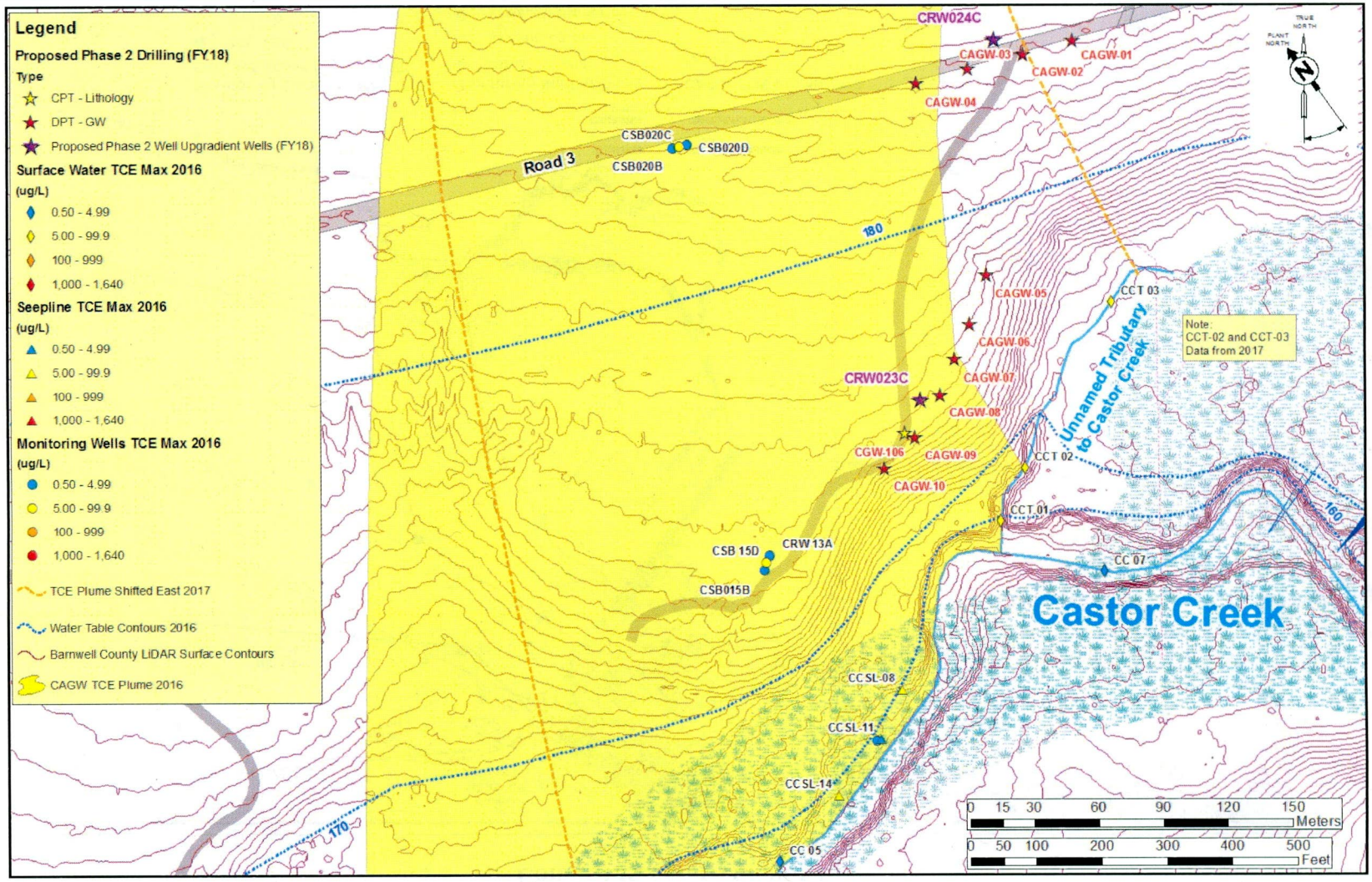

Figure 20. Phase 2 Castor Creek Proposed DPT Groundwater Samples and Wells