Minutes of Restoration Advisory Board Meeting
Former Atlas "D" Missile Site 4, Belvoir Ranch, Laramie County, Wyoming

May 19, 2022, 6:00–8:00 p.m.
Location: Laramie Community College, Room 110

1. Purpose

The Restoration Advisory Board (RAB) for the Former Atlas "D" Missile Site 4 (Site 4) met for the 25th time on May 19, 2022. The RAB is organized under guidance and authority established under the Formerly Used Defense Sites (FUDS) Program for the hazardous, toxic, and radioactive waste (HTRW) project at Site 4 (Project Number B08WY046702), located one mile south of Granite, Wyoming. The primary topics discussed during the meeting included the following:

- Long-Term Monitoring (LTM) Program: Fall 2021 LTM update
- Data Gaps Activities Update: 2021 monitoring well installations
- Pilot Testing Activities Update
  - Source Area: potassium permanganate and zero-valent iron injection
  - Transect Area: groundwater pump, treat, and reinject

Principal meeting participants included representatives of the U.S. Army Corps of Engineers (USACE), Wyoming Department of Environmental Quality (WDEQ), Cheyenne Board of Public Utilities, Wyoming State Engineer's Office (WSEO), URS Group (URS), Na Ali'i Consulting & Sales, LLC (Na Ali'i), Laramie County Health Department, and Laramie County Commissioners Office. A summary of the meeting discussions follows. The meeting agenda, attendance list, and the meeting presentation are included in Attachment A.

2. Meeting Participants

RAB Members

WSEO: Jeremy Manley, Natural Res. Program Principal
USACE: Laura Deck, RAB Co-Chair
Sherard Water Treatment Plant: Victor Spencer

Community Members:

Dr. Kathleen Quinn, RAB Co-Chair
Judd Eifeldt
Roger Schaffer
Mike Hand

Other Community Attendees:

Laramie County Health Department: Jennifer Escobedo
Laramie County Commissioners Office: Linda Heath
Cheyenne Public Works: Vicki Nemecek
Wyoming Water Development: George Moser

Private Citizens:
Tyler McClure, Dyno Noble Inc.
Paul Ivancie, Wood PLC
Chris Enthobaum

RAB Support:

USACE-Omaha District: Laura Deck, Project Manager; Quang Le, Project Engineer

URS: Scott Ross, Project Manager; Ryan Mowan, Deputy Project Manager; Tom Wohlford, Deputy Project Manager; Kristine Weber, Site Engineer; Jeny Mitchell, Project Assistant

WDEQ: Nicole Twing; Kira Weber

Na Ali'i: Kelly Hranac, Hydrogeologist; David Groy; Project Manager

3. Opening of Meeting

Dr. Kathleen Quinn, the RAB Co-Chair, called the meeting to order at 6:05 p.m. She noted that Brandon Sellers, U.S. Army Corps of Engineers, the RAB Co-Chair, requested Laura Deck, the U.S. Army Corps of Engineers Project Manager, be designated as the new co-chair.

Dr. Quinn stated there was a quorum to allow voting. The minutes from the previous meeting were approved and acknowledged. Linda Heath of the Laramie County Commissioners Office was the only elected official present.

Ms. Deck requested each person in the room identify themselves and who they are representing. Ms. Nicole Twing, WDEQ, introduced Ms. Kira Weber and said she would be replacing her as a RAB member.

Ms. Deck introduced the project team present at the meeting: Mr. Quang Le, an engineer with USACE, Mr. Scott Ross, the new URS Project Manager, and Mr. Tom Wohlford, the new URS Deputy Project Manager, as well as the other team members present from URS and Na Ali'i.

Ms. Deck then checked the contact information for each of the RAB members.

Dr. Quinn began the technical portion of the meeting by introducing Ms. Kristine Weber, Site Engineer with URS, to discuss the progress of the LTM program.

4. LTM Update

Ms. Kristine Weber provided a brief overview of the fall 2021 and spring 2022 LTM events. The fall event involved collecting 239 groundwater samples at 97 monitoring wells; 45 samples at stock, municipal industrial, and residential wells; 4 co-located surface water/sediment samples; and 25 vapor samples from the source area. The spring 2022 event will include collecting 265 groundwater samples at 99 monitoring wells; 33 samples at stock, municipal, industrial, and residential wells; and 4 co-located surface water/sediment samples. The spring 2022 sampling event started May 3, 2022 and was in progress during the RAB.

Question from Ms. Deck: Were water levels also collected during the spring event? Ms. Kristine Weber said they were.

