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

MAY 18 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: Action Memorandum and Responsiveness Summary for the Non-Time Critical Removal Action for the C-Area Groundwater Operable Unit (U), SEMS Number: 82

Pursuant to the National Oil and Hazardous Substances Pollution Contingency Plan [40 CFR Section 300.415(b)(2)(i)] that states removal actions shall be considered when there is "*Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants*", the U.S. Department of Energy (DOE) prepared a Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for C-Area Groundwater Operable Unit (SRNS-RP-2017-00365, Revision 1, February, 2018) CERCLIS Number: 82. The scope of this removal action is to reduce the mass of the trichloroethylene (TCE) groundwater plume in the distal portion of the C Area Groundwater Operable (CAGW) Unit (OU). The regulatory review of the Revision 0 RSER/EE/CA occurred from September 29, 2017 to December 5, 2017.

The Savannah River Site (SRS) received comments from the South Carolina Department of Health and Environmental Control (SCDHEC) on November 27, 2017 and the U.S. Environmental Protection Agency (EPA) on December 5, 2017. The SRS' responses to the EPA's and SCDHEC's comments were incorporated into the Revision 1 RSER/EE/CA, which was made available for public review and comment from March 13, 2018 to April 11, 2018. Comments received during the public comment period are addressed in the enclosed Responsiveness Summary, which will be made part of the Administrative Record. In addition, a notice will be filed in the Environmental Bulletin within two (2) weeks of submittal of the Action Memorandum and Responsiveness Summary to the Administrative Record File/Information Repository File.

The C Area Groundwater OU is located within the Fourmile Branch watershed and encompasses groundwater beneath C Area, which flows west to Fourmile Branch and south to Castor Creek. The C Area is situated near the center of the SRS. The primary SRS facility in C Area was the C-Reactor, which operated between 1955 and 1985. Known sources such as the C-Reactor Seepage Basins (904-66G, -67G, -68G), C-Reactor Area TCE Vadose Zone Source, C-Reactor Purification Area Tritium Source, and non-specified sources associated

with reactor operations have resulted in tritium and volatile organic compounds (VOCs) contamination to groundwater. Groundwater flow is generally towards the west and southwest from C-Reactor area. CAGW OU includes a VOC groundwater plume containing primarily TCE with minor quantities of tetrachloroethylene, and a larger tritium groundwater plume (not addressed through this action).

The groundwater is contaminated with TCE exceeding the maximum contaminant level (MCL) (5 µg/L). The distal portion of the CAGW OU TCE groundwater plume for this removal action covers an area of approximately 2,733 square meters (m^2) (29,418 square feet [ft^2]). The TCE groundwater concentrations in this area are estimated to exceed 50 µg/L.

The objective of the removal action is to protect human health and the environment by reducing the mass of TCE present in groundwater.

The three cleanup alternatives that were evaluated based on effectiveness, ease of implementation, and cost were: Alternative 1) No Action, Alternative 2) Treatment Barrier Using Emulsified Edible Oil, and Alternative 3) In Situ Chemical Oxidation Using Sodium Persulfate. The selected removal action for the CAGW OU is Alternative 2, Treatment Barrier Using Emulsified Edible Oil for the distal portion of the CAGW OU TCE groundwater plume. A mixture of emulsified edible oil, water and buffer solution will be injected into the groundwater at the areas of highest TCE concentrations in the distal portion of the CAGW OU TCE groundwater plume. The emulsified edible oil will provide a carbon source for the microbes already present within the area that will aid in the biodegradation of the TCE. The emulsified oil also acts to adsorb the TCE as the water flows through the injection zone, thus reducing TCE transport. This alternative will not preclude any additional remediation of the CAGW OU and is expected to be consistent with the expected final remedial actions at the CAGW OU. The selected alternative will comply with all action- and location-specific Applicable or Relevant and Appropriate Requirements listed in Table A-1 of the enclosed Responsiveness Summary.

Removal activities are scheduled to commence January 30, 2019. Upon conclusion of the removal action, a Removal Action Report that summarizes the work will be prepared and submitted to SCDHEC and EPA to document the completion of the removal action.

