6. IDENTIFICATION OF PCOCS AND COCS

This section summarizes the site use history for each site and includes identified PCOCs and retained COCs at each of the thirty-nine Main Installation sites considered in the Presidio Trust Revised FS Report.

The Main Installation sites can be divided into two groups that share similar characteristics. One group consists of eleven landfills and the other group consists of twenty-eight miscellaneous sites where the predominant COCs, if any, are likely to be metals or polycyclic aromatic hydrocarbons ("PAHs") in soil. Table 6-1 provides a breakdown of the landfill and miscellaneous sites by GMPA planning area. Main Installation sites are organized by the GMPA planning areas in which the sites are found[8]. Although the PTMP has different names and boundaries for its planning districts (Trust, 2002), the GMPA planning areas are used in this document because the GMPA includes both Area A and B sites, whereas the PTMP only includes Area B sites under Trust jurisdiction. Some Main Installation sites are in Area A.

The following sections describe the primary issues of environmental concern identified at each of the Main Installation sites based on the results of the chemical screening completed by the Trust. Sections 6.1 through 6.10 describe the historic activities, and summarize the nature and extent of chemicals in soil and water at each of these sites based upon the investigations performed by the Army and the Trust. Within the nature and extent of chemicals in soil and water sections, PCOCs and COCs are identified and discussed. Tables 6-2 and 6-3 summarize the COCs retained in soil and water at the Main Installation sites, respectively. Table 6-4 summarizes the Main Installation sites retained for detailed analysis in Section 10, as well as those sites requiring no further action ("NFA"). Figure 6-1 summarizes the environmental conditions at each of the Main Installation sites. Tables 6-5 through 6-160 provide summary statistics for each Main Installation site, tabulating PCOCs and COCs in soil or sediment samples, followed by PCOCs and COCs in water samples. Tables of analytical data compiled for the Main Installation sites upon which the summary statistics are based are included as Appendix B.

Figures 6-2A through 6-37B depict the individual Main Installation sites and identified areas of concern. For sites where chemicals were detected in soil samples at a frequency greater than five percent and above the applicable cleanup levels determined in Section 5, locations and depths where these chemicals were detected in soil samples and their applicable cleanup levels are posted on the figures. Specific locations where a sample contained chemicals exceeding the cleanup level are marked in the data boxes with an "X". Color coding of the sample location is used to identify areas where COCs are retained. The text and footnotes in the COC tables discuss occasions where a sample location may contain chemicals exceeding cleanup levels, but other methods (e.g., bivariate scatter plots, data sets collected by specific laboratories, statistical analysis)

[8] Reference to the PTMP Planning Districts is included in the Section Heading to allow the reader to cross-refenrence between the GMPA Planning Areas and the PTMP Planning Districts.

were used to determine whether the chemicals should be retained as COCs. For sites with groundwater, seep, or surface water, a separate figure identifies locations where COCs are retained in water and provides information regarding the estimated groundwater flow direction.

To evaluate which metals detected in soil samples may be considered PCOCs and COCs, the Trust, NPS, DTSC, RWQCB, and community members of the RAB met to examine site data. Information considered by the stakeholders included the following: (1) summary data tables presented in Appendix B; (2) PCOC and COC tables; (3) figures with COC data plotted to allow spatial evaluation; and (4) bivariate scatter plots of site metals data. With the exception of the full set of scatter plots, which are available in a technical memorandum (EKI, 2001a), this information is included in this document.

Bivariate scatter plots were employed to show the relationships between metals that are potential contaminants and major crustal elements that are not considered potential contaminants (e.g., iron, aluminum, magnesium, and manganese). The scatter plots are a method of comparing site-specific data with Presidio background data of various known lithologies. Because the known soil types have distinctive geochemical "signatures," the scatter plots allow quick identification of the soils present at a site, even when the soil has only been grossly classified as "miscellaneous" or "fill". Furthermore, data which were clearly "outliers" from the main mass or trend of data are more likely to be considered contaminants, whereas data in the midst of a cloud could arguably be considered naturally occurring or background concentrations. In addition, variations between data sets collected by individual laboratories can often be identified, and suspect or unrepresentative data excluded from consideration in the site-specific evaluation. Specific scatter plots referenced in the site descriptions are included in Appendix C.

As described in Section 4.5.3, the Trust met with stakeholders in a series of meetings in the spring of 2001. Through this series of meetings, verbal agreements were reached regarding which chemicals would be retained as COCs at individual sites. This section provides documentation of those verbal agreements. For sites where additional data was collected or where revised cleanup levels resulted in new COCs that were not included in the spring 2001 discussions, the same methodology for reviewing PCOCs and COCs was employed to be consistent with the screening process agreed upon with stakeholders.

6.1 MAIN POST

The Main Post planning area is the center of the Presidio community. The Main Post has the widest range of architectural styles within the Presidio, including unique or individual structures like the chapel, noncommissioned officers' club, barracks, and officers' housing. The Main Post serves as the primary visitor center and many of the buildings are leased to non-profit organizations and commercial companies. No landfills are situated in the Main Post planning area. Miscellaneous sites include the Building 215 Area, Sewer Lift Station No. 2, and the Former Building 609 Area.

6.1.1 Building 215 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 215 Area are discussed in Sections 6.1.1.1 through 6.1.1.3.

6.1.1.1 Building 215 Area Use History

Building 215 has most recently been used to house a bank automatic teller machine, but has also served as the Post Re-Enlistment Center and may have had other uses. According to historical records, the Army removed six buildings from the vicinity of Building 215 between 1973 and 1988. The area once occupied by these buildings is now a parking lot located to the north and east of Building 215. Building 215 is shown on Figure 6-2A. As presented in the Army's FS (Dames & Moore, 1997a), the site was once the location of a gas station and vehicle maintenance facility. Underground storage tanks ("USTs") associated with the site were removed in 1989. The Trust reviewed a quartermaster report dated 1940 that indicated two hydraulic lifts were present in the southern portion of the building and that an automobile paint room was appended to the northern end of the building in 1940. It is not certain that the quartermaster report building is the same as current Building 215.

Army files obtained by the Trust (Army, 1994) indicate that the Army collected soil samples from borings SSA and SSB prior to removal of the USTs. In February 1989, the Army removed two steel 3,500-gallon USTs. These were reportedly used to store leaded gasoline. Approximately 100 gallons of residual liquids from the tanks and 360 cubic yards of soil were also removed and disposed offsite. Four soil samples (NE, NW, SE, SW shown on Figure 6-2A) were collected from 8 feet below ground surface ("bgs") around the open excavation and analyzed for benzene, toluene, ethylbenzene, xylenes ("BTEX") and total petroleum hydrocarbons ("TPH") as gas and diesel. None of these compounds were detected above laboratory reporting limits. Approximately 360 cubic yards of backfill materials were imported to the site to fill the excavation. Land use at Building 215 Area is considered recreational (Table 5-1).

6.1.1.2 Building 215 Area Nature and Extent of Chemicals in Soil

According to records obtained by the Trust (Army, 1994), four soil samples were collected below the tanks after removal. Although BTEX was not detected in the soil samples, hydrocarbons resembling Stoddard Solvent were detected at concentrations ranging from 40 to 180 mg/kg in three of the four soil samples (Army, 1994).

As part of the RI, the Army collected ten soil samples at depths ranging from 5 to 41.5 feet bgs from five borings completed at the Building 215 Area (215SO01 through 215SO03, 215GW02, and 215GW03). Soil samples obtained from the borings were analyzed for volatile organic compounds ("VOCs"), SVOCs, and PCBs and pesticides. None of these chemicals were detected at concentrations greater than laboratory analytical method reporting limits. However, soil samples were not analyzed for metals or petroleum hydrocarbons, which are PCOCs likely to have been used or generated,

based upon the Building 215 Area use history. In addition, only one boring was located in the immediate proximity of the former tanks. Borings locations completed as monitoring wells include 215GW01, 215GW02, and 215GW03.

The lithologic log for the Army's soil boring 215SO02 indicates that gasoline odors were noted in soil removed from the boring at a depth of 15 feet bgs and that elevated readings were obtained with a photoionization detector ("PID") used to screen the soil at this depth. A PID is used to record emissions of volatile chemicals from soil. Elevated PID readings may indicate the presence of VOCs or volatile fractions of petroleum hydrocarbons in soil. However, the soil sample collected at 15.5 feet bgs was not analyzed for petroleum hydrocarbons. As indicated in Table 6-5, petroleum hydrocarbon compounds and related constituents are the identified PCOCs in soil.

In April 2001 during a routine maintenance activity, a Trust utility crew encountered odorous and visibly stained soil in a trench running north-south adjacent to Building 215. The utility trench was north and east of the area that was potentially impacted by the former tanks (Figure 6-2A). Impacted soil was not expected to be encountered in this area. The Trust collected samples 215-1 and 215-2 from the trench at the ends of the visible zone of impacted soil. Fuel oil was detected in one soil sample at a concentration of 8,900 mg/kg (above the recreational human health cleanup level of 4,500 mg/kg shown in Table 5-5). The Trust conducted additional characterization at the Building 215 Area in November 2001. The Trust collected and analyzed samples for selected metals, VOCs, SVOCs, and petroleum hydrocarbon compounds in the additional investigation. Based on the analytical results from the November 2001 sampling event, the soil at Building 215 does not appear to contain significant concentrations of PCOCs or COCs beyond the fuel oil identified by the Trust in April 2001.

Fuel oil has been identified as the COC in soil at the Building 215 Area (Table 6-6). Although previous samples collected at Building 215 Area did not contain elevated concentrations of petroleum hydrocarbon compounds, initial reports from soil samples collected in the trench in April 2001 indicate that petroleum hydrocarbons are present in the subsurface. Based on the November 2001 sampling event, the extent of the fuel oil detected in April 2001 appears to be extremely limited; therefore the Trust planned to remove residual hydrocarbons above applicable cleanup levels in and near the utility trench as part of the Petroleum Program. This work was performed in February 2003. No further action is recommended for soil at the Building 215 Area as part of the Presidio Trust Revised FS Report.

6.1.1.3 Building 215 Area Nature and Extent of Chemicals in Water

Estimated groundwater elevation contours at the Building 215 Area are presented on Figure 6-2B. One up gradient monitoring well (i.e., 215GW01) and two down gradient monitoring wells (i.e., 215GW02 and 215GW03) have been constructed to evaluate groundwater quality at the Building 215 Area. Groundwater samples from these wells have been analyzed for metals, cyanide, VOCs, SVOCs, petroleum hydrocarbons, and PCBs, pesticides, and herbicides. The list of PCOCs identified in groundwater samples

collected from the Building 215 Area is presented in Table 6-7. Although petroleum hydrocarbons have been detected in soil samples, groundwater sample data does not indicate that petroleum hydrocarbons have impacted groundwater at the Building 215 Area. Based on the relatively flat groundwater contours and approximate groundwater flow direction, it appears that any significant petroleum impacts to groundwater would have been detected in down gradient monitoring wells.

All the Building 215 Area groundwater monitoring wells are screened entirely within the Colma Formation. Applicable cleanup levels for groundwater from these wells are drinking water MCLs and freshwater and marine surface water quality criteria (Table 5-6). Surface water cleanup levels are applicable because of the site's proximity to the Crissy Field wetlands and the proposed Tennessee Hollow riparian corridor. Only chromium and benzene are identified as a chemicals of concern in groundwater at the Building 215 Area based on chemical screening (Table 6-8). Groundwater samples collected from the three wells contain dissolved chromium and dissolved hexavalent chromium at concentrations ranging from 17 to 31.8 µg/L, which are above the freshwater cleanup level of 11 µg/L. Chromium concentrations in groundwater samples collected from up gradient well 215GW01 do not differ from chromium concentrations detected in groundwater samples collected from the down gradient wells. Based on the tank contents and historic use of Building 215 Area, chromium is not likely to have been released to the environment. Further, as discussed in the Presidio-wide Cleanup Level Document (EKI, 2002d), chromium occurs naturally in groundwater throughout the upland areas of the Presidio. Chromium concentrations detected in groundwater samples obtained from wells screened in serpentinite are higher than concentrations measured in groundwater at the Building 215 Area (see Figure D-1 in Appendix D). It is believed that chromium in groundwater at the Building 215 Area is naturally occurring and originates from the flow of groundwater containing hexavalent chromium from upland areas of the Presidio. Therefore, chromium is not retained as a COC in groundwater at Building 215.

Benzene was detected for the first time at a concentration of 2.4 µg/L in groundwater collected from well 215GW02 in the March 2002 monitoring event. Benzene was not detected in groundwater collected in the seven prior sampling rounds from this well or in the other Building 215 wells. Although impacts, if real, do not appear to be significant, benzene is retained as a COC in groundwater at the Building 215 Area. All Building 215 wells are recommended to be monitored for benzene.

6.1.2 Sewer Lift Station No. 2

The use history and the nature and extent of chemicals in soil and groundwater at Sewer Lift Station No. 2 are discussed in Sections 6.1.2.1 through 6.1.2.3.

6.1.2.1 Sewer Lift Station No. 2 Use History

Sewer Lift Station No. 2 is located in an asphalt-paved area approximately 50 feet south of an elevated section of Highway 101, which is also known as Doyle Drive. Sewer Lift Station No. 2 is shown on Figure 6-3. Sewer lift stations pump sewage to the sewage

treatment plant. The capacity of the lift station may be exceeded and overflow during power outages, high flow periods, or other circumstances. The Army investigated Sewer Lift Station No. 2 in the RI to assess if overflows that occurred during severe storm events resulted in the release of PCOCs to soil and groundwater. Land use at Sewer Lift Station No. 2 is considered recreational (Table 5-1).

6.1.2.2 Sewer Lift Station No. 2 Nature and Extent of Chemicals in Soil

Two surface soil samples CFLSSB03 and CFLSSB04 collected from borings located near Sewer Lift Station No. 2 were analyzed for metals, VOCs, and petroleum hydrocarbons. PCOCs detected in soil samples collected at Sewer Lift Station No. 2 are listed in Table 6-9. Metals are the only identified PCOCs in soil at the site. Arsenic, beryllium, copper, lead, selenium, and zinc were detected above their respective background screening level concentrations of 3.9 mg/kg, 0.46 mg/kg, 24 mg/kg, 5.2 mg/kg, 0.5 mg/kg, and 43 mg/kg for Colma lithology (Table 4-1). Bivariate scatter plots of the soil sample data indicate that the majority of the data is within the range of concentrations to be expected for Colma lithology, with the exception of copper, lead, and selenium, which were detected above the expected range for Colma soils. However, the concentrations of these chemicals detected in soil samples were below the human health recreational cleanup levels established for these chemicals (Table 5-2). The chemical concentrations in soil at Sewer Lift Station No. 2 are also less than residential cleanup levels. No COCs are retained for soil at this site (Table 6-10) and no further action is recommended for soil.

6.1.2.3 Sewer Lift Station No. 2 Nature and Extent of Chemicals in Water

An unfiltered grab groundwater sample was collected from boring CFLSSB03 and analyzed for metals and petroleum hydrocarbons. PCOCs detected in the groundwater sample from Sewer Lift Station No. 2 are summarized in Table 6-11. Applicable cleanup levels for groundwater from these wells are water quality criteria for drinking water and marine surface water associated with the Crissy Field wetlands (Table 5-6). As summarized in Table 6-12, nickel is the only chemical detected above cleanup levels in the water sample from Sewer Lift Station No. 2. The detected nickel concentration in the grab groundwater sample from CFLSSB03 was 7.56 μg/L, which is slightly greater than the marine water cleanup level of 7.1 μg/L. Nickel is believed to be associated with suspended solids entrained in the sample, rather than impacts from the lift station. On behalf of the Trust, Treadwell & Rollo recently installed monitoring well 600GW108 as part of the Commissary investigation. This well is located up gradient of the Commissary area and downgradient from the lift station (Figure 6-3). Treadwell & Rollo indicated that nickel was not detected in the groundwater sample from this well, although the laboratory reporting limit was 50 μg/L. Nickel is retained as a COC for water at this site. The Trust will collect and analyze an additional sample from this well to demonstrate that groundwater at Sewer Lift Station No. 2 does not contain nickel.

6.1.3 Former Building 609 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Former Building 609 Area are discussed in Sections 6.1.3.1 through 6.1.3.3.

6.1.3.1 Former Building 609 Area Use History

The Former Building 609 Area is shown on Figure 6-4. The Army investigated this site in the RI because of pesticides that spilled during 1980 inside Building 609, which formerly was the commissary at the Presidio. The PA (Argonne National Laboratory, 1989) states "…that the spill involved a small amount of household pesticides which fell off a shelf." Although the spill was cleaned up, no reports documenting the cleanup appear to be available (Argonne National Laboratory, 1989). Building 609 was demolished in 1987 and replaced with Building 610, which contains the present-day commissary. Land use at Former Building 609 Area is considered recreational and buffer zone ecological (Table 5-1).

Mr. Mark Youngkin, a community member of the RAB, conducted research into the historic uses of the Former Building 609 Area. Mr. Youngkin provided the finding of his research in a letter to the Army, dated 2 May 1996. From review of historic maps and other documentation, Mr. Youngkin found that a gasoline tank car unloading station and motor pool existed in the Former Building 609 Area from at least the 1920s to 1975. The Army subsequently confirmed Mr. Youngkin's findings in its additional review of historic records (IT Corporation, 1999d). Both Mr. Youngkin's letter and the Army's report recommended that the former tank car unloading station and motor pool be investigated for releases of petroleum hydrocarbons. The Trust is investigating the former tank car unloading station and motor pool under its Petroleum Program because gasoline and other petroleum hydrocarbon products are suspected to be the predominant chemicals stored and handled at these former facilities (Treadwell & Rollo, 2002a).

6.1.3.2 Former Building 609 Area Nature and Extent of Chemicals in Soil

The Army collected soil samples at three locations along the northeast corner of the current commissary in Building 610 instead of within the footprint of former Building 609 as intended. Low levels of pesticides were detected in soil (Table 6-13), but they are below applicable recreational and ecological cleanup levels (Table 5-2) and thus are not considered COCs (Table 6-14). The low levels of pesticides detected in soil are likely due to historical legal application of these chemicals by the Army. Historic records show that Building 610 is not situated at the same location as former Building 609. Former Building 609 was located approximately 60 feet east of the northeast corner of Building 610 (Figure 6-4).

In July 2002, as part of the Trust's investigation of the Commissary/Post Exchange ("PX") under the Petroleum Program, the Trust collected six soil samples from a depth of approximately 2 feet bgs in the area around Former Building 609 and Building 610, and analyzed the samples for pesticides. Samples were collected at the depth of 2 feet to

assess the potential impact to native material, rather than baserock beneath the former building or under the pavement of the parking lot. Three soil samples were collected within the footprint of Former Building 609, and three soil samples were collected near the Army's surface soil sample locations near Building 610. Chlordane was detected in one soil sample at a concentration of 0.006 mg/kg, which is below the ecological cleanup level of 0.04 mg/kg (Table 5-2). No other pesticides were detected in the other soil samples and a duplicate.

Based on the additional testing by the Trust, there is no evidence of a release of pesticides to the environment in the Former Building 609 Area. The chemical concentrations in soil at Former Building 609 are also less than residential cleanup levels. No COCs are retained for soil at this site (Table 6-10) and no further action is recommended for soil.

6.1.3.3 Former Building 609 Area Nature and Extent of Chemicals in Water

It is believed that the pesticide release was entirely contained within Former Building 609 and there is no evidence that pesticides have impacted soil or groundwater in the area. No further action is proposed for groundwater at the Former Building 609 Area.

6.2 FORT SCOTT

Fort Scott was established to maintain the coastal and harbor defenses of the Golden Gate. The GMPA contemplates preserving and interpreting to the public the area's historic batteries, associated earthworks, and ancillary structures. Remnant native vegetation, including rare plants and serpentine habitat, will be protected and enhanced. The GMPA envisions that existing barracks, single family housing, offices, and warehouses will be used as research institutes, classrooms, workshops, accommodations, and cafeterias. The PTMP (Trust, 2002) echoes this land use, stating that Fort Scott is suited for "education, conferences, and applied research with supporting housing, lodging, and offices." The Fort Scott planning area, within Area B, contains the Battery Howe/Wagner landfill. Miscellaneous sites include the Building 1244 Area, Building 1245 Area, Building 1351 Area, Building 1369 Area, and the Building 1388 Area.

6.2.1 Battery Howe/Wagner

The use history and the nature and extent of chemicals in soil, groundwater, and soil gas at Battery Howe/Wagner are discussed in Sections 6.2.1.1 through 6.2.1.4.

6.2.1.1 Battery Howe/Wagner Use History

Battery Howe/Wagner is a coastal fortification that was used as early as 1893. This structure has since been covered by soil. Serpentinite bedrock was excavated before 1940 to create a cul-de-sac and to allow construction of buildings next to Battery Howe/Wagner, as shown on Figure 6-5A. The buildings were subsequently demolished

and the cul-de-sac has been filled with soil. Debris from demolition of the buildings is present in the soil. It is estimated that 16,000 cubic yards of fill has been placed in the cul-de-sac, which is referred to as Battery Howe/Wagner for purposes of the Presidio Trust Revised FS Report. The Trust conducted trenching at Battery Howe/Wagner in April 2001 to evaluate the nature and extent of fill around the battery (Figures 6-5A and 6-5B). Based on the results of that investigation, the top three feet of soil appear to be free of debris. The volume of fill believed to contain soil and debris (i.e., the volume of soil and debris underlying the three feet of clean fill) is estimated at 7,900 cubic yards.

Land use at Battery Howe/Wagner is considered residential and ecological with special status species potentially present (Table 5-1).

Analytical data from groundwater monitoring wells installed by the Army at Battery Howe/Wagner indicate that low concentrations of carbon tetrachloride ("CT") and other VOCs are present in groundwater near the battery. In July 2000, the Trust constructed and sampled three monitoring wells to evaluate if historic releases of carbon tetrachloride or other VOCs occurred at Building 1233 or elsewhere in the up gradient groundwater flow direction of Battery Howe/Wagner. Groundwater samples collected from these monitoring wells were also analyzed for hexavalent chromium to further assess if hexavalent chromium detected in groundwater at Battery Howe/Wagner is due to naturally occurring serpentinite, as indicated by studies conducted by the Army. The findings of the investigations completed by the Trust are discussed below in Sections 6.2.1.2, 6.2.1.3, and 6.2.1.4 as part of the chemical screening evaluation.

The Trust conducted additional historical records review and passive soil gas sampling to determine if there was a known or potential source of CT or other VOCs up gradient and in the vicinity of Battery Howe/Wagner. Based on available groundwater data, the source appears to be up gradient of the battery. The Trust conducted a historic records review of documents maintained by the NPS at the Park Archives and Records Center, Golden Gate National Recreation Area ("NPS Archives") to identify potential up gradient areas where carbon tetrachloride may have been used (EKI, 2002f).

Carbon tetrachloride is a solvent that was previously stored within Building 1233 as documented in the report summarizing the Army's additional review of historic records (IT Corporation, 1999d). The Trust's review of the NPS Archives for Building 1233 identified two Army work orders, dated February 1986 and August 1987, requesting contractor services to clean up after two separate spill incidents at Building 1233 (EKI, 2002f). Building 1233 is located west of Battery Howe/Wagner (Figure 6-5B) in the presumed up gradient direction of groundwater flow. The Army identified a 450-gallon underground storage tank at Building 1233 (Montgomery Watson, 1995b). This tank was subsequently removed, and soil beneath the tank containing petroleum hydrocarbons and PAHs was excavated until residual concentrations of these PCOCs were less than applicable cleanup levels (IT Corporation, 1998a). No further action is required for this tank and the Trust is pursuing formal closure of the matter under its Petroleum Program.

The buildings in the vicinity of Battery Howe/Wagner were categorized into three main classifications based on their historic use. Identified former barracks and offices are considered unlikely locations for chemical use or storage; former general storage areas are considered possible locations for chemical use or storage; and former maintenance and chemical/paint storage areas are considered likely locations for chemical use or storage. The actual buildings within each of these categories and their historic use are listed below.

- Former Barracks, Offices, and Residences:
  1) Building 1214: Former barracks
  2) Building 1216: Former barracks, offices
  3) Building 1240: Residence

- Former General Storage Areas (or other uses):
  1) Building 1211: Fire siren
  2) Building 1213: Former guardhouse or stockade
  3) Building 1226: Former post exchange & gymnasium
  4) Building 1230: Former warehouse, general supply storage
  5) Building 1239: Former provost marshal office

- Former Maintenance Shop and Chemical Storage Activities:
  1) Building 1227: Former plumbing and paint shop, self-help store
  2) Building 1228: Former garage or generator
  3) Building 1229: Former motor vehicle maintenance
  4) Building 1230: Former warehouse, general supply storage
  5) Building 1231: Former blacksmith shop
  6) Building 1233: Former paint store house
  7) Building 1235: Former printing plant, carpentry shop, and machine shop
  8) Building 1237: Former post office (possibly tailor shop and dry cleaning)
  9) Former gas station (location and existence uncertain)

In addition, Former Building 1283 appears to have been located within the current fill area south of Battery Howe/Wagner, as shown on Figure 6-5A. A quartermaster report identifies the former use as a motor repair shop. Based on the building location, the groundwater flow direction, and available CT data in groundwater, Former Building 1283 is not considered a likely source area. However, this area was included in the soil gas investigation.

As discussed above, at least two chemical spills occurred at Building 1233; one of these spills reportedly included CT. Documentation in the NPS Archives indicates that work orders were requested by the Army to perform clean up after spills in 1986 and 1987. Soil gas sampling activities were concentrated in this area (see Section 6.2.1.4).

Other chemical spills or actual use of CT at any of the other buildings reviewed is not known.

6.2.1.2 Battery Howe/Wagner Nature and Extent of Chemicals in Soil

Field observations and review of soil and groundwater analytical results obtained during the investigations by the Trust and previous sampling efforts by the Army indicate that the fill at Battery Howe/Wagner consists of soil and relatively minor amounts of non-decomposable debris in most areas. As discussed further in Section 7, under Title 27 of the California Code of Regulations, an inert waste is defined as follows:

> Inert waste does not contain hazardous waste or soluble pollutants in excess of applicable water quality objectives and does not contain significant quantities of decomposable waste.

Field observations during drilling and trenching indicated the presence of debris fill. According to the RI, the debris fill "contains building material, which includes concrete, brick, wood, wire, glass, porcelain, and metal straps in a matrix of mainly clay and silt" (Dames & Moore, 1997b). Field observations of trenching by the Trust in April 2001 indicated the debris included concrete, wood, brick, asphalt, plywood, steel pipes and rods, and sheet metal at various depths, compositions, and percentages (EKI, 2001b). In one of the trenches (HWTP102), significant quantities of wood debris were observed at a depth of approximately 9 feet bgs. The wood fill extended below the bottom of the trench (12 feet bgs). Wood debris is considered decomposable. Therefore, the fill at Battery Howe/Wagner cannot be considered inert in the area of the site near test pit HWTP102 with extensive wood debris.

The Army collected fifteen soil samples at depths ranging from 0.2 to 28 feet bgs from five borings (i.e., HWSB01 through HWSB05) as part of the RI. These samples were analyzed for metals, VOCs, SVOCs, petroleum hydrocarbons, and pesticides and herbicides. The Army collected twenty-two additional soil samples at depths ranging from 0.5 to 14.5 feet bgs from eight soil borings (i.e., HWSB06 through HWSB13) and analyzed these samples for antimony. The Trust collected soil samples from five trenches at depths of approximately 3 feet bgs and 10 to 12 feet bgs; the samples were analyzed for metals and VOCs. Data from all sampling events to date are presented in tables in Appendix B. Concentrations and frequency of detection for PCOCs in soil are summarized in Table 6-17.

Many metals were detected in soil samples at concentrations above background screening levels. For Battery Howe/Wagner the predominant lithologies are Colma and serpentinite, and screening for PCOCs used the most stringent screening level. Thus nickel, which was detected at a maximum concentration of 2,310 mg/kg, was retained as a PCOC since the Colma screening value for nickel is 83 mg/kg. However, the maximum value is below the serpentinite screening level of 3,100 mg/kg.

The combination of Colma and serpentinite is evident in the bivariate scatter plots. Selected scatter plots are included in Appendix C. The major element (e.g., iron, aluminum, manganese, and magnesium) plots indicate that the spread of Battery Howe/Wagner data is in the expected ranges of Colma and serpentinite soils. The

chromium, cobalt, and nickel plots show distinct groupings of Colma and serpentinite soils. In addition, samples analyzed by the Environmental Science and Engineering laboratory in Englewood, Colorado (identified as BHW-ED on Figure C-1 in Appendix C) did not always fit the expected distribution of data. Much of the data from this laboratory is considered spurious based on the scatter plots and review of site-wide data.

The PCOCs were screened against residential and ecological special status cleanup levels (Tables 5-2 and 5-5). The COCs in soil are listed in Table 6-18. Locations and depths where these chemicals were detected in soil samples and their applicable cleanup levels are posted on Figure 6-5A. Specific locations where a sample exceeded the cleanup level are marked with an "X". Color coding of the sample location is used to identify areas where COCs are retained.

In a meeting with the Trust, NPS, DTSC, and community members of the RAB, the stakeholders reviewed the PCOCs and COCs identified in soil at Battery Howe/Wagner. Based on the evaluation of the PCOC tables, site data tables, and scatter plots, the COCs agreed upon in the soil at Battery Howe/Wagner were as follows: arsenic, lead, selenium, and zinc. Mercury is also above applicable cleanup levels and is retained as a COC. Cadmium is also retained as a COC because it was detected at levels above background in samples from test pit HWTP102. Cadmium, silver, and cobalt detected in soil samples analyzed by Environmental Science and Engineering Laboratory were not retained as COCs, as these data appear to be spurious laboratory artifacts (see Figure C-1 in Appendix C).

Based on a review of historic topographical maps and the trenching conducted by the Trust in April 2001, the area of potentially impacted soil has been revised from the Alternate Remedial Actions report (EKI, 1998b) to that shown on Figure 6-5B. The revision of the anticipated areal extent of debris fill on the eastern portion of the site is based upon the fact that the Trust encountered intact asphalt paving in this area, and historic maps show a road in this same area. Based on the dates of the maps, it appears that filling activities at Battery Howe/Wagner occurred after this road to the cul-de-sac was constructed. No debris was observed in the fill overlying the road. In addition, evidence of this former road is also identified in the logs from borings HWSB17 and HWGW01 installed by the Army (Dames & Moore, 1997b). Thus, debris fill is not anticipated to be encountered in the eastern part of the site, as shown on Figure 6-5B.

On the western portion of the site, west of the estimated location of the former cul-de-sac, review of trench and boring logs indicate that the extent of debris fill is greater than previously estimated. The revised area is shown on Figure 6-5B. The revised fill area takes into account debris encountered within fill material to depths of 7 feet bgs in trench HWTP100 and borings HWGW03 and HWGW101. Boring and trench logs across the fill area indicate that the top thee feet of fill material do not appear to contain debris. The top layer of soil, estimated to be 8,100 cubic yards, could potentially remain in place and serve as a vegetative cover, or be removed, stockpiled, and replaced to allow excavation of the remaining estimated 7,900 cubic yards of debris-containing material.

6.2.1.3 Battery Howe/Wagner Nature and Extent of Chemicals in Water

Six groundwater monitoring wells are located in the vicinity of Battery Howe/Wagner. Applicable cleanup levels for groundwater from these wells are water quality criteria for drinking water and freshwater seeps (Table 5-6). Water samples were also collected from three seeps located downgradient of Battery Howe/Wagner. Applicable cleanup levels for these seeps are water quality criteria for freshwater seeps (Table 5-6). PCOCs identified in groundwater and seeps at Battery Howe/Wagner are listed in Table 6-19.

Chemicals detected above cleanup levels in groundwater collected from monitoring wells at Battery Howe/Wagner are dissolved chromium, hexavalent chromium, carbon tetrachloride, copper, and selenium (Table 6-20). Only carbon tetrachloride, copper, and selenium are retained as COCs in groundwater at Battery Howe Wagner.

