



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
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ATLANTA, GEORGIA 30303-8960

January 08, 2020

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Brian Hennessey, 730-B
SRS Remedial Project Manager
Area Completion Projects
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802



Dear Mr. Hennessey:

The U.S. Environmental Protection Agency (EPA) has reviewed the Effectiveness Monitoring Report for the Monitored Natural Attenuation at the Chemicals, Metals, and Pesticides Pits Operable Unit, March 2018 through March 2019, Revision 0 dated June 2019.

EPA can not provide approval for the above mentioned report until the comments below have been addressed. If you have any questions, please contact me at (404) 229 -9500.

Sincerely,

A handwritten signature in blue ink, appearing to read "Diedre Lloyd for".

Diedre Lloyd
Remedial Project Manager
Restoration and Sustainability Branch
Region 4, Superfund Division
61 Forsyth Street, S.W.
Atlanta, Georgia 30303

cc: Angelia Holmes, DOE-SRS, C. L. Bergren, SRNS-ACP (Signed Original), Phil Prater, DOE-SRS, C.L. Bergren SRNS-ACP (Signed Original), Susan Fulmer, SCDHEC

EPA COMMENTS on the EFFECTIVENESS MONITORING REPORT
for the MONITORED NATURAL ATTENUATION (MNA)
at the CHEMICALS, METALS, and PESTICIDES (CMP) PITS OPERABLE UNIT

MARCH 2018 THROUGH MARCH 2019
DATED JUNE 2019

SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA

EPA Comments:

1. Page 3, Section 1.2 Nature and Extent of Contamination:

There have been multiple working hypothesis for several years on the CMP OU since the groundwater surface was re-interpreted several years ago. The multiple working hypothesis have attempted to explain the plume geometry and site contaminant levels over time and have ranged from one large plume to the current interpretation of 2 separate plumes with multiple hypothesis for this different plume interpretation which have ranged from differing sources of contamination to complex hydrogeology to depleted source and with varying contaminant levels. The varied hypothesis are outlined below.

- a) 1st hypothesis: 2 different and separate sources of contamination
 - A drainage ditch may have been used as dumping location prior to CMP Pits and the CMP Pits itself
 - This hypothesis is supported by particle tracking (WSRC 2002) toward and from NE Plume suggests different sources for NE Plume vs the Main Plume
- b) 2nd hypothesis: vadose zone source now depleted
 - This hypothesis is supported by additional characterization work performed during the RFI/ RI (WSRC 2003) which followed the ERH treatment
 - EPA Note: Contradiction within 2019 EMR: 2017 Modeling and report text indicate the presence of additional source
- c) 3rd hypothesis: original main plume; separated into 2 plumes over time
 - This hypothesis is supported by outlining the complex hydrologic conditions (perched zones) that have been documented over time such as the dry zones in TZ along with some dry zones in MAZ which is asserted may have resulted in one plume separating into 2 plumes over time

The CMP OU Conceptual Site Model (CSM) has not been updated for many years. An updated CSM following the ERH treatment and re-interpretation of onsite groundwater would be helpful, especially when there is a large degree of uncertainty associated with site characterization. EPA requests that the CMP CSM be updated to ensure that all CMP site complexities have been captured thereby enabling the implementation of a cohesive plan/path forward for the CMP OU.

2. The CMP EMR for Monitored Natural Attenuation (MNA) should evaluate the efficacy of the MNA remedy and should follow EPA's MNA Guidance: *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*, OSWER Directive Number 9200.4-17P, dated April 21, 1999.

Natural attenuation is generally evaluated using a "lines of evidence" approach. This approach forms the basis for all current protocols and guidance documents.

The suggested lines of evidence include:

- I. Documented reduction of contaminant mass at the site: Typically, the first line of evidence is documented by reviewing historical trends in contaminant concentration and distribution in conjunction with site geology and hydrogeology to show that a reduction in the total mass of contaminants is occurring at the site.
- II. Presence and distribution of geochemical and biochemical indicators of natural Attenuation: The second line of evidence is documented by examining changes in the concentrations and distributions of geochemical and biochemical indicator parameters that have been shown to be related to specific natural attenuation processes.
- III. Direct microbiological evidence: The third line of evidence (i.e., microbiological evidence) is documented through laboratory microcosm studies and is used to: 1) confirm specific chlorinated solvent biodegradation processes that cannot be conclusively demonstrated with field data alone and/or 2) estimate site-specific biodegradation rates that cannot be conclusively demonstrated with field data alone. These can include: Co-metabolism, Degradation, Dechlorination, Electron Acceptor (measurement of oxygen, nitrate, sulfate, iron and carbon dioxide), Electron Donor, Growth Substrate, Metabolic Intermediate, Metabolism, Methanogen, Microcosm, Primary Substrate, Reductive Dechlorination.
 - a) Based on the information submitted to date, the first line of evidence has been demonstrated by decreases in contaminants over time following ERH treatment.
 - b) Additional information and discussion within the report text is requested to support the second line of evidence.
 - c) If the first and second lines of evidence are sufficiently supported then the third line of evidence may not need to be quantified.