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
Area Completion Project

IACD-18-150

Enclosure:
Responsiveness Summary for the Non-Time Critical Removal Action for C-Area Groundwater Operable Unit
SEMS Number: 82 (ERD-EN-2018-0022, Revision 0, April 2018)

cc w/o encl:
D. Scaturo, SCDHEC-Columbia
S. French, SCDHEC-Columbia
M. D. Wilson, SCDHEC-Columbia
G. K. Taylor, SCDHEC-Columbia
G. O'Quinn, SCDHEC - Aiken Environmental Affairs Office
R. Pope, EPA-Atlanta

cc w/encl:
J. Tufts, EPA-Atlanta
M. McRae, TechLaw, Inc.

Responsiveness Summary

The thirty (30) day public comment period for the *Removal Site Evaluation Report/Engineering Evaluation/Cost Analysis (RSER/EE/CA) for C-Area Groundwater Operable Unit (U) (SRNS-RP-2017-00365, Revision 1, February 2018)* CERCLIS No.: 82, began on March 13, 2018 and ended on April 11, 2018.

Public Comments

No comments were received on the RSER/EE/CA from the public during the thirty (30) day public comment period. However, one comment was received from the U.S. Environmental Protection Agency (EPA). The comment and the associated response are addressed below.

1. Section 3.2 Removal Action Objectives. Rather than state that groundwater contaminated with TCE above MCLs will be reduced to MCLs before discharging to surface water, the cleanup goal should be AWQC. Please modify the RAO to state:

The removal action objective to protect human health and the environment is to reduce discharge of groundwater contaminated with TCE above MCLs to surface water so that the ~~MCL (5 µg/L)~~ AWQC ~~no longer~~ will not be exceeded in the unnamed tributary to Castor Creek.

Response: Clarification. Given that the groundwater is the target media where treatment will be applied, the removal action objective will be revised in the Action Memorandum to the following:

"The objective of the removal action is to protect human health and the environment by reducing the mass of TCE present in groundwater."

In addition, in the cover letter that accompanied the comment, EPA Region 4 recommended additional Applicable, or Relevant and Appropriate Requirements (ARAR)s for inclusion in the RSER/EE/CA, Table A-1 Potential ARARs and TBC Criteria for the CAGW OU. The potential chemical specific concentration-based ARARs SC R.61-58 and South Carolina (SC) R.61-68 are considered applicable for the MCLs only, since the removal action only deals with groundwater. However, it is recognized that this removal action may not achieve the MCLs within this groundwater plume. The intent of the action is to reduce the mass of TCE within this plume with the long-term goal of achieving the MCLs as part of the final remedial decision goals.

The additional action specific ARARs identified by EPA were evaluated but not considered applicable or relevant and appropriate for various reasons (e.g., land area to be disturbed is under one acre, underground injection will not generate fugitive dust, environmental media does not contain a hazardous waste, etc.). The necessary administrative permits (Underground Injection Control, well program plan, etc.) will be obtained and the ARARs identified as applicable or relevant and appropriate will be met by the removal action. The revised Table A-1 is provided below.

Table A-1. ARARs and TBC Criteria for the CAGW OU

Action	Requirements	Prerequisite	Citation
	Action Specific ARARs		
Underground Injection Well Installation, Operation, and Abandonment			
Monitoring of Class V underground injection wells	Monitoring requirements shall, at a minimum, specify: a) Monitoring of the nature of injected fluids with metering and daily recording of injected and produced fluid volumes as appropriate; b) Monitoring of injection pressure and either flow rate or volume semimonthly, or metering and daily recording of injected and produce fluid, volumes as appropriate; c) Demonstration of mechanical integrity at least once every five years during the life of the well; d) Monitoring of the fluid level in the injection zone semimonthly, where appropriate and monitoring of the parameters chosen to measure water quality in the monitoring wells semimonthly	Monitoring into the injection zone of ground waters of the State of South Carolina - **applicable**	SCDHEC R.61-87.14(G)(3)
Operation and maintenance of Class V underground injection wells	Shall at all times properly operate and maintain all facilities and systems of treatment and controls which are installed or used.	Operation of well for underground injection of any fluids into the subsurface or ground waters of the State of South Carolina – **applicable**	SCDHEC R.61-87.13(X)
	Shall report malfunction of injection system which may cause fluid migration into or between underground sources of drinking water; shall immediately stop injection upon determination that the injection system has malfunctioned and could cause fluid migration into or between underground sources of drinking water; shall not restart the injection system until the malfunction has been corrected.		SCDHEC R.61-87.13(EE)
Closure of Class V underground injections wells	Wells must be closed in a manner that complies with the prohibition of fluid movement in 40 CFR 144.82(a)(l). Also, any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well must be disposed or otherwise managed in accordance with substantive applicable Federal, State, and local regulations and requirements.	Closure of Class V wells [as defined in 40 CFR 144.6(e)] – **applicable**	40 CFR 144.82(b)

