

SECTION 3

Corrective Action Objective Developments

This section presents the development of the corrective action objectives for impacted soils and groundwater beneath the POL Hill AST-2 Area. Within this section, chemicals of concern (COCs) (petroleum hydrocarbon contamination related to past base operations) and applicable regulations specific to the POL Hill AST-2 Area are identified. Subsequently, corrective action objectives are derived, potential exposure pathways are identified, and cleanup criteria are presented. Finally, areas and volumes of impacted media are estimated based upon the extent of contamination exceeding the GSA Phase I residential cleanup goals (WCFS, 1995c).

Based on the corrective action development process, a baseline of proven, viable corrective-action technologies are identified and assembled into corrective action alternatives which are capable of meeting the stated objectives and achieving site closure. The corrective action technologies are identified in Section 4 and are used to develop the corrective action alternatives described in Section 5. The recommended corrective action alternative is discussed in Section 6. The results of the natural attenuation monitoring are discussed in Appendix H.

3.1 COCs

COCs for POL Hill AST-2 Area were identified by comparing the concentrations of detected analytes against their cleanup levels in groundwater. As previously explained, contaminant cleanup levels were already identified for the GSA Phase I Sale Area (WCFS, 1995c). Because these cleanup levels (i.e., GSA RCGs) have previously been developed to be protective of human receptors and used for evaluation of other nearby portions of the HAAF, these levels were also used for an evaluation-basis in this CAP (see Section 2.6.1).

Comparing the unrestricted land-use GSA Phase I Sale Area RCGs to the analyte levels in soil and groundwater investigation at the POL Hill AST-2 area, the following COCs were identified:

- **Soil** – TPH measured as diesel
- **Groundwater** – TPH measured as JP-4¹

All impacted soil materials below and adjacent to the former AST-2 were previously removed if they had TPH concentrations above 100 mg/kg. Excavated soils were replaced with clean fill. Although a composite sample of the rock outcrop on POL Hill indicated that TPH measured as diesel is a COC at concentrations exceeding the cleanup goal for soil, the exposure pathway is not complete because the impacted materials are contained within the bedrock fractures and are relatively immobile. All impacted soils that could be feasibly removed by hand were removed from the top of the bedrock outcrop. For these reasons, no further soil remediation activities are planned in the POL Hill AST-2 Area.

¹ Chemical interferences and degradation phenomena result in the quantitation of JP-4 against diesel and gasoline standards (see Section 2.8). Process knowledge suggests JP-4 is the COC.

3.2 Applicable Regulations

A review of federal, state, and local regulations was conducted to determine applicable regulations for the POL Hill AST-2 area. Three types of regulation applicability were evaluated: chemical-specific, location-specific, and action-specific. Accordingly, applicable regulations for each of the three requirement types are presented in Sections 3.2.1 through 3.2.3, respectively.

3.2.1 Chemical-Specific Applicable Requirements

Chemical-specific applicable regulations are numerical standards that protect the environment and human health. These requirements regulate releases or establish cleanup standards for air, soil, and water quality. There are no sources of air contamination at the POL Hill AST-2 Area; therefore, there are no chemical-specific applicable regulations for air.

Soil contamination was caused by releases of petroleum products during past site activities. The contaminated soils were removed under previous remedial actions (see Section 2 and Table 2-1) and clean fill material was used to backfill the excavated areas. TPHs measured as diesel were identified as a COC. However, there are no chemical-specific applicable regulations for TPH in soils.

Chemical-specific applicable regulations for water quality address surface water and groundwater. There is no impacted surface water in the POL Hill AST-2 Area; therefore, there are no chemical-specific applicable requirements for surface water. Groundwater contaminants consist of TPH measured as JP-4; however, there are no chemical-specific standards for TPH. In addition, the groundwater beneath this site is currently not considered to be a source of drinking water because of its location in a low-flow fractured bedrock layer and its low aquifer production rates. Other detected groundwater analytes were not observed above the GSA Phase 1 RCGs (IT, 1997).

3.2.2 Location-Specific Applicable Regulations

Location-specific applicable regulations address impacts to environmental resources (e.g., floodplains, wetlands, historic places, and sensitive ecosystems or habitats). The POL Hill AST-2 Area has no association with any of the mentioned environmental resources; therefore, there are no location-specific applicable regulations.

3.2.3 Action-Specific Applicable Regulations

Action-specific applicable regulations evaluate the actions, technologies, and treatment processes used to remediate any contamination at the site. This POL Hill AST-2 Area CAP only addresses contaminated groundwater. Based on the information in the CAP, the following action-specific applicable regulations should be considered:

Title 23, Division 3, Chapter 16 – Underground Storage Tanks, Article 11 – Corrective Action Requirements (CCR, 1994): The regulations set the requirements for the investigation and documents needed to ensure the proper corrective action for a release from USTs. As listed in Section 1.4, Section 2725 of Article 11 is being used to develop the CAP for the POL Hill AST-2 Area.