3. The information below is not indicative of Natural Attenuation and indicates that additional remedial action may be necessary in the future:

- a) Groundwater contamination continues to migrate vertically
- b) Plume size and configurations have not changed over the last 8 years of MNA
- c) The horizontal extent of groundwater contamination has not been adequately delineated, to date, as indicated by data gaps
- d) The 2017 Model indicated that the groundwater plume would remain above MCLs for ~100 years
- e) Lindane contaminant values increased
- f) Very little biodegradation with exception of wetland areas
- g) Still have high contaminant values – CMP 35 D
 - PCE – 1,150 µg/L
 - TCE – 685 µg/L

Please suggest actions to address the concerns outlined above

4. EPA requests that site specific Natural Attenuation (NA) data collection be performed during the next sampling event at the CMP Pits OU. Please collect:

- a) Parameters indicative of NA processes should be collected and specific analyses conducted for: dissolved oxygen, Nitrate, Iron (II), Sulfate, Methane, ORP, pH, TOC, Temperature, Carbon Dioxide, Alkalinity, Chloride Hydrogen, PCE/TCE along with all associated daughter products in order to assess the presence/absence of an anaerobic environment
- b) The parameters should be collected at several specified key monitor well points: Several background, source, center and side gradient monitor wells in each geologic aquifer and

- media (sand, silt, clay) and environment (swamp, fluvial) present onsite
- c) Identify any areas that may need amendments (carbon source) to enhance onsite biodegradation and thereby ensuring that onsite remedial objectives are met within a reasonable time frame. Reductive dechlorination is more likely to occur in an environment with a pH greater than 5 and less than 9.
 - d) An isopleth map should be constructed for each environmental parameter (dissolved oxygen, Nitrate, Iron (II), Sulfate, Methane, ORP, pH, TOC, Temperature, Carbon Dioxide, Alkalinity, Chloride Hydrogen) along with a plume configuration map for PCE/TCE and each associated daughter product to demonstrate the distribution of the site specific parameters within the CMP study area.
 - e) Did the 2017 modeling effort include a fate and transport model to estimate the timeframe for NA processes onsite?
 - f) Did the 2017 modeling effort include an estimate of the plume size/configuration within a specified timeframe?
 - g) If any areas are identified where NA processes may be uncertain or unlikely, contingency measures should be suggested

5. Page 25, Section 3.0, Summary:

EPA disagrees with DOE-SRS plan to discontinue surface water sampling at CMP-SW-21.

- a) This location is a sampling location that is at the upper most eastern portion of Pen Branch where the TZ is incised by Pen Branch and may be an early indicator for potential surface water contamination from the TZ. Furthermore, the TZ, as indicated within the report text, has large portions of the TZ monitoring area that are dry and as a result, the MWs don't always produce enough water for sampling purposes which makes the TZ surface water monitoring locations of importance, especially since Pen Branch is a gaining stream.
- b) In Section 3, Summary, the report text asserts there is no surface water contamination in Pen Branch. However, the report text also outlines that previous surface water sampling data has indicated that VOC detections have been identified above MCLs and the 2017 modeling results demonstrate an expectation of a future VOC discharge to Pen Branch above MCLs.
- c) There is a lack of delineation, as indicated by the dashed potentiometric contour lines present in Figure 6.

Please continue surface water sampling at CMP-SW-21.

6. Section 1.4 Observed Hydrology at the CMP Pits OU, Page 6 of 102:

The next to last paragraph indicates the hydraulic conductivity constants 60 feet per day (ft/day), 50 ft/day and 20 ft/day for the Transmissive Zone (TZ), Middle Aquifer Zone (MAZ) and Lower Aquifer Zone (LAZ), respectively and the porosity value of 30% was used for each aquifer zone in the calculation taken from the modeling efforts (WSRC 2003 & SRNS 2017). Given the porosity value of 30% was used for each TZ, MAZ and LAZ in the velocity calculation, it is unclear how the respective hydraulic conductivity values were determined (i.e., site specific or modeling). As the velocity calculation is sensitive to varying hydraulic conductivities, Please revise the EMR to address this issue.

7. Section 2.1, CMP Pits Vadose Zone Remedial Action, Page 8 of 102:

The second paragraph indicates the soil confirmation sample results were below the remedial goal (RG) for tetrachloroethene (PCE) of 36 milligrams per kilogram (mg/kg). However according to the *Fifth Five-Year Remedy Review Report for the Savannah River Site Operable Units with Groundwater Remedies (U)* Aiken, South Carolina, SRNS-RP-2015-00419, Revision 1, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC, 2017, the RG for PCE contaminated soil is 30.7 mg/kg. Please revise the EMR to address this discrepancy in the reported PCE RG for soil.