Action	Requirements	Prerequisite	Citation
	Action Specific ARAR		
Monitoring Well Installation, Operation, and Abandonment			
Installation or Abandonment of Permanent and Temporary Monitoring Wells	All monitoring wells shall be drilled, constructed, maintained, operated, and/or abandoned to ensure that underground sources of drinking water are not contaminated. Abandonment of permanent conventionally installed monitoring wells shall be by forced injection of grout or pouring through a tremie pipe starting at the bottom of the well and proceeding to the surface in one continuous operation. The well shall be filled with either with neat cement, bentonite-cement, or 20% high solids sodium bentonite grout, from the bottom of the well to the land surface.	Construction of permanent and temporary monitoring wells (including non-standard installation, as defined in R.61-71B(2)) – Removal and abandonment of wells - **applicable**	SC R.61-71H.1(b) SC R.61-71H.2(e)
Transportation of Samples (i.e. Solid Waste, Soils and Wastewaters)	Samples are not subject to any requirements of 40 CFR Parts 261 through 268 or 270 when: • The sample is being transported to a laboratory for the purpose of testing; or • The sample is being transported back to the sample collector after testing. In order to qualify for the exemption in paragraphs (d)(1)(i) and (ii), a sample collector shipping samples to a laboratory must: • Comply with U.S. DOT, U.S. Postal Service, or any other applicable shipping requirements • Assure that the information provided in (1) thru (5) of this section accompanies the sample. • Package the sample so that it does not leak, spill, or vaporize from its packaging.	Water samples for purpose of conducting testing to determine its characteristics or composition will occur as part of the groundwater monitoring program - **applicable**	40 CFR 261.4(d)(1)(i)-(iii) SC R.61-79 261.4*(d)* (1) 40 CFR 261.4(d)(2)(i) 40 CFR 261.4(d)(2)(i)(A) and (B) SC R.61-79 261.4*(d)* (2)(i)(A) and (B)
	Location Specific ARAR		
Discharge of groundwater during well drilling operations	Discharges to the ground must not impact or reach waters of the state.	Discharges of water to the ground that will not reach surface waters – **TBC**	SRS No Discharge Permit #ND0072125
Protection of Migratory Birds	No person may take, possess, import, export, transport, sell, purchaser, barter or offer for sale, purchase or barter, any migratory bird, or the parts, nests, or eggs of such bird except as under the terms of a valid permit.	Migratory bird populations may be present in the vicinity – **applicable**	16 *USC* 703-704 – Migratory Bird Treaty Act

Chemical-specific ARARs			
Protection of Groundwater [1]	• For organic chemicals, establishes maximum contaminant levels as set forth in R.61-58, State Primary Drinking Regulations.	This regulation classifies all groundwater as GB as a potential drinking water source in the state. – **applicable**	SC R. 61-68, Section H.2. Water Classification SC R. 61-68, Section H.9. - Quality Standards for Class GB Groundwaters
	Tetrachloroethylene (PCE) = 0.005 mg/L (5 µg/L) Trichloroethylene (TCE) = 0.005 mg/L (5 µg/L) Cis-1,2-dichlroethylene = 70 µg/L	This regulation defines the maximum contaminant levels for Volatile Synthetic Organic Chemicals for public water systems. –**applicable**	SC R.61-58.5.N(2)(e), MCLs for Volatile Synthetic Organic Chemicals (VOCs)

Alt	=	Alternative	DOT	=	U.S. Department of Transportation
ARAR	=	applicable or relevant and appropriate requirement	EPA	=	U.S. Environmental Protection Agency
CFR	=	*Code of Federal Regulations*	SCDHEC	=	South Carolina Department of Health and Environmental Control

1- It is recognized that this removal action may not achieve the MCLs within this groundwater plume: The intent of the action is to reduce the mass of TCE within this plume with the long-term goal of achieving the MCLs as part of the final remedial decision goals.