Dissolved hexavalent chromium and dissolved chromium have been detected at concentrations up to 137 µg/L and 146 µg/L, respectively, in groundwater samples collected from monitoring well HWGW01 (Appendix B). Hexavalent chromium concentrations are typically 110 to 140 µg/L in well HWGW01. These concentrations are some of the highest chromium concentrations detected in groundwater samples from the Presidio. However, these high concentrations are localized to one well at Battery Howe/Wagner; while other water samples from the Battery Howe/Wagner area (i.e., up gradient of this well) are not as high. Based on the site use history at the battery, there is no reason to suspect historical use of hexavalent chromium at the site. Dissolved chromium and hexavalent chromium detected in groundwater at Battery Howe/Wagner likely derives from serpentinite at the site. As discussed in the Presidio-wide Cleanup Level Document (EKI, 2002d), the findings of investigations and studies conducted by the Army clearly indicate that hexavalent chromium (and dissolved chromium) is naturally occurring in groundwater at the Presidio (Montgomery Watson, 1999c). DTSC agreed that hexavalent chromium is naturally occurring in areas where groundwater contacts serpentinite (DTSC, 2000c). Figure D-1 in Appendix D summarizes chromium concentrations detected from water samples throughout the Presidio. Chromium concentrations may be the highest in groundwater at Battery Howe/Wagner because the construction of the cul-de-sac and the battery into the serpentinite bedrock may have created fresh, unweathered surfaces. Chromium in these fresh surfaces may be more susceptible to oxidation than in undisturbed serpentinite. Thus, hexavalent chromium and dissolved chromium are not considered COCs in water at Battery Howe/Wagner.

Carbon tetrachloride was detected in groundwater samples collected from monitoring wells HWGW01 and HWGW101 at concentrations ranging from 0.60 to 2.7 µg/L, which are greater than the human health cleanup level of 0.5 µg/L, respectively. Dissolved selenium was detected in groundwater collected from monitoring wells HWGW01, HWGW04, and HWGW05 at a maximum concentration of 21 µg/L, which is above the freshwater seep cleanup level of 5 µg/L. Dissolved copper was detected above cleanup levels in groundwater collected from monitoring well HWGW01 at concentrations ranging from 1.48 to 21.2 µg/L. The freshwater seep cleanup level for copper is

11.8 µg/L. These chemicals were not detected at concentrations above their cleanup levels in the water samples from the other Battery Howe Wagner monitoring wells or the seep samples (HWSW100, BHWSP01 and BHWSP02).

The highest concentrations (2.7 µg/L) of carbon tetrachloride were detected in groundwater samples collected from up gradient monitoring well HWGW101. Carbon tetrachloride was also consistently detected in well HWGW01, located downgradient of Battery Howe Wagner. These results suggest that the carbon tetrachloride is not associated with the fill at Battery Howe/Wagner. In addition to the records review described above in Section 6.2.1.1, the Trust conducted a passive soil gas survey investigation (see Section 6.2.1.4) to evaluate potential sources areas that are in the up gradient direction of groundwater flow, and that may have used carbon tetrachloride which resulted in the observed low-level impact to groundwater.

The low selenium and copper concentrations detected in Battery Howe/Wagner groundwater and surface water are likely natural background concentrations, as described in the Presidio-wide Cleanup Level Document (EKI, 2002d). However, this finding cannot be confirmed based upon available data. Additional monitoring is recommended up gradient of the site to allow comparison of up gradient metals concentrations in groundwater to metals concentrations at the site. All Battery Howe/Wagner wells and the downgradient seeps are recommended to be monitored for all identified COCs in water.

6.2.1.4 Battery Howe/Wagner Passive Soil Gas Survey for VOCs

The Trust conducted a passive soil gas survey in October 2001 to investigate the potential source(s) of CT and other VOCs detected in groundwater samples collected from monitoring wells near Battery Howe/Wagner. GORE-SORBER® module samples were collected at fifty locations in the vicinity of Battery Howe Wagner, including potential up gradient source areas identified from the records review. The soil gas sampling locations are depicted on Figure 6-5A. The samples were submitted to the Gore analytical laboratory for analysis for VOCs. The data were reported in January 2002 (EKI, 2002f).

CT was the primary focus of the passive soil gas investigation. Chloroform and tetrachloroethene ("PCE") were the most commonly detected VOCs in the GORE-SORBER® modules. Other VOCs detected include 1,1,1-trichloroethane, 1,1-dichloroethene, 1,1,2,2-tetrachloroethane, and carbon disulfide.

All reported concentrations of VOCs were very near the method detection limits. Based on a review of the analytical results, none of the concentrations reported are considered to represent potential source soils or areas of elevated concentrations in groundwater. The following summarizes the data collected:

- Chloroform was detected sporadically on the southern and northern edges of the area up gradient of Battery Howe/Wagner.

- CT was not detected in any of the samples.

- PCE was detected within the area of fill along the southern portion of Battery Howe/Wagner and at the far northern portion of the up gradient area.

The following conclusions can be drawn regarding the distribution of VOCs in soil gas at Battery Howe/Wagner:

- There are no elevated soil gas concentrations that are indicative of a source in either soil or groundwater.

- There are no contiguous areas of low soil gas concentrations of CT or other VOCs would indicate that there is a source in soil or a plume in groundwater.

- The soil gas data are consistent with the soil data collected at Battery Howe/Wagner; namely, that there are no identified areas of elevated concentrations of VOCs in soils.

- The soil gas data are consistent with the groundwater data collected at Battery Howe/Wagner; namely, that there are no groundwater VOC "plumes". The monitoring well data indicate only isolated areas of extremely low concentrations that are apparently residuals of minor releases that occurred many years ago.

The results of the passive soil gas survey demonstrate that either no significant releases of VOCs have occurred near Battery Howe/Wagner or that a prior removal action, such as that for the UST at Building 1233, may have removed a co-located source of CT or other VOCs. The fact that a significant source of CT or other VOC was not identified is consistent with the findings that the concentrations of CT and other VOCs in groundwater are very low (i.e., the original release may have been very small). Taken together, it is apparent that no distinct point source is present in the vicinity of Battery Howe/Wagner, including up gradient areas, and that the low concentrations of VOCs found in groundwater do not represent a threat to human health or the environment. However, the Trust does recognize that the low concentrations of CT in groundwater have been present above Presidio-specific cleanup levels and CT is retained as a COC in groundwater at Battery Howe/Wagner.

6.2.2 Building 1244 Area

The use history and the nature and extent of chemicals in soil and groundwater at Building 1244 Area are discussed in Sections 6.2.2.1 through 6.2.2.3.

6.2.2.1 Building 1244 Area Use History

The location of the Building 1244 Area is shown on Figure 6-6A. The Army stated in the RI (Dames & Moore, 1997b) that lithographic printing and film processing occurred in Building 1244, and that these activities generated silver waste solutions. The Trust conducted a historic records review (EKI, 2002e) that confirmed information reported by

Mr. Mark Youngkin (1996b), a community member of the RAB, which indicates that Building 1244 also served as a printing plant. The plant used graining machines equipped with sand traps in floor trenches. Former uses of Building 1244 include a motor vehicle repair shop and diesel engine classroom that was equipped with engine sumps and floor trenches. The Trust's review identified two sumps in the area of the diesel engine classroom. The record reviews indicated that Building 1244 contained a chemical storage room (designed for storage of "toxics and inflammables") and a chemical laboratory. A site walk in May 2001 indicated that many of the floor trenches are filled with concrete, and portions of the concrete floor and the sink in one of the photo developing rooms at the south end of the building show signs of significant deterioration. No evidence of the other sand traps described above was observed during the walk-through.

During concrete coring of the floor as part of the Trust's November 2001 investigation, a ½-inch diameter steel pipe was intersected within the floor slab, two to three inches below the floor surface, at three locations (locations 1244SB108 and 1244SB111) and the concrete core cut from a location approximately five feet east of the gravel filled trench (Figure 6-6A). The pipe appeared clean, dry, and empty (no staining or odors); no special repair of the pipe was requested by the Trust and no outstanding issues are anticipated regarding this matter. Soil samples were collected underneath the areas where the pipe was encountered (see Section 6.2.2.2).

Land use at the Building 1244 Area is considered residential and buffer zone ecological (Table 5-1).

6.2.2.2 Building 1244 Area Nature and Extent of Chemicals in Soil

Five soil samples were collected by the Army at depths ranging from 1.5 to 6 feet bgs from borings 1244SB01 and 1244SB02 below a gravel-filled trench inside the building. Boring 1244SB03 (Figure 6-6A) was also completed inside the building for geotechnical purposes, but apparently no soil samples were collected from this boring. Soil samples from borings 1244SB01 and 1244SB02 were analyzed for lead, VOCs, SVOCs, and petroleum hydrocarbons. No VOCs, SVOCs, or petroleum hydrocarbons were detected.

In November 2001, the Trust collected 19 additional soil samples from locations in and around Building 1244. These samples were analyzed for metals, PAHs, VOCs, and petroleum hydrocarbons. None of the chemical concentrations from soil samples collected in the November 2001 sampling event at Building 1244 exceed applicable residential or buffer-zone ecological cleanup levels. With the exception of lead at one trench location sampled by the Army, the soil at Building 1244 does not appear to have elevated concentrations of PCOCs. PCOCs in soil are summarized in Table 6-21.

Lead in soil is the only COC identified for the Building 1244 Area (Table 6-22). The maximum lead concentration detected in soil was 350 mg/kg, which is slightly greater than the applicable ecological cleanup level of 300 mg/kg (Table 5-2). The lead has only

been detected above cleanup levels in a gravel filled trench, where it appears to be a single isolated event, and the sample location is currently covered with concrete.

Based on the results of the November 2001 sampling event, and the fact that the only COC is the lead from the gravel filled trench, a limited removal action is proposed for this site (Figure 6-6B). The Trust anticipates a minor level of effort will be required to remove the gravel and lead impacted soil and repair the floor. This removal action will be coordinated with the Trust's tenant at Building 1244. Once this limited removal action is completed, no further action for soil is recommended. For purposes of evaluating remedial alternatives in this FS, it is assumed that 5 cubic yards of impacted soil exists in the Building 1244 Area, which is the area identified on Figure 6-6B.

6.2.2.3 Building 1244 Area Nature and Extent of Chemicals in Water

It is unlikely that groundwater has been impacted at the Building 1244 Area as lead is the only COC identified as released at the site. Metals bind tightly to soil and are not prone to leach into water. During the November 2001 sampling event, the Trust attempted to collect a grab groundwater sample. Groundwater was not encountered. Due to the nature of the soil COC (i.e., lead typically is not mobile in the environment), the threat to groundwater is considered unlikely. For purposes of evaluating remedial alternatives in this FS, based on the available data, groundwater does not appear to be impacted at this site. No further action for groundwater at the Building 1244 Area is recommended.

6.2.3 Building 1245 Area

The use history and the nature and extent of chemicals in soil and groundwater at Building 1245 Area are discussed in Sections 6.2.3.1 through 6.2.3.3.

6.2.3.1 Building 1245 Area Use History

The location of Building 1245 is shown on Figure 6-6A. Building 1245 was formerly used for the storage of flammable materials. No records of the specific materials stored within Building 1245 seem to be available. The Army indicated in the RI that there were visible signs that releases inside the building took place (Dames & Moore, 1997b), and releases may have exited the east side of the building through two drain holes in the bottom of the wall near the concrete floor. Land use at Building 1245 Area is considered residential (Table 5-1).

6.2.3.2 Building 1245 Area Nature and Extent of Chemicals in Soil

The Army collected two soil samples outside along the eastern side of Building 1245 where the two drain holes are located. These soil samples were analyzed for SVOCs, pesticides, and herbicides. Concentrations of PAHs, measured in the analysis for SVOCs, and pesticides were less than applicable residential cleanup levels (Table 5-2). Soil samples were not analyzed for metals or VOCs (including flammable solvents such as acetone and methyl ethyl ketone ("MEK")), which may have been in chemicals stored

and handled at Building 1245. In November 2001, the Trust collected two additional soil samples. These samples were analyzed for metals, PAHs, VOCs, and petroleum hydrocarbons. None of the chemical concentrations in the November 2001 sampling event soil samples collected at Building 1244 exceed applicable residential cleanup levels. PCOCs in soil are summarized in Table 6-25.

No COCs have been identified in soil at the Building 1245 Area (Table 6-26). No further action is recommended for soil.

6.2.3.3 Building 1245 Area Nature and Extent of Chemicals in Water

No groundwater sampling has been conducted at the Building 1245 Area. The Trust attempted groundwater sampling in November 2001 to assess if PCOCs have impacted groundwater. VOCs, if present in soil, could potentially migrate to groundwater. During the Trust's November 2001 sampling event, groundwater was not encountered before drilling was refused by the serpentinite bedrock. No VOCs were detected in soil samples from the Building 1245 Area. Therefore, it is assumed that groundwater is not impacted at this site. No PCOCs or COCs have been identified in groundwater at the Building 1245 Area. No further action is recommended for groundwater at the Building 1245 Area.

6.2.4 Building 1351 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 1351 Area are discussed in Sections 6.2.4.1 through 6.2.4.3.

6.2.4.1 Building 1351 Area Use History

The location of Building 1351 is shown on Figure 6-7A. Building 1351 was used for vehicle maintenance. An area used for storing waste oil, two wash racks, and an underground oil/water separator were located to the north and east of Building 1351. A degreaser is located within the building, near the southern wall. The Army removed a hydraulic oil tank associated with a hydraulic lift (IT Corporation, 1998a). A second hydraulic lift is also present in the building. The hydraulic lifts are being closed under the Trust's Petroleum Program. Although not identified in the RI, a pad supporting three transformers was located northeast of Building 1351. The Army determined these transformers did not contain PCBs (Watkins-Johnson, 1993).

As shown on Figure 6-7A, two underground vaults on the southern side of Building 1351 were reportedly used for acid neutralization and oil/water separation. In 1998, NPS representatives discovered that these two vaults were filled with oily water and informed the Army of this observation (NPS, 1998). In response, the Army pumped out 750 gallons of oily water and removed 40 gallons of organic sludge from the vaults, and pressure washed the interiors of the vaults. Sludge from the vaults contained elevated concentrations of metals (IT Corporation, 1999f). The wastes were transported and disposed at off-site, permitted oil recycling or waste management facilities.

The Trust and Army inspected the vaults on 5 November 1998 after they had been cleaned. This inspection found the vaults had partially refilled with water containing petroleum hydrocarbons (Presidio Trust, 1998). The Trust observed that the sump (oil/water separator) on the northern side of Building 1351 also contained water with petroleum hydrocarbons that needed to be addressed.

Soil sampling by the Army focused on the east side of the site, and included metals, VOCs, SVOCs, and petroleum hydrocarbons. The Trust's historic record review (EKI, 2002e) located a June 1959 design drawing that indicates that groundwater was encountered immediately south of the planned Building 1351 location at three to four feet below ground surface. Another drawing within the same set indicated that the piping leaving the acid neutralization tank and sand and oil trap discharged to an open drainage ditch. The drawings indicated the wash rack drainage north of the building was plumbed to the sanitary sewer.

Land use at Building 1351 Area is considered recreational and buffer zone ecological (Table 5-1).

6.2.4.2 Building 1351 Area Nature and Extent of Chemicals in Soil

The Army investigated potential releases at the Building 1351 Area by collecting four surface soil samples and twelve subsurface soil samples from six borings. These soil samples were analyzed for metals, VOCs, SVOCs, and petroleum hydrocarbons. The Army collected additional soil samples that were tested for lead only.

As at Buildings 1244 and 1245, the Trust conducted an additional investigation in November 2001 (EKI, 2002e). The additional investigation focused on the area of the acid neutralization tank, the sand and oil trap and associated piping, the degreaser, and the wash racks. In addition, the drainage ditch southeast of Building 1351 was also identified and investigated.

In November 2001, the Trust collected 26 additional soil samples. Soil samples were analyzed for metals, VOCs, and petroleum hydrocarbons; some samples near the acid neutralization tank were also analyzed for pH; and samples near washracks were analyzed for PAHs. The metals zinc and cadmium were detected in one soil sample (boring 1351SB108) east of Building 1351 where the Army had previously identified metals. TPH diesel and motor oil were also detected in soil samples from 0.5 and 1.5 feet bgs near a drainage ditch that received discharge from drainage piping from the building (boring 1351SB105). TPH diesel and motor oil were not detected in a deeper sample (collected from 4 feet bgs) at this location, indicating that only the near surface soil appears to be impacted. The location of soil samples and the concentrations of COCs are shown on Figure 6-7A. The extent of impacted soil based on Army and Trust investigations is shown on Figure 6-7B.

The pH in soil samples near the former acid neutralization vault and associated piping ranged from 6.5 to 8.1. The pH of 6.5 is considered mildly acidic, indicating the potential for a release of chemicals. However, metals, which can be mobilized under acidic conditions, are not present at elevated levels in the area near the vault or associated piping. Groundwater was not encountered to the maximum boring depth of 16 feet bgs. The vault was full of liquid, and the soil logged around and below of the bottom of the vault was dry, indicating that there is no evidence of leakage of liquids from the vault to the environment.

PCOCs in soil are summarized in Table 6-29. According to Table 5-1, the predominant lithology at the Building 1351 Area is beach/dune sand. However, the bivariate scatter plots clearly indicate the presence of serpentinite in some of the deeper soil samples (Figure C-2 in Appendix C). While several metals were detected above their respective screening levels for beach/dune sand, the distribution of concentrations as illustrated by bivariate scatter plots indicate that most metals are naturally occurring. Metals and TPH were detected at concentrations greater than applicable recreational and buffer zone ecological cleanup levels (Tables 5-2 and 5-5). Based on the chromium, cobalt, and nickel pattern in the bivariate scatter plots, at least two of the Army samples fall within the expected distribution for serpentinite. This observation was confirmed with a review of the lithologic logs from samples 1351SO01B and 1351SO02B, which indicate that these samples were obtained from serpentinite bedrock at 17 and 15 feet bgs, respectively. Six of the soil samples from the Trust's November 2001 sampling event showed nickel above applicable cleanup levels. One soil sample from boring 1351SB102 also had chromium above cleanup levels. Scatter plots reveal a distribution of nickel in the range between beach/dune and serpentinite lithology. In addition, all four borings from which the samples were collected were logged as containing serpentinite. Based on the Trust's review of their data, the metals concentrations in these samples appear to represent a mixed serpentinite and beach/due soil (EKI, 2002b). The nickel concentration in sample 1351SO05A also reflects this mixed lithology. Therefore, for samples from borings logged as containing weathered serpentinite or serpentinite bedrock, chromium, cobalt, and nickel are considered naturally occurring, and are not considered indicative of chemical releases or retained as COCs.

Zinc was detected above applicable cleanup levels in several soil samples and is retained as a COC at the site (see Figure 6-7A). However, in two soil samples, 1351SB108 at 1.5 feet bgs and 1351SB111 at 4 feet bgs, scatter plots indicate the concentration of zinc is along the edges of the expected range of background beach/dune, shale, and Colma lithologies (EKI, 2002b).

As shown in Table 6-30, the highest metal concentrations detected for retained COCs are cadmium at 17.6 mg/kg, copper at 207 mg/kg, lead at 473 mg/kg, and zinc at 499 mg/kg. For the organic compounds, the highest concentrations detected for retained COCs are TPH diesel at 2,000 mg/kg and TPH motor oil at 5,700 mg/kg.

For purposes of evaluating remedial alternatives in this FS, the volume of impacted soil is assumed to be 300 cubic yards. The assumed generalized areas of concern are shown on Figure 6-7B.

6.2.4.3 Building 1351 Area Nature and Extent of Chemicals in Water

Available data indicate that releases of metals are confined to shallow soil. Groundwater impacts due to the release of metals is not anticipated at the Building 1351 Area. In November 2001, grab groundwater sampling was attempted, but no groundwater was encountered at depths up to 16 feet bgs. Field crews noted that water had collected in the acid neutralization vault. Although groundwater was not encountered at the site, the level of water in the vault was within one foot of the ground surface. Therefore, no leakage of the vault to the environment and specifically to groundwater appeared to be occurring in November 2001. Based on the available data, no impacts to groundwater have been identified or are anticipated. No further action for groundwater at the Building 1351 Area is recommended.

6.2.5 Building 1369 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 1369 Area are discussed in Sections 6.2.5.1 through 6.2.5.3.

6.2.5.1 Building 1369 Area Use History

The Building 1369 Area is shown on Figure 6-8. Building 1369 was used as an indoor firing range. Spent ammunition was collected in a pit filled with sand. The Army disposed of the sand in the pit that was contaminated by lead-containing ammunition and removed solid sheets of lead that served as the firing range backstop (Dames & Moore, 1997a). The site is also equipped with a trench that terminates into a small sump outside of Building 1369. It is believed that the sump collected wash water used to clean the interior of the building. Water would discharge to the ground through a pipe near the top of the sump in the event that the sump overflowed. Land use at the Building 1369 Area is considered recreational (Table 5-1).

6.2.5.2 Building 1369 Area Nature and Extent of Chemicals in Soil

The Army investigated the possibility of a chemical release from the sump by collecting three surface and three subsurface soil samples outside the building near the location where the pipe discharged to the ground and testing these samples for lead (Figure 6-8). Lead data are summarized in Table 6-33. The maximum lead concentration detected in soil was 365 mg/kg. Although this concentration exceeds background levels for lead, the detected concentrations are less than the applicable recreational cleanup level of 500 mg/kg (Table 5-2). The detected concentrations are also less than the maximum average and not-to-exceed residential cleanup levels of 370 and 400 mg/kg, respectively, for lead (Table 5-2, see Presidio-wide Cleanup Level Document for derivation of residential lead cleanup level (EKI, 2002d)).

As indicated in Table 6-34, lead is not retained as a COC. No further action is recommended for soil at the Building 1369 Area.

6.2.5.3 Building 1369 Area Nature and Extent of Chemical in Water

Impacts to groundwater at the Building 1369 Area are not expected given that lead concentrations in soil are less than applicable cleanup levels, and the fact that lead binds tightly to soil and is not prone to leach into water. No further action is recommended for groundwater at the Building 1369 Area.

6.2.6 Building 1388 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 1388 Area are discussed in Sections 6.2.6.1 through 6.2.6.3.

6.2.6.1 Building 1388 Area Use History

The Building 1388 Area is shown on Figure 6-9. Equipment and materials were stored by an Army contractor on the asphalt parking lot south of Building 1388 during the time that the RI was performed between 1990 through 1995. Two 500-gallon fuel aboveground storage tanks, several large maintenance vehicles and truck trailers, and eight 5-gallon plastic containers of hydraulic fluid were reportedly placed on the parking lot south of Building 1388. Stained asphalt was observed near the aboveground storage tanks. Land use at the Building 1388 Area is considered recreational (Table 5-1).

6.2.6.2 Building 1388 Area Nature and Extent of Chemicals in Soil

Staining near the locations of the aboveground storage tanks was investigated by collecting subsurface soil samples from six borings and analyzing collected soil samples for petroleum hydrocarbons (Figure 6-9). Of the eighteen soil samples analyzed, petroleum hydrocarbons were measured in only one shallow soil sample at 100 mg/kg. PCOCs in soil are summarized in Table 6-37. Cleanup levels for petroleum hydrocarbons as gasoline and petroleum hydrocarbons as diesel to protect recreational populations are 2,400 mg/kg and 3,200 mg/kg, respectively (Table 5-5). The petroleum hydrocarbon concentrations of less than 100 mg/kg are considerably less than either of these cleanup levels and are not indicative of significant impacts. Detected petroleum hydrocarbon concentrations are also less than residential cleanup levels (Table 5-5).

As indicated in Table 6-38, petroleum hydrocarbons are not retained as COCs. No further action is recommended for soil at the Building 1388 Area.

6.2.6.3 Building 1388 Area Nature and Extent of Chemicals in Water

Releases of petroleum hydrocarbons at the Building 1388 Area were minor and confined to shallow soil. No impacts to groundwater are expected. No further action is recommended for groundwater at the Building 1388 Area.

6.3 LETTERMAN COMPLEX

The Letterman Complex planning area contains approximately 50 structures, previously dominated by the Letterman Army Medical Center and the Letterman Army Institute of Research. The Letterman Medical Center was a nonhistoric building that was constructed in 1969. The hospital has been demolished to make room for construction of Lucasfilm's Letterman Digital Arts Center. The Letterman Complex planning area contains the Fill Site 6 landfill. Miscellaneous sites include the Building 1057 Area, Building 1151/1153 Area, and the Building 1167 Area.

6.3.1 Fill Site 6

The use history and the nature and extent of chemicals in soil and groundwater at Fill Site 6 are discussed in Sections 6.3.1.1 through 6.3.1.3. As shown on Figure 6-10A and indicated in Table 5-1, Fill Site 6 is subdivided into three areas based on the planned and existing land uses. As shown in the VMP, the Tennessee Hollow riparian corridor is proposed to pass through the southern and western portion of the area west of Girard Road. This portion of the site is located within the Freshwater Ecological Protection Zone (Figure 5-4) and is designated as residential and ecological special status land uses. The adjacent area surrounding the proposed riparian corridor, still west of Girard Road and part of the Freshwater Ecological Protection Zone, is designated as residential and buffer zone ecological land uses. Finally, the portion of Fill Site 6 east of Girard Road is designated as a human land use area, in particular residential land use.

6.3.1.1 Fill Site 6 Use History

The eastern portion of Fill Site 6 reportedly contains debris from demolition of the original Letterman Army Medical Center ("LAMC") in 1975. The Army estimated the volume of fill in the area between Buildings 1016 and 1047 to be 8,000 cubic yards in its FS. The Alternate Remedial Actions report noted that the volume of fill in this area is probably substantially less because the Army misinterpreted imported soil as fill that possibly contained debris during the RI. The Army subsequently revised its estimate of fill in this area to be 4,200 cubic yards (Montgomery Watson, 1999a). This revised volume estimate does not include fill that may have been placed elsewhere within the boundaries of Fill Site 6. As shown on Figure 6-10A, other structures in the vicinity of Fill Site 6 have been demolished and it is possible that debris exists in the locations of these former structures. Most of the Fill Site 6 Area is covered by improvements such as parking, buildings, and landscaping.

Based upon a review of historical aerial photographs (EPA, 1990c), the two westernmost buildings in the area west of Girard Road, bounded by Halleck Street, Lincoln Boulevard, and Building 1030 were demolished between 1963 and 1973. Grading in the building footprint is visible in the 1973 photo. In 1988, Buildings 1029 and 1030 appear to be under construction, and the buildings that formerly occupied these areas have been removed. Debris from these buildings may have been placed to the south, east of Building 222 (see Figure 6-10A), as suggested by the unnatural, mounded topography in the area. For the eastern side of the area, the aerial photographs indicate that the former Nurses' Quarters, Buildings 1020 through 1026, existed near Girard Street from before 1946 to sometime after 1988.

Field observations of visible rubble at the surface and fill encountered while drilling monitoring well LF6GW102 led the Trust to conduct an additional investigation of the footprint of the two westernmost former buildings in the area bounded by Girard Road, Halleck Street, Lincoln Boulevard, and Building 1030. In February 2001, the Trust dug five test pits in the western portion of Fill Site 6 to investigate the nature and extent of fill (Figure 6-10A). Fill encountered ranged from minor debris (1 to 10% by volume) to significant sand and concrete foundations and rubble (estimated 75% compacted concrete rubble). The results of field observations and chemical analysis of soil samples collected are discussed below in Section 6.3.1.2.

The Army analyzed four unfiltered grab groundwater samples for metals, trichloroethene and associated transformation products, and SVOCs from borings completed at Fill Site 6 during the RI. VOCs and SVOCs were not detected in the grab groundwater samples. The unfiltered grab groundwater samples contained several metals above potentially applicable cleanup levels. However, conclusions could not be reached whether Fill Site 6 is contributing metals to the subsurface because the unfiltered groundwater samples obtained by the Army are not considered representative. The metals may have been artifacts associated with testing suspended solids that became entrained in groundwater during sampling. In July 2000, the Trust constructed and properly sampled four monitoring wells to evaluate if dissolved metals or other PCOCs are in groundwater at Fill Site 6. The Trust has conducted regular groundwater monitoring at wells and piezometers in the Fill Site 6 area since May 2001.

6.3.1.2 Fill Site 6 Nature and Extent of Chemicals in Soil

The Army conducted an investigation of Fill Site 6 in the RI. Their investigation focused mainly on the parking lot east of Building 1028 and west of Buildings 1007, 1008, and 1009 at the location of the former LAMC (see Figure 6-10A). Figure 6-10A identifies areas of filling or suspected filling based on boring logs, trench logs, locations of historical buildings, and review of historical air photos. As noted above, most of the Fill Site 6 Area is covered by improvements such as parking, buildings, and landscaping.

The Trust installed four groundwater monitoring wells in July 2000. The locations of the monitoring wells (i.e., LF6GW100, LF6GW101, LF6GW102, LF6GW103) are shown on Figure 6-10A. No debris was observed in the soil from borings for monitoring wells

LF6GW101 or LF6GW102. Minor amounts of debris were observed in soil from borings for wells LF6GW100 and LF6GW103. Pieces of tar paper, estimated at less than 1 percent by volume, were logged in soil to a depth of approximately 3 feet bgs in the boring for well LF6GW100. Concrete, brick, and mortar fragments were observed at less than 5 percent by volume in the boring for well LF6GW103. The components of the fill are similar to those logged by the Army in the RI. The wells were screened over the first 10 feet of saturated thickness encountered in sandy material underlying Fill Site 6. Soil samples were not collected during the Trust's well installation.

In February 2001, the Trust excavated five test pits in the western portion of Fill Site 6 to investigate the nature and extent of fill. Test pits LF6TP100 and LF6TP101 were located in the area immediately west of Girard Road (Figure 6-10A). Significant sand and concrete rubble (estimated 75% compacted concrete rubble) were encountered in test pit LF6TP100. LF6TP101 was relocated due to the concrete encountered, most likely the foundation of a former building that remains in place. Significantly less debris (1 to 10% by volume) was encountered in the three other test pits (LF6TP103, LF6TP104, and LF6TP105) located in the mounded portion of Fill Site 6. Planned test pit LF6TP102 was not excavated due to extensive utilities in the proposed location.

In support of the Building 1065 Corrective Action Plan ("CAP"), the Trust conducted an investigation in the Building 1065 Area (MACTEC, 2003). The Building 1065 Area is within the Fill Site 6. The results of this investigation indicated the presence of COCs in soil (e.g., lead) that may not be associated with petroleum releases in the Building 1065 Area, but rather, may be associated with the fill. These data were collected recently and have not been incorporated into the Presidio Trust Revised FS Report.

Field observations and review of soil analytical results obtained during the investigation by the Trust and previous sampling efforts by the Army indicate that the debris fill at Fill Site 6 consists of soil and non-decomposable debris. As discussed further in Section 7.6.3.4.2, under Title 27 of the California Code of Regulations, an inert waste is defined as follows:

> Inert waste does not contain hazardous waste or soluble pollutants in excess of applicable water quality objectives and does not contain significant quantities of decomposable waste.

Field observations during drilling and trenching indicated the presence of debris fill, as mentioned above. According to the boring logs in the RI, bricks, concrete, mortar, sand, gravel, and a horseshoe were observed in the subsurface (Dames & Moore, 1997b). In the Trust's investigation in February 2001, the observed debris included concrete, brick, clay pipe, cast iron pipe, rebar, concrete with rebar, sand, and gravel (EKI, 2001c).

PCOCs detected in soil and debris placed at Fill Site 6 are listed in Table 6-41. Bivariate scatter plots of concentrations of major elements from site soil samples confirm a distribution expected for Colma lithology. Metals above background screening levels identified as PCOCs were largely within the distribution expected for Colma lithology.

Metals and PCB 1260 were the only PCOCs measured in soil at concentrations greater than applicable residential, ecological buffer zone, and/or ecological special status species cleanup levels presented in Table 5-2. These COCs are listed in Table 6-42. As mentioned in Section 6.3.1, Fill Site 6 has different ecological land uses along with residential uses; the land use is ecological special status within the Tennessee Hollow riparian corridor, and ecological buffer zone surrounding the Tennessee Hollow riparian corridor (within the freshwater ecological protection zone). For the area east of Girard Road, only residential land use is applicable. The applicable cleanup levels for COCs for each portion of the site are posted on Figure 6-10A.