San Francisco Bay Basin Water Quality Control Plan (RWQCB, 1995): This document is used to define any beneficial uses of the groundwater under the POL Hill AST-2 Area. Potential beneficial uses of groundwater in the San Francisco Bay Basin include municipal, industrial, and agricultural supplies; therefore, the *Water Quality Control Plan* will be used to establish water-quality objectives by providing two types of objectives: narrative and numerical.

There may be other regulations applicable to the POL Hill AST-2 Area; however, based on information contained in this CAP, only the regulations listed in this section are considered applicable at this time. Because the alternatives and cleanup processes developed in the alternatives section do not impact air quality or surface water, do not generate any waste, and do not physically treat the groundwater, there are no other action-specific applicable regulations.

3.2.4 Other Guidance Documents

In addition to the applicable regulations, guidance documents are used to assist in the development of remedial activities. The following guidance documents will be used to support the remedial efforts at the POL Hill AST-2 Area:

Preliminary Endangerment Assessment Guidance Manual (DTSC, 1994), California State Department of Toxic Substances Control. This guidance document covers the development of the preliminary endangerment assessment report and assists in the investigation, particularly in the human-health and ecological-screening evaluations.

California Well Standards (California Department of Water Resources Bulletin 74-90, June 1991) requires the Department of Water Resources to establish standards for the construction, operation, and abandonment of water wells, monitoring wells, and cathodic protection wells.

3.3 Corrective Action Objective Development

The identification of corrective action objectives is necessary for the development of corrective action alternatives. Corrective action objectives are specific goals aimed to protect human health and the environment and constitute the basis for developing corrective action alternatives.

The objective of the corrective action is to provide a remedy that is technically sound and permanent, cost-effective, and acceptable to the Army, the regulators, and the public.

Assuming unrestricted future land use (i.e., a residential scenario), the following corrective action objectives are identified for the POL Hill AST-2 Area:

- Prevent human exposure through ingestion of impacted groundwater
- Prevent further migration of contaminants in the aquifer.

3.3.1 Potential Exposure Pathways

An exposure pathway describes the course an analyte takes from the source to the receptor. Sources identified at the POL Hill AST-2 Area consist of impacted soil and groundwater. The contamination associated with the rock outcrop on Reservoir Hill is not considered a source of contamination. Though analysis of the stained rock indicates contamination above cleanup criteria, no apparent pathway exists, as even direct contact does not allow for exposure.

Because of the low level of contamination present in the surface soil and inaccessibility of the groundwater in the discontinuous bedrock fractures, no risks are anticipated for future ecological receptors. Therefore, the only potential receptor identified for the POL Hill AST-2 Area is human contact through residential development of land or through groundwater use; the site will not be used for residential or drinking water purposes, the planned reuse for the site is recreational open space. The resulting potential exposure pathways for human receptors are:

- Dermal contact with impacted soils
- Ingestion of impacted soils
- Ingestion of impacted groundwater

3.3.2 Cleanup Criteria

The RCG development process involved arraying a range of concentrations that could be used as cleanup goals. For soils, these included unit risk concentrations (URCs) representing a chemical concentration that will produce an excess cancer risk of one in a million (10^{-6}) and a hazard quotient equal to 1, background concentrations, and practical quantitation limits (PQLs). For groundwater, the list of potential goals included URCs, PQLs, and levels protective of aquatic receptors.

Once the range of concentrations was compiled for each medium, selection of cleanup goals for a residential receptor was based on the most stringent goal for each medium (i.e., soil and groundwater). The cleanup goals are 200 mg/kg (TPH measured as diesel) for soil and 1,200 $\mu\text{g}/\text{L}$ (TPH measured as JP-4²) and 600 $\mu\text{g}/\text{L}$ (TPH measured as gasoline) for groundwater.

3.3.3 Impacted Areas and Volumes

Calculation of impacted areas and volumes is an integral part in the development of appropriate remedial alternative components and their respective costs. Impacted areas and volumes were determined for the POL Hill AST-2 Area by comparing the results of field investigations and applicable cleanup criteria. However, IR hydrocarbon analyses (denoted as total recoverable petroleum hydrocarbons [TRPH] detections in this report) were used during some of the previous POL Hill AST-2 Area investigations. As a result, these investigations may not be representative of contamination because of the potential for detection of naturally occurring hydrocarbons. Such detections would skew the sampling results. Therefore, TRPH data were not used in the determination of impacted areas and volumes in this document.

² Because no numerical value existed for TPH measured as JP-4, the cleanup goal for TPH measured as diesel was used.

A definable area of contaminated groundwater in bedrock fractures was determined using site groundwater-elevation contours (Figure 2-1 through 2-4) and groundwater-monitoring data. Given the quantitation problems associated with TPH measured as JP-4, the reported values for TPH measured as gasoline and diesel were totaled at each location to conservatively estimate the extent and magnitude of TPH measured as JP-4 groundwater contamination.

As previously stated, impacted media associated with the site are soil and groundwater. Because COCs detected in the soil are not present in large volumes (i.e., detected in one sample) and are not found at excessive concentrations (maximum concentration essentially equivalent to the RCG)(IT, 1997c), impacted soil volumes are considered negligible at the POL Hill AST-2 Area and are not defined in this report.