

TECHNICAL BRIEFING – 2013 ANNUAL MONITORING REPORT – AREA D (PICA-076) – MAY 2014

The document reviewed was an annual report for post-remedy groundwater and surface water monitoring completed in 2013. The response action for the site involved the installation of a permeable reactive barrier (PRB) in April 2007 to protect surface water quality in Green Pond Brook. Groundwater containing volatile organic compounds (VOCs) in the plume upgradient of the PRB travels through the PRB and is passively “treated” during transit time through the barrier as it reacts with the iron filings within the barrier. The remainder of the plume is treated with monitored natural attenuation (MNA); institutional controls are also an element of the remedy. The contaminants of concern (COCs) in the area consist of the following: tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC). The predominant COC is TCE.

Several types of monitoring are performed in the area at a frequency specified in the Remedial Design Report and in subsequent approved modifications. The monitoring can be classified as follows:

- PRB performance monitoring
- PRB hydraulic performance monitoring
- Surface water compliance sampling
- MNA sampling
- Supply well sampling

Each of the monitoring programs and attendant results are discussed below.

PRB Performance Monitoring

Performance monitoring for the PRB is designed to evaluate the function and efficiency of the barrier. COC concentrations are examined upgradient and downgradient of the barrier to track the reduction in concentrations as groundwater travels through the barrier. Samples are analyzed for VOCs, field parameters, alkalinity, dissolved iron, and sulfate. Sampling was conducted on August 20, 2013.

The report notes that “the PRB is performing as designed.” Concentrations upgradient of the PRB (or “influent”) were as high as 312 ug/L whereas all downgradient (“effluent”) samples were less than 1 micrograms per liter (ug/L). Some TCE daughter products (cDCE and VC) were detected in some

downgradient samples. The report states that “MNA processes act to decrease the remaining COC concentrations to reach the surface water cleanup criteria in GPB.” VOCs were not detected in perimeter wells indicating that there is no preferential flow around the PRB.

PRB Hydraulic Performance Monitoring

Hydraulic performance monitoring is designed to evaluate hydraulic conditions around the wall. Water-level data were collected in the first and third quarters of 2013; the semiannual monitoring represented the first reduction of monitoring from quarterly. Both horizontal and vertical groundwater flow gradients were consistent with historical data. The groundwater flow direction was “fairly consistent” between sampling events. A component of lateral transport within the wall was detected which could increase treatment time within the PRB. No mounding was observed.

Surface Water Compliance Sampling

There are four surface water sampling locations located along Green Pond Brook. Samples were collected in May and November 2013. VC was the only constituent that was detected above Area D ROD comparison criteria (0.083 ug/L). At three locations (DSW-3, DSW-4, and DSW-8) there were exceedances for VC in both the May and November 2013 sampling rounds. The greatest exceedance (4.89 ug/L) was detected at DSW-3. Other maximum detections were similar in concentration (3.55 ug/L at DSW-4 – 11/8/13; and 3.23 ug/L at DSW-8 – 11/8/13). The report states that “TCE has not been detected above the comparison criteria established in the ROD (1.09 ug/L) since installation of the PRB.” However, in the May 2013 sampling round the concentration of TCE reported for location DSW-4 was 1.01 ug/L. Reported concentrations of VC, cDCE, and TCE are characterized as “low”; however the TCE detection of 1.01 ug/L is essentially the same as the ROD comparison criteria (1.09 ug/L) and the maximum detection of VC is found at a concentration over 50 times the ROD comparison criteria. While the report concludes that historical COC detections at surface-water sampling locations downgradient of the PRB “suggest that the PRB continues to be protective of the surface water in GPB”, there are many factors contributing to the detected concentrations in surface-water samples including the amount of flow in the brook which is related to the amount of precipitation preceding sampling. Higher flow volumes in the brook will tend to dilute contaminants entering the water body from groundwater.

MNA Sampling

MNA sampling includes monitoring wells both upgradient and downgradient of the PRB; the purpose of MNA sampling is to monitor the decrease in contaminant concentrations over time via natural processes.

The MNA monitoring wells are categorized by their location in the plume as follows:

- Upgradient and cross gradient background: D-13-1, D-111-1;
- Former source area: D-9-H ;
- Plume centerline: D-92-3, D-112-6, D-112-7, D-MW21-1;
- Plume fringe: D-41-8, D-41-9, D-CAF-2, D-CAF-6; and
- Sentinel: D-41-16, D-41-17, D-41-14, D-41-1, and D-MWD-1.

Three sentinel wells are located downgradient of the PRB (D-41-14, D-MWD-1, and D-41-1). Of the downgradient wells two are located between the PRB and GPB; D-41-1 is located on the opposite side of GPB. Wells D-41-16 and D-41-17 are side gradient of the PRB and seem to be situated to detect contamination that might be skirting the PRB.