The fall event included sampling three monitoring wells (MW02, MW18, and MW25) located west (upgradient) of the source area. No volatile organic compounds (VOCs) were detected in any of the wells. Mr. David Groy stated the samples were collected west of the source area between the new houses being constructed and the Launch and Service Buildings. The results indicated there was not reversal of gradient in this area.

Ms. Kristine Weber discussed a passive diffusion bag (PDB) demonstration study conducted in January 2020 (5 PDBs sampled) and the spring 2021 LTM event to determine if PDBs should be used as an alternative to the conventional sampling method for very deep wells, low producing wells, or wells with extended screened intervals. PDB samples were collected at 26 locations in spring 2021 and the results were compared to the conventionally collected sample data. Ms. Kristine Weber had a filled PDB that she showed to the RAB; and Mr. Ross provided synopsis of PDB technology and usefulness.

Ms. Kristine Weber noted PDBs are being used in 60 percent of the monitoring wells and test holes during the spring 2022 LTM event.

Question from Mr. Jeremey Manley: Are you saying that the bag Ms. Kristine Weber is holding is the membrane? Mr. Ross said yes, it is the membrane, and the volatile contaminants diffuse through it. He also said there is new technology being developed so other contaminants can be collected this way.

Question from Mr. Victor Spencer: When you collect a standard sample, you pull water (and contamination) from within the formation. You wouldn't get that effect with these bags, right? Ms. Kristine Weber stated the PDBs only sample the water in the interval the bag is placed in. However, comparing sample results collected by the two methods was part of the test completed in spring 2021. The PDBs are placed in a well and allowed to remain for two weeks, then they are removed, and the samples are collected into standard sampling jars. The wells are then pumped using the conventional sampling methods , and samples were collected. This way a direct comparison of the results obtained using the conventional sampling method can be compared to the results obtained using the PDB method.

Mr. Wohlford stated the wells are normally pumped until the field parameters, such as pH, stabilize to ensure that formation water is coming into the well before the samples are collected. This is the water that is the same as water collected by the PDB.

5. Data Gaps Investigation

Ms. Kristine Weber then described the data gap investigation, which included installing wells at seven locations, for a total of 19 monitoring wells.

- MW104 and MW105 was installed to north and south, respectively, of the source area along the previously interpreted 1,000 µg/L plume contour in Area A to confirm the north-south extent of TCE concentrations in this area. The results showed that TCE above 1000 µg/L is not present in either area. Mr. Mowan pointed out the western (upgradient) wells are shown on slide 10.

  Question from Mr. Manley: How deep are those wells? Mr. Mowan said they will get the depths for him.

- Shallow and deep screens were installed at MW84B to define TCE concentrations above 1,000 µg/L in the upgradient Transition Area and vertical gradients in the lower White River Formation (WRF) (Chadron Member). TCE was not present in any screened intervals at MW84 or MW84B.
- MW 106 was installed to define the plume core and the WRF/Ogallala contact in the Transition Area. TCE was present above 100 µg/L in all well screens in Ogallala and WRF, indicting a potential southern groundwater migration pathway.
- MW54B, adjacent to MW54, was installed to define TCE in groundwater in the 130 feet of saturated thickness above the shallowest screen in MW54. TCE was detected in the shallow screened interval at MW54B, but not in other zones in MW54B or MW54. This indicates that these wells are not within a preferential migration pathway downgradient of MW106.

- MW92B: Installed to replace a dry interval and determine source of TCE detected in grab sample collected in temporary well. TCE was detected in the shallow samples from MW92 and MW92B. Data indicates these wells are not within a preferential migration pathway downgradient of MW106.
- MW107: Installed with three screens to refine plume core in Area B near TH6, which has a 26-foot screened interval. Sampling of the new intervals confirms the results from TH6 at around 10 µg/L.

The objective for each of these data gap wells was achieved.

6. Activities Update—Pilot Testing

Ryan Mowan, Deputy Project Manager and Project Engineer for URS, then discussed the pilot studies. The results of the two pilot studies conducted in the source area are summarized below.

Zero-valent iron (ZVI) was injected into three locations at Launch & Service Building (LSB) 2. Injection Area 2A and four locations at LSB 2 Area 2B. The results from 14 monitoring events are as follows:

- Initial reduction in TCE concentrations, except at MW160-146, where TCE concentrations increased by an order of magnitude. Although this is may look alarming, the goal of the pilot study is to see if ZVI could be efficiently injected into the formation and create a change in the environment. Because the team had to increase the permeability of the formation for injection, this is likely drawing in contamination from farther away—both horizontally and vertically.
- Increases in cis-1,2 dichloroethene (DCE) and vinyl chloride (VC), also an indication of a changed environment and positive result.
- Changes in field parameters (oxygen reduction potential, dissolved oxygen), geochemical parameters (chloride, sulfate) and methane/ethane/ethene (indicates dechlorinization of TCE).
- ZVI created a change in the subsurface groundwater—reducing conditions and changes in contaminant concentrations were observed.