Cadmium and zinc were detected above applicable cleanup levels in the ecological special status zone and the ecological buffer zone. However, based on review of the bivariate scatter plots of cadmium and zinc data, the stakeholders agreed that the distribution of these two metals is not distinguishable from background. Mercury, detected at 0.49 mg/kg in the ecological special status zone, which is slightly above its ecological special status cleanup level of 0.4 mg/kg, is retained as a COC.

As depicted on Figure 6-10A, PCB 1260 was detected above the applicable ecological cleanup level at three locations (LF6TP103, LF6TP104, and LF6TP105) at depths up to 13 feet bgs. The maximum detected PCB 1260 concentration is 1.4 mg/kg. The area of Fill Site 6 believed to contain PCBs and mercury above applicable cleanup levels is depicted on Figure 6-10B. The volume of impacted material is estimated at 33,000 cubic yards.

Field observations during the recent investigation by the Trust and previous sampling efforts by the Army indicate that the fill consists of soil with a range of relatively minor to significant amounts of non-decomposable debris. Analytical results of soil and groundwater (see below) samples combined with field observations (i.e., little to no decomposable material observed in the fill) indicate that the debris fill at Fill Site 6 outside of the area with PCBs and mercury above cleanup levels and outside the Building 1065 Area appear to meet the statutory definition of an inert waste.

Due to the newly available data in the Building 1065 Area, the evaluation of alternatives for Fill Site 6 in Section 10.3.1 only addresses the portion of Fill Site 6 with PCBs and mercury above cleanup levels (i.e., the area bounded by Halleck Street, Lincoln Boulevard, Girard Road, and Building 1030; see hatched area on Figure 6-10B). This area will hereafter be referred to as Fill Site 6A. Remedial alternatives for the remainder of Fill Site 6 (i.e., Fill Site 6B) will be subject to an evaluation of the data and potential remedial action alternatives in a future decision document.

6.3.1.3 Fill Site 6 Nature and Extent of Chemicals in Water

In July 2000, the Trust constructed four monitoring wells to evaluate groundwater quality at Fill Site 6 (i.e., LF6GW100, LF6GW101, LF6GW102, and LF6GW103) (Figure 6-10B). These four wells were sampled in July 2000 and have been monitored regularly since May 2001 as part of the Trust's Groundwater Monitoring Program. In

July 2000, at the request of DTSC (2000d), the Trust also sampled six shallow monitoring wells located in the Building 1065 Area (i.e., 1065PZ1A, 1065PZ2A, 1065PZ3A, 1065PZ4A, 1065PZ5A, 1065PZ6A, and1065PZ7A), and two monitoring wells located in the vicinity of the Building 1027 Area (i.e., 1027MW01 and 1027MW03). The Army constructed these monitoring wells, which are within the boundaries of Fill Site 6, to evaluate petroleum releases. In 1997, an additional monitoring well, 1065TMW3, was added to the Building 1065 Area and is monitored as part of the Trust's Groundwater Monitoring Program. As discussed in Section 6.3.1.2, the Building 1065 Area is a petroleum program CAP site (which also includes Building 1027) that is being addressed separately by the Trust. Petroleum hydrocarbons and related constituents, such as BTEX and methyl tertiary-butyl ether ("MtBE"), have generally not been detected in groundwater samples obtained from the Fill Site 6 wells. PCOCs in groundwater at Fill Site 6 are summarized in Table 6-43. Petroleum hydrocarbon and related constituent data compiled for the Building 1065 and 1027 Areas wells are included in the assessment of COCs in groundwater for Fill Site 6, but such data are not considered representative of potential impacts from Fill Site 6. Applicable cleanup levels for groundwater at Fill Site 6 are drinking water MCLs and surface water quality criteria (Table 5-6).

According to Montgomery Watson (1996 and updated attachments), shallow monitoring wells at the Building 1065 and 1027 Areas are screened within a zone consisting of native deposits of clayey silts and clayey silty sand with discontinuous lenses of poorly graded fine to medium sand. Monitoring wells LF6GW100, LF6GW101, LF6GW102, and LF6GW103 appear to be screened in a similar unit.

Chemicals detected above identified cleanup levels in groundwater at Fill Site 6 include dissolved arsenic, chromium, selenium, zinc, petroleum hydrocarbons quantified as gasoline, diesel, and fuel oil, benzene, dieldrin, and PAHs, including benzo(a)anthracene, benzo(b)fluoranthene, and chrysene. Petroleum hydrocarbons have only been detected above cleanup levels in wells associated with Building 1065 (i.e., wells 1065PZ1A, 1065PZ3B, and 1065TMW3). Therefore, petroleum hydrocarbons quantified as gasoline, diesel, and fuel oil are not retained as COCs in groundwater at Fill Site 6. Benzene was detected consistently at low levels in groundwater collected from monitoring well 1065PZ5A at concentrations ranging from 1.5 to 2.6 µg/L, which is greater than the surface water and human health cleanup levels of 1.2 and 1 µg/L, respectively (Table 5-6). The benzene is most likely associated with known petroleum hydrocarbon releases in the Building 1047/1065 area, rather than releases at Fill Site 6, and thus is not retained as a COC. MtBE was detected once in groundwater samples from wells 1065PZ1B and 1065TMW3. The MtBE is most likely associated with known petroleum hydrocarbon releases in the Building 1065 Area, rather than releases at Fill Site 6, and thus is not retained as a COC.

The PAHs, benzo(a)anthracene ("BaA"), benzo(b)fluoranthene ("BbF"), and chrysene, were detected at concentrations of 0.11, 0.26, and 0.17 µg/L, respectively, in groundwater samples from well LF6GW100 from the most recent groundwater sampling event addressed in this document (June 2002). PAHs have not been detected in the four prior

sampling events from this well or in any other Fill Site 6 well. The surface water cleanup level is 0.0044 µg/L for each of these PAHs. The human health cleanup levels for BaA, BbF, and chrysene are 0.10, 0.20, and 20 µg/L, respectively[9]. The source of the PAHs is not known; petroleum hydrocarbons were not detected in groundwater at this location. PAHs are highly immobile in the environment. The primary receptor of concern is protection of surface water resources. Well LF6GW100 is approximately 600 feet from the proposed alignment of Tennessee Hollow. PAHs are unlikely to migrate from location LF6GW100 to Tennessee Hollow. Considering that these PAHs have only been detected once at a level slightly greater than the reporting limit, the MCLs are proposed and not enforceable, and the distance to Tennessee Hollow, BaA, BbF, and chrysene are not retained as COCs in groundwater at Fill Site 6.

Dieldrin and endosulfan were detected in laboratory duplicate groundwater samples from well LF6GW100 at concentrations of 0.073 µg/L and 0.058 µg/L, respectively. These concentrations exceed the applicable surface water cleanup levels (i.e., 0.00014 µg/L for dieldrin and 0.056 µg/L for endosulfan; Table 5-6). Neither chemical was detected in other samples collected from well LF6GW100 during the same sampling round (i.e., in the primary sample and the blind field duplicate) or in any other sampling events from the Fill Site 6 wells. Like the PAHs, dieldrin and endosulfan are unlikely to migrate from well LF6GW100 to Tennessee Hollow because pesticides generally are not mobile in the environment. Considering that dieldrin and endosulfan have only been detected once at a level slightly greater than the reporting limit and the distance to Tennessee Hollow, dieldrin and endosulfan are not retained as COCs in groundwater at Fill Site 6.

As indicated in Table 6-44, arsenic was detected in groundwater collected from monitoring wells 1065PZ1A, 1065PZ2A, 1065PZ4A, and 1065PZ5A at concentrations ranging from 14 to 44 µg/L, which exceeds the human health cleanup level of 10 µg/L (Table 5-6). Arsenic concentrations at all other wells in the Fill Site 6 area were either not detected or less than 3.1 µg/L. Historically, methane and dissolved iron were detected in groundwater collected from wells 106PZ1A, 1065PZ2A, 1065PZ4A, and 1065PZ5A (Montgomery Watson, 1999b, 1999e, 1999h, 1998a). Oxidation-reduction potential ("ORP") values of these groundwater samples were variable, at times less than zero and at times, greater than zero. The iron, methane, and ORP data indicate that groundwater is reducing in nature in the areas where arsenic was detected. Methane and dissolved iron were not detected in groundwater collected from wells 106PZ3A, 1065PZ6A, and 1065PZ7A, where dissolved arsenic was not detected. ORP values in groundwater from these wells were variable, but generally were greater than zero. The iron, methane and ORP data indicate that groundwater in the area of these wells is oxidizing in nature. Thus, there is a strong correlation between reducing conditions and the presence of dissolved arsenic and oxidizing conditions and the absence of dissolved arsenic. Under oxidizing conditions, arsenic(V), the oxidized form of arsenic, is strongly sorbed to ferric iron oxides and hydroxides, resulting in low levels of arsenic and iron (e.g., near or below the detection limit) in groundwater. In contrast, under reducing conditions, the ferric iron oxides become reduced and soluble as ferrous iron hydroxides,

[9] Human health cleanup levels of 0.10 and 0.20 µg/L for benzo(a)anthracene and benzo(b)fluoranthene are proposed MCLs; they are not yet enforceable.

releasing reduced arsenic (arsenic(III)) to groundwater (Fetter, 1993). The dissolved arsenic detected in groundwater at Fill Site 6 appears to be a by-product of the localized anaerobic conditions at this part of the site (i.e., solubilization of the naturally-occurring arsenic in soil). Because the arsenic is only detected in groundwater samples from the Building 1065 Area, arsenic will be addressed as part of the CAP for the Building 1065 Area.

In contrast to arsenic, dissolved chromium, which is likely hexavalent chromium, was detected in monitoring wells 1027MW01, 1027MW03, 1065PZ3A, 1065PZ6A, 1065PZ7A, LF6GW101, and LF6GW103 at concentrations ranging from 10 to 43 µg/L. These concentrations are greater than the surface water cleanup level of 11 µg/L, but less than the human health cleanup level of 50 µg/L (Table 5-6). As discussed previously for arsenic, these wells appear to be oxidizing in nature. Chromium was not detected in groundwater monitoring wells 106PZ1A, 1065PZ2A 1065PZ4A, 1065PZ5A, LF6GW100, and LFGW102. As discussed previously for arsenic, wells 106PZ1A, 1065PZ2A, 1065PZ4A, and 1065PZ5A appear to be reducing. Chromium was not detected at these locations. Thus, there is a strong correlation between reducing conditions and the lack of dissolved chromium, and oxidizing conditions and the presence of dissolved chromium (i.e., hexavalent chromium).[10]

As described in Section 6.2.1.3, the conceptual model for the occurrence and distribution of hexavalent chromium in groundwater at the Presidio is based upon the findings that hexavalent chromium is present in trace amounts in serpentinite bedrock at the Presidio and/or can be created from serpentinite through interaction with infiltrating surface water or contact with groundwater. Relatively high concentrations of hexavalent and dissolved chromium have been detected in wells completed in the Franciscan Bedrock Formation (serpentinite) (Figure D-1 in Appendix D). Conversion of dissolved hexavalent chromium to insoluble trivalent chromium occurs in areas where geochemical conditions are reducing in nature, such as in areas with elevated natural (e.g., former marsh deposits) or anthropogenic (e.g., petroleum hydrocarbons) organic matter. Within the Fill Site 6 area, chromium was not detected in groundwater from the wells in the northern portion of the site, close to the historic Crissy Field marsh and generally north of the petroleum release area at Building 1065. There are no known sources of hexavalent chromium in the Fill Site 6 area. The chromium detected in groundwater at Fill Site 6 appears to be naturally-occurring hexavalent chromium that is derived from upland serpentinite formations. Dissolved chromium is not retained as a COC in groundwater at Fill Site 6.

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[10] Based on the Fill Site 6, Building 1065, and Building 1027 area monitoring data, methane and iron measurements are clearer indicators of the presence of oxidizing or reducing conditions than ORP or dissolved oxygen measurements. This is because ORP and dissolved oxygen measurements are difficult to perform correctly. Further, ORP is not a reliable indicator of redox state because it is not a measure of any specific redox couple. Methane and iron were not measured in groundwater collected from monitoring wells LF6GW100, LF6GW101, LF6GW102, LF6GW103, 1027MW01 and 1027MW03. Groundwater from the following wells had positive ORP values: LF6GW100 and 1027MW01; dissolved chromium was detected in groundwater collected from monitoring well 1027MW01. Groundwater from the following wells had negative ORP values: LF6GW101, LF6GW102, LF6GW103, and 1027MW03. Dissolved chromium was detected in monitoring wells 1027MW03, LF6GW101, and LF6GW103. Thus, the correlation between ORP and dissolved or hexavalent chromium is not as strong as the correlation between iron, methane, and chromium. The same conclusions can be drawn with regard to arsenic.

Selenium was detected in groundwater collected from monitoring wells 1065PZ1A and LF6GW102 at a concentration of 6.2 µg/L, which is greater than the surface water cleanup level of 5 µg/L, but less than the human health cleanup level of 50 µg/L (Table 5-6). Selenium was not detected in three subsequent sampling rounds from well LF6GW102. These low-level concentrations of selenium are likely natural background concentrations of selenium. However, this finding cannot be confirmed based upon available data. Additional monitoring is recommended to be incorporated into the remedial actions considered for Fill Site 6B in order to allow comparison of up gradient metals concentrations in groundwater to metals concentrations at the site.

Dissolved zinc has been detected above its surface water cleanup level of 106 µg/L, but below the human health cleanup level of 5,000 µg/L, in recent (2001/2002) groundwater samples collected from wells LF6GW100, LF6GW101, and LF6GW103. The zinc appears to be an artifact of groundwater sampling (it has been detected at concentrations ranging from 100 to 300 µg/L at several other sites where it previously was either not detected or present at levels less than 100 µg/L (Treadwell & Rollo, 2002b). Treadwell & Rollo investigated the potential cause for the elevated zinc concentrations; the Clearwater Engineering™ filters, which were used in the Second Quarter 2001 through the Third Quarter 2002, appear to have caused the elevated zinc concentrations observed through that period. The Clearwater Engineering™ filters were either not effectively filtering the sample water or were contributing to concentrations of zinc to the sample water. Treadwell & Rollo's groundwater sampling contractor has changed to a different filter (i.e., the QED Quickfilter™) for all groundwater filtering. Zinc concentrations will continue to be monitored as part of the Trust's groundwater monitoring program to ensure that the filter change has solved the zinc concentration inconsistency problems.

Based on the results of groundwater monitoring, the soil and debris fill at Fill Site 6 does not appear to have impacted groundwater. Only selenium, which is believed to be present at background levels, and zinc, which, as discussed above, is believed to be a sampling artifact, are retained as COCs in groundwater at Fill Site 6 (Table 6-44). As discussed above in Section 6.3.1.2, due to the newly available data in the Building 1065 Area, the evaluation of alternatives for Fill Site 6 in Section 10.3.1 only addresses Fill Site 6A. Additional groundwater monitoring at Fill Site 6A is recommended to compare up gradient concentrations of metals in groundwater to concentrations in groundwater at and downgradient of Fill Site 6A to confirm that there are no groundwater impacts.

6.3.2 Building 1057

The use history and the nature and extent of chemicals in soil and groundwater at Building 1057 are discussed in Sections 6.3.2.1 through 6.3.2.3.

6.3.2.1 Building 1057 Use History

Building 1057 is shown on Figure 6-11. Building 1057 was constructed in 1924, and was used at various times as a maintenance shop, wood shop, and medical research and development facility. Radioisotopes were historically handled in this building. Testing

conducted by the Army did not find radioactivity and it was determined that Building 1057 met the Nuclear Regulatory Commission's criteria for unrestricted use. A 4-inch diameter steel pipeline from the building terminates inside a concrete vault situated adjacent to the building. The vault was investigated for releases of PCOCs. Land use at Building 1057 is considered recreational (Table 5-1).

6.3.2.2 Building 1057 Nature and Extent of Chemicals in Soil

The Army collected a sample of the sediment inside the vault and a sample of soil beneath the vault. These samples were analyzed for metals, VOCs, SVOCs, and petroleum hydrocarbons. Soil sample analytical results do not indicate that PCOCs have been released from the sump. PCOCs detected in sediment and soil at Building 1057 are listed in Table 6-45. Bivariate scatter plots of concentrations of major elements from site soil and sediment samples confirm a distribution expected for beach/dune lithology. Metals above background screening levels identified as PCOCs were largely within the distribution expected for beach/dune lithology, with the exception of cadmium, lead, mercury, silver, and zinc. Elevated levels of five metals were associated with sediment in the vault. Figure C-3 in Appendix C shows zinc from the vault to be well outside the normal scatter of background zinc. The only chemical detected at a concentration greater than applicable recreational cleanup levels (Table 5-2) was cadmium, measured in the sediment sample from the vault at 6 mg/kg (Table 6-46).

Metal concentrations in the soil sample collected beneath the vault did not exceed background levels. In addition, detected concentrations in the soil are less than recreational and residential cleanup levels. These analytical results indicate that no COCs were released from the vault to the environment. Therefore, no further action is recommended for soil at the site. Sediment from the vault will be removed as part of regular Trust maintenance activities.

6.3.2.3 Building 1057 Nature and Extent of Chemicals in Water

Groundwater is not likely to be impacted at Building 1057. No evidence of chemical releases from the vault was found. No further action is recommended for groundwater at the site.

6.3.3 Building 1151/1153 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 1151/1153 Area are discussed in Sections 6.3.3.1 through 6.3.3.3.

6.3.3.1 Building 1151/1153 Area Use History

Building 1153 is a concrete pad that was constructed in 1941 for storing transformers. The PA (Argonne National Laboratory, 1989) states that the site was investigated in 1987 and PCBs were found in soil near the pad. The Army performed additional testing during the RI to further characterize the extent of PCBs in soil. PCB-containing transformers

were removed from Building 1153 (E.C. Jordon Company, 1990), and soil containing PCBs was subsequently excavated in accordance with an Engineering Evaluation/Cost Analysis ("EE/CA") that the Army prepared (Army, 1996).

The Army excavated contaminated soil at the Building 1151/1153 Area in June 1997. Approximately 81.5 tons of PCB-containing soil was excavated to a depth of 2 feet bgs near the concrete pad and from the courtyard between Buildings 1151 and 1152. An additional 10 tons of PCB-containing soil was excavated to a depth of 1 foot bgs from an area southeast of the former storage shed. A total of 91.5 tons of soil was removed and transported for disposal at an off-site, permitted waste management facility. The extent of soil excavated by the Army is shown on Figure 6-12A.

Land use at the Building 1151/1153 Area is considered recreational (Table 5-1).

6.3.3.2 Building 1151/1153 Area Nature and Extent of Chemicals in Soil

The Army performed remedial actions to achieve cleanup levels for petroleum hydrocarbons in soil established in RWQCB Order No. 96-070 and 1 mg/kg of PCBs in soil proposed in the EE/CA (Army, 1996).[11] These cleanup levels were achieved as summarized in the closure report for Building 1153 (IT Corporation, 1999e). PCOCs and COCs remaining in soil are summarized in Tables 6-49 and 6-50, respectively. The maximum concentrations of PCB 1260 and PCBs (0.96 and 0.44 mg/kg, respectively) remaining in soil at the Building 1151/1153 Area are from sample 1153EX40 at 0.5 feet bgs (Figure 6-12A). The PCB concentrations in this soil sample were greater than the applicable PCB cleanup level of 0.39 mg/kg established for protection of recreational land use in the Presidio-wide Cleanup Level Document (EKI, 2002d).

To evaluate if the residual concentrations of PCB 1260 or PCBs in soil pose a risk to recreational receptors such that further cleanup is warranted, the 95 percent upper confidence limit on the arithmetic mean of residual PCB concentrations in soil was computed for the Building 1151/1153 Area. U.S. EPA (1989d) refers to this value as the exposure point concentration ("EPC") in its risk assessment guidance. Only laboratory analytical results were used to compute the EPC. Field immunoassay analytical results of verification samples (31 data points) were not included in the EPC calculation because the high detection limit of 1 mg/kg for these semi-quantitative analyses would bias the EPC. The EPC was computed to be 0.54 mg/kg for PCB 1260 in soil (11 data points) and 0.31 mg/kg for PCBs (15 data points) in soil at the Building 1151/1153 Area. The statistics generated to perform this calculation are shown in the table below. A description of the approach and the equations used to calculate the EPC is presented in Appendix G.

[11] The purpose and scope of RWQCB Order No. 96-070 are described in Section 7.6.1.5.

PCBs in Soil at the Building 1151/1153 Area		
Chemical	PCB 1260	PCBs
Data Table Source	Table B-46 (Appendix B)	Table B-46 (Appendix B)
Number of Data Points	11	15
Data Distribution	Non-parametric[12]	Non-parametric
Arithmetic Mean of Lognormally Transformed Data	-2.5	-2.1
Standard Deviation of Lognormally Transformed Data	1.1	0.92
Percent UCL to Represent EPC	95%	95%
EPC	0.54 mg/kg	0.31 mg/kg

The EPC provides an estimate of the reasonable maximum exposure ("RME"). As defined by U.S. EPA (1989d), the RME is the highest exposure that is reasonably expected to occur at a site. Under the RME approach, some exposure variables, such as the EPC, will not be at their individual maximum values. Although the EPC does not reflect the maximum concentration that could be contacted at any one time, U.S. EPA (1989d) regards the EPC as a conservative estimate of the concentration likely to be contacted over time. The representative concentration of PCBs in soil (0.31 mg/kg) at the Building 1151/1153 Area is less than the applicable recreational cleanup level of 0.39 mg/kg (Table 5-2).

The EPC of PCB 1260 (0.54 mg/kg) is greater than the applicable recreational cleanup level of 0.39 mg/kg. The recreational cleanup level is based on an estimated lifetime incremental cancer risk of $1x10^{-6}$. An EPC of 0.54 mg/kg corresponds to an estimated lifetime incremental cancer risk of $1.4x10^{-6}$ for recreational populations. According to U.S. EPA's Risk Assessment Guidance for Superfund (U.S. EPA, 1989d), risks should be calculated to one significant figure. Rounding to one significant figure, the estimated lifetime incremental cancer risk for potential exposure of recreational users to PCB 1260 in soil at the Building 1151/1153 Area is $1x10^{-6}$, which is the target risk level for this population. Therefore, the residual PCB 1260 concentrations in soil should not pose a significant risk to current and future users of the site.

As indicated in Table 6-49, low levels of metals are present at this site. Bivariate scatter plots of concentrations of major elements from site soil samples confirm a distribution expected for beach/dune lithology. Metals above background screening levels identified as PCOCs were within the distribution expected for beach/dune lithology. As indicated in Table 6-50, PCBs are not a COC at this site because the EPC in soil is less than the applicable cleanup level of 0.39 mg/kg. PCB 1260 is not retained as a COC because of the residual concentrations in soil should not pose a significant risk to users of the site. No other chemicals were detected at concentrations greater than applicable recreational cleanup levels.[13] Therefore, no further action appears necessary for soil at this site (Figure 6-12B).

[12] A non-parametric data distribution is neither a normal nor lognormal distribution.

[13] Although the EPCs for PCB 1260 and PCBs at Building 1151/1153 Area are consistent with recreational land use, the EPCs are greater than the residential cleanup level of 0.16 mg/kg established in the Presidio-wide Cleanup Level Document (EKI, 2002d). A land use control will be required for this site to prevent potential future residential development.

6.3.3.3 Building 1151/1153 Area Nature and Extent of Chemicals in Water

Groundwater is not likely to have been impacted at the Building 1151/1153 Area. Releases of PCBs were confined to shallow soil. No further action is recommended for groundwater at this site.

6.3.4 Building 1167 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 1167 Area are discussed in Sections 6.3.4.1 through 6.3.4.3.

6.3.4.1 Building 1167 Area Use History

The Building 1167 Area location is shown on Figure 6-13A. Furniture was manufactured and painted or stained at the Building 1167 Area. Three paint spray booths were installed along the northern wall of the building. Two of these paint spray booths were equipped with 6-inch diameter floor drains. The remaining paint spray booth had a 10-feet long by 4-feet wide by 2-feet deep metal trough in the floor with no apparent outlet. The RI (Dames & Moore, 1997b) stated the sludge that accumulated in the paint spray booths was removed and disposed in a dumpster near the Building 1167 Area. Stains, paints, lacquers, adhesives, and solvents were stored in drums within Building 1167.

According to a historic environmental document survey at the Army Records Center conducted by Mr. Mark Youngkin, Building 1167 (formerly called M-13) may have also been used as an incinerator (Youngkin, 1996a). Land use at the Building 1167 Area is considered recreational (Table 5-1).

6.3.4.2 Building 1167 Area Nature and Extent of Chemicals in Soil

The Army investigated the possibility that releases occurred from the paint spray booths by collecting six soil samples from three borings that were placed next to the northern wall of the building where the paint spray booths were located inside the building (Figure 6-13A). Soil samples were collected at depths ranging from 0.5 to 10 feet bgs and analyzed for metals and VOCs. No VOCs were detected in the samples tested. PCOCs in soil are summarized in Table 6-53.

Bivariate scatter plots of concentrations of major elements from site soil and sediment samples confirm a distribution expected for beach/dune lithology, as well as minor serpentinite (Figure C-4 of Appendix C). Metals above background screening levels identified as PCOCs were also largely within the distribution expected for beach/dune lithology, with the exception of isolated detections of arsenic, cobalt, copper, lead, mercury, selenium, vanadium, and zinc. Although some detected metals appear to be greater than background concentrations, comparison of the maximum concentrations of PCOCs detected with the applicable recreational cleanup levels (Table 5-2) results in only arsenic and lead being retained as COCs (Table 6-54). Arsenic and lead were

measured in the soil samples at concentrations as high as 11.2 mg/kg and 586 mg/kg, respectively.

Figure 6-13B depicts the generalized area of the Building 1167 Area with known impacts to soil. For purposes of evaluating remedial alternatives, it is assumed the volume of impacted soil at the Building 1167 Area is approximately 150 cubic yards.

6.3.4.3 Building 1167 Area Nature and Extent of Chemicals in Water

Groundwater was not encountered during soil sampling at the Building 1167 Area. However, it is unlikely that groundwater has been significantly impacted because no VOCs were found in the subsurface, and metals bind tightly to soil and are not prone to leach into water. No further action is recommended for groundwater at the Building 1167 Area.

6.4 CAVALRY STABLES (PART OF PTMP'S CRISSY FIELD PLANNING DISTRICT)

The Cavalry Stables planning area is a small, forested valley that is nestled between Crissy Field, Fort Scott, and the National Cemetery. Constructed in 1914 to support Army cavalry troops, the five large brick stables and the barracks were sited facing San Francisco Bay. The GMPA envisions that excess pavement surrounding the stables will be taken up where possible to restore the historic landscape. Exotic vegetation that obscures historic vistas will be removed and native vegetation will be reintroduced. Remnant natural dunes and riparian areas south and southeast of the stables will be protected. These areas provide valuable wildlife habitat. The PTMP anticipates cultural and educational uses of this area (part of the PTMP's enlarged Crissy Field Planning Area), including retaining the stables and paddock for the U.S. Park Police Mounted Patrol (Trust, 2002). The vegetation is anticipated to be protected and restored in accordance with the Vegetation Management Plan (NPS and Trust, 2001). No landfills exist in the planning area. Miscellaneous sites include the Building 662 Area, Building 669 Area, and Building 680 Area.

6.4.1 Building 662 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 662 Area are discussed in Sections 6.4.1.1 through 6.4.1.3.

6.4.1.1 Building 662 Use History

Building 662 was a former automobile service area (Figure 6-14A). Waste oil was stored in an underground storage tank and an aboveground storage tank located near the building. The aboveground storage tank was located on a concrete pad. These tanks were removed in 1996 and 1994, respectively (IT Corporation, 1998a; Montgomery Watson, 1995b). The Trust will seek closure of these tanks as part of the Remedial Action Plan for the Main Installation sites. Closure documentation for these

Building 662 tanks is included as Appendix F. Land use at Building 662 is considered recreational (Table 5-1).

6.4.1.2 Building 662 Area Nature and Extent of Chemicals in Soil

A confirmation soil sample from the underground storage tank removal (Tank 662.2) was analyzed for petroleum hydrocarbons, PAHs, BTEX, SVOCs, PCBs, herbicides, pesticides, and selected metals. No data are available for the removal of the former aboveground storage tank (Tank 662.1). However, as part of the RI, the Army collected soil samples in the area adjacent to the former location of the underground and aboveground storage tanks, next to hydraulic lifts within the building, and in stained areas outside along the southern edge of the building (Figure 6-14A). Surface soil samples collected adjacent to the former aboveground storage tank and along the southern edge of the building were analyzed for metals, VOCs, and selected SVOCs. Soil samples 662SB01 and 662SB02 were obtained next to the former hydraulic lifts and tested for lead and petroleum hydrocarbons using immunoassay test kits. Soil samples collected from borings 662SB03 through 662SB07 were analyzed for metals, PAHs, and petroleum hydrocarbons.

PCOCs detected in soil samples at Building 662 are listed in Table 6-57. Bivariate scatter plots of concentrations of major elements from site soil and sediment samples confirm a distribution expected for beach/dune lithology. Metals above background screening levels identified as PCOCs were largely within the distribution expected for beach/dune lithology, with the exception of cadmium, copper, lead, and zinc. The data indicate that elevated concentrations of these metals are generally co-located. The only COCs detected at a concentration greater than applicable recreational cleanup levels (Table 5-2) were cadmium and lead measured at maximum concentrations of 6.6 mg/kg and 1,400 mg/kg, respectively (Table 6-58). The human health cleanup levels for cadmium and lead are 1.7 and 500 mg/kg, respectively. Petroleum hydrocarbons, PCBs, PAHs, VOCs, and other metals concentrations were all less than applicable cleanup levels (Tables 5-2 and 5-5).

Figure 6-14B depicts the assumed area of the Building 662 Area with impacted soil. For purposes of evaluating remedial alternatives, it is assumed that 20 cubic yards of impacted soil exists at the Building 662 Area. After remedial actions are implemented for this site, no further action should be required for closure of former Tanks 662.1 and 662.2.

6.4.1.3 Building 662 Area Nature and Extent of Chemicals in Water

Groundwater does not appear to be impacted at the Building 662 Area. A grab groundwater sample was obtained from boring 662SB08, which was situated in the presumed down gradient direction of groundwater flow from the Building 662 Area (Figure 6-14B). The grab groundwater sample was analyzed for lead and petroleum hydrocarbons. Petroleum hydrocarbons were not detected in this groundwater sample. Table 6-59 identifies lead as the only PCOC in groundwater. Drinking water MCLs are

the applicable cleanup levels for groundwater at the site (Table 5-6) and lead was not measured at concentrations greater than MCLs. No COCs were identified in groundwater (Table 6-60). No further action is recommended for groundwater at the Building 662 Area.

6.4.2 Building 669 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 669 Area are discussed in Sections 6.4.2.1 through 6.4.2.3.

6.4.2.1 Building 669 Area Use History

Building 669 was constructed in 1936 and contained an incinerator that was used to burn animal carcasses and likely municipal waste. Ash generated by this operation reportedly was disposed on the hillside close to the building. Building 669 is also close to areas where Caltrans excavated lead-containing soil that was associated with Doyle Drive. Building 669 Area is shown on Figure 6-15A. Land use at Building 669 Area is considered recreational and buffer zone ecological (Table 5-1).

6.4.2.2 Building 669 Area Nature and Extent of Chemicals in Soil

Caltrans found up to 10,530 mg/kg of lead in shallow soil samples (up to 3 feet bgs) on the hillside below Building 669 during its investigation of soil under Doyle Drive (Caltrans, 1995) (Table 6-61). The Army contended that lead detected in soil by Caltrans was likely due to deteriorated lead-based paint or vehicle exhaust from nearby Doyle Drive. In response to discovery of the contamination near Doyle Drive, Caltrans excavated lead-containing soil to 1 foot bgs up to a distance of approximately 60 feet from Doyle Drive and at the Caltrans staging area adjacent to Crissy Field Avenue. The excavated soil was transported off-site for disposal at a permitted waste management facility. The sample locations, detected concentrations, and lateral extent of soil excavated by Caltrans near the Building 669 Area is shown on Figure 6-15A.

