

Interim Monitoring Program and Strategy for Determining Suitability for Site Closure

This section provides a short summary of previous groundwater-monitoring results and proposes an interim monitoring program to assess the effectiveness of the chosen remedial alternative, MNA. In addition, a strategy to determine when the POL Hill AST-2 Area is suitable for closure is proposed.

7.1 Groundwater Monitoring Summary

Groundwater monitoring associated with the POL Hill AST-2 Area was first completed in 1992 (IT, 1999). However, the results of the 1992 sampling event are not discussed in this report because TPH was measured by EPA Method 418.1 and so are not comparable to the analytical results completed after 1992, which were completed with the more accurate EPA Method 8015M. For this reason, the March 1994 sampling event (IT, 1997) is considered as the initial groundwater monitoring event for the POL Hill AST-2 Area as shown on Figure 2-1. While this round of sampling did not include all wells (MW-POLA-120 and MW-POLA-121[Shallow(S)] were installed at a later date), this sampling round represents a useful baseline for groundwater conditions in the AST-2 Area.

A comprehensive groundwater-monitoring and sampling program including quarterly, semiannual, and annual sampling schedules was developed for the POL Hill Outparcel (including the AST-2 Area) in 1997 (IT, 1999). Due to delays in the installation of new wells for the RI, the first sampling round of all POL Hill AST-2 Area wells (i.e., previously existing and newly installed) was not completed until February 1997 and represents the second groundwater monitoring event (see Figure 2-2). A third monitoring event was conducted in March 1997. After receiving a regulatory decision on further environmental activities at the POL Hill Outparcel, the quarterly groundwater monitoring program was restarted in March 1998. The fourth groundwater monitoring event was performed in April 1998. The results of this fourth monitoring event are presented on Figure 2-3.

The fifth and sixth groundwater monitoring events were conducted in June/July 1998 and September/October 1998. The seventh groundwater monitoring event associated with the AST-2 wells was collected during January 1999 as presented in Figure 2-4. Three additional groundwater monitoring events were completed by SOTA in September 2001, February 2002, and August 2002 (SOTA, 2002).

All groundwater samples were analyzed for TPH-purgeable, TPH-extractable, BTEX, lead, and PNAs. However, the only constituent consistently detected above the cleanup level (i.e., GSA Phase I RCGs) was TPH analytes. The BTEX, lead, and PNA concentrations were either not detected or were below RCGs. Beginning with the January 1999 monitoring event, the samples were analyzed only for TPH-purgeable and TPH-extractable. Analytical results from these sampling episodes are presented in Appendix E for the eight wells that encompass the petroleum-hydrocarbon contaminants in the groundwater within bedrock fractures beneath the former location of AST-2.

The TPH contamination, which is located in the vicinity of the former AST-2, is depicted for the March 1994, February 1997, March/April 1998, and January 1999 sampling episodes on Figures 2-1 through 2-4, respectively. The area of contamination shown on these figures is defined by TPH-concentration isopleths representing combined TPH (i.e., total of TPH measured as diesel and TPH measured as gasoline) concentrations of 100 µg/L, 500 µg/L, and 1,200 µg/L.

The GSA Phase I RCG for TPH (measured as diesel) is 1,200 µg/L. The boundary of the contamination shown on Figures 2-1 through 2-4 was drawn primarily based on detected TPH concentrations, taking into consideration the location of former AST-2 and the groundwater-flow directions. The only wells with combined TPH detections exceeding the GSA Phase I RCG of 1,200 µg/L were PL-MW-101 (RCG exceeded in all sampling rounds) and MW-POLA-121 (RCG exceeded in March 1997 sample only). Each of these wells is located within approximately 80 ft of the former AST-2 location.

An additional three rounds of groundwater sampling has been completed by SOTA as documented in their August 2002 draft report. Analytical testing of these groundwater samples included extractable and purgeable TPH. The latest analytical data are included in Table of 4-1 of this report. Figures representing the contaminant isopleths of these data are presented in the SOTA (2002) report, which is included in Appendix I. The SOTA results support the conclusion that the TPH-contaminated groundwater in bedrock fractures is relatively stable in the area of the former AST-2 and that natural attenuation is occurring.