Potassium permanganate ($KMnO_4$) was injected at four injection points LSB1. At MW59-74, the team could not analyze samples for 4 events because of the presence of $KMnO_4$ (i.e., purple water). The focus of permanganate treatment is destruction. The pilot test was successful in distributing the injectate.

Question from Ms. Kelly Hranac: Are you preliminarily thinking that one method is better than the other? Mr. Mowan said both have their positives and negatives; ZVI does not work as well with high concentrations like at LSB 1. Potassium permanganate is more effective at destroying contaminants at very high concentrations.

Ms. Deck stated the draft FS will be available in October 2023.

Participants took a break from 6:55 to 7:10.

Mr. Mowan turned it over to Ms. Kristine Weber to discuss the pump, treat, and reinject (PTI) pilot

test in the Transition Area (i.e., midpoint of the plume). This test was conducted in the mid-area of the plume along a north-south transect of wells.

Ms. Kristine Weber described the treatment of the water before reinjection: the water is extracted at 50 gallons per minute and enters Tank 1 (primary treatment tank), which contains granular activated carbon (GAC). This tank removes most of the TCE before the water moves to Tank 2, which also contains GAC, for polishing. Samples of the water are collected before Tank 1 (primary influent treatment), after Tank 1, and after Tank 2. After Tank 2, the water is reinjected approximately 1,000 feet downgradient via the injection well. Performance monitoring sampling is being conducted on MW48, MW 45R, and MW47. The pilot study treated 5.3 million gallons of contaminated groundwater and removed approximately 0.73 pounds of TCE from the groundwater.

Question from Mr. Victor Spencer: Did you have to change the GAC in the first tank during the test? Ms. Kristine Weber stated they did not.

Ms. Kristine Weber described the flow rates and water levels during the test shown on slide 34. They noticed a rise in water level in the injection well, and subsequently used a downhole camera to inspect the well. What they found was fouling of the well screen from calcium carbonate. To correct this, they initially cleaned the well screen.

Question from Mr. George Moser: What kind of treatment did you use? Ms. Kristine Weber said they did mechanical/ physical brushing of the screen. In the spring, they plan to do both chemical and physical cleaning of the screen prior to restarting the system.

Question from Mr. Manley: Do you know why this happened? Ms. Kristine Weber replied they did not, as they had not done anything to the well. There was then a discussion regarding why this may be happening. Mr. Wohlford stated by pumping the well, the water can become oxygenated, and the chemistry changed. Ms. Kristine Weber agreed but said they did not see this at the extraction well.

7. Study of Train Operations and how They Affect Water Levels

Mr. Mowan discussed the analysis of the train operations study conducted at MW47 and MW48 using pressure transducers. The transducers collected data over three days but only one day had good resolution: one day there was a transducer problem and one day there was a storm that affected barometric pressure. (see slides 34 and 38).

The data was corrected for barometric pressure, and they applied a running average to the water level data to smooth it and used a t-test to determine the statistical difference between means of the data. Mr. Mowan stated they noticed a 0.01-to-0.02-foot change in water level for several minutes resulting from a train passing by. This did indicate a statistically significant change.

Question from Mr. Manley: Was the t-test conducted on the smoothed data? Mr. Mowan said it was. There was a slight increase in the water level as the trains passed and then a decrease. Mr. Manley asked if the rise was significant, and Mr. Mowan stated it was (about 0.02 feet); however, the rise in the water level over the day was much greater than that caused by the trains. Mr. Wohlford stated this was due to hydraulic diffusivity.

Question for Mike Hand: You removed less than one pound of TCE? Ms. Kristine Weber said yes,

because of dilution from clean water being pulled into the extraction well, the average influent concentration was only 20 µg/L.

Question from Mr. Manley: How much water would be required to cut off the plume at this location? Mr. Mowan stated they estimated they needed 3 extraction wells pumping at 100 gallons/minute or 5 extraction wells pumping at 50 gallons/minute. They anticipate that multiple extraction wells would be necessary to remove contamination as it moves downgradient.

Question from Mr. Manley: Are you injecting into the entire screen or using packers. Mr. Mowan said they are injecting into the entire screen for the PTI.

8. Open Forum
Next RAB meeting: November 10, 2022.

Attachment