The Army investigated the Building 669 Area by completing seven soil borings during the RI and visually inspecting soil for an ash layer. Four borings (669A, 669B, 669C, and 669D) were drilled in the vicinity of the Caltrans boring 210S3R that had the maximum concentrations of lead in soil. Three borings (669SB01, 669SB02, and 669SB03) were drilled around Building 669 to investigate potential ash disposal in the area (Dames & Moore, 1997b). Because no significant ash layer was observed, the Army did not collect soil samples for laboratory analysis of lead or other compounds possibly associated with incineration of animal carcasses (e.g., PAHs that are formed through incomplete combustion of organic matter).

PCOCs identified at the Building 669 Area are lead and chromium (Table 6-61). The only sample in which chromium was detected above the applicable cleanup level is from Caltrans soil boring 60S1R, which is north of Crissy Field Avenue, beneath the area excavated by Caltrans. The lithology of this area is not known, but it is likely that the

chromium is in the range of background concentrations. As indicated in Table 6-62, only lead is retained as a COC at this site.

Investigations conducted at the site to date have included only limited laboratory analyses for lead and other metals, and no analysis for PAHs that may be associated with incinerator ash. The Trust proposes that testing should also be performed to evaluate if vehicular traffic on Doyle Drive or the Doyle Drive structure itself have contributed to COCs in soil at the northern portion of the site (e.g., near boring locations 100S3R and 100S4R. Soil testing to evaluate these issues is recommended as part of the remedial design or remedial actions for the Building 669 Area. Figure 6-15B depicts the generalized area of the site with identified impacts to soil. For purposes of evaluating remedial alternatives, it is assumed that 1,500 cubic yards of impacted soil exists at the Building 669 Area.

6.4.2.3 Building 669 Area Nature and Extent of Chemicals in Water

Impacts to groundwater at the Building 669 Area are not likely given the fact that metals and PAHs bind tightly to soil and are not prone to leach into water. No further action is recommended for groundwater at the Building 669 Area.

6.4.3 Building 680 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 680 Area are discussed in Sections 6.4.3.1 through 6.4.3.3.

6.4.3.1 Building 680 Use History

The Army used Building 680 to store electrical equipment and unserviceable transformers. Analytical results of soil samples near this structure indicated the presence of petroleum hydrocarbons and PCBs in soil within a fenced yard. The Army removed PCB-containing electrical equipment from Building 680 (CKY, Inc. Environmental Services, 1995; E.C. Jordon Company, 1990), and subsequently excavated soil containing petroleum hydrocarbons and PCBs in accordance with an EE/CA that it prepared (Army, 1996).

Excavation of contaminated soil was accomplished in two phases. The first phase was performed from June to July 1997 and the second phase was performed from May to October 1998. A total of 484 tons of soil was removed and transported for disposal at an off-site, permitted waste management facility (IT Corporation, 1999e). Most soil containing petroleum hydrocarbons and PCBs was limited to a depth of approximately 1 foot bgs. However, at some locations, contaminated soil had to be removed to depths varying from 2.5 to 8.5 feet bgs. The extent of soil excavated by the Army is shown on Figure 6-16A.

Land use at the Building 680 Area is considered recreational and ecological with special status species potentially present (Table 5-1).

6.4.3.2 Building 680 Area Nature and Extent of Chemicals in Soil

The Army performed remedial actions to achieve cleanup levels for petroleum hydrocarbons in soil established in RWQCB Order No. 96-070 and 1 mg/kg of PCBs in soil proposed in the EE/CA (Army, 1996). These cleanup levels were achieved as summarized in the closure report for Building 680 (IT Corporation, 1999e). PCOCs and COCs remaining in soil are summarized in Tables 6-65 and 6-66, respectively. The maximum concentration of PCB 1260 remaining in soil is 0.58 mg/kg at 0.5 feet bgs, which is greater than the cleanup level of 0.033 mg/kg of PCBs established for protection of special status ecological receptors in the Presidio-wide Cleanup Level Document (EKI, 2002d). Detected concentrations of PCBs based on laboratory analysis are posted on Figure 6-16A. PCBs were either not detected or were analyzed by immunoassay test kits at all other locations.

Similar to the process used at Building 1151/1153 Area, to evaluate if the residual concentrations of PCBs in soil pose a risk to ecological receptors such that further cleanup is warranted, the 95 percent upper confidence limit on the arithmetic mean of residual PCB concentrations in soil was computed for the Building 680 Area. U.S. EPA (1989d) refers to this value as the EPC in its risk assessment guidance. Only laboratory analytical results were used to compute the EPC. Field immunoassay analytical results of verification samples were not included because the high detection limit of 1 mg/kg for these semi-quantitative analyses would bias the EPC. Total PCBs were only analyzed using immunoassay test kits; therefore, an EPC was not calculated for total PCBs. The EPC for PCB 1260 in soil at the Building 680 Area was computed to be 0.20 mg/kg. The statistics generated in this calculation are shown in the table below. The equations used to calculate the EPC are included as Appendix G.

PCB 1260 in Soil at the Building 680 Area	
Chemical	PCB 1260
Data Table Source	Table B-62 (Appendix B)
Number of Data Points	40
Data Distribution	Non-parametric
Arithmetic Mean of Lognormally Transformed Data	-3.2
Standard Deviation of Lognormally Transformed Data	1.2
Percent UCL to Represent EPC	97.5%
EPC	0.20 mg/kg

The EPC provides an estimate of the reasonable maximum exposure. Based on an EPC of 0.20 mg/kg, the representative concentration of PCB 1260 in soil at the Building 680 Area is less than the recreational cleanup level of 0.39 mg/kg (Table 5-2), but it is not below the ecological special status cleanup level of 0.033 mg/kg of PCBs in soil.

In the Presidio-wide Cleanup Level Document (EKI, 2002d), the ecological special status PRGs were established as the lowest PRG_{low}, unless this value was below the laboratory method detection limit, in which case the special status PRG was set at the detection

limit. The selection of the lowest PRG_{low} was intended to protect special status species. However, for PCBs, the lowest PRG_{low} is for the American robin (Table 5-12 of the Presidio-wide Cleanup Level Document, (EKI, 2002d)), which is not an indicator species for special status wildlife at the Presidio. The PRG_{low} for the Peregrine falcon, which is the applicable indicator species for special status wildlife at the Presidio, is 0.09 mg/kg (Table 5-19 of the Presidio-wide Cleanup Level Document). The PRG_{low} for plants and soil fauna is 40 mg/kg. The EPC of 0.20 mg/kg is nearly the same as the PRG_{low} for the Peregrine falcon. In fact, a value of 0.20 mg/kg is in approximately the first percentile between the PRG_{low} (0.09 mg/kg) and the PRG_{high} (8.0 mg/kg). In comparison, the former cleanup levels for special status species were based on the fifth percentile; the use of the first percentile is thus more conservative than the methodology originally used in the Presidio-wide Cleanup Level Document. The Trust recognizes that the applicable cleanup levels have been calculated to protect potentially sensitive species. However, for this location where remedial activities have already been conducted and the remedial action has achieved an EPC of essentially the same concentration as the PRG_{low} for the applicable indicator special status species, PCBs are not retained as COCs and no further remedial action is recommended for soil at the Building 680 Area (Figure 6-16B)[14].

6.4.3.3 Building 680 Area Nature and Extent of Chemicals in Water

Groundwater is not likely to have been impacted at the Building 680 Area. Groundwater was not encountered during excavation of contaminated soil. Encountered subsurface conditions indicate that petroleum hydrocarbons and PCBs released at the Building 680 Area likely sorbed to soil before reaching groundwater. No further action is recommended for groundwater at the Building 680 Area.

6.5 EAST HOUSING

The East Housing planning area contains 135 historic and nonhistoric buildings that were mostly housing for officers and enlisted personnel and their families. Originally known as the east and west cantonments, this area was used for temporary encampments that were replaced with permanent quarters starting in 1903. El Polin Spring and the Tennessee Hollow area are located in the East Housing planning area. Both the GMPA and the PTMP anticipate that existing housing will continue to be used, and that drainages near El Polin Spring and in Tennessee Hollow area will be restored. Both El Polin Spring and the Tennessee Hollow area have high potential for buried prehistoric and historic archeological resources. El Polin Spring, one of the earliest water supplies in the area, was near the historic trail between the Spanish Presidio and the Mission de San Francisco de Assisi. The Tennessee Hollow area was the site of a temporary encampment in the late 1800s and a staging area for the Panama Pacific International

[14] Although the EPC for PCB 1260 at Building 680 Area is less than the recreational cleanup level, the EPC is not less than the residential cleanup level of 0.16 mg/kg established in the Presidio-wide Cleanup Level Document (EKI, 2002d). A land use control will be required for this site to prevent potential future residential development.

Exposition. The planning area contains Landfill E and Fill Site 1, which are landfills, and El Polin Spring, which is a miscellaneous site.

6.5.1 Landfill E

The use history and the nature and extent of chemicals in soil and groundwater at Landfill E are discussed in Sections 6.5.1.1 through 6.5.1.3.

6.5.1.1 Landfill E Use History

Landfill E is shown on Figure 6-17A. Based on examination of aerial photographs, this site was used for disposal of debris and municipal waste from before 1946 to approximately 1973 (Dames & Moore, 1997b). Prior to filling, the canyon that became Landfill E was reportedly used as the Barnard Avenue Protected Range, a small arms firing range. The firing range is being addressed by the Trust under OU 3, Firing Ranges. Pop Hicks athletic field was constructed on the landfill after waste disposal at the site ceased. It was estimated in the Alternate Remedial Actions report that Landfill E contains approximately 110,000 cubic yards of fill. The Army originally estimated the volume of fill at the site to be 77,000 cubic yards in its FS, but subsequently revised this estimate to 115,000 cubic yards (Montgomery Watson, 1999a) after performing a similar analysis to that completed by the Trust in the Alternate Remedial Actions report. As discussed in Section 3.3, the volume estimates in the Alternate Remedial Actions report were estimated by comparing historical and current topographic lines (EKI, 1998b).

The location of Landfill E is in the western drainage of the Tennessee Hollow area. Groundwater has been observed and monitored emanating from seeps at the steep slope at the northern end of the landfill. The riparian habitat north of the site is part of the Tennessee Hollow restoration described in the GMPA. Landfill E is also in the Freshwater Ecological Protection Zone, as depicted on Figure 5-4. Land use at Landfill E is considered residential and ecological with special status species potentially present (Table 5-1).

6.5.1.2 Landfill E Nature and Extent of Chemicals in Soil

Inorganic and organic chemicals detected above cleanup levels in soil samples are presented on Figures 6-17A and 6-17B, respectively. A list of PCOCs detected in soil samples at Landfill E is presented in Table 6-69. The Army collected thirty-seven soil samples from Landfill E at depths ranging from ground surface to 28 feet bgs. These samples were obtained from borings (i.e., DAESBO1 through DAESB04, DAESBO6 through DAESB08, DAESB10 through DAESB17), surface locations (i.e., DAESS01 through DAESS04), and exploratory trenches (i.e., DAETP01 through DAETP04). Various soil samples were analyzed for metals, VOCs, SVOCs, petroleum hydrocarbons, and PCBs, pesticides, and herbicides. In addition, the Army conducted additional investigations in 1996. Work included excavating six trenches to visually inspect and document the fill/native soil interface; performing a soil gas survey within the boundary

of Landfill E; and installing six geotechnical borings within the fill material (Montgomery Watson, 1999a).

In the fall of 2001, stakeholders met to express their concerns regarding site characterization, data availability and comprehensiveness, and selection of an appropriate remedial action for Landfill E. Based on the input received from the stakeholders, the Trust prepared the Landfill E Field Sampling Plan in November 2002 (EKI, 2002c) with the purposes of (1) collecting additional data to address existing Landfill E environmental and geotechnical data gaps to support remedial alternative selection and (2) perform some investigation required for the design of the selected remedial alternative (i.e., pre-design studies). The investigation objectives identified in the Landfill E Field Sampling Plan include:

(1) Conduct a radiation assessment;

(2) Refine waste characteristics to improve the estimate of disposal costs, evaluate the viability of material separation, collect data that can be used to evaluate the nature and extent of contamination at the former Barnard Avenue Protected Range[15], and evaluate the potential existence of a "halo effect" (impacts into native material) beneath the landfill;

(3) Collect geotechnical data to evaluate the static and dynamic stability of Landfill E during a Maximum Credible Earthquake ("MCE"), or other appropriate design earthquakes, and evaluate adjacent hillside stability under the excavation scenario[16];

(4) Conduct a landfill gas assessment to determine the presence and concentration of landfill gases at the site, evaluate gas transmissivity within various portions of the site, and evaluate the potential for landfill gas migration and the potential need for gas collection or control under the capping scenario; and

(5) Evaluate the hydrology and hydrogeology to assess past impacts to groundwater at the site and potential future risks to water quality and potential impacts to future receptors of Tennessee Hollow, measure and evaluate water levels and the potential effects at the fill/native soil interface at the base of the landfill, reevaluate and modify the current site conceptual model, and review data to aid the design of surface and subsurface water conveyance systems.

The Trust initiated the field investigation at Landfill E in mid-November 2002. Results of the sampling event will be reported to the Trust and stakeholders in the winter of 2003. The data collected in the field investigation will be incorporated into the detailed analysis of alternatives, and presented in the RAP for Landfill E or some other document, such as an addendum to this Presidio Trust Revised FS Report. The following assessment of the nature and extent of contamination at Landfill E is based on data available prior to the Trust's Landfill E field investigation initiated in November 2002.

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[15] Further evaluation of the nature and extent of contamination at the Barnard Avenue Protected Range will be included in the forthcoming Small Arms Firing Range Remedial Investigation/Feasibility Study.
[16] These data will also be used for settlement analysis.

Low concentrations of VOCs, PAHs, and pesticides and herbicides were infrequently detected in the soil samples obtained from Landfill E (Table 6-69). Low levels of VOCs have also been measured in landfill gas samples obtained by the Army (Montgomery Watson, 1999a). Barium, copper, lead, silver, and zinc are the PCOCs found at the greatest concentrations in fill from Landfill E. Barium has been detected at 2,510 mg/kg, copper at 39,000 mg/kg, lead at 8,200 mg/kg, silver at 3,230 mg/kg, and zinc at 24,000 mg/kg. These metal concentrations suggest that portions of fill in Landfill E might be characterized as hazardous waste if the fill were to be excavated and disposed at an off-site, permitted waste management facility. The requirements for disposing of soil and waste off-site are discussed further in Section 8.3.6.1 of this report.

Bivariate scatter plots of concentrations of major elements from site soil and sediment samples confirm a distribution expected for Colma Formation lithology with some minor serpentinite. Nearly all of the CCR Title 22 metals were detected in Landfill E above background screening levels and are therefore identified as PCOCs. While some of the high concentrations of metals were detected in soil samples as described above, other samples contain chromium, cobalt, and nickel concentrations that are in the range of distributions associated with serpentinite soils. All inorganic and organic compounds detected in soil samples above applicable residential and ecological special status species cleanup levels were retained as COCs at Landfill E (Tables 5-2 and 5-5), although specific locations where data exhibited characteristics of serpentinite were not identified as a location with COCs (Figure 6-17A). Organic COCs at Landfill E include pesticides, PAHs, and diesel range petroleum hydrocarbons (Figure 6-17B). The COCs in soil are listed in Table 6-70.

Landfill E is the only Main Installation landfill with measurable amounts of gas in its interior. Methane has been measured in gas from Landfill E at concentrations up to 66,000 parts-per-million by volume (Montgomery Watson, 1999a). Engineering controls may be required to control accumulation of gas within the landfill if a low permeability cover is constructed at the site.

The environmental conditions at Landfill E are summarized on Figure 6-17C. The landfill is estimated to contain 110,000 cubic yards of fill.

6.5.1.3 Landfill E Nature and Extent of Chemicals in Water

Estimated groundwater elevation contours at Landfill E are presented on Figure 6-17C. One goal of the Trust's November 2002 Landfill E field investigation is to assess whether groundwater may seasonally contact portions of fill in Landfill E when groundwater elevations are high.

Despite the fact that groundwater may be in contact with fill during certain parts of the year, groundwater and seep sample analytical results do not indicate that significant leaching of PCOCs from fill into groundwater has occurred. Six monitoring wells (i.e., DAEGW03 through DAEGW08) were constructed at the site by the Army.

Sampling of seeps at locations DAESP01, DAESP02, DAESP02A, DAESP03, and DAESP04 has also been performed. The locations of these wells and sampling points are shown on Figure 6-17C.

Monitoring well DAEGW06 is located at the up gradient end of Landfill E and is largely screened within the Colma Formation, although the lower portion is screened in serpentinite. Monitoring wells DAEGW03 and DAEGW05 are within the landfill and are screened at the Colma Formation and serpentinite interface. Monitoring wells DAEGW04, DAEGW07, and DAEGW08 are at the down gradient end of Landfill E and screened within the Colma Formation. Monitoring well DAEGW07 is screened very close to ground surface, while groundwater monitoring well DAEGW08 is screened somewhat deeper.

The groundwater elevations shown on Figure 6-17C indicate that water from wells DAEGW06 and DAEGW07 may emerge as seeps (or, in the future, into the surface water of the riparian corridor) because the water levels in these wells (i.e. 108 and 70 feet PLLW, respectively) are at or slightly above the ground surface elevation at the toe of the landfill. Therefore, applicable cleanup levels for groundwater from these wells are water quality criteria for drinking water and surface water (Table 5-6). The water levels in the remaining wells (DAEGW03, DAEGW04, DAEGW05, and DAEGW08) are 20 to 25 feet below the elevation of the potential seep or surface water locations; as such, groundwater from these wells may not emerge into surface water for hundreds of feet (greater than 450 feet) down gradient of the site. Applicable cleanup levels for groundwater from monitoring wells DAEGW03, DAEGW04, DAEGW05, and DAEGW08 are drinking water quality criteria only.

As discussed in more detail below, low concentrations of metals have been detected in groundwater samples collected from monitoring wells and the seeps at Landfill E. PCOCs in water samples collected at this site are summarized in Table 6-71. Petroleum hydrocarbons, SVOCs, and VOCs have been periodically detected in groundwater and/or seep samples; in general, the concentrations are less than site specific cleanup levels (Table 5-6). Chemicals identified as COCs in water samples collected from Landfill E monitoring wells and seeps based on screening against applicable cleanup levels are summarized in Table 6-72 and include cadmium, chromium, copper, lead, nickel, selenium, zinc, motor oil range petroleum hydrocarbons ("TPH motor oil"), phenol, and 1,2-DCA. The chemicals retained as COCs in groundwater or surface water after consideration of the frequency of detection, timing of the monitoring event (i.e., not the most recent event), or other site-specific considerations include the following: copper, lead, nickel, and zinc. The rationale for not retaining the other chemicals as COCs is presented below and summarized in the footnotes to Table 6-72.

In Landfill E groundwater monitoring wells, concentrations of dissolved chromium in groundwater samples typically range from 1 to 29.1 µg/L, and have been measured at concentrations up to 130 µg/L. This maximum concentration was detected in the first analysis for dissolved chromium from groundwater samples collected from monitoring well DAEGW04; dissolved chromium concentrations have been in the typical range in

each subsequent analysis (Appendix B). Figure D-1 in Appendix D summarizes chromium concentrations detected from water samples throughout the Presidio. As discussed in Section 6.2.1.3, hexavalent chromium and dissolved chromium in groundwater in upland areas of the Presidio appear to be derived from serpentinite. Serpentinite underlies Landfill E. The presence of dissolved chromium in groundwater samples at this site is likely associated with the serpentinite. Thus, dissolved total chromium is not considered a COC in water at Landfill E.

Cadmium, selenium, phenol, 1,2-DCA, and TPH motor oil were eliminated as COCs in Landfill E groundwater based upon the infrequency of detection, the low level detection, and the timing of the monitoring event (i.e., not the most recent event). These chemicals were not detected in at least the five most recent sampling rounds. In some cases, the frequency of detection in a given well was also less than five percent. The monitoring well, chemical detected, number of samples collected, usual detection limit, detected concentration and event of detection are presented in the table below.

Petroleum hydrocarbons as motor oil were detected during the same monitoring period (First Quarter, 1996 ("1Q96")) at Fill Site 1 (Section 6.5.2.3) and Landfill 2 (Section 6.8.1.3), suggesting the laboratory had some problems with the analysis. Based on historic groundwater elevation data, the groundwater elevation during 1Q96 was within the normal range of elevations measured at Landfill E between 1995 and 1998. Therefore, the detections of motor oil could not be due to contact with potential contaminants in the unsaturated zone during an unusually high groundwater event. Rather, the widespread occurrence of motor oil at multiple sites during the same monitoring event suggests the data are spurious.

Monitoring Well	Chemical Detected	Number of Monitoring Events	Usual Detection Limit (μg/L)	Detected Concentration (μg/L)	Monitoring Event
DAEGW03	Cadmium	20 - 1995 through 2002	0.5 to 2	11	1Q98
				11	2Q98
				10.3	3Q98
				8.4	4Q98
				9.5	1Q99
				11.2	2Q99
DAEGW06	Selenium	20 - 1995 through 2002	1 to 10	7	3Q96
				7	4Q96
				6	3Q97
DAEGW05	1,2-DCA	10 - 1995 through 2002	0.5	0.6	2Q96
DAEGW06				0.6	2Q96
DAEGW05	Phenol	8 - 1995 through 2002	10	17	3Q95
DAEGW03	TPH motor oil	7 - 8 - 1995 through 1999	300 to 1,300	3,000	1Q96
DAEGW04				2,700	1Q96
DAEGW05				2,800	1Q96
DAEGW06				680	1Q96
DAEGW07				660	1Q96
DAEGW08				5,000	1Q96

Dissolved nickel was consistently detected in groundwater samples collected from monitoring well DAEGW04 at concentrations ranging from 260 to 4,100 µg/L, which is significantly greater than cleanup levels for human health (100 µg/L). The source of the nickel is not known; well DAEGW04 is the only sampling location at the Presidio with these levels of nickel. The remaining COCs (copper lead, and zinc) were detected in groundwater collected from up gradient monitoring well DAEGW06, as well as within and down gradient of the landfill at generally similar concentrations. However, downgradient monitoring well DAEGW07 is the only well in which copper and lead were detected above cleanup levels in recent groundwater monitoring events. Detected dissolved copper groundwater concentrations in samples from well DAEGW07 ranged from 1 µg/L to 12 µg/L, slightly greater than the cleanup level for surface water of 11.8 µg/L. The maximum dissolved lead concentration in groundwater samples from well DAEGW07 was 9.5 µg/L (with the exception of one likely outlier at 171 µg/L), slightly greater than the cleanup level for surface water of 3.2 µg/L. Zinc concentrations in groundwater samples from wells DAEGW06 and DAEGW07 ranged from 14 to 180 µg/L, which exceeds the surface water cleanup level of 106 µg/L. Copper, lead, and zinc were not detected above cleanup levels in recent groundwater samples from other monitoring wells (i.e., wells DAEGW03, DAEGW04, DAEGW05, and DAEGW08). The metals detected at Landfill E are likely due to naturally-occurring copper and lead dissolved in groundwater. As discussed previously (Section 6.3.1.3), the zinc is likely an artifact of the sampling.

Surface water samples were collected from seeps located near Landfill E (DAESP01, DAESP02, DAESP02A, DAESP03, and DAESP04). Total and dissolved metal concentrations were used to evaluate potential COCs in samples collected from these locations except for one sample collected and analyzed for total metals by NEIC and reported in 2000. This sample was rejected from the database because NEIC reported that total elemental results were orders of magnitude higher than their dissolved elemental results due to the dissolution of mineral particles in the samples. Applicable cleanup levels for water from these seeps are water quality criteria for freshwater seeps (Table 5-6).

Copper, lead, and zinc were detected in surface water samples at concentrations greater than their respective cleanup levels for aquatic organisms. Detected copper concentrations in surface water ranged from 1.8 µg/L to 22.8 µg/L, which is slightly greater than the cleanup level for surface water of 11.8 µg/L. Detected lead concentrations in surface water ranged from 0.96 µg/L to 8.9 µg/L, which is slightly greater than the cleanup level for surface water of 3.2 µg/L. Detected zinc concentrations in surface water ranged from 29.6 µg/L to 1,010 µg/L, which is greater than the surface water cleanup level of 106 µg/L. It is likely that these surface water concentrations are consistent with naturally-occurring copper, lead, and zinc in surface water, or are associated with particulates.

Based on the results of this assessment, copper, lead, and zinc in water at Landfill E are most likely associated with background concentrations of these metals. If nickel in well DAEGW04 is due to releases from Landfill E, the impact to groundwater is limited

because elevated levels are not detected throughout the site. At a minimum, monitoring wells in the up gradient direction of groundwater flow at Landfill E are needed to allow comparison of up gradient metals concentrations in groundwater to metals concentrations in groundwater at and downgradient of the site. Two up gradient monitoring wells have recently been constructed at Landfill E as part of the Trust's November 2002 investigation. All Landfill E wells and seeps are recommended to be monitored for all identified COCs in water.

6.5.2 Fill Site 1

The use history and the nature and extent of chemicals in soil and groundwater at Fill Site 1 are discussed in Sections 6.5.2.1 through 6.5.2.3.

6.5.2.1 Fill Site 1 Use History

Fill Site 1 (Figure 6-18A) was reportedly used for disposal of building debris and landscape waste from approximately 1948 to 1973. Fill Site 1 is loosely compacted and voids have been observed within the disposal site. These conditions indicate that Fill Site 1 might be geotechnically unstable. It was estimated in the Alternate Remedial Actions report that Fill Site 1 contains approximately 39,000 cubic yards of fill. The Army originally estimated the volume of fill at the site to be 44,000 cubic yards in its FS, and obtained an almost identical estimate of 45,000 cubic yards (Montgomery Watson, 1999a) after performing a similar analysis to that completed by the Trust in the Alternate Remedial Actions report. Although the Trust and Army estimated that Fill Site 1 contains 39,000 and 45,000 cubic yards, respectively, trenching by the Trust in July 2000 indicates that the size of the landfill may be smaller. Fill Site 1 is located in the central drainage of the Tennessee Hollow (Figure 5-4). As such, the site is in the Freshwater Ecological Protection Zone designated in RWQCB's 96-070 Order. Land use at Fill Site 1 is considered residential and ecological with special status species potentially present (Table 5-1).

6.5.2.2 Fill Site 1 Nature and Extent of Chemicals in Soil

During the RI, the Army dug three test pits in Fill Site 1, and collected a soil sample from each test pit. The Army also completed soil borings LF1SB01 and LF1SB02; two soil samples were collected from boring LF1SB01 but no samples were collected from boring LF1SB02 due to the presence of concrete. In addition, the Army collected two surface soil samples (one composite and one discrete), and installed seven groundwater monitoring wells (Dames & Moore, 1997b). Figure 6-18A shows these sample location points. Debris encountered in the Army's test pits included building debris (concrete, tile, bricks and mortar, wood, pipe, burlap, glass, porcelain, roofing material, and asphalt), and fill soil (shale and serpentinite) (Dames & Moore, 1997b; Montgomery Watson, 1999a). According to the RI, inorganic chemicals detected in soil were within the range of other regional soils (Dames & Moore, 1997b).

The Trust dug and logged five trenches (i.e., LF1TP100 through LF1TP104) at Fill Site 1 in July 2000 (EKI, 2000b). Trenching at Fill Site 1 provided information to reevaluate the estimated extent of the landfill. The northern portion of Fill Site 1 is considered to be much smaller than previously estimated based on the results of trenching by the Trust and review of boring and trench lithologic logs and analytical data compiled by the Army. As shown on Figure 6-18A, Fill Site 1 may be approximately three-fourths of the size estimated in the Alternate Remedial Actions report and may contain 30,000 cubic yards of fill that necessitate remedial actions. Therefore, 30,000 cubic yards will be used as the assumed volume for this Presidio Trust Revised FS Report. The northeastern portion of the fill site appears to be soil that was imported, likely for the construction of Building 767.

Fill observed in trenches excavated by the Trust at Fill Site 1 consisted primarily of sand and gravel. Thickness of the fill appeared to range from approximately 4 feet at the northern portion of the landfill (i.e., LF1TP100 and LF1TP101) to at least 12 feet at the southern portion of the landfill (i.e., LF1TP102 and LF1TP103). Trench LF1TP104 was located in the center of the landfill and contained fill that consisted of sand, gravel, and lithic fragments to approximately 3.5 feet bgs.

Trench LF1TP100 contained essentially no material that could be classified as debris. Debris (i.e., concrete, brick, and mortar fragments) in Trench LF1TP101 was confined to the upper 0.5 feet of the trench and consisted of approximately 1 to 3 percent of this 6-inch layer. Debris comprised approximately 5 percent of the fill by volume in Trench LF1TP102. Debris observed in this trench included concrete, a tire, bottle, wire and metal pieces, bricks, plastic, asphalt, and wood. Fill from trench LF1TP103 contained approximately 1 to 3 percent of debris by volume. Debris from this trench included a tree stump, bricks, mortar pieces, and concrete, marble, and asphalt fragments. No debris was observed in trench LF1TP104.

Air monitoring was performed while digging the five trenches at Fill Site 1. No methane or hydrogen sulfide was detected during or after excavation. Four-point composite soil samples were collected from various points within trenches LF1TP100 through LF1TP103 and analyzed for metals, pesticides, PCBs, SVOCs, VOCs, and petroleum hydrocarbons.

PCOCs detected in the soil samples from Fill Site 1 are summarized in Table 6-73. Bivariate scatter plots of concentrations of major elements from site soil samples show a mixture of concentration distributions that are expected for Colma Formation and serpentinite lithologies. This mixed lithology setting is not surprising given the filling history at this site. Metals above background screening levels identified as PCOCs were largely within the distribution expected for Colma Formation and serpentinite lithologies, and were not considered in the evaluation of COCs. While arsenic, barium, cadmium, chromium, cobalt, lead, nickel, selenium, and zinc were detected in soil samples at concentrations above Colma Formation threshold levels, only arsenic and lead are retained as COCs at Fill Site 1. The maximum barium, selenium, and zinc concentrations are slightly above the threshold levels and in line with the expected background

distributions. Based on these observations, stakeholders agreed not to retain barium, selenium, and zinc as COCs. The cadmium concentrations were in the range to be expected for mixed lithologies, and the stakeholders also agreed not to retain cadmium as a COC. Chromium, cobalt, and nickel concentrations greater than applicable cleanup levels appears to be naturally occurring due to the presence of serpentinite in the fill, and were not retained as COCs. Serpentinite was observed in the trenches at Fill Site 1 (EKI, 2000b). Low levels of pesticides, PAHs, and petroleum hydrocarbons were detected infrequently at Fill Site 1, most at concentrations less than applicable residential and ecological special status species cleanup levels (Tables 5-2 and 5-5). DDT was detected in one sample at a concentration of 0.11 mg/kg, greater than the ecological special status cleanup level. The only COCs in soil retained for Fill Site 1 are arsenic, lead, and DDT (Table 6-74).

The results of trenching by the Trust combined with data collected by the Army in the RI indicate that no remedial actions are anticipated to be necessary for the northeastern portion of Fill Site 1 because the fill does not contain retained COCs at concentrations greater than cleanup levels and has minimal amount of debris. Remedial actions may still be required for the southern portion of Fill Site 1 that contains higher percentages of debris. The arsenic and lead greater than applicable cleanup levels were detected in samples from locations LF1SB01 and LF1TP102; DDT was also detected in a sample from LF1TP102. These sample locations are in the central part of Fill Site 1 (Figure 6-18A).

