**Cold Regions Research and Engineering Laboratory**

**Restoration Advisory Board (RAB) Meeting Minutes**

**January 17, 2024, 1600 HRS**

Hybrid Meeting: Held In-Person at the Richmond Middle School Library and Virtually, via Microsoft Teams

**Attending:**

Chris Kane (USACE-NAE)

Amy Rosenstein (USACE-NAE)

Scott Calkin (WSP)

Amy Quintin (WSP)

Wolfgang Calicchio (WSP)

Ryan Ordung (WSP)

Rod Rustad (WSP) (virtual)

Bryan Connolly (WSP)

Terry Harwood (CRREL)

Laurie Haines-Eklund (USAEC) (virtual)

Drew Hoffman (NHDES) (virtual)

Tod Briggio (Weston and Sampson Consultant for NHDES) (virtual)

Kristine McDevitt (Community Member)

Roelof Versteeg (Community Member) (virtual)

Bree Carlson (Dartmouth) (Community Member)

Annette Chisholm (Dartmouth)

(Community Member)

James M. Wieck (GZA)

(Consultant for Dartmouth)

Chief Michael Gilbert (Hanover Fire Department) (Community Member)

Presentation file: 2024-01\_17 CRREL RAB Meeting\_Rev3.pptx

Mr. Kane of the United States Army Corps of Engineers-New England District (USACE-NAE) called the meeting to order at 1601 hours on January 17th. He welcomed everyone to the RAB for the Cold Regions Research and Engineering Laboratory (CRREL) Remedial Investigation/Feasibility Study project. Mr. Kane introduced supporting staff and invited meeting participants to introduce themselves and state their role on the RAB. All participants gave introductions.

Mr. Kane motioned to approve the September 2023 (RAB) meeting minutes, the motion was seconded and approved unanimously.

Mr. Kane reviewed the meeting agenda from the presentation which included: Review/Approval of September 2023 Meeting Minutes, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) documents status, Groundwater Management Zone (GMZ) sampling, Groundwater Treatment Plant (GWTP) design status, Conceptual Site Model (CSM) for CRREL and the Connecticut (CT) River, remedial systems updates, and upcoming work. New for this meeting is to present the soil vapor (SV) model for CRREL.

Mr. Kane reviewed the status of the on-site CERCLA documents, stating that there was no change in status since the previous RAB meeting, and that comment responses on the Feasibility Study (FS) were still under final review by the New Hampshire Department of Environmental Services (NHDES). He stated that a draft final Proposed Plan was ready to be distributed once regulatory review of the FS was complete. Mr. Kane handed the presentation to WSP personnel to provide project updates.

Mr. Calkin (WSP) stated that the onsite CERCLA investigation documentation is still in the process of resolving NHDES comments for the FS (which was finalized in December 2022) and may result in an addendum to the FS. Once completed, the project team will then be able to complete the Draft Final Proposed Plan (PP).

Mr. Calkin stated that the project team wants to make sure prior documents are final before going to 100% design of the GWTP. Extraction well design pilot test is still in Draft Final status. Most likely will occur Spring to Fall of 2025.

Mr. Calkin stated that the CT River RI Report was still under review by NHDES. VTDEC approved Report back in July 2023. The project team is still responding to outstanding comments from the NHDES to the CT River RI report. Once comments from NHDES are resolved, appropriate revisions to the CT River FS will be made before USACE-NAE review, followed by RAB and NHDES review.

Mr. Calkin stated that Site GW zone sampling is expected in April 2024 and we should be able to update the data once that is performed.

Mr. Calkin stated that TCE was first used as heat transfer agent at the facility from 1960 through to 1987. Air Force at CRREL sampled water from onsite to be used in experiments and discovered TCE in the site groundwater (GW) which eventually led to discovery of GW TCE contamination across the CT River into VT. The groundwater treatment plant (GWTP) was built subsequently to take control of the TCE GW problem.

Mr. Calkin stated that TCE vapors were first detected in 2010 prompting subsequent investigation. The soil vapor extraction (SVE) pilot took out 3,600 kgs of TCE from the SV.

Mr. Calkin then discussed the status of the GWTP design.

Mr. Calkin reviewed slides depicting Area of Concern 2 (AOC2) and AOC9 and the location of the TCE above ground storage tank (AST) conflagration and presented the pathway which introduced TCE into the CT River. Also presented the Ice Well at AOC 9. Mr. Calkin stated that the Ice well does not appear to be a migration pathway to get to bedrock and that the bedrock data supports this.

Mr. Calkin presented a slide of the soil gas plume and how it generates the GW plume. The profile plot does not support the presence of dense non-aqueous phase liquid (DNAPL). Mr. Calkin also presented a slide of TCE removed from soil gas from the SVE Pilot which shows how removal of the TCE in the non-saturated vapor phase reduces detected TCE concentrations in the GW.

Mr. Ordung (WSP) then presented snapshots of the three-dimensional model of the SV plume, an overview of the site with buildings and surrounding structures, and the CT river. Mr. Ordung then presented locations of monitoring wells (MW) or SV wells. He also presented the digital elevation model to show topography of the area, including Storrs Pond depression to east, high point of land of Site, then CT River depression to the west, as well as a 3-dimensional block model of the geology of the site with distribution of the geologic material. Mr. Ordung stated that we find coarser material at the bottom as elevation increases goes to finer material. He then showed a cross section and a side view of the cross section, a figure of 2015 GW and soil data showing extent and concentrations of the TCE SV plume under the Site, with soil vapor at 10,000 ug/m3 and GW at 100 ug/l. Mr. Ordung stated that the figure shows the mass of the SV plume that is feeding the GW plume. The GW plume then makes it to the esker, which the production wells intercept. Then TCE is extracted from the GW before it can discharge to the CT river.