7.2 Interim Groundwater Monitoring Plan

Investigations in the POL Hill AST-2 Area have shown that natural attenuation is a viable remedial alternative for petroleum-hydrocarbon contamination in groundwater. In particular, overall contaminant concentrations appear to be declining or stable while the horizontal extent of the contaminants is also shrinking. The following interim groundwater-monitoring plan is proposed for tracking the progress of natural attenuation processes until such time as the site is deemed ready for closure. The additional data collected from this interim monitoring plan will assure that no further contaminant migration is taking place and that natural-attenuation processes are adequately addressing residual petroleum-hydrocarbon contamination in groundwater in the POL Hill AST-2 Area.

The nine groundwater monitoring wells used to assess environmental conditions in the POL Hill AST-2 Area include the following: PL-MW-101(Deep [D]), PL-MW-103, PL-MW-104, PL-MW-106, PL-MW-107, PL-MW-114, PL-MW-115, PL-MW-116, and MW-POLA-121(S). These monitoring wells can be placed in three different categories designated as trigger wells, point-of-compliance wells, and guard wells:

- Trigger wells are data-collection points located in the downgradient portion of the contaminated groundwater area where concentrations exceed the Phase 1 RCG for TPH as diesel (1,200 µg/L). These wells could provide an early indication that the contaminants may be migrating if contaminant concentrations are observed to increase over time.

- Point-of-compliance wells are data-collection points located at or near the portion of the area where the groundwater contaminant concentration is above the method detection limit (i.e., above nondetect [ND]), but below the Phase 1 RCG for TPH. Point-of-compliance wells could provide an early indication of horizontal contaminant migration. Increasing concentrations in point-of-compliance wells could indicate that guard wells might become contaminated over time.
- Guard wells are data-collection points located cross-gradient or downgradient from the point at which contaminant concentrations are nondetect. If possible, guard wells are located approximately 1 year's travel time from the point-of-compliance wells. Guard wells are used to detect movement of the contaminants outside of the perimeter of containment and identify the need to manage potential expansion of the contaminated groundwater area. Formerly contaminated wells will only be considered as guard wells when they have at least three sampling rounds where the COC concentration has been nondetect.

The baseline condition has already been established by previous sampling that followed the AST and contaminated soil removals. From this baseline condition (i.e., March 1994 round), the COC (i.e., TPH) data trends can be used to establish the basis for ongoing monitoring. If the COC concentration appeared to have an increasing trend, trigger wells, point-of-compliance wells, and guard wells would have been sampled more frequently (e.g., quarterly) to monitor changes in the contaminant distribution and provide enough lead time to adjust the site management strategy. If the groundwater data indicated no trend or stable concentrations, trigger wells, point-of-compliance wells, and guard wells could be sampled at an extended frequency (e.g., semi-annually or annually). If the groundwater data indicated a decreasing trend for COC concentrations, trigger wells, point-of-compliance wells, and guard wells could be sampled at an even more extended frequency (e.g., annually). The sampling frequency for stable or decreasing COC data trends can also be modified if changes in the data trends are observed. Based on the observed data trends in TPH concentrations for the AST-2 wells, the annual sampling frequency used to this point appears to be appropriate.

In the POL Hill AST-2 Area, wells PL-MW-101(D) and MW-POLA-121(S) were considered as the trigger wells. While well PL-MW-101(D) has had COC concentrations consistently over the Phase 1 RCG for TPH during the monitoring period, well MW-POLA-121(S) only exceeded the RCG level in the 1997 monitoring event and has been below that level in the last three sampling events. For this reason, the category of well MW-POLA-121(S) should be changed from trigger well to point-of-compliance well.

In addition to MW-POLA-121(S), other point-of-compliance wells in the AST-2 Area include PL-MW-103, PL-MW-104, and PL-MW-115, which all showed levels of TPH, but at concentrations below the RCG.

Another well, PL-MW-114, had TPH contamination in the March 1994 sampling round but has been nondetect in the last four sampling events. For this reason, the category of well PL-MW-114 should be changed from point-of-compliance well to guard well. Wells PL-MW-114 and PL-MW-116 are considered to be the guard wells at the POL Hill AST-2 Area. MW-POLA-120 is a previous guard well that was abandoned in 1999.

For the interim period until the POL Hill AST-2 Area is deemed ready for closure, it is proposed that the AST-2 wells continue with an annual sampling frequency. The samples should be analyzed for TPH measured as diesel and TPH measured as gasoline in order for the results (i.e., total of both analyses) to be directly comparable to the previous sample rounds. Because the POL Hill AST-2 Area has already been shown to be suited for the MNA remedial alternative, further sampling for natural attenuation parameters is not proposed. If changes in COC trends from future groundwater samples indicate that the contaminant concentrations may be increasing, it may be necessary to alter the interim monitoring plan to include the natural attenuation parameters.