6.5.2.3 Fill Site 1 Nature and Extent of Chemicals in Water

Seven groundwater monitoring wells are located in the Fill Site 1 vicinity, as shown on Figure 6-18B. In addition, surface water samples were collected from seeps located near Fill Site 1, as well as El Polin Spring. Monitoring wells LF1GW07 and LF1GW04 are located up gradient of Fill Site 1 and are largely screened within the Colma Formation, although the lower portions are screened in serpentinite or serpentinite fragments, as noted during drilling. Monitoring wells LF1GW03 and LF1GW06 are within the landfill and are screened within the Colma Formation. LF1GW06 is screened well below the ground surface and fill material. Monitoring wells LF1GW01, LF1GW02, and LF1GW05 are down gradient of Fill Site 1 and screened within the Colma Formation. Table 6-75 identifies PCOCs in water at Fill Site 1. The groundwater elevations shown on Figure 6-18B indicate that water from wells LF1GW01, LF1GW03, LF1GW04, and LF1GW07 may emerge as seeps (or, in the future, into the surface water of the riparian corridor) because the water levels in these wells (i.e., 99 to 106 feet PLLW) are at or above the ground surface elevation at El Polin Spring (i.e., approximately 100 feet PLLW). Therefore, applicable cleanup levels for groundwater from these wells and for water samples from the seeps are water quality criteria for drinking water and surface water (Table 5-6). The water levels in the remaining wells (LF1GW02, LF1GW05, and LF1GW06) are 10 to 20 feet below the elevation of the potential seep or surface water locations; as such, groundwater from these wells may not emerge into surface water for hundreds of feet down gradient of the site. Applicable cleanup levels for groundwater

from monitoring wells LF1GW02, LF1GW05, and LF1GW06 are drinking water quality criteria only.

Chemicals identified as COCs in water samples collected from Fill Site 1 monitoring wells and seeps based on screening against applicable cleanup levels are summarized in Table 6-76 and include cadmium, chromium, hexavalent chromium, copper, lead, zinc, phenol, and TPH quantified as motor oil. The chemicals retained as COCs in groundwater or surface water after consideration of the frequency of detection, timing of the monitoring event (i.e., not the most recent event), or other site-specific considerations include the following: cadmium, copper, and zinc. The rationale for not retaining the other chemicals as COCs is presented below and summarized in the footnotes to Table 6-76.

Dissolved hexavalent chromium and dissolved chromium have been detected at concentrations up to 39.7 µg/L and 55 µg/L, respectively, in groundwater samples collected from monitoring well LF1GW03 (Appendix B). Figure D-1 in Appendix D summarizes chromium concentrations detected from water samples throughout the Presidio. As discussed in Section 6.2.1.3, hexavalent chromium and dissolved total chromium in groundwater in upland areas of the Presidio appear to be naturally occurring from oxidation of trivalent chromium in serpentinite. Groundwater underlying portions of Fill Site 1 is in contact with serpentinite. Thus, hexavalent chromium and dissolved chromium at Fill Site 1 are believed to derive from serpentinite and are not considered COCs in water.

Copper and lead were detected above cleanup levels in groundwater samples collected from one or both up gradient monitoring wells LF1GW07 and LFGW04, as well as within and down gradient of the landfill at generally similar concentrations. Detected dissolved copper concentrations in Fill Site 1 groundwater ranged from 1 µg/L to 47.3 µg/L, which is greater than the cleanup level for surface water of 11.8 µg/L. Detected dissolved lead concentrations in Fill Site 1 groundwater ranged from 0.18 µg/L to 21 µg/L, which is greater than the cleanup level for human health and surface water (15 and 3.2 µg/L, respectively). As indicated in Table 6-76, the frequency of detection in some of the wells (e.g., LF1GW01) was less than 5%. In other wells (i.e., LF1GW03, LF1GW04, and LF1GW07), copper and/or lead has not been detected above the applicable cleanup levels in the six to seven most recent monitoring rounds (see the table below). Considering that the up gradient and down gradient concentrations of copper and lead are similar and there is a substantial track record of these metals not being present above cleanup levels (i.e., at least the five most recent sampling rounds), groundwater does not appear to have been impacted by copper and lead.

TPH motor oil was not retained as a COC based upon the infrequency of detection, and the timing of the monitoring event (i.e., not the most recent event). The monitoring well, chemical detected, number of samples collected, usual detection limit, detected concentration, and event of detection are presented in the table below. As discussed in Section 6.5.1.3, TPH motor oil was detected during the same monitoring period at Landfill E, suggesting the laboratory had some problems with the analysis. The

widespread occurrence of motor oil at multiple sites during the same monitoring event suggests the data are spurious.

Phenol was similarly not retained as a COC based on the infrequent detection and the timing of the monitoring event (i.e., not the most recent event). Phenol has only been detected once at a concentration of 21 µg/L in a groundwater sample from well LF1GW02. Phenol was not detected in all other water samples from Fill Site 1 analyzed for SVOCs. In addition, phenol has not been detected in five subsequent monitoring rounds from well LF1GW02.

Monitoring Well	Chemical Detected	Number of Monitoring Events	Usual Detection Limit (µg/L)	Detected Concentration (µg/L)	Monitoring Event
LF1GW01	Copper	21 to 23 - 1995 through 2002	1 to 10	20.3	4Q98
LF1GW03				18	1Q97
				12	2Q98
				12	4Q98
LF1GW04				43.1	4Q98
LF1GW07				20.8	4Q98
LF1GW01	Lead	21 to 23 - 1995 through 2002	1 to 5	3.6	1Q97
LF1GW03				11	1Q97
				6.0	4Q98
LF1GW04				3.5	1Q97
				4.5	1Q99
LF1GW06				21	1Q97
LF1GW01	TPH motor oil	Seven to eight - 1995 through 1999	300 to 1,300	470	1Q96
LF1GW02				2,200	1Q96
LF1GW03				3,030	1Q96
LF1GW04				586	1Q96
LF1GW05				327	1Q96
LF1GW06		Nine through 2001		1,990	1Q96
LF1GW02	Phenol	Six – 1995 through 1996	10	21	3Q95

Dissolved cadmium was infrequently detected in groundwater samples collected from monitoring wells LF1GW05 and LF1GW06 at concentrations ranging from 2 to 64.7 µg/L, which are greater than the cleanup levels for human health and surface water (5 µg/L and 1.1 µg/L, respectively). Dissolved zinc groundwater concentrations range from 7 µg/L to 3,400 µg/L (in well LF1GW06). Zinc concentrations do not exceed the human health cleanup level of 5,000 µg/L in any of the groundwater samples collected from Fill Site 1. However, zinc concentrations exceed the surface water cleanup level of 106 µg/L in groundwater samples from wells LF1GW01, LF1GW03, LF1GW04, and LF1GW07, which are also screened against surface water criteria. In most instances, the elevated zinc levels were detected in the sampling rounds after May 2001. As discussed previously in Section 6.3.1.3, the zinc detected in the recent sampling events is most likely a sampling artifact. Zinc and cadmium are retained as COCs in groundwater at Fill Site 1.

Surface water samples were collected from seeps located near Fill Site 1 (FS1SP01 and FS1SP02) and El Polin Spring. El Polin Spring data will be discussed in the following section. Copper was detected in surface water samples at concentrations greater than its respective cleanup level for freshwater seeps. Detected copper concentrations in surface water ranged from 14 µg/L to 25.3 µg/L, slightly greater than the cleanup level for surface water of 11.8 µg/L. It is likely that these surface water concentrations are consistent with naturally-occurring copper in surface water or are associated with particulates.

Because the metals are only detected sporadically and typically at levels that are only slightly greater than the cleanup levels, the metals detected in groundwater and the seeps at Fill Site 1 are most likely associated with background concentrations in water. Additional groundwater monitoring wells at Fill Site 1 are recommended to evaluate up gradient metal concentrations in groundwater at the site. All Fill Site 1 wells and seeps are recommended to be monitored for all COCs in water.

6.5.3 El Polin Spring

The use history and the nature and extent of chemicals in soil and groundwater at El Polin Spring are discussed in Sections 6.5.3.1 through 6.5.3.3.

6.5.3.1 El Polin Spring Use History

El Polin Spring is a naturally occurring spring that is situated in the down gradient direction of groundwater flow from Fill Site 1 and Landfill 2. Figures 6-18A and 6-27A show the location of El Polin Spring in relationship to Fill Site 1 and Landfill 2, respectively. El Polin Spring is located in the Freshwater Ecological Protection Zone identified in RWQCB Order 96-070 (Figure 5-4). Land use at El Polin Spring is considered recreational and buffer zone ecological (Table 5-1).

6.5.3.2 El Polin Spring Nature and Extent of Chemicals in Soil

No chemical storage or usage is believed to have occurred at El Polin Spring. The Army identified El Polin Spring as a Main Installation site in the RI because PCOCs may have potentially migrated in groundwater from Fill Site 1 and Landfill 2 to El Polin Spring.

6.5.3.3 El Polin Spring Nature and Extent of Chemicals in Water

Review of available data does not suggest that El Polin Spring has been impacted by releases of PCOCs from Fill Site 1 and Landfill 2. Surface water samples were collected from three locations in the El Polin Spring area, EPSP01, EPSW01, EPSPRING,[17] and EPSPRING2. Total and dissolved metal concentrations were used to evaluated COCs in samples collected from these locations, except for one sample collected and analyzed for total metals by NEIC and reported in 2000. This sample, EPSPRING2, was rejected from the database because NEIC reported that total elemental results were orders of

[17] Location EPSPRING is the same as EPSP01 and data are tabulated under location EPSP01.

magnitude higher than their dissolved elemental results due to the dissolution of mineral particles in the samples. This location was only sampled once. Applicable cleanup levels for water at El Polin Spring are water quality criteria for freshwater seeps (Table 5-6).

Chemicals identified as COCs in water samples collected from El Polin Spring based on screening against applicable cleanup levels are summarized in Table 6-80 and include cadmium, chromium, hexavalent chromium, copper, lead, mercury, bromodichloromethane, TPH quantified as diesel, and TPH quantified as fuel oil. The chemicals retained as COCs in water at El Polin Spring after consideration of the frequency of detection, timing of the monitoring event (i.e., not the most recent event), or other site-specific considerations include the following: cadmium, copper, lead, mercury, TPH quantified as diesel, and TPH quantified as fuel oil. The rationale for not retaining the other chemicals as COCs is presented below and summarized in the footnotes to Table 6-80.

Bromodichloromethane was eliminated as a COC at El Polin Spring based upon the infrequency of detection, the low level detection, and the timing of the monitoring event (i.e., not the most recent event). The detected concentration of 0.6 µg/L is only slightly greater than the surface water cleanup level of 0.56 µg/L. The sample location, chemical detected, number of samples collected, usual detection limit, detected concentration and event of detection are presented in the table below.

Sample Location	Chemical Detected	Number of Monitoring Events	Usual Detection Limit (µg/L)	Detected Concentration (µg/L)	Monitoring Event
EPSP01	Bromodichloro-methane	6 - 1998 through 1999	0.5	0.6	4Q98

Dissolved hexavalent chromium and dissolved chromium have been detected at concentrations up to 30.9 µg/L and 40 µg/L, respectively, in seep samples collected from location EPSP01 (Appendix B). Figure D-1 in Appendix D summarizes chromium concentrations detected from water samples throughout the Presidio. The dissolved hexavalent chromium and dissolved chromium concentrations at El Polin Spring are consistent with concentrations detected in groundwater samples from nearby wells. The occurrence of hexavalent chromium appears to be associated with serpentinite present in upland areas at the Presidio, rather than anthropogenic sources. DTSC concurred with this assessment (DTSC, 2000c). Thus, hexavalent chromium and dissolved chromium are not considered COCs in water at El Polin Spring.

As summarized in Table 6-80, cadmium, copper, mercury, lead, and petroleum hydrocarbon compounds were identified as COCs. Copper was detected in water collected from El Polin spring at concentrations ranging from 1 to 59.6 µg/L, which is greater than the cleanup level for surface water of 11.8 µg/L. Detected lead concentrations in surface water collected from El Polin Spring ranged from 3.4 µg/L to 14 µg/L, which is slightly greater than the cleanup level for surface water of 3.2 µg/L.

Mercury was detected in only one surface water sample at a concentration of 0.118 µg/L, which is greater than the cleanup level for surface water of 0.012 µg/L. Cadmium was detected in one sample collected from El Polin Spring at a concentration of 4 µg/L, which is greater than the cleanup level for surface water of 1.1 µg/L. It is likely that these surface water concentrations are consistent with naturally-occurring levels in surface water, or are associated with particulates.

Fuel oil range petroleum hydrocarbons were detected in one sample collected at El Polin Spring at a concentration of 1,800 µg/L. Montgomery Watson interpreted these to be caused by interference from dissolved organic matter from the abundant surrounding vegetation (e.g., eucalyptus trees, bark and leaves) rather than fuel oil. Diesel range petroleum hydrocarbons have also been detected at El Polin Spring. Although petroleum hydrocarbons are not COCs in water at Fill Site 1 and Landfill 2, they are retained at El Polin Spring. Remedial actions to be implemented at these landfills will reduce the potential for contamination of the spring. Except for monitoring of the spring water as part of the remedial actions at Landfill 2, no further action is proposed for El Polin Spring.

6.6 CRISSY FIELD

Crissy Field was historically a tidal marsh and an airfield. In 1921, Crissy Field became the first and only Army Air Service defense station on the west coast of the United States. Cleanup of most of the chemical release sites at Crissy Field was expedited and performed in 1998 to facilitate restoration of wetlands and the grass covered airfield by the Golden Gate National Parks Association ("GGNPA") and NPS. Remaining sites at Crissy Field to be addressed under the Presidio Trust Revised FS Report include Sewer Lift Station No. 1, Former Building 611 Area, and Building 633 Firing Range.

6.6.1 Sewer Lift Station No. 1

The use history and the nature and extent of chemicals in soil and groundwater at Sewer Lift Station No. 1 are discussed in Sections 6.6.1.1 through 6.6.1.3.

6.6.1.1 Sewer Lift Station No. 1 Use History

Sanitary sewers typically flow by gravity to the sewage treatment plant, with the assistance of lift stations along the route to pump sewage from low points and over long distances. The capacity of the lift station may be exceeded and result in overflow conditions in the event of power outages, high flow periods, or other circumstances. The Army performed a limited investigation of Sewer Lift Station No. 1 to evaluate if overflows that occurred during severe storms resulted in the release of PCOCs to soil and groundwater. The location of Sewer Lift Station No. 1 is shown on Figure 6-19A. Land use at Sewer Lift Station No. 1 is considered recreational and buffer zone ecological (Table 5-1).

6.6.1.2 Sewer Lift Station No. 1 Nature and Extent of Chemicals in Soil

Two shallow soil samples collected from borings CFLSSB01 and CFLSSB02 completed near Sewer Lift Station No. 1 were analyzed for metals, VOCs, and petroleum hydrocarbons.

PCOCs detected in the soil samples from Sewer Lift Station No. 1 are summarized in Table 6-81. Bivariate scatter plots of concentrations of major elements from site soil samples show a distribution of concentrations that are expected for beach/dune lithology. Metals above background screening levels identified as PCOCs were largely within the distribution expected for beach/dune soil, with the exceptions of lead and zinc. The soil sample from boring CFLSSB02 contained 603 mg/kg of lead and 139 mg/kg of zinc; both of these concentrations are greater than applicable recreational or buffer zone ecological cleanup levels (Table 5-2). Although nickel was detected in the soil at a concentration of 110 mg/kg, which exceeds the applicable cleanup level of 71 mg/kg, review of the bivariate scatter plots indicated the nickel was also in the range of the beach/dune distribution. Therefore lead and zinc are retained as COCs in soil at Sewer Lift Station No. 1 (Table 6-82).

For purposes of evaluating remedial alternatives, it is assumed that 50 cubic yards of impacted soil exists at Sewer Lift Station No. 1. The generalized area of concern is depicted on Figure 6-19B.

6.6.1.3 Sewer Lift Station No. 1 Nature and Extent of Chemicals in Water

Grab groundwater samples were collected from boring CFSSB01 completed at Sewer Lift Station No. 1. PCOCs detected in the water samples from Sewer Lift Station No. 1 are summarized in Table 6-83. Applicable cleanup levels for groundwater at this site are drinking water MCLs (Table 5-6). COCs detected in the water samples from Sewer Lift Station No. 1 are summarized in Table 6-84. Samples were not filtered prior to analysis for metals. Total arsenic, barium, chromium, lead, and nickel were detected in these samples at concentrations greater than their applicable cleanup levels. It is believed that these elevated metals concentrations are associated with suspended solids entrained in the sample, rather than impacts from the lift station. As part of the remedy the Trust will collect and analyze a filtered grab groundwater sample to demonstrate that groundwater at Sewer Lift Station No. 1 does not contain metals at levels of concern.

6.6.2 Former Building 611 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Former Building 611 Area are discussed in Sections 6.6.2.1 through 6.6.2.3.

6.6.2.1 Former Building 611 Area Use History

The Former Building 611 Area is shown on Figure 6-4. Transformers were formerly stored in this building. A concrete pad enclosed by a fence is what remained of

Building 611 at the time the Army performed the RI. These remnants were demolished prior to the restoration of the Crissy Field wetlands by GGNPA and NPS. The Former Building 611 Area is located in the footprint of the Crissy Field wetlands and former Fill Site 7. Land use at the Former Building 611 Area is considered recreational and buffer zone ecological (Table 5-1).

6.6.2.2 Former Building 611 Area Nature and Extent of Chemicals in Soil

No evidence of chemical releases was identified at the Former Building 611 Area. The Army collected three surface samples 611SS01, 611SS02, and 611SS03 and analyzed these samples for PCBs. As reported in the Army's RI, no PCBs were detected in these samples at concentrations greater than analytical laboratory reporting limits (Dames & Moore, 1997b)[18]. Therefore, there are no PCOCs or COCs in soil at this site. Moreover, the actual location of this site has been excavated to construct the Crissy Field wetlands. Taken together, no significant impacts to soil are likely present at the site. No further action is recommended for soil at the Former Building 611 Area.

6.6.2.3 Former Building 611 Area Nature and Extent of Chemicals in Water

Groundwater is not likely to have been impacted at the Former Building 611 Area. No PCOCs in soil are present. No further action is required for groundwater at Fill Site 7 (Army and DTSC, 1998). Similarly, no further action is recommended for groundwater at the Former Building 611 Area.

6.6.3 Building 633 Firing Range

The use history and the nature and extent of chemicals in soil and groundwater at the Building 633 Firing Range are discussed in Sections 6.6.3.1 through 6.6.3.3.

6.6.3.1 Building 633 Firing Range Use History

A small arms firing range formerly was located southwest of Building 633 as shown on Figure 6-20A. The Army indicated in the RI (Dames & Moore, 1997b) that 2.5 to 5 feet of sand existed over the concrete floor of the backstop and target area throughout the time the firing range was in use. The sand is reportedly still present at the target area. The firing line area was covered with asphalt pavement in the 1960s or early 1970s. The approximate location of the firing line is shown on Figure 6-20A based on a 1937 air photo in a site investigation work plan for the nearby Commissary/Post Exchange Study Area (IT, 1998b). The Army used the area around Building 633 to treat petroleum hydrocarbon impacted soil using low temperature thermal desorption ("LTTD") processes between 1995 and 1998. Land use at the Building 633 Firing Range is considered recreational and buffer zone ecological (Table 5-1).

[18] Analytical data for these samples were not included in the Army's database. The results of the sampling are discussed in the text of the RI. As such, laboratory reporting limits are not available for these samples.

6.6.3.2 Building 633 Firing Range Nature and Extent of Chemicals in Soil

The Army investigated the Building 633 Firing Range to determine the impacts to the sand by lead-containing ammunition used at the firing range. The Army also performed sampling in the vicinity of the Building 633 Firing Range as part of their use of the area for LTTD treatment (Montgomery Watson, 1999g). Based on sampling conducted by the Army before and after their use of the area around Building 633 for soil treatment, the Army concluded that no impacts directly related to the LTTD treatment were detected (Montgomery Watson, 1999g). The data collected by Montgomery Watson related to the LTTD treatment process indicates that past land uses (i.e., prior to the LTTD treatment) have impacted the soil. In July 2002, as part of its investigation of the Commissary/PX Area, the Trust collected additional soil samples in the LTTD area and Building 633 Area (Treadwell and Rollo, 2002a). Data from sample locations from these LTTD investigations that are in the vicinity of, and thus applicable to, the Building 633 Firing Range area are included in the data tables in Appendix B. PCOCs detected in the soil samples from Building 633 Firing Range, including the results of the other investigations by the Army and the Trust, are summarized in Table 6-89. Sample locations and COCs are posted on Figure 6-20A.

Nickel was detected in six soil samples above its applicable cleanup level of 71 mg/kg, and chromium was detected in one sample above its applicable goal of 120 mg/kg. No boring logs are available to review, but scatter plots of the chromium and nickel concentrations in these samples indicates that some serpentinite was likely present in the sample. The distribution of the chromium and nickel data plot between the distributions expected for the beach/dune and Colma and the serpentinite lithologies. These data suggest the presence of minor serpentinite in the fill that was sampled (EKI, 2002b). Therefore, nickel and chromium are not retained as COCs at this site.

Antimony was detected in all the pre-LTTD samples, but only one of the post-LTTD samples. As discussed in Section 4.3.1, analysis for antimony is problematic, and can be prone to false positive results. Over three years passed between the analysis of the two sets of samples, and it is very possible that different laboratories and methods were used for the analyses. The antimony detected in the pre-LTTD samples is believed to be a laboratory artifact and not a COC. The only post-LTTD sample containing antimony above detection limits (POST-LTTD-16) also contained elevated concentrations of lead. Although the antimony detected in that sample may also be a laboratory artifact, antimony is retained as a COC.

Zinc was detected at concentrations up to 170 mg/kg (sample POST LTTD-17), which exceed the applicable ecological cleanup level of 66 mg/kg. The zinc cleanup level is based on background levels of zinc in beach/dune sand. The occurrence of zinc above 66 mg/kg at the Building 633 Firing Range appears to be widespread, including areas that may not be associated with the firing range. As such, the zinc may be associated with shallow fill at the site. To test this hypothesis, EKI used the same approach used to assess zinc at Building 1450/1451 Area (Section 6.7.6.2). Consistent with DTSC policy (DTSC, 1997), EKI used the Wilcoxon Rank Sum test to evaluate whether the zinc in soil

at the Building 633 Firing Range could be distinguished from background concentrations. Zinc concentrations in soil at the Building 633 Firing Range were statistically different from background levels in beach/dune and Colma Formation soil; however, the zinc concentrations could not be statistically distinguished from background levels in serpentinite. As discussed above, the bivariate scatter plots of the Building 633 Firing Range data suggest that serpentinite is present in the fill at the site. Therefore, zinc is not retained as a COC at the Building 633 Firing Range.

The maximum concentration of lead detected was 6,100 mg/kg. This concentration is greater than the applicable ecological cleanup level of 300 mg/kg (Table 5-2). Chemicals identified as COCs in soil at or near the Building 633 Firing Range include antimony, arsenic, copper, lead, and benzo(a)pyrene (Table 6-90). Concentrations of the COCs are posted on Figure 6-20A. For purposes of identifying and evaluating remedial actions, the volume of impacted sand and soil at the Building 633 Firing Range, including both the backstop and the firing line, is assumed to be approximately 2,000 cubic yards. The assumed generalized areas of concern are depicted on Figure 6-20B.

6.6.3.3 Building 633 Firing Range Nature and Extent of Chemicals in Water

It is unlikely that groundwater has been impacted at the Building 633 Firing Range. The lead in soil is believed to be confined to the sand pit that is underlain by concrete. In addition, lead and other metals and PAHs bind tightly to soil and are not prone to leach into water. To confirm this understanding, the Trust collected two grab groundwater samples and a duplicate from soil borings in the Building 633 Firing Range area in the July 2002 investigation. These samples were analyzed for dissolved cadmium, chromium, copper, lead, nickel, and zinc. None of these metals were detected above method detection limits (Appendix B). Therefore, based on the analytical data, no further action is recommended for groundwater at the Building 633 Firing Range.

6.7 PRESIDIO HILL (PART OF PTMP'S SOUTH HILLS PLANNING DISTRICT)

The Presidio Hill planning area (a subset of the PTMP's South Hills planning district) is dominated by recreational open space. Mountain Lake, a significant natural resource and a campsite of the first Anza expedition into the region, is today the centerpiece of an adjacent City of San Francisco playground. The 160-acre Presidio golf course, established in 1895 as one of the earliest golf courses on the west coast of the United States, contributed to the Presidio's emerging park-like identity in the early 1900s. Presidio Hill also contains three distinct nonhistoric housing complexes. These complexes include two small neighborhoods along Washington Boulevard and the Wherry housing area built in the 1950s (currently called the Baker Beach Apartments). Together, the complexes contain about 650 units. Presidio Hill will continue to provide for active outdoor recreation by bikers, golfers, and other visitors. The GMPA and PTMP envision that the Baker Beach Apartments will be removed over time and replaced with native plants and forest species. The Presidio Hill planning area contains the

Graded Area 9 landfill and the miscellaneous sites Mountain Lake, Nike Facility, Nike Swale, Former Building 302 Area, and Building 1450/1451 Area.

6.7.1 Graded Area 9

The use history and the nature and extent of chemicals in soil and groundwater at Graded Area 9 are discussed in Sections 6.7.1.1 through 6.7.1.3.

6.7.1.1 Graded Area 9 Use History

Graded Area 9 is northwest of the former PHSH complex, as shown on Figure 6-21A. Graded Area 9 reportedly was a low-lying area that was filled with "clean fill" and building rubble (Dames & Moore, 1997b). The graded area was reportedly created by depositing fill to create a level surface in order to construct a soccer field. The surface area of the site is estimated to be 150,000 square feet (EKI, 1998b), and the volume of fill is estimated to be approximately 32,000 cubic yards, with an average thickness of approximately 5 to 6 feet. The exact dates of the filling are not known, but the cleared area appears in aerial photographs as early as 1958 (Dames & Moore, 1997b). Land use at Graded Area 9 is considered recreational and ecological with special status species potentially present (Table 5-1).

6.7.1.2 Graded Area 9 Nature and Extent of Chemicals in Soil

As part of the Army's investigations in Graded Area 9 (Dames & Moore, 1997b), five soil samples were collected at depths ranging from 1 to 7 feet bgs from one soil boring and three test pits (LF9SB01, LF9TP01, LFTP02, LFTP03, see Figure 6-21A). Soil samples were analyzed for inorganic chemicals, VOCs, and SVOCs. Selected samples were also analyzed for pesticides, PCBs, and chlorinated herbicides.

To further delineate the extent of fill comprising Graded Area 9 and to better characterize PCOCs within the fill, twelve additional samples from six trenches were collected by the Trust during the summer of 2000 (EKI, 2000a). Soil samples collected from the trenches were analyzed for metals, pesticides, PCBs, PAHs, and SVOCs. While digging the trenches, the air around the trenches was monitored for VOCs using an organic vapor meter ("OVM") equipped with a photoionization device. No VOCs were detected in the air above background concentrations while digging the six trenches. Therefore, soil samples were not analyzed for VOCs.

Fill material observed in the Graded Area 9 trenches consisted primarily of lithic gravel and sand. A small amount (less than 2% by volume) of building debris was observed in trenches LF9TP103, LF9TP104, and LF9TP105. The building debris observed in these trenches included small amounts of concrete, asphalt, clay pipe, and wood. No decomposable matter was observed in these trenches. No debris was observed in the trenches dug east of Battery Caulfield Road (LF9TP100 and LF9TP101) or in trench LF9TP102.

PCOCs detected in the soil samples from Graded Area 9 are summarized in Table 6-93. PAHs were detected infrequently and at concentrations less than applicable recreational and ecological special status cleanup levels (Table 5-2). The pesticides DDT and dieldrin were detected in soil samples at concentrations slightly greater than their applicable ecological special status cleanup levels; a detailed evaluation of this data is presented below. Bivariate scatter plots of concentrations of major elements and metals detected above screening level concentrations for beach/dune soil exhibit what appears to be two distinct distributions of metals concentrations. The Trust interprets this distinction as two separate filling events, a shallow fill and a deeper fill. The range of concentrations of cadmium, chromium, cobalt, copper, nickel, thallium, and vanadium appear to be grouped by depth. Figure C-5 of Appendix C illustrates the contrast between the shallow fill (shown as GA9-F1) and the deeper fill (shown as GA9-F2). The shallow fill appears to have a chromium-cobalt signature somewhere between beach/dune and serpentinite. The Trust believes the actual lithology is greenstone, which typically has chromium, nickel, and cobalt concentrations between serpentinite and beach/dune sand. Greenstone is also characterized by higher concentrations of vanadium and other metals (see Figure C-6 of Appendix C). The deeper fill is characterized by metal ratios that plot with the beach/dune and/or Colma samples. The observed shallow soil was logged as serpentinite (EKI, 2000a), but, based on the analytical data, the soil was likely actually greenstone.

Based on this grouping of common fill areas, and observations from the field sampling (i.e., minimal debris), the stakeholders agreed that the concentrations of cadmium, chromium, nickel, thallium, and vanadium can be interpreted as naturally occurring background metals even though these metals are detected above their applicable cleanup levels. Although cobalt and copper were not specifically discussed by the stakeholders, the copper and cobalt concentrations in the soil samples above applicable cleanup levels follow the same general pattern and are in the same soil samples as the metals agreed by the stakeholders to be background concentrations.

Dieldrin was detected at chemical concentrations slightly greater than the applicable ecological special status species cleanup level in one soil sample collected at Graded Area 9 (0.04 mg/kg, slightly above the 0.039 mg/kg ecological cleanup level, but below the recreational cleanup level of 0.074 mg/kg). Similar to the PCB evaluation at Building 1151/1153 and 680 Areas, the 95 percent upper confidence limit on the arithmetic mean of dieldrin concentrations (EPC) in soil was computed for Graded Area 9. The EPC was computed to be 0.036 mg/kg of dieldrin in soil at Graded Area 9, which is less than the ecological special status cleanup level of 0.039 mg/kg of dieldrin in soil. Therefore, dieldrin is not retained as a COC. The EPC for dieldrin is slightly above the residential cleanup level of 0.030 mg/kg of dieldrin in soil, which is assessed in consideration of unrestricted use of the site. Similar to the approach used at Building 1151/1153 (Section 6.3.3.2), an EPC of 0.036 mg/kg corresponds to an estimated lifetime incremental cancer risk of approximately $1x10^{-6}$. Therefore, the residual dieldrin concentrations at Graded Area 9 also should not pose a significant risk to hypothetical future residential users of the site. The statistics generated in the EPC calculation are

shown in the table below. The approach and equations used to calculate the EPC are presented in Appendix G.

Pesticides in Soil at Graded Area 9		
Chemical	Dieldrin	DDT
Data Table Source	Table B-90 (Appendix B)	Table B-90 (Appendix B)
Number of Data Points	17	14
Data Distribution	Non-parametric	Non-parametric
Arithmetic Mean of Lognormally Transformed Data	-5.3	-5.6
Standard Deviation of Lognormally Transformed Data	1.2	0.88
Percent UCL to Represent EPC	97.5%	95%
EPC	0.036 mg/kg	0.017 mg/kg

DDT was detected in two soil samples collected at Graded Area 9. The maximum detected DDT concentration of 0.026 mg/kg is slightly greater than the applicable ecological special status species cleanup level of 0.0082 mg/kg. The EPC for DDT in soil at Graded Area 9 was computed to be 0.017 mg/kg; however, the EPC is above the DDT cleanup level for special status species, which was established as the lowest PRG_{low}. As discussed below, the lowest PRG_{low} does not appear to be applicable for the exposure of special status species to DDT.

In the Presidio-wide Cleanup Level Document (EKI, 2002d), the ecological special status PRGs were established as the lowest PRG_{low}, unless this value was below the laboratory method detection limit, in which case the special status PRG was set at the detection limit. The selection of lowest PRG_{low} was intended to protect special status species. However, for DDT, the lowest PRG_{low} is for the American robin (Table 5-12 of the Presidio-wide Cleanup Level Document, (EKI, 2002d)), which is not an indicator species for special status wildlife at the Presidio. The PRG_{low} for the Peregrine falcon, which is the applicable indicator species for special status wildlife at the Presidio, is 0.14 mg/kg (Table 5-19 of the Presidio-wide Cleanup Level Document). The DDT PRG_{low} for plant and soil fauna (the indicator for special status plant species) is 40 mg/kg. The EPC of 0.017 mg/kg is an order of magnitude less than the PRG_{low} for the Peregrine falcon and two orders of magnitude less than the PRG_{low} for plants and soil fauna. In fact, the maximum detected concentration of DDT of 0.026 mg/kg is less than the PRG_{low} for the Peregrine falcon. The Trust recognizes that the applicable cleanup levels have been calculated to protect potentially sensitive species. However, for this location where the filling of soil has resulted in the detection of extremely low concentrations of pesticides, the EPC for DDT is less than the PRG_{low} for the applicable indicator special status species. DDT is not retained as a COC at Graded Area 9.