Sampling for VOCs is on annual frequency; samples are collected using passive diffusion bags (PDBs). Biogeochemical parameters include the following which are sampled every five years: total organic carbon (TOC), nitrate, total and dissolved iron, sulfate, and field analytes (dissolved oxygen, oxidation-reduction potential, pH, and conductivity). These parameters are used to “evaluate aquifer chemistry.” Biogeochemical parameters are sampled using HydraSleeves; the last sampling event was in 2010 and will not occur again until 2015. A total of 15 monitoring wells comprised the MNA network for the 2013 sampling year. Results for each of the COCs are briefly summarized below.

PCE

- No exceedances of the 1 ug/L cleanup standard in any of the MNA network wells
- No detection in Plume Fringe wells D-41-8 and D-41-9, or Sentinel Well D-MWD-1, which are located downgradient of the PRB
- No detection in Sentinel Well D-41-1 which is located on the opposite side of GPB from the PRB

TCE

- Exceedances of the 1 ug/L cleanup standard in nine MNA wells

- Maximum concentration of 604 ug/L detected in Plume Centerline well (D-112-6).
- No detection in Sentinel Well D-41-1 which is located on the opposite side of GPB from the PRB

Cis-1,2-DCE

- Exceedances of the 10 ug/L cleanup standard in three of the MNA network wells
- No detection in Sentinel Well D-41-1 which is located on the opposite side of GPB from the PRB

1,1-DCE

- No exceedances of the 2 ug/L cleanup standard in any of the MNA network wells

VC

- Exceedance of the 2 ug/L cleanup standard in one MNA network well
- Maximum concentration of 175 ug/L detected in downgradient Plume Fringe well D-41-9

MNA Network Wells Data Trends

Results from MNA network wells were also plotted in concentration versus time plots for the COCs. Furthermore, statistical analyses of the eight most recent results from each of the MNA network wells were performed to evaluate data trends (analysis included as Appendix D within the annual report). MNA monitoring was initiated in 2007. Some of the wells have demonstrated a statistically significant decrease in TCE from 2007 to 2013. Concentrations in other wells have fluctuated considerably and not exhibited any clear trend. None of the results are especially notable and overall you would expect decreases of some contaminants as time goes on and increases in other (daughter products) as well as fluctuations due to the nature of the source and flow conditions.

Crossgradient Background Well: A statistical decrease in TCE concentrations has been observed in the 2007 to 2013 time period.

Former Source Area: TCE continued to occur in excess of the cleanup standard in Well D-9-H.

Plume Centerline: Within these wells there has been widespread fluctuation of VOC concentrations with the exception of Well D-MW21-1 which has shown a statistically significant decrease of TCE and cDCE in the 2007 to 2013 time period. All of these wells are upgradient of the PRB and their concentrations are not relevant to the functioning of the PRB.

Plume Fringe: None of the wells have statistically demonstrated decreases in TCE. Any commentary on changes in concentration is based on apparent trends.

Supply Well Sampling

Annual sampling of a drinking water supply well (D-PW-131) is included in the monitoring program. The sample was collected from influent to the treatment system; after treatment the water is distributed for potable purposes. TCE was detected at a concentration of 4.73 ug/L in the August 20, 2013 sampling. PCE and cis-1,2-DCE were detected but at estimated concentrations below cleanup standards (0.343 and 0.351 ug/L, respectively). Other Area D COCs were not detected.

Conclusions

The report concluded that the PRB is functioning as designed and that the remedy was protective of human health and the environment. The following general data trends were noted:

- Plume fringe/centerline wells: TCE concentrations were stable or decreasing in the monitoring period.
- Sentinel wells: Trends were stable for all COCs.
- Green Pond Brook: Historically, low concentrations of COCs have periodically been detected in some surface-water samples before the installation of the PRB. Reportedly all COCs have displayed stable trends at the upstream sampling location (D-SW-2) and no COCs have been detected above their SCL since installation of the PRB. The report also notes that “TCE has not been detected above the comparison criteria established in the Record of Decision (1.09 ug/L) in samples from D-SW-3, D-SW-8 (directly downgradient from the PRB) and D-SW-4 (the farthest downgradient location) since installation of the PRB indicating its continuing effectiveness.” It should be noted that the detection of TCE at 1.01 ug/L in DSW-4 is just about identical to the comparison criteria. The report also concludes that VC was detected at “low concentrations that slightly exceed the comparison criteria.” However, the detected concentrations, albeit estimated for some detections (those below 1 ug/L), are found at between 11 (0.979 J ug/L at DSW-4 on May 8, 2013) and over 50 times the comparison criteria concentration.