It is proposed that wells PL-MW-106 and PL-MW-107 be excluded from future sampling events. No TPH has been detected in PL-MW-106 or PL-MW-107 in the last 4 groundwater sampling events (September/October 1998, September 2001, February 2002, and August 2002). These two wells will be added back into the interim monitoring program if evidence of contaminated groundwater expansion is indicated by the data in the remaining seven POL Hill AST-2 Area wells.

7.3 Strategy for Determining Suitability for Site Closure

The following strategy is proposed for determining when the POL Hill AST-2 Area will be considered ready for closure. This strategy is intended to identify the conditions where the interim groundwater-monitoring data indicate that residual petroleum-hydrocarbon contamination has been reduced to levels below the GSA Phase 1 RCG by natural attenuation and shows no risk for future rebound. At that time, the AST-2 Area will be considered suitable for closure. The historical and interim groundwater-sampling data will then be integrated into a closure report for review and acceptance by regulatory authorities.

As indicated in the previous section, annual sampling will continue on seven of the original nine AST-2 Area wells. These groundwater samples will be analyzed for TPH measured as diesel and TPH measured as gasoline and the total of these two values will be calculated for each well and each sampling round. By tracking COC levels as the sum of these two analyses, this provides a conservative estimate of the TPH levels with respect to the GSA Phase 1 RCG, which is based solely on TPH measured as diesel. The calculated TPH information will be used to follow data trends from the previously completed sampling rounds. The groundwater data trends must support the hypothesis that TPH levels are decreasing in groundwater over time because of natural attenuation processes.

In order for the POL Hill AST-2 Area to be considered ready for closure, all groundwater samples must be below the GSA Phase 1 RCG level for TPH. In particular, TPH concentrations must fall below this level (i.e., 1,200 µg/L TPH measured as diesel) in the POL Hill AST-2 Area trigger well, PL-MW-101(D). At the same time, TPH levels can not be shown to increase above the GSA Phase 1 RCG level in any of the point-of-compliance wells.

TPH levels in guard wells should remain as nondetect; however, if TPH 'hits' are observed in a guard well, then the monitoring frequency for that well should go from annual to quarterly. If the TPH 'hits' are observed in the next three consecutive quarterly sample rounds, then a meeting with the RWQCB will be initiated to discuss an appropriate response. The point-of-compliance wells should not indicate any increasing trends for

TPH contamination during this period. An increasing trend would be defined as a 50-percent (relative percent difference) increase in TPH concentrations in each of three consecutive sampling events.

Because it is recognized that contaminant levels may fluctuate over time, it will be necessary for the interim monitoring data to demonstrate that TPH concentrations will not be likely to rebound after the monitoring program is considered complete. For this reason, it is proposed that three rounds of groundwater samples in a row with no exceedances of the TPH RCG level in any of the AST-2 wells be required.

If needed to speed the site-closure process, it is proposed that monitoring-well sampling and analysis be shortened to a quarterly frequency once initial attainment of the Phase 1 RCG has been demonstrated. In this way, the required monitoring period to attain the compliance with three straight rounds of groundwater results can be shortened from three years to 1 year, provided all wells in all of these final rounds have TPH levels below the RCG concentration. If the GSA Phase 1 RCG TPH value is exceeded in the trigger or point-of-compliance wells in the final three sampling rounds, unless the RWQCB directs otherwise, the sampling and analysis program should continue until three straight sampling rounds are completed that demonstrate that TPH concentrations have fallen below the GSA Phase 1 RCG concentration.

Final site closure will be completed in accordance with the Interim Guidance on Required Cleanup at Low Risk Fuel Sites (RWQCB, 1996). This guidance defines low risk groundwater sites according to six conditions, as follows:

1. The leak has been stopped and ongoing sources, including free product, have been removed or remediated.
2. The site has been adequately characterized.
3. The dissolved hydrocarbon plume is not migrating.
4. No water wells, deeper drinking water supply aquifers, surface water, or other sensitive receptors are likely to be impacted.
5. The site presents no significant risk to human health.
6. The site presents no significant risk to the environment.

When groundwater monitoring results meet the requirements proposed in this section, the case for site closure will be discussed with regulatory agencies. Once agreement about closure for the site is reached, the Closure Report will be prepared, incorporating information from this Corrective Action Plan with subsequent monitoring data. The Closure Report will also discuss how the POL Hill AST-2 Area satisfies the six conditions noted above.