Based on the analysis described above, no COCs are retained at Graded Area 9 (Table 6-94), which is a site with recreational and ecological special status land use. Chemical concentrations detected at Graded Area 9 also meet residential cleanup levels or are consistent with hypothetical future residential use at the site.

No further action is recommended for soil at Graded Area 9.

6.7.1.3 Graded Area 9 Nature and Extent of Chemicals in Water

No groundwater samples were collected in Graded Area 9 during the Main Installation RI work implemented on behalf of the Army (Dames & Moore, 1997b). Therefore, the Trust installed groundwater monitoring wells to allow groundwater quality characterization. Four groundwater monitoring wells (LF9GW100A, LF9GW100B, LF9GW101, and LF9GW102, Figure 6-21B) were constructed in June 2000. Groundwater wells LF9GW100B, LF9GW101, and LF9GW102 are all screened at the Colma Formation and serpentinite interface. LFGW100A is screened entirely within serpentinite. Groundwater was not encountered during drilling in June 2000, and the wells have been dry in each inspection through November 2001. In March 2002, some water was present in well LF9GW100B, but the quantity of water was insufficient for sampling. Wells LF9GW101 and LF9GW102 were dry in March 2002 (Treadwell & Rollo, 2002b). No groundwater samples have been collected from Graded Area 9.

Groundwater is not likely to be impacted because of the low levels of PCOCs detected in soil. Further, the metals, which appear to be naturally occurring, are unlikely to affect groundwater quality beneath Graded Area 9 because metals bind tightly to soil and are not prone to leach into water. Similarly, pesticides, which were detected in soil at concentrations slightly greater than the applicable cleanup levels, also bind tightly to soil and are not prone to leaching. No further action is recommended for groundwater at Graded Area 9.

6.7.2 Mountain Lake

The use history and the nature and extent of chemicals in soil and water at Mountain Lake are discussed in Sections 6.7.2.1 through 6.7.2.3.

6.7.2.1 Mountain Lake Use History

Mountain Lake is a spring-fed natural lake near the southern boundary of the Presidio (Figure 6-22A). Mountain Lake covers nearly 4 acres and has a maximum depth of approximately 15 feet. The actual water surface area of Mountain Lake varies seasonally; during the dry season, the northern portion of the lake area becomes marsh-like, with less free water present than in the wet winter months (personal communication, URS Corporation, 2001).

The Mountain Lake watershed covers at least 162 acres and includes most of the Presidio Golf Course, Mountain Lake Park and residential areas to the south, and runoff from Park Presidio Boulevard. A majority of the watershed extends to the residential area to the south of the Presidio and encompasses the entire Presidio Golf Course. The highest point in the watershed is Presidio Hill, which is occupied by a reservoir. A portion of former officer housing adjacent to Washington Boulevard lies within the watershed. Highway 1 (Park Presidio Boulevard) enters the MacArthur Tunnel near the center of the watershed.

The topography of the vicinity of Mountain Lake is moderately sloping with a southwestern aspect.

Originally, Mountain Lake extended significantly further westward, over what is now Park Presidio Boulevard. During the construction of Park Presidio Boulevard and the MacArthur Tunnel in the 1930s, this portion of the lake was filled, reducing the lake area by 40%. Mountain Lake has occasionally been used as an irrigation supply for the Presidio Golf Course. In addition, groundwater wells on the northeast bank of Mountain Lake have historically been used for irrigation of the Presidio Golf Course may draw water from Mountain Lake (Dames & Moore, 1997b).

Mountain Lake is depicted on Figure 6-22A. The current and planned future land use in Mountain Lake is habitat for aquatic organisms, waterfowl, non-game fish, and birds, and as potential drinking water for humans. Significant human contact with sediment or water is not expected because swimming and wading are not allowed in Mountain Lake. Swimming and wading are prohibited because of possible damage to critical and sensitive habitats. According to the GMPA and the PTMP, the natural aquatic system and wildlife habitat in and around Mountain Lake will be protected and enhanced for their ecological and recreational values. Consistent with the GMPA and the PTMP, the NPS, the GGNPA, and the Trust are in the environmental planning stages of implementing the approved Mountain Lake enhancement project. As part of the project, approximately 5 to 6 feet of sediment from the center portion of the lake may be dredged (Trust, et al., 2000a).

Mountain Lake is not considered a potential source of chemicals (Dames & Moore, 1997b); however sediment and surface water were sampled to determine if the lake has been impacted by other sources. Potential COCs could be released to Mountain Lake through surface water runoff that originates from Park Presidio Boulevard or the Presidio Golf Course, infiltration and groundwater migration from sites such as Landfill 8, and to a lesser extent, airborne particulate transport.

Land use at Mountain Lake is considered ecological with special status species potentially present (Table 5-1).

6.7.2.2 Mountain Lake Nature and Extent of Chemicals in Sediment

Four sediment sampling programs have been conducted at Mountain Lake; the first was conducted by the Army during the RI (Dames & Moore, 1997b), the second was conducted by the Trust in 1998 (EKI, 1998a), the third was conducted by the University of California at Berkeley ("UCB") in 2000 (Byrne and Reidy, 2000), and the fourth and most recent was conducted by the Trust in 2001 (URS, 2001).

As part of the Army's RI investigations of Mountain Lake, four shallow sediment samples were collected from Mountain Lake (MLSD01, MLSD02, MLSD03, and MLSD04) and analyzed for inorganic chemicals, VOCs, SVOCs, and pesticides (Dames & Moore, 1997b) (Figure 6-22A). The Trust conducted additional investigations by

drilling five boreholes and collecting sediment cores in 1998 (EKI, 1998a). The objective of the Trust's sampling was to characterize the sediment that may be removed from the lake as part of the Mountain Lake enhancement project and evaluate disposal options. At that time, the NPS and GGNRA were considering removal of all of the sediment (i.e., to a depth of approximately 20 feet) as part of the enhancement project. The sediment samples collected in 1998 were composited and analyzed for metals, PCBs, pesticides, chlorinated herbicides, SVOCs, petroleum hydrocarbons, and VOCs. In 2000, researchers from UCB conducted a paleoecology study of Mountain Lake sediments to develop an understanding of the native vegetation historically surrounding the lake and the rate of sedimentation. UCB collected four sediment cores and two grab sediment samples from Mountain Lake and analyzed the samples for lead, zinc, organic carbon, and pollen (Byrne and Reidy, 2000). Prompted by the UCB results, which indicated that elevated metals concentrations might exist in Mountain Lake sediments, the Trust conducted an extensive sediment investigation that included analysis for metals, BTEX, MtBE, cyanide, nitrate, pesticides, and petroleum hydrocarbons. This program involved collection of multiple-depth sediments from 15 locations in Mountain Lake and four grab sediment samples collected from storm drains that enter the lake from Park Presidio Boulevard (URS, 2001).

PCOCs detected in Mountain Lake sediments are listed in Table 6-97. Cleanup levels are based on ecological freshwater sediment criteria, assuming the presence of special status species (Tables 5-3 and 5-5). Chemicals above the applicable cleanup levels include metals (antimony, cadmium, chromium, copper, lead, mercury, nickel, vanadium, and zinc), pesticides (Lindane and three of its isomers), diesel range petroleum hydrocarbons, and motor oil range petroleum hydrocarbons. No freshwater sediment cleanup level was available for diesel range petroleum hydrocarbons and motor oil range petroleum hydrocarbons; therefore the saltwater sediment cleanup level of 144 mg/kg was used for both of these compounds (Table 5-5). Figures 6-22A and 6-22B post the sample analytical results data for inorganic and organic COCs, respectively, at Mountain Lake. Based on the distribution of chemicals described below, the storm drain drop inlets appear to be point sources for most of the COCs. The drop inlets are not addressed in this Presidio Trust Revised FS Report. Therefore, chemicals detected in the storm drain drop inlets (samples MLSD 1 through MLSD 3 collected on 24 January 2001) are listed in the data tables in Appendix B, and posted on Figures 6-22A and 6-22B, but these samples are not included in the statistics of the PCOC and COC tables. Site COCs are tabulated in Table 6-98. Although antimony was detected in one sample greater than the applicable cleanup level (Section 4.5.1), the frequency of detection was less than five percent; therefore antimony is not retained as a COC.

Using scatter plots, the stakeholders evaluated the Mountain Lake sediment data relative to the soil metals background data. These plots confirmed the anthropogenic origin of some metals, but suggested that chromium, nickel, and vanadium could be attributed to natural sources. In particular, the scatter plots suggested that the chromium, nickel, and vanadium could have come from greenstone that may have been used as fill for the construction of the Park Presidio Boulevard. The concentration distributions of these chemicals were similar to the distributions expected for greenstone. As a result, the

stakeholders agreed that chromium, nickel, and vanadium were not retained as COCs at the site.

The remaining anthropogenic metals, with the exception of cadmium, tended to be associated with each other and appeared to be causally related to stormwater discharge into Mountain Lake from Park Presidio Boulevard. Figure 6-22C shows the estimated generalized horizontal extent of metals contamination in relation to the stormwater discharge points. Review of the metals analytical data by depth (Figure 6-22A) shows that vertically, the metals contamination is almost entirely confined to the top two feet of sediments, a thickness that probably represents the last 60 to 70 years of sediment deposition (Byrne and Reidy, 2000). This corresponds to a time period when lead from leaded gasoline combustion, zinc from tires, and copper from brake linings could potentially have been significant inputs to the stormwater along Park Presidio Boulevard.

Using lead, the most widespread COC, as an exemplar, all the lead concentrations in excess of 80 mg/kg occur in the upper two feet of sediment. The only exception to this is a pair of samples collected from 5 and 6 feet below sediment surface ("bss") at location MLSE6. The Trust believes the results for these two samples may be spurious or misidentified. Another possibility is that these results could be due to a past erosion channel that has filled in, possibly a rut from Army actions at the lake, such as amphibious activities. No other sediment boring shows lead in excess of 80 mg/kg at depths below 2 feet. Further, depths of 5 to 6 feet bss would correspond to sediment deposition more than 150 years ago. It is unlikely that lead would have been released to Mountain Lake in the mid-19th century or earlier.

Cadmium is an exception to the conceptual model discussed above. Low levels of cadmium are present throughout the sediment strata sampled (i.e., it generally does not show a decreasing trend with depth), suggesting that it occurs as a background constituent at concentrations up to 4 mg/kg. The occurrence of cadmium at concentrations up to 12 mg/kg in storm drain sediment suggests that low-level anthropogenic inputs of cadmium in stormwater also occur. As has been observed of cadmium in Presidio soils, the anthropogenic contributions of cadmium can be very difficult to distinguish from background. The stakeholders agreed to retain cadmium as a COC, but cadmium will not be regarded as a driver in remedial actions unless cadmium concentrations in confirmation samples are greater than ten times the applicable cleanup level of 1.1 mg/kg.

Lindane (gamma-BHC) and its isomers, alpha-, beta-, and delta-BHC, are also COCs (Table 6-98). The distribution of these pesticides in sediment does not indicate a clear source. These organochlorine pesticides occur within the upper 2 feet of sediment, but do not seem to be preferentially located relative to the storm drains (Figure 6-22B). This spatial distribution suggests non-point sources, such as legal application of pesticides at Mountain Lake City Park and the Presidio Golf Course, may have contributed to the pesticides found in the sediments. The same pesticides were also measured in storm drain samples; as such, other sources (including discharge from the storm drain system)

are also probable. Because the source of these pesticides is anticipated to be legal application, these chemicals are listed as COCs, but they will not drive remedial actions.

TPH as diesel and motor oil are also detected above applicable cleanup levels (Table 5-5) and thus are listed on Table 6-98. The TPH as motor oil and the TPH as diesel, where it exceeds cleanup levels, appear to be reasonably associated with sediment discharged from the Park Presidio storm drains (Figure 6-22B). Like the metals, it is restricted to the upper two feet of sediments. In contrast, lower concentrations of TPH as diesel (i.e., less than 100 mg/kg) appear to be more ubiquitous at all depths tested. All the diesel results from samples collected in January 2001 are flagged with a "J", which the laboratory has used to describe results that do not match the diesel standard used for comparison. Given the high concentrations of organic material (i.e., 20 to 30 percent) in the sediments (URS, 2001), the diesel results may represent naturally occurring organic compounds. However, both TPH diesel and TPH motor oil are retained as COCs.

Figure 6-22C presents the general area of concern at Mountain Lake, based on the distribution of retained COCs in sediment that will serve as drivers of cleanup. Metals in sediment in the vicinity of the storm drain outlets not only exceed applicable cleanup levels, but the sediment is also likely to meet the definition of a hazardous waste if it is dredged from the lake. Outside of those areas (e.g., between the storm drain outlets), the presence of lead and metals above cleanup levels is not clearly defined. For purposes of evaluating remedial alternatives, the total assumed volume of impacted sediment is estimated as 6,000 cubic yards.

6.7.2.3 Mountain Lake Nature and Extent of Chemicals in Surface Water

Six surface water samples were collected from Mountain Lake during the Main Installation RI investigations (MLSW01 on two occasions, MLSW02, MLSW03, MLSW04, and MLSW05). Samples MLSW01 were analyzed for metals, cyanide and other miscellaneous parameters, VOCs, SVOCs, and pesticides. Samples MLSW02, MLSW03, MLSW04, and MLSW05 were analyzed for total petroleum hydrocarbons as gasoline and diesel. Detected chemicals of particular note were low-level concentrations of lead, cyanide and heptachlor (Table 6-99). Other chemicals detected in surface water samples include barium, vanadium, and diesel range petroleum hydrocarbon compounds (Table 6-99).

Additional surface water sampling was conducted by the Trust in 2000 to confirm (1) whether significant impacts of lead, cyanide, and heptachlor to Mountain Lake have occurred, and (2) if so, whether these impacts were likely due to urban runoff from Park Presidio Boulevard or the Golf Course. Therefore, three surface water samples were collected in June and August 2000 (MLSW100, MLSW101, and MLSW102). Surface water samples collected in June 2000 were analyzed for lead, chlorinated pesticides, and cyanide. Surface water samples collected in August 2000 were analyzed for cyanide and heptachlor because detection limits were elevated for the June 2000 sampling event. Surface water samples collected in 2000 did not contain heptachlor, lead, or cyanide above reporting limits (Appendix B). A summary of detected compounds in surface

water, the frequency of detection, and minimum and maximum concentrations detected is given in Table 6-99. Sampling locations are shown on Figure 6-22C.

Surface water cleanup levels for Mountain Lake are drinking water standards (i.e., MCLs or action levels) and surface water quality criteria for protection of aquatic life and human health, whichever are more stringent, as shown in Table 5-6. Heptachlor, lead, and cyanide were detected at concentrations greater than their respective cleanup levels in samples collected during the Army's RI investigations in 1990 and are considered COCs (Table 6-100).

However, sample collection and analysis activities conducted in 2000 did not reproduce the earlier findings (Tables B-95 and B-96, Appendix B). Lead was not detected in surface water samples at concentrations greater than 3.0 µg/L. Heptachlor was not detected in surface water samples at concentrations greater than 0.009 µg/L. Cyanide was not detected in surface water samples at concentrations greater than 10 µg/L. This cyanide detection limit is slightly higher than the cleanup level of 5.2 µg/L and slightly higher than a previous detection of 8.2 µg/L. The laboratory indicated that it could not obtain a lower reporting limit. Cyanide was detected in only one surface water sample collected in 1990. Cyanide was not detected in other surface water samples collected in Mountain Lake or in sediment samples from Mountain Lake. Therefore, cyanide, if present, is not widespread at Mountain Lake.

Lead, heptachlor, and cyanide likely derive from runoff that originates from Park Presidio Boulevard or the Presidio Golf Course (Beutel, 1997). Sediment data collected by the Trust and others clearly indicate that runoff originating from Park Presidio Boulevard has transported lead to Mountain Lake. The source for the pesticides is not clear; however, the distribution of pesticides in sediment suggests non-point source releases into the lake. In addition, the presence of pesticides in storm drain sediments indicates that Park Presidio Boulevard may also be a source of pesticides to the lake through the storm system.

No further action is recommended for surface water at Mountain Lake because these low concentrations that have not been detected in repeated sampling events, and remedial activities to address sediments at Mountain Lake should also address any remaining surface water issues.

6.7.3 Nike Facility

The use history and the nature and extent of chemicals in soil and groundwater at the Nike Facility are discussed in Sections 6.7.3.1 through 6.7.3.3.

6.7.3.1 Nike Facility Use History

The Nike Facility consists of three abandoned underground Nike Ajax missile silos or magazines (Figure 6-23A). Nike Ajax missile operations were conducted at the site from 1956 to 1965. Operational procedures at the site included the handling and storage of a

variety of materials, including liquid missile fuel, starter fluids, oil, hydraulic fluid, gasoline, solvents, and battery electrolyte. Hydraulic systems were used to open the silo doors and elevate the missiles. The missile silo bay doors were rendered inoperable by the Army in 1999 and the access doors are locked. Since decommissioning as a missile site, the area has been used for storage of camper trailers and other vehicles, telephone poles, trash dumpsters, wood chips, and gravel (Dames & Moore, 1997b). More recently, the area has been used by the Trust for temporarily stockpiling landscaping waste. Storm water runoff from the magazines is channeled into subsurface drains that discharge storm water to ditches along the eastern and western edges of the facility. The ditches convey storm water to the Nike Swale immediately south of the facility. Land use at the Nike Facility is considered recreational and ecological with special status species potentially present (Table 5-1).

6.7.3.2 Nike Facility Nature and Extent of Chemicals in Soil

Investigations conducted by the Army indicate that sediment in the subsurface drains and ditches contain metals, PAHs, PCBs, and petroleum hydrocarbons at concentrations that are greater than applicable recreational and ecological cleanup levels presented in Tables 5-2 and 5-5. PCOCs in beach/dune soil and sediment at the Nike Facility are summarized in Table 6-101. Figures 6-23A and 6-23B present analytical results for inorganic and organic COCs, respectively, in soil and sediment samples collected at the Nike Facility.

Scatter plots show that the suite of arsenic, cadmium, copper, lead, selenium, and zinc have impacted the soil and sediments at the Nike Facility. Nickel occurs at a maximum concentration of 95 mg/kg (slightly above the applicable ecological special status cleanup level). The scatter plot (Figure C-7 of Appendix C) shows nickel to be within the normal background range. The stakeholders agreed that nickel would not be retained as a COC at Nike Facility.

Based on review of the scatter plots, the low cleanup level for zinc in beach/dune sand (66 mg/kg) could be problematic at the time of remediation because the true zinc background threshold may be considerably higher than this value, e.g., 100 mg/kg or greater (Figure C-8 of Appendix C). The DTSC agreed that during remediation, evaluation of the zinc data would require careful consideration. In order to avoid excavation of background levels of zinc in soil, scatter plot analysis of metals confirmation samples may be appropriate.

As summarized in Table 6-102, metals, PAHs, PCBs, and petroleum hydrocarbons are the retained COCs in soil and sediment at the Nike Facility. The COCs are present in sediment in the underground storm drains and in soil along the surface drainage channels (Figure 6-23C). The RI indicates that the source of these chemicals was materials stored on the pavement at the Nike Facility. Testing of surface soil near the catch basins to the subsurface drains, near the magazines, and in the westernmost drainage is recommended as part of remedial design to confirm that metals and PAHs are not an ongoing source of contamination and that no other COCs (e.g., pesticides) exist in soil. For purposes of

evaluating remedial alternatives, the volume of impacted soil at Nike Facility is assumed to be approximately 250 cubic yards.

6.7.3.3 Nike Facility Nature and Extent of Chemicals in Water

The Army implemented remedial actions in 1998 and 1999 to eliminate the primary sources of PCOCs to groundwater. Approximately 585 gallons of hydraulic fluid was removed by draining tanks of hydraulic equipment as well as skimming hydraulic fluid entrained in or floating on standing water in the magazines. After skimming the hydraulic fluid, 418,776 gallons of water (including wastewater from pressure washing the floor, walls, and ceiling) was pumped from the magazines to the sanitary sewer. After dewatering the magazines, the Army removed 9.4 tons of sludge containing lead-based paint, 18 cubic yards of petroleum hydrocarbon-containing soil, and 1,380 square feet of asbestos (IT Corporation, 1999c). The Army pressure washed the interior of each magazine to clean residual petroleum hydrocarbons from the floor, walls, and ceiling. Petroleum hydrocarbons in the hydraulic fluid reservoirs, pumps, and appurtenant piping were drained and this equipment was taken out of the magazines to eliminate primary sources of PCOCs inside these underground structures. The Army identified a small amount of sandy material that could not be removed from the Magazines 1 and 2 escape hatches because of safety concerns related to the stability of the sandy material in the hatches. This sand, estimated to total one cubic yard in both of the magazines, was tested and found to have petroleum hydrocarbons present at concentrations greater than the Army's cleanup levels (IT Corporation, 1999c). However, due to the small volume, restricted access, and safety concerns, no additional attempt to remove this material is proposed.

The locations of five monitoring wells at the Nike Facility area and the estimated groundwater elevation contours are shown on Figure 6-23C. Monitoring well NKGW03 is located generally up gradient of the Nike Facility and is screened in beach/dune sand and Colma Formation. Monitoring well NKGW02 is down gradient of Buildings 1451 and 1450 and is screened across the beach/dune, Colma, and Franciscan Bedrock (serpentinite) Formations. Monitoring wells NKGW01, NKGW04, and NKGW05 are within the Nike Facility and are screened across Colma Formation and serpentinite interface. Applicable cleanup levels for groundwater from these wells are water quality criteria for drinking water (background levels for petroleum hydrocarbons and related constituents) and freshwater seeps (Table 5-6).

PCOCs detected in groundwater samples collected from the site include metals, VOCs, and petroleum hydrocarbons (Table 6-103). Petroleum hydrocarbons and related constituents do not appear to have significantly impacted groundwater conditions at the Nike Facility. Petroleum hydrocarbons and toluene have occasionally been measured in groundwater samples for Nike Facility monitoring wells at concentrations up to 360 and 12 µg/L, respectively (Table 6-103), which exceed the applicable cleanup levels presented in Table 5-6 and based on the protection of Lobos Creek Basin water resources at background levels. TPH gasoline and toluene were detected in groundwater prior to the Army's clean out of the hydraulic systems. Toluene and TPH gasoline have not been

detected in the last four rounds of groundwater sampling. TPH diesel was detected in groundwater in February 1999, at approximately the same time that the Army completed its cleanout activities. TPH diesel has not been detected in the last two rounds of groundwater sampling (the well was not sampled during the third quarter 2002 because it was dry). Based on the available data, impacts from petroleum hydrocarbons have been addressed through the removal and/or clean out of the hydraulic systems by the Army. Toluene, TPH gasoline, and TPH diesel are not retained as COCs in groundwater at the Nike Facility.

SVOCs, including PAHs, have not been detected in groundwater samples from the Nike Facility wells. The petroleum hydrocarbon levels in groundwater at the Nike Facility are likely to attenuate further due to biological transformation by indigenous microorganisms and because the Army implemented source removal actions to prevent continued leaching of petroleum hydrocarbons to groundwater from the underground structures.

Dissolved chromium has been detected at concentrations up to 20 µg/L and 23 µg/L in groundwater samples collected from monitoring wells NKGW02 and NKGW05, respectively (Appendix B). These levels exceed the freshwater seep cleanup level of 11 µg/L. Figure D-1 in Appendix D summarizes chromium concentrations detected from water samples throughout the Presidio. Based on the site use history, there is no reason to suspect historical use of hexavalent chromium at the site. As discussed in Section 6.2.1.3, hexavalent chromium and dissolved chromium in groundwater in upland areas of the Presidio appear to be naturally occurring and derived from serpentinite. Serpentinite underlies the Colma Formation soil at the Nike Facility. Thus, dissolved chromium is likely naturally occurring and is not considered a COC in water at the Nike Facility.

As summarized in Table 6-104, the other chemicals detected above cleanup levels in groundwater collected from Nike Facility monitoring wells include cadmium, mercury, selenium, and zinc. These chemicals are all retained as COCs even after consideration of the frequency of detection and the timing of the monitoring event. Dissolved cadmium was detected in one groundwater sample collected from monitoring wells NKGW02 and NKGW04 at concentrations of 2 and 1.2 µg/L, respectively, which are above the cleanup level for freshwater seeps of 1.1 µg/L. Mercury was detected in up gradient monitoring well NKGW03, as well as in groundwater collected from wells NKGW01 and NKGW02, located within the Nike Facility. However, mercury has not been detected above cleanup levels in at least the five most recent monitoring events at wells NKGW02 and NKGW03. Mercury was detected repeatedly and at higher concentrations in groundwater samples collected from downgradient monitoring well NKGW01. Detected dissolved mercury concentrations ranged from 0.26 µg/L to 3.3 µg/L, which is greater than the human health and freshwater seep cleanup levels of 2 µg/L and 0.012 µg/L, respectively. Detected dissolved selenium concentrations ranged from 5 µg/L to 13 µg/L, which is slightly greater than the cleanup level for freshwater seeps of 5 µg/L. Only groundwater samples from well NKGW01 contained selenium at levels that exceeded the cleanup level of 5 µg/L.

Zinc was detected above the applicable freshwater seep cleanup level of 106 µg/L in groundwater samples from all of the Nike Facility monitoring wells. As observed at other Presidio sites, zinc concentrations in groundwater samples increased significantly in the 2001 and 2002 monitoring events, when the Trust began its groundwater monitoring program. As discussed previously in Section 6.3.1.3, zinc is believed to be an artifact of sampling; however, zinc is retained as a COC.

It is unclear if the concentrations of cadmium, mercury, and selenium are indicative of naturally occurring concentrations or if these metals originate from releases of metals from the magazines or storm drains. In the event that the metals are not naturally occurring (or a sampling artifact), remedial actions implemented by the Army to address lead-based paint and other contamination in the magazines, as well as those proposed by the Trust for soil and sediment at Nike Facility, should remove on-going sources of metals to groundwater. At a minimum, additional groundwater monitoring is recommended for Nike Facility. All Nike Facility wells are recommended to be monitored for all COCs in water.

6.7.4 Nike Swale

The use history and the nature and extent of chemicals in soil and groundwater at Nike Swale are discussed in Sections 6.7.4.1 through 6.7.4.3.

6.7.4.1 Nike Swale Use History

Nike Swale is a densely vegetated area. As shown on Figure 6-24A, the swale is situated at the base of a steeply sloping hillside below the Nike Facility. Nike Swale receives storm water runoff from the Nike Facility and groundwater that discharges as seeps in the upper portion of the swale during wet weather months. Land use at Nike Swale is considered recreational and ecological with special status species potentially present (Table 5-1).

6.7.4.2 Nike Swale Nature and Extent of Chemicals in Soil

The Army did not sample Nike Swale as part of the RI. The Trust collected a total of twelve soil samples from six soil borings (i.e., NSSB100 through NSSB105) at Nike Swale in July 2000 (EKI, 2000b). Boring locations are shown on Figure 6-24A. Two soil samples were collected from each boring from top of ground surface to 0.5 feet bgs, and 1 to 1.5 feet bgs. Soil samples were analyzed for metals, cyanide, SVOCs, petroleum hydrocarbons, and PCBs. PCOCs in soil at Nike Swale are summarized in Table 6-105. PCOCs include metals and PAHs, and very low concentrations of PCBs and petroleum hydrocarbons. Applicable cleanup levels include recreational and ecological special status species for soil and sediments (Tables 5-2 and 5-3).

As summarized in Table 6-106, metals, PCBs, and PAHs are the COCs identified in soil at the Nike Swale. Cadmium, copper, nickel, and zinc were detected at maximum concentrations of 2.9, 57, 72, and 120 mg/kg, respectively, in soil at Nike Swale

(Figure 6-24A). Scatter plots show that the nickel and zinc occur in the normal range of distributions of background concentrations for beach/dune sand. Therefore, stakeholders agreed not to retain nickel and zinc as COCs at Nike Swale. Copper was detected in sample NSSB100 at a concentration of 57 mg/kg, slightly greater than the ecological cleanup level of 43 mg/kg; however, review of the scatter plots show that the maximum copper concentration is within the normal range of distributions of background concentrations for beach/dune sand. Therefore, copper is also not retained as a COC at Nike Swale. The sample NSSB104, in which the maximum concentration of cadmium was detected, is not located in a clearly identifiable drainage channel (Figure 6-24A). The Trust believes that the cadmium that occurs in this sample may also be naturally occurring. However, the Trust agreed to retain cadmium as a COC and to perform verification sampling at this sampling location. The metals at this site may be the result of historic cut and fill activities associated with the construction of the Nike Facility.

PAHs were found in a different portion of the swale than the locations where the maximum concentrations of metals were detected (Figure 6-24A). PAH concentrations in some soil samples exceed the recreational cleanup levels for soil or sediments (Tables 5-2 and 5-3). Boring NSSB101 is located near the outlet of a drainage channel that originates from the Nike Facility. The PAHs detected in surface soil likely reflect sediment that was conveyed with storm water runoff in the ditches from the Nike Facility. PCBs were detected in only one soil sample at location NSSB105 at a concentration of 0.039 mg/kg; PAHs were co-located with the PCBs in this sample. Generalized areas of concern are depicted on Figure 6-24B. For purposes of identifying and evaluating remedial actions, the volume of impacted soil at Nike Swale is estimated to be approximately 50 cubic yards.

6.7.4.3 Nike Swale Nature and Extent of Chemicals in Water

No surface water impacts have been identified at Nike Swale. The Trust collected an unfiltered surface water sample from location NSSW100 (Figure 6-24B). The surface water sample was analyzed for metals, hexavalent chromium, cyanide, VOCs, SVOCs, petroleum hydrocarbons, and PCBs. PCOCs in surface water at Nike Swale are summarized in Table 6-107. Applicable cleanup levels for Nike Swale are freshwater criteria for protection of aquatic organisms. No COCs were identified in the unfiltered surface water sampled collected from Nike Swale (Table 6-108). No further action is recommended for the surface water at Nike Swale.

6.7.5 Former Building 302 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Former Building 302 Area are discussed in Sections 6.7.5.1 through 6.7.5.3.

6.7.5.1 Former Building 302 Area Use History

Former Building 302 was situated near the Presidio golf course (Figure 6-25). Golf course maintenance equipment, as well as herbicides, fungicides, pesticides, and

fertilizers, were stored in Building 302. This building was demolished prior to construction of the new clubhouse in 1999. Land use at former Building 302 Area is considered recreational (Table 5-1).

6.7.5.2 Former Building 302 Area Nature and Extent of Chemicals in Soil

The Army collected nine soil samples at depths ranging from 0.5 to 5 feet bgs from three borings through the concrete floor of Building 302, and one boring outside of the building to evaluate potential impacts to soil associated with releases of pesticides, herbicides, and fertilizers (Figure 6-25). The herbicides (2,4-dichlorophenoxy)acetic acid ("2,4-D") and 3,6-dichloro-2-methoxy-benzoic acid ("dicamba"), as well as metals, were detected in some of these soil samples (Table 6-109). However, the maximum 2,4-D and dicamba concentrations in these soil samples are less than applicable recreational cleanup levels (Table 5-2). The concentrations of metals detected above background screening levels were in the range of background concentrations for beach/dune or Colma lithology. Serpentinite underlies the shallow soil at the Former Building 302 Area.

As indicated in Table 6-110, no chemicals were detected in soil at concentrations greater than applicable recreational cleanup levels (Table 5-2). Detected chemical concentrations are also less than residential cleanup levels. No further action is recommended for soil at the Former Building 302 Area.