Mr. Ordung then presented the 2019 SV and GW plume which was reduced in size compared to 2015 due to the soil vapor extraction (SVE) pilot. The 2021 data showed an even more significant reduction in the size of the SV and GW plumes. After 2021, the SVE pilot was shut off. The 2023 SV data shows that the SV plume rebounded from the 2021 plume size but is still significantly smaller than the plume size in 2015. The 2023 GW plume is also reduced in size when compared to 2015.

Mr. Ordung then presented the CT River system TCE plumes beginning with the 2015 Site SV and GW plume and asked: “Why is there TCE in the GW across river in VT?” He presented the different ways TCE is migrating to the west of the site in VT. He then presented WSP installed bedrock wells. Down hole geophysics was performed in the bedrock wells to describe the orientation and distribution of fractures in the wells where water could flow. Mr. Ordung then showed the network of water bearing fractures. Mr. Rustad clarified the representations of bedding plane orientations. Mr. Calkin stated the bedding planes agree with what the bedrock fractures of the area generally indicate. Samples were collected from the discrete intervals. The discrete sampling indicates that there is not a large mass of TCE contaminated groundwater flowing through the bedrock. The conclusion is that the bedrock fractures are not the source of TCE contamination in the VT wells. Mr. Groher asked the question: ”Were the bedrock wells packer sampled all on the east side of the river?” Mr. Calkin answered, “Yes, they are all located on CRREL property.”

Mr. Ordung indicated that WSP collected sediment samples from the CT river bottom. The presentation figure was updated to show the surface of river water, bottom the river, top of rock, and the bottom is the interpolated model of the CT River-bed bottom. Then Mr. Ordung presented the distribution of TCE results in the samples collected. The data indicates that sediment samples are upstream of the Site. Mr. Calkin stated The TCE was discharged from the outfall into a low point in the river bottom and the bedding plane fractures along the western bank of the CT river > the 1970 TCE release settled upstream to a low point in the river bottom and then got into the till deposit on top of the bedrock and from there moved into the bedrock fractures. TCE was drawn into the CT GW due to well pumping stress.

Multiple lines of evidence and data that strongly suggests a separate TCE source for the CT River TCE GW from AOC2 and AOC 9 onsite. Ms. Rosenstein asked Mr. Calkin to clarify “separate source” because the TCE all came from the same place. Mr. Calkin stated: “The GW from CRREL wants to discharge to the surface water body [CT River]. Not go under the river to the GW on the other side.” Mr. Rustad summarized by stating that the soil vapor is the source of GW contamination on the CRREL Site. In the Site saturated overburden TCE shows decreasing overburden GW concentrations to bedrock. The [bedrock] fracture alignment does not show there is a bedrock connection from the Site to the river. Bedrock TCE concentrations beneath the Site are not similar to the bedrock concentration in the VT bedrock, further suggesting the lack of connection. The contamination is within the CT River bathymetry. The data shows the river was quiescent at the time of the 1970 release allowing the TCE to settle into the CT River’s low point near the CRREL stormwater discharge.

Mr. Hoffman (NHDES) stated that he recognizes that the presentation is in part based on the NHDES comments from the CT River RI, and is meant to contribute to NHDES and Weston & Sampson (W&S) understanding of how the CSM was developed and how the sampling and data supports the CSM and the RIs. Mr. Hoffman stated that NHDES is low on staff and hopes new staffing will be able to work with W&S to get an understanding of the info and data to resolve the comments. Mr. Rustad suggested that technical sessions with NHDES and W&S would be productive and lead to a better understanding of the CSM for the Site. Mr. Hoffman concurred with Mr. Rustad.

Mr. Calkin stated that tomorrow morning WSP will update the Admin Record at the information desk of the Howe library.

Mr. Calkin then presented upcoming work. The project team will continue to monitor indoor air (IA) at CRREL every working day and monitor remediation systems in place. Mr. Calkin stated that the project team may introduce a VaporSafe® monitor (a fixed GC with an electron capture detector (ECD), a 16 position multi-port valve, and a sample collection pump, which does not need to be staffed, and allows remote access to the data) to supplement IA sampling in the summer.

Mr. Calkin stated that the next GW sampling round is in April 2024 and the project team anticipates submitting the final pilot test extraction well plan. Mr. Calkin stated that the Corps project team is reviewing the synoptic soil vapor report and once completed, will be able to finalize the report and upload to the administrative record of the NHDES OneStop.

Mr. Calkin then stated that once the NHDES FS comments for onsite are resolved, the project team will be able to go forward with the Proposed Plan and Decision Document.

Mr. Kane introduced questions and comments session.

Mr. Kane stated that follow-up questions can be submitted via email. Contact information provided below for questions: [Christopher.g.kane@usace.army.mil](mailto:Christopher.g.kane@usace.army.mil) or via phone 978-318-8025 (USACE PM).

Mr. Kane indicated that the project team is working on the Draft Final CT River RI Report response to NHDES comments. Next RAB meeting is scheduled for May 15th 2024. No additional comments/questions.

Mr. Kane adjourned the meeting at 1703 hours.