8. Section 2.1, CMP Pits Vadose Zone Remedial Action, Page 8 of 102:

The text in the last paragraph states “Even though the RA was successful and confirmation samples were below RGs, there is a possibility that residual contamination trapped within clay horizons and/or pore space in the vadose zone, in or out of the ERH/SVE zone, could act as a secondary source for groundwater contamination.” Additionally, according to the text in Section 2.2.1 Groundwater Aquifers, Page 9 of 102, the “...updated groundwater model (SRNS 2017) added sorption and continuing VOC sources in clays and estimated the plumes would remain above MCLs for approximately 100 years (~2117).” Furthermore, the text in Subsection Lower Aquifer Zone, Page 14 of 102 indicates increasing concentrations in the LAZ over time are expected. As such, based on the increased cleanup time attributed to sorption, and on the continued plume migration/instability based on the increases in VOC concentrations in the LAZ, additional source zone characterization and/or controls will be necessary to ensure the effectiveness and long-term protectiveness of the monitored natural attenuation (MNA) remedy. When this issue is addressed, please include suggestions to mitigate/address the remaining source contamination in the future.

9. Subsection Middle Aquifer Zone, Page 13 of 102:

The last paragraph in this section states the plume footprint expanded horizontally with data points collected in 2016. It is noted the plume footprint expanded due to additional characterization addressing data gaps in the horizontal extent of contamination on the east side of the plume. As seen in Figure 9, 2018 PCE Plume and Groundwater and Surface Water Results for the TZ and MAZ, Page 43 of 102 and Figure 16, 2018 TCE Plume and Groundwater and Surface Water Results in the TZ and MAZ, Page 57 of 102, data gaps remain in the horizontal extent of PCE and TCE contamination in the MAZ to the east as indicated by the dashed plume iso-concentration contours inferring delineation.

- a) Please include specific actions to address the above mentioned data gaps in the future
- b) Please restate “plume footprint expanded due to additional characterization.....” the plume footprint didn’t expand but was instead identified due to additional characterization.
- c) Please revise the EMR to ensure the data gaps identified with the horizontal extent of contamination in Figure 9 and Figure 16 are adequately addressed to delineate the plume(s).

10. Section 2.2.4 Additional Data from Independent Analysis, Page 21 of 102:

The text in the second paragraph states groundwater samples were collected using passive diffusion bags (PDBs). However, it is noted the PDB sampler is a low-density polyethylene bag filled with deionized water. VOCs in groundwater will diffuse across the PDB until contaminant concentrations within the bag reach equilibrium with concentrations in the surrounding groundwater. Therefore, no actual groundwater samples are collected utilizing PDB. Revise the text to address this issue.

11. Section 2.2.4 Additional Data from Independent Analysis, Page 21 of 102:

It is not clearly understood if the 2017 groundwater model considers contaminated groundwater to discharge and mix with Pen Branch surface water. For example, the text in the third paragraph on Page 21 of 102 states "...contaminant discharges are thin or discrete which quickly mix with clean surface water, as surface water is not contaminated with PCE or TCE above MCLs." It is noted the EMR indicates the 2002 groundwater model was updated in 2017 and that the current plume behavior is as predicted by the model. As such, groundwater modeling that incorporates contaminated groundwater discharges mixing with clean surface water would be inconsistent with *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*, OSWER Directive Number 9200.4-17P, dated April 21, 1999 (MNA Guidance), particularly to support demonstration of plume shrinkage and/or stability. Please revise the EMR to address this issue to ensure the effectiveness and long-term protectiveness of the MNA remedy.

12. Figure 7, 2018 Potentiometric Surface for the LAZ and GA, Page 39 of 102:

- a) As seen in the figure, no groundwater elevation contours are prepared for the Gordon Aquifer (GA). As such, the flow direction arrow depicted in the figure is not drawn based on GA groundwater elevation contours and therefore the flow direction is uncertain. Please revise figure 7 or within the text of the EMR to address this issue.
- b) It is noted that two additional GA wells will be installed to adequately monitor plume detections and potential migration in the GA. When installed, please ensure the new GA wells are appropriately surveyed so the groundwater elevations in the GA can be contoured and flow direction arrows can be drawn relative to the elevation contours in future reports.

13. Figure 10, 2018 PCE Plume and Groundwater Results for the LAZ and GA, Page 45 of 102 and Figure 17, 2018 TCE Plume and Groundwater Results for the LAZ and GA, Page 59 of 102:

As seen in the figures, data gaps remain for delineating the horizontal extent of PCE and TCE contamination to the east in the LAZ, as indicated by the dashed plume iso-concentration contours inferring delineation.

- a) Please include specific actions to address the above mentioned data gaps in the future
- b) Please revise the EMR to ensure the data gaps identified with the horizontal extent of contamination in Figure 10 and Figure 17 are adequately addressed to delineate the plume(s)