6.7.5.3 Former Building 302 Area Nature and Extent of Chemicals in Water

Although groundwater has not been investigated at the Former Building 302 Area (i.e., monitoring well 300GW01, installed more than 200 feet southeast of former Building 302, is too far away to provide data indicative of impacts, if any), it is unlikely that the minor releases that have taken place at the site have impacted groundwater in the area. Herbicides bind tightly to soil and are not prone to leach into water, especially given the low 2,4-D and dicamba concentrations that have been measured in soil. No further action is recommended for groundwater at the Former Building 302 Area.

6.7.6 Building 1450/1451 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 1450/1451 Area are discussed in Sections 6.7.6.1 through 6.7.6.3.

6.7.6.1 Building 1450/1451 Area Use History

Buildings 1450 and 1451 originally served as operations control and maintenance centers for the Nike Facility. The Building 1450/1451 Area is shown on Figure 6-26. After the Nike Facility was decommissioned, Building 1450 was used for administrative purposes. A former concrete pit is located south of Building 1450. Potential source areas near Building 1451 include a concrete vault, acid fuel storage shed, and concrete pads used for storing jet fuel and other petroleum hydrocarbon products (Figure 6-26).

Land use at the Building 1450/1451 Area is considered residential and buffer zone ecological (Table 5-1).

6.7.6.2 Building 1450/1451 Area Nature and Extent of Chemicals in Soil

The Army collected twelve soil samples from four borings (i.e., NKSB12 through NKSB15) at depths ranging from ground surface to 10 feet bgs near potential source areas at the Building 1450/1451 Area (Figure 6-26). The soil samples were analyzed for metals, VOCs, SVOCs, and petroleum hydrocarbons. PCOCs in soil at this site are summarized in Table 6-113. Analytical results of these samples indicated that phenol and petroleum hydrocarbons were present at low concentrations in soil that are below applicable residential and ecological cleanup levels (Tables 5-2 and 5-5). Metals detected in the soil samples were mostly consistent with background levels for Presidio beach/dune or Colma Formation soils.

Soil sample results for chemicals screened as COCs are posted on Figure 6-26. Sample NKSB15 collected at 9.5 feet bgs contained elevated concentrations of chromium (138 mg/kg), copper (151 mg/kg), and nickel (641 mg/kg). Although logged as Colma Formation, these metals at these concentrations are suggestive of serpentinite. This sample may have been collected at the Colma/serpentinite interface. Although it is unlikely that a release of these metals occurred at depth, the stakeholders requested an additional soil boring to confirm the lithology and the metal concentrations in the subsurface.

In November 2001, the Trust collected two samples from soil boring 1450SB100, located near boring NKSB15. The metals analytical data from the 9.5-foot and 12-foot bgs samples from boring 1450SB100 are typical of Beach/Dune lithology, which is consistent with the field observations. The deeper sample appeared to be Beach/Dune with pieces of weathered serpentinite. Although the nickel detected in the 9-foot sample from this boring was slightly higher than the Beach/Dune lithology cleanup level, the presence of weathered serpentinite is likely the source of the higher nickel concentration (200 mg/kg) detected in the 12-foot sample. Bivariate scatter plots confirmed this finding.

The analytical results of the November 2001 soil sampling event from soil boring 1450SB100 do not indicate significant concentrations of PCOCs. The elevated chromium, copper, and nickel concentrations in the Army's sample 9.5-foot sample were not confirmed. However, the presence of weathered serpentinite pieces in the 12-foot deep sample indicates that the Beach/Dune lithology may not be the appropriate classification for the soil located above weathered serpentinite formation at this site.

Cadmium was detected in the 12-foot bgs soil sample from 1450SB100 at a concentration of 2.4 mg/kg, slightly greater than the applicable cleanup level of 1.7 mg/kg, which is based on a background concentration in Beach/Dune lithology. This cadmium concentration is also slightly above the serpentinite background concentration of 1.9 mg/kg. Cadmium was not detected in the 9-foot sample from this boring, and cadmium had not been included in the analyses during the Army's investigation. There is

no indication of a metals release in this area or to this depth; therefore the Trust concludes that the cadmium is in the range of background concentrations, and cadmium is not retained as a COC at this site.

Zinc was measured at a maximum concentration of 110 mg/kg in beach/dune sand at a depth of 1 foot bgs in sample NKSB12. Zinc was also detected slightly above cleanup levels in other shallow soil samples collected in the Building 1450/1451 Area. These concentrations are considered likely to reflect background conditions in the soil. To verify this hypothesis, DTSC requested that the Trust test the soil zinc data from the Building 1450/1451 Area statistically relative to the background zinc data. In accordance with DTSC procedure (DTSC, 1997), the Wilcoxon Rank Sum test was used to compare the Building 1450/1451 Area soil zinc data against beach/dune background zinc data and Colma Formation background zinc data. In both cases, the test could not find a statistically significant difference between the Building 1450/1451 Area zinc data (including the NKSB12 sample with 110 mg/kg zinc) and the background data. As such, zinc was not retained as a COC at the site.

As summarized in Table 6-114, cadmium, chromium, copper, nickel, and zinc were detected at concentrations that exceed applicable residential and ecological cleanup levels (Table 5-2). However, based on the lithology of soil boring 1450SB100, these metals appear to be associated with the Beach/Dune - Serpentinite interface of this area or general background levels. Due to background conditions, no COCs are known to be present in soil at the Building 1450/1451 Area. Therefore, no further action is recommended for the soil at this site.

6.7.6.3 Building 1450/1451 Area Nature and Extent of Chemicals in Water

The Building 1450/1451 Area is located next to the Nike Facility in the up gradient direction of groundwater flow from that site. Based on analytical data for soil for the Building 1450/1451 Area, impacts to groundwater are not likely to have occurred. Nike Facility well NKGW02 is located in the Building 1450/1451 Area (Figure 6-26). Cadmium and mercury were detected in groundwater collected from well NKGW02 at maximum concentrations of 8 and 0.25 µg/L respectively, which exceed applicable cleanup levels summarized in Table 5-6. Groundwater at the Building 1450/1451 Area is being addressed as part of the Nike Facility (see Section 6.7.3.3).

6.8 PRESIDIO FOREST (PART OF PTMP'S SOUTH HILLS PLANNING DISTRICT)

The Presidio Forest planning area (a subpart of the PTMP's South Hills Planning Area) was the result of an ambitious tree planting project conceived in the 1880s. The forest is a major component of the Presidio's cultural landscape. Composed largely of Monterey pine, Monterey cypress, acacia, eucalyptus, and redwoods, the forest is mature and will require extensive management to survive. Under the GMPA and the PTMP, overgrown portions of the Presidio Forest planning area will be cleared and replanted with native

species to enhance habitat diversity and to restore important vistas. Parts of the forest that provide important wildlife habitat will be maintained. Remnant native plant communities, including serpentine grasslands, are still intact in the Presidio Forest planning area. To protect this rare habitat, nonnative plants will be removed and visitor access will be confined to designated trails. This rehabilitation of the forest will be conducted as set forth in the VMP (NPS and Trust, 2001). At the southern edge of the Presidio Forest planning area is Julius Kahn playground, established in 1922 as a City of San Francisco park on land leased from the Army. The playground is very popular with nearby residents. The Presidio Forest planning area contains Landfill 2 and Landfill 4, and the Transfer Station Area, which is a miscellaneous site.

6.8.1 Landfill 2

The use history and the nature and extent of chemicals in soil and groundwater at Landfill 2 are discussed in Sections 6.8.1.1 through 6.8.1.3.

6.8.1.1 Landfill 2 Use History

Landfill 2 is located above El Polin Spring as shown on Figure 6-27A. The site is at the head of the central stream channel for the Tennessee Hollow enhancement project. Landfill 2 reportedly was used for the disposal of debris and municipal waste from approximately 1946 to at least 1973. Materials identified in the fill include glassware, charred wood, possible hospital waste, and general construction debris, such as concrete brick, slate, piping, and metal roofing materials. Some of the construction debris is suspected to contain asbestos. It was estimated in the Alternate Remedial Actions report that Landfill 2 contains approximately 43,000 cubic yards of fill. The Army originally estimated the volume of fill at the site to be 14,000 cubic yards in its FS, but subsequently revised this estimate to 52,000 cubic yards (Montgomery Watson, 1999a) after performing a similar analysis to that completed by the Trust in the Alternate Remedial Actions report. Land use at Landfill 2 is considered recreational and ecological with special status species potentially present (Table 5-1).

6.8.1.2 Landfill 2 Nature and Extent of Chemicals in Soil

Limited sampling has been conducted at Landfill 2. The Army collected several surface soil samples, drilled soil borings, and excavated test pits to obtain soil samples at Landfill 2 (Figure 6-27A). Not all of the samples were analyzed for a wide range of PCOCs; some samples were collected in the vicinity of an identified “hot spot” in the eastern portion of Landfill 2 and were analyzed only for antimony and lead. The western portion of the landfill remains largely uncharacterized.

PCOCs detected in the soil samples from Landfill 2 are summarized in Table 6-117. Bivariate scatter plots of concentrations of major elements from site soil samples show a distribution of concentrations that are expected for Colma Formation lithology. Several metals above background screening levels identified as PCOCs were within the distribution expected for Colma Formation soil. Chemicals that exceed applicable

recreational and ecological special status species cleanup levels (Tables 5-2 and 5-5) at Landfill 2 are identified in Table 6-118, and posted on Figure 6-27A. These chemicals include antimony, barium, chromium, copper, lead, nickel, silver, vanadium, zinc, and DDT. Antimony was not retained as a COC because it was detected in less than five percent of the soil samples at Landfill 2.

Chromium and cobalt were detected above applicable cleanup levels in soil sample LF2SB02 at 23 feet bgs. Evaluation of the scatter plots indicates that the chromium concentration is in the range of expected concentrations for serpentinite lithology. A serpentinite outcrop is adjacent to Landfill 2. Concentrations of cobalt and nickel in this same sample also appear to be characteristic of serpentinite soils. The stakeholders agreed that chromium and cobalt are naturally occurring and therefore chromium and cobalt are not retained as COCs. Nickel was detected in a native soil sample characteristic of serpentinite; however, nickel was also detected at elevated concentrations in one other sample not necessarily characteristic of serpentinite. Therefore, nickel is retained as a COC.

The landfill is estimated to contain 43,000 cubic yards of fill. The elevated chemical concentrations of metals, such as lead, silver, and zinc, suggest that fill in Landfill 2 might be characterized as hazardous waste if the fill were to be excavated and disposed at an off-site, permitted waste management facility.

6.8.1.3 Landfill 2 Nature and Extent of Chemicals in Water

Figure 6-27B presents environmental conditions at Landfill 2, including locations of groundwater monitoring wells and estimated groundwater elevation contours. Three groundwater monitoring wells are located in the Landfill 2 area (Figure 6-27B). In addition, surface water samples were collected from a seep located near Landfill 2 (LF02SP01), as well as El Polin Spring. Monitoring well LF2GW04 is located cross gradient of Landfill 2 and is screened largely in the Colma Formation, although the lower portion is screened within serpentinite. Monitoring wells LF2GW01 and LF2GW02 are down gradient of the landfill and are also screened within the Colma Formation, with the lower portion of each well screen within serpentinite. Applicable cleanup levels for groundwater from these wells are water quality criteria for drinking water and surface water (Table 5-6).

As discussed in more detail below, low concentrations of metals have been detected in groundwater samples collected from monitoring wells and the seep. PCOCs in water samples collected at this site are summarized in Table 6-119. Petroleum hydrocarbons and VOCs have been periodically detected in groundwater and seep samples; in general, the concentrations are less than site specific cleanup levels (Table 5-6). Chemicals identified as COCs in water samples collected from Landfill 2 monitoring wells and seeps based on screening against applicable cleanup levels are summarized in Table 6-120 and include arsenic, cadmium, chromium, hexavalent chromium, copper, lead, selenium, zinc, TPH quantified as motor oil, and PCE. The chemicals retained as COCs in groundwater or surface water after consideration of the frequency of detection,

timing of the monitoring event (i.e., not the most recent event), or other site-specific considerations include the following: copper, zinc, and PCE. The rationale for not retaining the other chemicals as COCs is presented below and summarized in the footnotes to Table 6-120.

Dissolved chromium has been detected at concentrations up to 16 µg/L in groundwater samples collected from monitoring well LF2GW01 (Appendix B). Figure D-1 in Appendix D summarizes chromium concentrations detected from water samples throughout the Presidio. The concentrations of dissolved chromium in groundwater detected at Landfill 2 are similar to levels detected in other areas of the Presidio. DTSC concurred with this assessment (DTSC, 2000c). Landfill 2 is underlain by serpentinite. As discussed in Section 6.2.1.3, hexavalent chromium and dissolved chromium in groundwater in upland areas of the Presidio appear to be naturally occurring and are derived from serpentinite. Thus, hexavalent chromium and dissolved chromium are believed to be naturally occurring and are not considered COCs in water at Landfill 2.

Dissolved arsenic, cadmium, copper, lead, selenium, and TPH motor oil were eliminated as COCs in Landfill 2 groundwater based upon the infrequency of detection, the low level detection, or the timing of the monitoring event (i.e., not the most recent event). The monitoring well, chemical detected, number of samples collected, usual detection limit, detected concentration, and event of detection are presented in the table below. For arsenic, cadmium, lead, and selenium, the frequency of detection is 5% or less in each well where the chemical was detected above applicable cleanup levels. Dissolved copper was detected in groundwater collected from all three monitoring wells at concentrations ranging from 1 µg/L to 29.2 µg/L, which exceeds the cleanup level for aquatic organisms of 11.8 µg/L. However, copper has not been detected above applicable cleanup levels in groundwater samples collected in the six to seven most recent monitoring rounds (see table below). As discussed in Section 6.5.1.3, petroleum hydrocarbons as motor oil were detected during the same monitoring period at Landfill E and Fill Site 1, suggesting the laboratory had some problems with the analysis. The widespread occurrence of motor oil at multiple sites during the same monitoring event suggests the data are spurious.

Monitoring Well	Chemical Detected	Number of Monitoring Events	Usual Detection Limit (µg/L)	Detected Concentration (µg/L)	Monitoring Event
LF2GW02	Arsenic	20 - 1995 through 2002	1 to 5	11	4Q96
LF2GW02	Cadmium	21 - 1995 through 2002	0.5 to 2	1.9	4Q95
LF2GW01 LF2GW02 LF2GW04	Copper	20 to 21 - 1995 through 2002	1 to 10	15 19.9 14 29.2 11.4 15 14.3	2Q98 4Q98 2Q98 4Q98 1Q99 2Q98 4Q98
LF2GW02	Lead	21 - 1995 through 2002	1 to 3	4.6	4Q98
LF2GW02	Selenium	21 - 1995 through 2002	5	19	1Q02
LF2GW01 LF2GW02 LFGW04 LF2SP01	TPH motor oil	Four to eight - 1995 through 1999	300 to 1,300	1,600 1,200 310 1,100	1Q96 1Q96 1Q96 1Q98

Zinc is the only COC retained in groundwater from Landfill 2 monitoring wells (Table 6-120). Zinc was detected in groundwater collected from all three monitoring wells at concentrations ranging from 8 µg/L to 180 µg/L, which is greater than the cleanup level for aquatic organisms of 106 µg/L. Like other sites at the Presidio, zinc concentrations increased significantly in 2001, when the Trust started its Groundwater Monitoring Program. As discussed previously in Section 6.3.1.3, the zinc detected in the recent sampling events is most likely a sampling artifact. Zinc is retained as a COC at Landfill 2.

Surface water samples were collected from a seep located near Landfill 2 (LF2SP01) and El Polin Spring. El Polin Spring data were discussed in Section 6.5.3.3. Total and dissolved metal concentrations were used to evaluate COCs in samples collected from these locations, except for one sample collected and analyzed for total metals by NEIC and reported in 2000, which was discussed previously. Applicable cleanup levels for water from these seeps are surface water criteria (Table 5-6).

Copper and selenium were detected in surface water samples collected at LF2SP01 at concentrations greater than respective cleanup levels for aquatic organisms. Detected copper concentrations in surface water ranged from 3.6 µg/L to 24.6 µg/L, which is slightly greater than the cleanup level for aquatic organisms of 11.8 µg/L. Selenium was detected in one of five surface water samples at a concentration of 6.4 µg/L, which exceeds the cleanup level of 5 µg/L for aquatic organisms. The surface water concentrations of copper and selenium are likely due to naturally-occurring levels in surface water and associated particulates. PCE was detected at a concentration of 2 µg/L in the most recent sampling event from the seep at LF2SP01. The surface water cleanup level for PCE is 0.8 µg/L, based on protection of human health. Although PCE had not

detected in the three prior sampling rounds at LF2SP01, PCE is retained as a COC in surface water at Landfill 2.

Because the metals are only detected sporadically and typically at levels that are only slightly greater than the cleanup levels, the metals detected in groundwater and the seeps at Landfill 2 are most likely associated with background concentrations in groundwater. In addition, due to the one-time detection of PCE in the Landfill 2 seep, it is not clear if PCE is actually present at the site. Monitoring of wells in the up gradient direction of groundwater flow of the site and wells closer to Landfill 2 in the down gradient groundwater flow direction are recommended to confirm that Landfill 2 has not impacted groundwater and surface water in the area. All Landfill 2 wells and the seep are recommended to be monitored for all COCs.

6.8.2 Landfill 4

The use history and the nature and extent of chemicals in soil and groundwater at Landfill 4 are discussed in Sections 6.8.2.1 through 6.8.2.3.

6.8.2.1 Landfill 4 Use History

Landfill 4 is situated near the Rob Hill group camping area (Figure 6-28A). Landfill 4 reportedly was used for the disposal of debris, municipal waste, and chemical wastes from approximately 1946 to 1981 (Dames & Moore, 1997b). The Army originally estimated the volume of fill at the site to be 5,700 cubic yards in its FS. In 1999, the Army stated it was difficult to define a site boundary or estimate the volume of debris, and did not provide a revised volume in its Landfill Design Summary Report (Montgomery Watson, 1999a). Although Landfill 4 was estimated to contain approximately 7,000 cubic yards of fill in the Alternate Remedial Actions report, trenching by the Trust indicates that the size of the landfill requiring remedial actions may be significantly smaller. The Trust performed trenching at Landfill 4 to investigate whether chemical wastes reportedly deposited in this landfill exist in any significant amounts. At the request of DTSC, the Trust collected samples of native soil underlying the fill and constructed two additional monitoring wells, LF4GW100 and LF4GW101, in the assumed down gradient direction of groundwater flow from Landfill 4 to confirm that groundwater has not been impacted at the site. Land use at Landfill 4 is considered recreational and ecological with special status species potentially present (Table 5-1).

6.8.2.2 Landfill 4 Nature and Extent of Chemicals in Soil

The Army's investigations at Landfill 4 included borings, test pits, and soil sampling. Surface samples were collected from the within the fill material and outside the footprint of Landfill 4. Five test pits were excavated, and one soil sample collected from each test pit. Debris encountered in the fill included brick, glassware, gravel, concrete, pipes, battery caps, and plastic. Eleven soil borings were installed, and soil samples were collected in either the fill material, in native soil below the fill, or in both fill and native materials. Additional borings are shown on Figure 6-28A based on the figures from the

RI, but no data is associated with those borings (Dames & Moore, 1997b). These borings were apparently installed for lithologic logging only.

Six trenches (i.e., LF4TP100 through LF4TP105) at Landfill 4 were excavated and logged by the Trust in July 2000 (EKI, 2000b). Trenching at Landfill 4 yielded information to reevaluate the estimated extent of the landfill, as well as to provide insight into the widely varying waste and debris that may be found in this landfill. The eastern portion of Landfill 4 is considered to be much smaller than previously estimated based on the results of trenching by the Trust, and review of boring and trench lithologic logs and analytical data compiled by the Army. As shown on Figure 6-28B, Landfill 4 may be approximately one-half of the size estimated in the Alternate Remedial Actions report and may contain only 4,200 cubic yards of fill that require remedial actions. Therefore, 4,200 cubic yards will be used as the assumed volume for this Presidio Trust Revised FS Report.

Waste and debris encountered in trenches at Landfill 4 varied significantly. Fill appeared to be nonexistent in the eastern portion of the landfill (i.e., LF4TP100); the soil appeared to be beach/dune sand rather than fill. The fill was encountered to a depth of at least 8 feet in the northwest and western portion of the landfill (i.e., LF4TP103 and LF4TP104). Debris in Landfill 4 included aluminum cans, wood, wire, fabric, concrete, asphalt, metal, glass, pipe, bricks, and lithic gravel. Debris was observed in fill from trenches LF4TP101, LF4TP102, LF4TP103, LF4TP104, and LF4TP105, and appeared to be more abundant along the western edge of the landfill. Smaller debris amounts were observed in the fill from the middle of the landfill and no debris was observed in trench LF4TP100, which was located at the northeastern corner of the landfill.

The greatest amount of debris was observed in trench LF4TP103, where the debris comprised approximately 30 to 40 percent of the fill by volume. In trench LF4TP104, debris comprised approximately 15 to 25 percent of the fill by volume. A 3-foot thick zone of wood debris was observed in trench LF4TP105, beginning at a depth of approximately 5 feet bgs. Debris made up less than 1 percent of the fill by volume in trenches LF4TP101 and LF4TP102.

A thin layer of gray, silt- and clay-like material was observed in trench LF4TP104. This gray material was also observed in trench LF4TP105 in a layer that extended from approximately 1 foot bgs to approximately 5 feet bgs. Clasts of serpentinite rock and some debris were observed in the gray material. An odor was also present in trench LF4TP105, but the source of the odor was not identified and only minor volatile concentrations were detected above background levels during air monitoring. The source of the gray material observed in trenches LF4TP104 and LF4TP105 is not known, but no distinct evidence of disposal of chemical wastes in Landfill 4 (e.g., drums, cans, or jars of chemicals) was observed. Further, the sample of gray material from trench LF4TP105 did not contain elevated concentrations of PCOCs.

In addition to sampling the gray material, composite soil samples were collected from trenches LF4TP100 through LF4TP104, as well as discrete samples of native soil

underlying the fill at the bottom of each trench. These samples were analyzed for metals, VOCs, SVOCs, petroleum hydrocarbons, PCBs, and pesticides. One sample of the gray material in trench LF4TP105 was collected at 4 feet bgs. This sample was analyzed for the same compounds as the other samples, with the exception of SVOCs. Due to the presence of rocks in the sample, there was not enough sample volume for the laboratory to conduct analysis for SVOCs. As summarized in Table 6-121, PCOCs in soil at Landfill 4 include metals, pesticides, PCBs, PAHs, and petroleum hydrocarbons.

Evaluating metals present in soil samples, bivariate scatter plots of concentrations of major elements from site soil samples show a distribution of concentrations that are expected for beach/dune lithology with minor chert/shale and serpentinite. Most of the CCR Title 22 metals were detected in soil samples at concentrations above the beach/dune background screening levels. Several metals above background screening levels were within the distribution expected for beach/dune soil. Chemicals were screened against applicable cleanup levels for beach/dune lithology for recreational land use and for ecological land use with special status species potentially present (Tables 5-2 and 5-5). The chemicals identified as COCs at Landfill 4 are identified in Table 6-121, and posted on Figure 6-28A.

Arsenic was detected above the applicable cleanup level of 5.9 mg/kg in only one sample, LF4TP105, at a concentration of 6.2 mg/kg. The arsenic cleanup level is based on background concentrations. Based on review of the data, the stakeholders agreed that arsenic should not be retained as a COC at this site.

Chromium, cobalt, and nickel were detected at concentrations above applicable cleanup levels for beach/dune lithology in three soil samples, LF4SB03, LF4TP03, and LF4TP105. The pattern of elevated concentrations of chromium, cobalt, and nickel exhibited in these samples are a signature of serpentinite lithology, which could be a component of the fill material at this landfill. Therefore, the stakeholders agreed that chromium, cobalt, and nickel should not be retained as COCs. Therefore, other metals that were detected at concentrations below serpentinite background concentrations from these sample locations are also not considered COCs (e.g., copper and zinc at LF4TP03).

Lead concentrations as high as 940 mg/kg have been detected in soil samples obtained from Landfill 4. Lead concentrations measured in soil samples from the landfill suggest that portions of the fill might be characterized as hazardous waste if the fill were to be excavated and disposed at an off-site, permitted waste management facility.

In addition, the pesticides aldrin, chlordane, DDT, dieldrin, endrin, heptachlor epoxide, and isodrin were detected in several soil samples above applicable cleanup levels (Figure 6-28A). PCBs were also detected in three soil samples.

Surface soil sample LF4SS01 is a four point composite sample, with two of the points collected outside of the generalized area of the Landfill 4, and two points from within the area of the landfill, as shown on Figure 6-28A. Zinc and pesticides were detected in this composite sample at concentrations above applicable cleanup levels. The generalized

area of the landfill represents an estimate of the extent of the landfill based on the available data. However, due to the uncertainty involved with interpreting the results of a four-point composite from locations that extended outside the boundary of the landfill, the DTSC requested that, at the conclusion of remedial activities, discrete confirmation sampling be conducted at these locations outside the footprint of Landfill 4.

As summarized in Table 6-122, retained COCs in soil at Landfill 4 are metals, pesticides, and PCBs. Based on the results of the Trust's trenching at the site, the landfill is estimated to contain 4,200 cubic yards of fill that necessitate remedial actions. The eastern portion of the site appears to be native beach/dune sand (Figure 6-28A).

6.8.2.3 Landfill 4 Nature and Extent of Chemicals in Water

Three groundwater monitoring wells are located in the Landfill 4 area. All three wells are located in the presumed down gradient direction of Landfill 4. The locations of the wells and presumed groundwater flow direction are shown on Figure 6-28B. Monitoring well LF4GW03 is screened at the interface between the Beach/Dune Sand and Colma Formations. Monitoring wells LF4GW100 and LF4GW101 are screened within the Colma Formation, but the wells have been dry (or insufficient water has been present for sampling) since construction in July and August 2000. Applicable cleanup levels for groundwater from these wells are water quality criteria for drinking water (Table 5-6). These wells are located at a great distance from potential freshwater seeps; thus, freshwater water quality objectives are not applicable cleanup levels.

The occurrence of groundwater in existing monitoring well LF4GW03 is seasonal. In the May 2001 and March 2002 sampling events, the quantity of water in well LF4GW03 was insufficient for sampling (Treadwell & Rollo, 2002b). Analytical results of groundwater samples that have been compiled for this well do not suggest that groundwater has been significantly impacted by PCOCs in Landfill 4. As summarized in Table 6-123, metals, petroleum hydrocarbons, and VOCs have been detected in groundwater samples from well LF4GW03.

Testing of native soil collected underneath the fill by the Trust supports the data that show that significant groundwater impacts have not occurred. PCOCs were not detected in native soil. This finding indicates that chemicals do not appear to be leaching from fill in Landfill 4 and infiltrating to groundwater.

As summarized in Table 6-124, trichloroethene ("TCE"), detected at a maximum concentration of 6.2 µg/L at well LF4GW03, is the only COC identified in groundwater at Landfill 4. The drinking water standard for TCE is 5 µg/L. TCE has been only detected in one monitoring event (i.e., February 1999); the well LF4GW03 has not had sufficient water to sample or the sample was not analyzed for TCE in subsequent sampling events. Additional monitoring is recommended to confirm if TCE is present in groundwater at Landfill 4. All Landfill 4 monitoring wells are recommended to be monitored for TCE.

6.8.3 Transfer Station Area

The use history and the nature and extent of chemicals in soil and groundwater at the Transfer Station Area are discussed in Sections 6.8.3.1 through 6.8.3.3.

6.8.3.1 Transfer Station Area Use History

Following cessation of disposal operations at on-site landfills, the Army used the Transfer Station to collect municipal waste generated at the Presidio. Soil was imported to level the site for construction of the Transfer Station. The location of the Transfer Station Area is shown on Figure 6-29A. Waste transfer operations were performed at the site from 1983 to 1994. Garbage from trucks was emptied into roll-off bins along a 150-foot long retaining wall for transport to an off-site, permitted waste management facility. The site was not intended for on-site disposal of waste, but releases of PCOCs may have occurred during waste transfer activities. Rubbish appears to have been dumped along the slope northeast of the Transfer Station. Land use at the Transfer Station Area is considered recreational and ecological with special status species potentially present (Table 5-1).

6.8.3.2 Transfer Station Area Nature and Extent of Chemicals in Soil

The Army collected several surface soil samples and soil samples from borings at the Transfer Station Area, as shown on Figure 6-29A. Soil samples were analyzed for metals, VOCs, SVOCs, petroleum hydrocarbons, PCBs, pesticides, and herbicides. Relatively low concentrations of metals PAHs, and pesticides have been detected in soil at the Transfer Station Area (Table 6-125). Applicable cleanup levels are presented in Tables 5-2 and 5-5.

Evaluation of the boring logs and distribution of metals concentrations on scatter plots indicates that the fill lithology at the Transfer Station Area appears to be a mixture of greenstone, chert/shale, and Jurassic/Cretaceous sedimentary rocks with some sand. Construction of the elevated area to load roll-off bins required the import of fill material and grading at the site. The composition of imported fill material suggests that it could have been imported from Fort Baker in Marin County. Boring logs from the Transfer Station Area mention serpentinite with chert and subarkose. As discussed in the Presidio-wide Cleanup Level Document (EKI, 2002d), greenstone can resemble serpentinite, and samples collected at the Transfer Station Area (and Graded Area 9) may have erroneously been logged as serpentinite rather than greenstone. Greenstone is chemically characterized by concentrations of chromium, nickel, and vanadium in the hundreds of mg/kg (EKI, 2002d). These concentrations of chromium and nickel are significantly less than those characteristic of serpentinite. To assist in the evaluation of the Transfer Station Area data, metals data from fill at Fort Baker in Marin County, as well as greenstone data from Schlocker (1974), were used on the scatter plots. Although the source of the Transfer Station fill is unknown, Fort Baker fill data were selected because the Fort Baker quarries shown on the geologic map mined a combination of greenstone,

chert/shale, and Jurassic/Cretaceous sedimentary rocks.[19] As mentioned in Section 6.7.1.2, copies of the Graded Area 9 scatter plots that included greenstone are included as Figures C-5 and C-6 in Appendix C.

Based on review of the site data and scatter plots, stakeholders agreed that the elevated concentrations of chromium, nickel, and vanadium are associated with greenstone and are not retained as site COCs. In addition, the samples in which cobalt and copper are greater than Beach/Dune lithological background concentrations are at the same locations that the chemistry of chromium, nickel, and vanadium indicate that greenstone is present. Therefore, cobalt and copper are also not retained as site COCs.

As summarized in Table 6-126, COCs retained in soil include arsenic, barium, lead, mercury, zinc, benzo(a)anthracene, DDT, endrin, isodrin, and gamma-chlordane. Analytical data are posted on Figure 6-29A. The presence of lead at 559 mg/kg, and the low concentrations of PAHs and pesticides suggest that minor releases of PCOCs from previous waste transfer activities have taken place. Additional investigation as part of remedial design or remedial actions is recommended to better characterize environmental conditions of soil along the retaining wall with respect to localized background levels of metals, PAHs, and pesticides in soil. For purposes of evaluating remedial alternatives, the volume of impacted soil at the Transfer Station Area is assumed to be approximately 650 cubic yards. The generalized area of concern is depicted on Figure 6-29B.

6.8.3.3 Transfer Station Area Nature and Extent of Chemicals in Water

Although groundwater has not been investigated at the Transfer Station Area, it is unlikely that releases have taken place at the site that have impacted groundwater. PCOCs detected in soil are limited to relatively low concentrations of metals, pesticides, and PAHs. These compounds bind tightly to soil and are not prone to leach into water. Therefore, no further action is proposed for groundwater at the Transfer Station Area.

6.9 LOBOS CREEK VALLEY

Lobos Creek provides potable water for the Presidio. The creek and groundwater that feeds it support riparian woodland, mixed evergreen, and northern coast scrub communities that include rare plant species and provide important wildlife habitat. Because of the stream's location, outfall, and limited land disturbance, there is high potential for buried prehistoric and historic archeological resources in the area. The GMPA envisions that that the riparian woodland will be restored and tributaries to Lobos Creek will be maximized to support and enhance aquatic habitat. The Lobos Creek Valley contains beach dunes that provide habitat for several rare species. The dune habitat will be protected and expanded. The Building 1750 Area and Lobos Creek are the only Main Installation sites in the Lobos Creek planning area.

[19] The source of the Fort Baker fill material is also unknown and may not necessarily be from the Fort Baker quarries.

6.9.1 Building 1750 Area

The use history and the nature and extent of chemicals in soil and groundwater at the Building 1750 Area are discussed in Sections 6.9.1.1 through 6.9.1.3.

6.9.1.1 Building 1750 Area Use History

The Building 1750 Area consists of several small buildings located east of Building 1750 that were associated with former motor pool activities (Figure 6-30). As described in the RI, these buildings included Building 1752, which was a garage with storage areas for batteries and hazardous waste, a waste petroleum, oil, and lubricants storage shed; Building 1754, which was a flammable materials storage shed; Building 1753, which was an outdoor vehicle service ramp, and an oily water underground storage tank. The Trust's record review (EKI, 2002e) identified a 1969 drawing that identified the location of a concrete wash rack and grease trap that was to remain in the northeast corner of the site and a gasoline storage tank and island in the northeast side of the site to be removed. An undated drawing shows hazardous materials storage in the east side of the site. These features are shown on Figure 6-30. Pesticide storage is not known to have occurred at this site.

The former Lobos Creek Protected Range, which was a small arms firing range used in the early 1900s, is situated within a portion of the Building 1750 Area. This firing range will be addressed separately as part of OU 3. Land use at the Building 1750 Area is considered recreational and buffer zone ecological (Table 5-1).

6.9.1.2 Building 1750 Area Nature and Extent of Chemicals in Soil

Assessment of soil conditions at the Building 1750 Area by the Army was limited. Some testing was done as part of investigating the former Lobos Creek Protected Range (Montgomery Watson, 1997a). Soil samples collected at the former firing range were analyzed for metals. No metals were measured at concentrations greater than the applicable recreational and ecological cleanup levels (Table 5-2). However, the sampling locations were not chosen to evaluate releases of hazardous substances that may have occurred as a result of the historic activities at the Building 1750 Area.

According to the Army's RI (Dames & Moore, 1997b), the Army conducted a soil gas survey at the Building 1750 Area. Using a grid spacing of approximately 100 feet, soil gas was collected at approximately 3.5 and 10 feet bgs at 20 probe locations. No halogenated or aromatic hydrocarbons were detected above method detection limits. One unidentified volatile hydrocarbon was detected from one sample location, and was confirmed as alpha-pinene by GC/MS analysis. To provide further confirmation of the analysis, the Army drilled soil boring 1750SB01 in the area of the soil gas detection, and collected a soil sample from 10 feet bgs. This soil sample was analyzed only for alpha-pinene, which was not detected above the laboratory reporting limit (Dames & Moore, 1997b). No other chemicals were detected in the soil gas survey. The Army did not

collect soil samples from former chemical storage and use locations to evaluate whether releases of hazardous substances may have occurred.

In November 2001, the Trust conducted an investigation of this site. The investigation included soil sampling in the area of former chemical storage and use locations, and analysis for metals, VOCs, petroleum hydrocarbons, PAHs, and PCBs. The detected concentrations of metals in samples analyzed from Building 1750 were below applicable recreational and ecological cleanup levels for Beach/Dune lithology. Trace concentrations of diesel were also detected in one sample below applicable cleanup levels. PCOCs are listed in Table 6-131.

In the fall of 2002 a NPS maintenance employee provided anecdotal evidence that the Army had buried "car batteries" in the planted area between Buildings 1750 and 1752. On the 25th and 29th of October 2002, the Trust excavated the area (i.e., 6 feet long, 5 feet wide, and 4.5 feet deep, see Figure 6-30) to look for the batteries; no batteries were found. Rather, two pallets of No. 80 Cosmic Grease containers were encountered. The grease containers were not leaking and the underlying soil did not appear stained. The pallets of grease containers were on a steel beam and were not in direct contact with the soil. The grease containers were placed into three 55-gallon drums and one 30-gallon bucket, along with the soil excavated adjacent to and underneath the pallets. The grease cans, excavated soil, and steel beam were disposed of offsite. A soil sample was collected from the soil underneath and adjacent to the pallets and was analyzed for total oil and grease ("TOG") with and without silica gel cleanup. TOG was not detected in soil. The trench was backfilled with the remaining excavated soil.

Since no COCs were found in site soil, no data is posted on Figure 6-30. Based on the data collected, no further action is recommended for soil at the Building 1750 Area.

6.9.1.3 Building 1750 Area Nature and Extent of Chemicals in Water

A soil gas survey of the Building 1750 Area for VOCs and petroleum hydrocarbons as gasoline was conducted at the Building 1750 Area as part of the RI. No PCOCs were measured above analytical method reporting limits in this survey. Further, no COCs were identified in the soil during the Trust's November 2001 investigation. These results suggest that significant releases to groundwater have not occurred in the Building 1750 Area. No further action is proposed for groundwater at the Building 1750 Area.

6.9.2 Lobos Creek

The use history and the nature and extent of chemicals in soil and groundwater at Lobos Creek are discussed in Sections 6.9.2.1 through 6.9.2.3.

6.9.2.1 Lobos Creek Use History

Lobos Creek has been, and continues to be, the source of 90% of the potable water in the Presidio. The creek water has been historically diverted to the water plant at Baker

Beach for use as potable water. The creek is 1.3 miles long and is located on the southern boundary of the Presidio (Figure 6-31). According to the Army's RI (Dames & Moore, 1997b), approximately 85% of the drainage basin that feeds Lobos Creek is not within the Presidio boundary and lies to the south in the Richmond District of the City of San Francisco. The Presidio portion of the watershed is bounded to the north by a topographic ridge, to the east by the western edge of the Presidio Golf Course, and to the west by the Pacific Ocean. The total Lobos Creek watershed located within the Presidio is 146 acres.

The portion of the watershed north of Lobos Creek extends to the Baker Beach Apartments (former Wherry Housing Complex), the Nike Facility, Landfill 10, and the Presidio Golf Course. Stream flow is perennial and comes from groundwater seepage and runoff from storm events. During wet years, water normally contained in Mountain Lake may flow into Lobos Creek (Dames & Moore, 1997b).

Although Lobos Creek is not considered a potential source of chemicals, sediment and surface water were sampled to determine if the creek has been impacted by other sources. PCOCs could be released to Lobos Creek through surface water runoff, infiltration and groundwater migration, and to a lesser extent, airborne particulate transport. Presidio sites representing potential sources of PCOCs to the creek are the Building 1750 Area, the Nike Facility, Landfill 8, and Landfill 10. The former Lobos Creek Target Butt and Lobos Creek Protected Range, which were small arms firing ranges in the Lobos Creek valley, are also potential sources of PCOCs to the creek. In addition, debris from Landfill 10 could potentially enter the creek in the event of a landslide from Landfill 10 if slopes of the landfill are unstable. This potential concern is being addressed by the Trust under a separate action.

The current and future planned land use in Lobos Creek is habitat for aquatic organisms and birds; therefore cleanup levels for special status ecological receptors are applicable to sediment at this site. Human contact with sediment or water is not expected because swimming and wading are not allowed in Lobos Creek. Swimming and wading are prohibited because of possible damage to critical and sensitive habitats and for protection of the drinking water supply. Beneficial use of the Lobos Creek water also includes continued use as a potable water supply.

6.9.2.2 Lobos Creek Nature and Extent of Chemicals in Sediment

As part of the Army's RI investigations, three sediment samples were collected from Lobos Creek (LCSD01, LCSD02, and LCSD03) and analyzed for inorganic chemicals, VOCs, SVOCs, and pesticides (Dames & Moore, 1997b). Low concentrations of arsenic were detected in sediment samples. No organic compounds were detected in the sediment samples. Additional sampling was conducted by the Trust in 2000 to determine if the arsenic (and lead detected in surface water) represent significant impacts to Lobos Creek (EKI, 2000a). Three additional sediment samples were collected in June 2000 and analyzed for lead and arsenic (LCSD100, LCSD101, and LCSD102). Sample locations are shown on Figure 6-31. PCOCs identified in Lobos Creek sediments are listed in

Table 6-133. The maximum arsenic and lead concentrations detected in Lobos Creek sediment samples were 14.6 and 61 mg/kg, respectively. These levels are less than the applicable ecological cleanup levels of 19 and 82 mg/kg (Table 5-3).

No COCs were identified in Lobos Creek sediment samples above applicable cleanup levels identified in Table 5-3, as indicated in Table 6-134. No further action is recommended for sediment at Lobos Creek.

6.9.2.3 Lobos Creek Nature and Extent of Chemicals in Water

A total of nine surface water samples were collected from Lobos Creek (Figure 6-31), five during the Army's RI investigations (LCSW01, LCSW02, LCSW03, LCSW04, and LCSW05) and four during the Trust's investigations in June 2000 (LCSW100, LCSW101, LCSW102, and LCSW103). Analysis of surface water samples collected during the Main Installation RI work included inorganics, miscellaneous water quality parameters, VOCs, SVOCs, and pesticides. The surface water samples collected in 2000 were analyzed for lead, arsenic, and hexavalent chromium. The Trust's investigation included surface water sample analysis for hexavalent chromium because dissolved chromium was detected in groundwater samples collected near Landfill 10. Landfill 10 is located immediately upstream of Lobos Creek.

No organic compounds were detected in surface water samples collected at Lobos Creek. Inorganic compounds detected in surface water samples and identified as the PCOCs in surface water include arsenic, barium, and lead (Table 6-135). Hexavalent chromium was not detected in the surface water samples collected by the Trust.

Arsenic and lead were the only compounds detected in surface water at concentrations greater than the applicable cleanup levels of 10 and 3.2 µg/L, respectively (Table 6-135). Total arsenic was detected at a concentration of 17 µg/L in sample LCSW103. Total lead was detected in sample LCSW04 collected in 1990 and in sample LCSW103 collected in 2000 at concentrations of 8.55 and 9.1 µg/L, respectively. Lead was not detected in sample LCSW100, which was adjacent to the 1990 sampling location LCSW04. The arsenic and lead detected in the surface water samples may be associated with the localized geochemistry in the creek, as indicated by the presence of a red-orange floc seen at location LCSW103 during the 2000 sampling event. The Trust conducted a biological analysis of the floc, which was determined by scientists at the University of California, Berkeley to be *Leptothrix ochracea (Leiblein) Kuetzing*, a common cosmopolitan organism. The orange color is likely to be due to crystals of ferric hydroxide deposited on the empty sheaths of this bacterium. Alternatively, the arsenic and lead may be associated with suspended particulate matter in the creek. Background concentrations of arsenic and lead in the soils of the Presidio range from 3.3 to 6.2 mg/kg and 7.5 to 66 mg/kg, respectively (Table 4-1). A certain amount of arsenic and lead would be contained in sediment suspended in Lobos Creek. Lobos Creek does not appear to be impacted by other sources of hazardous substances released from Presidio sites. No further action is recommended for water at Lobos Creek.

6.10 COASTAL BLUFFS

The coastal bluffs have not changed significantly over time because the steep slopes have limited the amount of development. Under the GMPA, the Coastal Bluffs planning area will be preserved as the wildest part of the Presidio. Some of the last native plant communities in San Francisco are found along the coastal bluffs. To protect rare and sensitive plants, visitor access will be confined to developed trails, and threatened or endangered plants species will be subject to restoration efforts. The Coastal Bluffs planning area contains the Fill Site 5, and Baker Beach Disturbed Areas 1, 2, and 3 landfills; and the Baker Beach Disturbed Areas 1A and 4 miscellaneous sites. Only Fill Site 5 is in Area B; the remaining Coastal Bluffs sites are within Area A.

6.10.1 Fill Site 5

The use history and the nature and extent of chemicals in soil and groundwater at Fill Site 5 are discussed in Sections 6.10.1.1 through 6.10.1.3.

6.10.1.1 Fill Site 5 Use History

Fill Site 5 is located between Lincoln and Washington Boulevards (Figure 6-32A). The RI indicates that Fill Site 5 was used for the disposal of green wastes, debris, and municipal waste from approximately 1946 to 1981. Although the site is covered by a gravel parking lot, the fill appears to be loosely compacted and voids have been observed in Fill Site 5 that suggest the site is possibly geotechnically unstable. Fill Site 5 reportedly was used when inclement weather rendered disposal at Landfill 4 difficult. Given this use history, it is possible that waste in Fill Site 5 and Landfill 4 are similar. It was estimated in the Alternate Remedial Actions report that Fill Site 5 contains approximately 55,000 cubic yards of fill. The Army originally estimated the volume of fill at the site to be 3,500 cubic yards in its FS, but subsequently revised this estimate to 45,000 cubic yards (Montgomery Watson, 1999a) after performing a similar analysis to that completed by the Trust in the Alternate Remedial Actions report. Land use at Fill Site 5 is considered recreational and ecological with special status species potentially present (Table 5-1). The landfill is believed to be underlain by serpentinite.

6.10.1.2 Fill Site 5 Nature and Extent of Chemicals in Soil

The types and concentrations of PCOCs in fill are not well characterized at Fill Site 5. A total of 11 soil samples have been collected in and around Fill Site 5 (Figure 6-32A). Four soil samples were collected within the upper 3 feet of the landfill, two samples were collected at 4 feet bgs, and the remaining five samples were collected below 10 feet bgs.

Low concentrations of metals and pesticides have been detected in soil samples from Fill Site 5. PCOCs detected at Fill Site 5 are listed in Table 6-137. Applicable cleanup levels are recreational and ecological special status species (Table 5-2). Evaluation of the distribution of metals concentrations indicates that the soil in Fill Site 5 appears to have a mixed beach/dune and greenstone lithology. The fill material could include greenstone,

which is commonly available from Marin County. As discussed in the Presidio-wide Cleanup Level Document (EKI, 2002d), greenstone can visually resemble serpentinite. Soil at Fill Site 5 (as well as the Transfer Station Area and Graded Area 9) may have erroneously been logged as serpentinite rather than greenstone. Greenstone is chemically characterized by concentrations of chromium, nickel, and vanadium in the hundreds of mg/kg (EKI, 2002d). These concentrations of chromium and nickel are significantly less than those characteristic of serpentinite.

Based on review of the site data and scatter plots, the few data points available indicate the site data have a distribution between serpentinite and beach/dune, which is more characteristic of greenstone. The relatively high concentrations of vanadium are in the range of distributions associated with greenstone. Based on review of the site data, the stakeholders agreed that the elevated concentrations of vanadium appear to be associated with greenstone rather than from a release to the environment. Therefore, vanadium is not retained as a site COC.

As summarized in Table 6-138, lead, DDT, endrin, and gamma-chlordane are the COCs retained in soil at Fill Site 5. The distribution of COCs at Fill Site 5 is presented on Figure 6-32A. However, the identification of COCs in soil at this site are based on limited data. Because Fill Site 5 may contain materials that are similar to Landfill 4, it is possible that a portion of the landfill contents may be classified as a non-RCRA hazardous waste if the fill is excavated and disposed at an off-site, permitted facility. The estimated extent of fill and environmental conditions at Fill Site 5 are shown on Figure 6-32B.

6.10.1.3 Fill Site 5 Nature and Extent of Chemicals in Water

Groundwater at Fill Site 5 was not characterized during the Army's RI. To address this data gap, the Trust constructed monitoring wells LF5GW100 and LF5GW101 down gradient of the presumed direction of groundwater flow from Fill Site 5 in July 2000. The locations of the wells are in the bike lane of Lincoln Boulevard. Estimated groundwater elevation contours for Fill Site 5 are presented on Figure 6-32B. Groundwater samples were collected from the two new monitoring wells and existing monitoring well 1349MW03 using low-flow groundwater sampling techniques. The samples were analyzed for metals, hexavalent chromium, VOCs, SVOCs, petroleum hydrocarbons, and PCBs. PCOCs in groundwater at this site are summarized in Table 6-139.

Monitoring well 1349GW03 is located in the vicinity of Building 1349 and within a portion of Fill Site 5 that is situated in the up gradient direction of groundwater flow. Monitoring wells LF5GW100 and LF5GW101 are located in the down gradient direction of groundwater flow of Fill Site 5. All three wells are screened in serpentinite. Wells LF5GW100 and LF5GW101 are located near freshwater seeps, possibly influenced by the suspected fault trace in the area. Applicable cleanup levels for groundwater samples obtained from these wells are water quality criteria for freshwater seeps and drinking water MCLs (Table 5-6).

Dissolved chromium has been detected at concentrations up to 120 µg/L in groundwater samples collected from 1349GW03 (Appendix B). Dissolved chromium concentrations in groundwater samples from wells LF5GW100 and LF5GW101 are lower, but have been measured at concentrations up to 58 and 49 µg/L, respectively. Figure D-1 in Appendix D summarizes chromium concentrations detected from water samples throughout the Presidio. The range of dissolved chromium detected in groundwater at Fill Site 5 is similar to that in other upland portions of the Presidio (e.g., background well UBR02GW02). In addition, these wells are all screened in serpentinite. As discussed in Section 6.2.1.3, hexavalent chromium and dissolved total chromium in groundwater in upland areas of the Presidio appear to be naturally occurring and derived from serpentinite. DTSC concurred with this assessment (DTSC, 2000c). Fill Site 5 is underlain by serpentinite. Thus, hexavalent chromium and dissolved chromium appear to be naturally occurring and are not considered COCs in water at Fill Site 5.

As summarized in Table 6-140, dissolved copper, selenium, and zinc are the only other PCOCs detected in groundwater at concentrations greater than water quality criteria for freshwater seeps or drinking water MCLs (Table 5-6). The maximum dissolved copper concentration was 13 µg/L, detected slightly above the freshwater seep cleanup level of 11.8 µg/L in one out of six sampling rounds from well up gradient well 1349GW03. Dissolved copper concentrations in groundwater samples collected from monitoring wells LF5GW100 and LF5GW101, located downgradient of well 1349GW03 and downgradient of Fill Site 5, are consistently less than the copper cleanup level. Because copper has only been detected once slightly above the cleanup level in an up gradient well, the copper detected in groundwater at Fill Site 5 is likely associated with background concentrations and copper is not retained as a COC.

Dissolved selenium was detected in two laboratory duplicate groundwater samples from up gradient well 1349GW03 at concentrations of 5.2 µg/L and 6.3 µg/L. These concentrations exceed the applicable surface water cleanup level (i.e., 5 µg/L; Table 5-6). However, selenium was not detected in the primary samples or the blind, field duplicate groundwater samples collected from up gradient well 1349GW03 during the same sampling round or in any other sampling events from that well. Because selenium has only been detected slightly above the cleanup level in the laboratory duplicates from this up gradient well, the selenium detected in groundwater at Fill Site 5 is not retained as a COC. Similarly, zinc was detected at a concentration of 170 µg/L in a blind, field duplicate groundwater sample collected from well 1349GW03 on 28 November 2001. This concentration exceeds the freshwater seep cleanup level for zinc of 106 µg/L. However, zinc concentrations in the primary sample and a laboratory duplicate sample were 41 and 16 µg/L, respectively. As such, zinc is not retained as a COC at Fill Site 5.

Additional groundwater monitoring at Fill Site 5 is recommended to compare up gradient concentrations of metals in groundwater to concentrations in groundwater at the site.

6.10.2 Baker Beach Disturbed Area 1A

The use history and the nature and extent of chemicals in soil and water at Baker Beach Disturbed Area 1A are discussed in Sections 6.10.2.1 through 6.10.2.3.

6.10.2.1 Baker Beach Disturbed Area 1A Use History

Baker Beach Disturbed Area 1A is located on the hillside approximately 350 feet north of Disturbed Area 1 (see Section 6.10.3), just north of Battery Marcus Miller, as shown on Figure 6-33A. Disturbed Area 1A reportedly consists of approximately 140 cubic yards of tar-permeated debris that was formerly used as roofing material for the nearby battery. The material appears to be a mounded pile located west of the dripline of the battery, indicating that roofing material may have been scraped off and deposited on the adjacent hillside, creating Disturbed Area 1A. Land use at Baker Beach Disturbed Area 1A is considered recreational and ecological with special status species potentially present (Table 5-1).

6.10.2.2 Baker Beach Disturbed Area 1A Nature and Extent of Chemicals in Soil

The Army collected soil samples from soil borings at two locations in the vicinity of Baker Beach Disturbed Area 1A. Based on the analytical results of soil samples collected from these borings, PCOCs consist primarily of metals and PAHs in surface soil (Table 6-141). Low levels of pesticides and petroleum hydrocarbons have also been detected. Surface soil sample BBSB21 contained three PAHs at concentrations above applicable human health cleanup levels (Table 5-2). No PAHs greater than applicable cleanup levels were detected in a soil sample obtained at 2 feet bgs from the same boring, although heptachlor epoxide was detected above applicable cleanup levels in this soil sample. Metals concentrations in soil are present at background levels and are less than applicable cleanup levels.

Benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, and heptachlor epoxide are the COCs detected in soil at Baker Beach Disturbed Area 1A (Table 6-142). The roofing material may also contain asbestos. Prior to removal of the impacted material, the Trust anticipates sampling the debris for asbestos to determine the appropriate manner of handling the material during remedial actions. For purposes of evaluating remedial alternatives, the volume of impacted soil at Baker Beach Disturbed Area 1A is assumed to be approximately 140 cubic yards. The assumed area of concern is depicted on Figure 6-33B.

6.10.2.3 Baker Beach Disturbed Area 1A Nature and Extent of Chemicals in Water

The Baker Beach Disturbed Areas are situated along steep cliffs within the Coastal Bluffs planning area. The shallow depths to bedrock along these cliffs indicate that significant amounts of groundwater are not present at these sites. Rainfall that infiltrates into soil along the cliffs emerges as seeps at various locations along the Coastal Bluffs. Seeps have not been observed at Baker Beach Disturbed Area 1A so no sampling of water has

been performed. Impacts to water at Baker Beach Disturbed Area 1A are not likely, given the absence of water at this site, relatively low concentrations of PAHs and pesticides detected in soil, and the fact that these COCs bind tightly to soil and are not prone to leach into water. No action is proposed for water at Baker Beach Disturbed Area 1A.

6.10.3 Baker Beach Disturbed Area 1

The use history and the nature and extent of chemicals in soil and groundwater at Disturbed Area 1 are discussed in Sections 6.10.3.1 through 6.10.3.3.

6.10.3.1 Baker Beach Disturbed Area 1 Use History

Baker Beach Disturbed Area 1 lies on the steep cliffs between Lincoln Boulevard and the Pacific Ocean to the west of Batteries Boutelle and Marcus Miller (Figure 6-34A). An earthen path extends from a parking lot at the top of the cliffs through Baker Beach Disturbed Area 1 to the beach below. Soil, debris, and municipal waste may have been deposited on the cliffs as early as 1918, and more certainly from approximately 1946 to 1973. A mounded area is located in the central portion of Baker Beach Disturbed Area 1.

A former incinerator, located at the top of the cliffs, is identified on a map of the Presidio, dated 13 January 1944. Ash and partially burned debris from this incinerator may also have been placed in Baker Beach Disturbed Area 1. Some debris that is visible in Baker Beach Disturbed Area 1 appears to have been burned. It was estimated in the Alternate Remedial Actions report that Baker Beach Disturbed Area 1 contains approximately 24,000 cubic yards of fill. The Army in its FS estimated that Baker Beach Disturbed Area 1 contains 17,000 cubic yards of fill. Land use at Baker Beach Disturbed Area 1 is considered recreational and ecological with special status species potentially present (Table 5-1).

6.10.3.2 Baker Beach Disturbed Area 1 Nature and Extent of Chemicals in Soil

The Army collected soil samples from borings at 14 locations in and around Baker Beach Disturbed Area 1 and analyzed samples for metals, VOCs, SVOCs, pesticides, PCBs, and petroleum hydrocarbons (Figure 6-34A). PCOCs in soil at this site are summarized in Table 6-145 and include metals, pesticides, PAHs, PCBs, petroleum hydrocarbons, and VOCs. Evaluating metals present in soil samples, bivariate scatter plots of concentrations of major elements from site soil samples show a distribution of concentrations that are expected for serpentinite lithology. Most of the CCR Title 22 metals were detected in soil samples at concentrations above the serpentinite background screening levels. Vanadium was detected at a maximum concentration of 99 mg/kg, above the applicable cleanup level. However, upon review of bivariate scatter plots, stakeholders agreed that the maximum concentration of vanadium detected was within the range of distributions expected for serpentinite lithology. Therefore, vanadium was not retained as a COC. The chemicals identified as COCs at Baker Beach Disturbed Area 1 are presented in

Table 6-145, posted on Figure 6-34A, and include metals, PCBs, pesticides, and methylene chloride[20].

Zinc concentrations in nearly all of the soil samples analyzed were greater than applicable recreational or ecological cleanup levels (Table 5-2). Zinc was measured as high as 13,100 mg/kg in soil. A sediment sample collected from a seep flowing from the cliffs near the bottom of Disturbed Area 1 contained lead at 3,700 mg/kg. These elevated metals concentrations are consistent with possible disposal of incinerator ash at this site. The high zinc and lead concentrations measured in soil and sediment suggest that fill in Baker Beach Disturbed Area 1 might be characterized as hazardous waste if the fill were to be excavated and disposed at an off-site, permitted waste management facility.

During meetings discussing the site COCs, DTSC representatives raised concerns that PAHs may be present at the site, particularly within incinerator ash. DTSC requested that ten percent of the confirmation soil samples collected during remedial activities be analyzed for PAHs, even though PAHs are not considered a site COC. If elevated PAHs are detected or visual evidence of ash is present after remediation, additional sampling for PAHs may be requested by DTSC.

6.10.3.3 Baker Beach Disturbed Area 1 Nature and Extent of Chemicals in Water

A surface water sample was collected from the seep flowing from the cliffs near the bottom of Disturbed Area 1 as part of the Army's RI. The seep sample was analyzed for VOCs, SVOCs, PCBs and pesticides, and petroleum hydrocarbons. No organic chemicals were detected in the water sample. Total metal concentrations measured in the samples were used to evaluate PCOCs in the seep. Low concentrations of barium, vanadium and zinc were detected in the seep sample (Table 6-147) at levels indicative of naturally occurring concentrations. The detected concentrations are less than applicable water quality criteria for protection of freshwater seeps (Table 5-6).

As summarized in Table 6-148, no COCs were identified in surface water samples collected at Baker Beach Disturbed Area 1. The analytical results of the seep sample do not suggest that PCOCs are leaching from fill in Baker Beach Disturbed Area 1. No further action is recommended for the seep at Baker Beach Disturbed Area 1.

6.10.4 Baker Beach Disturbed Area 2

The use history and the nature and extent of chemicals in soil and groundwater at Disturbed Area 2 are discussed in Sections 6.10.4.1 through 6.10.4.3.

6.10.4.1 Baker Beach Disturbed Area 2 Use History

Baker Beach Disturbed Area 2 lies on the steep cliffs south of Baker Beach Disturbed Area 1 and immediately south of Battery Godfrey (which is just north of Building 1644),

[20] Although methylene chloride is a common laboratory contaminant, the detected concentrations exceed site cleanup levels; therefore, methylene chloride is retained as a COC.

shown on Figure 6-35A. Soil from grading activities during construction of Battery West reportedly was deposited on the cliffs in approximately 1955. Concrete and asphalt debris are also believed to be present in Baker Beach Disturbed Area 2. It was estimated in the Alternate Remedial Actions report that Baker Beach Disturbed Area 2 contains approximately 4,000 cubic yards of fill. The Army in its FS estimated that Baker Beach Disturbed Area 2 contains 2,200 cubic yards of fill.

A disturbed area to the north of Baker Beach Disturbed Area 2, also adjacent to the parking lot at Battery Godfrey, was identified by NPS. This area appears to have surficial deposits of debris down the slope. Although no data are available to indicate if chemical impacts to the environment have occurred in this area, the Trust is planning to include this area in its evaluation of remedial actions for Baker Beach Disturbed Area 2. This additional area is assumed to include 1,700 cubic yards. For purposes of cost estimates, a total volume of 5,700 cubic yards is assumed. Land use at Baker Beach Disturbed Area 2 is considered recreational and ecological with special status species potentially present (Table 5-1).

6.10.4.2 Baker Beach Disturbed Area 2 Nature and Extent of Chemicals in Soil

The Army collected soil samples from borings at three locations in Disturbed Area 2 (Figure 6-35A). Samples were analyzed for metals, VOCs, SVOCs, pesticides, and petroleum hydrocarbons. PCOCs in soil at this site are summarized in Table 6-149. Evaluating metals present in soil samples, bivariate scatter plots of concentrations of major elements from site soil samples show a distribution of concentrations that are expected for mixed serpentinite and beach/dune lithologies. Several of the CCR Title 22 metals were detected in soil samples at concentrations above the serpentinite background screening levels. PAHs (e.g., acenaphthylene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene) and low levels of pesticides and VOCs were also detected in the soil samples from these borings. The presence of metals and PAHs may indicate that waste was burned in Baker Beach Disturbed Area 2, or that ash generated from the incinerator at the top of the cliffs near Baker Beach Disturbed Area 1 was also disposed in Baker Beach Disturbed Area 2. As indicated above, chemical impacts to the additional disturbed area north of Baker Beach Disturbed Area 2 have not been characterized.

Cadmium and selenium were detected at maximum concentrations of 2.2 and 1.3 mg/kg, respectively, which are above their respective applicable cleanup levels. However, upon review of bivariate scatter plots, stakeholders agreed that the concentrations of cadmium and selenium were within the range expected for serpentinite lithology. Therefore, cadmium and selenium were not retained as COCs.

The chemicals identified as COCs at Baker Beach Disturbed Area 2 are presented in Table 6-150, and posted on Figure 6-35A. The highest copper, lead, and zinc concentrations measured in these samples were 118, 210 and 310 mg/kg, respectively (Table 6-150). These concentrations are slightly higher than ecological cleanup levels established for these metals (Table 5-2), and are in the range of background

concentrations expected for serpentinite and beach/dune lithologies. In addition, benzo(a)pyrene, DDT, and endrin were retained as COCs. The lead concentrations measured in soil samples suggest that some portions of Baker Beach Disturbed Area 2 may be characterized as non-RCRA hazardous waste if the fill is excavated and disposed at an off-site, permitted facility.

6.10.4.3 Baker Beach Disturbed Area 2 Nature and Extent of Chemicals in Water

Seeps have not been observed at Baker Beach Disturbed Area 2 so no sampling of water has been performed. Impacts to water at Baker Beach Disturbed Area 2 are unknown, but are not suspected at this site. No action is recommended for water at Baker Beach Disturbed Area 2.

6.10.5 Baker Beach Disturbed Area 3

The use history and the nature and extent of chemicals in soil and groundwater at Disturbed Area 3 are discussed in Sections 6.10.5.1 through 6.10.5.3.

6.10.5.1 Baker Beach Disturbed Area 3 Use History

Baker Beach Disturbed Area 3 lies within the ravine south of Battery Crosby, as shown on Figure 6-36A. The upper portion of Baker Beach Disturbed Area 3 (generally east and above the 195 foot contour line) appears to consist entirely of soil imported to stabilize Lincoln Boulevard, as was reportedly the case for Baker Beach Disturbed Area 4. The lower portion of Baker Beach Disturbed Area 3 consists of soil mixed with concrete, asphalt, and metal debris. It was estimated in the Alternate Remedial Actions report that Baker Beach Disturbed Area 3 contains approximately 47,000 cubic yards of fill. The Army in its FS estimated that Baker Beach Disturbed Area 3 contains 33,000 cubic yards of fill. Based on investigations conducted by the Trust in July and August 2000, the volume estimate of fill requiring remedial actions has been reduced to 32,000 cubic yards, which includes only the lower portion of Baker Beach Disturbed Area 3. These findings are discussed further below. Land use at Baker Beach Disturbed Area 3 is considered recreational and ecological with special status species potentially present (Table 5-1).

6.10.5.2 Baker Beach Disturbed Area 3 Nature and Extent of Chemicals in Soil

The Army installed five borings within Baker Beach Disturbed Area 3 (borings BBSB11 through BBSB15 on Figure 6-36A). Metals and pesticides were detected in soil samples (Table 6-153). Elevated lead and zinc concentrations were detected in samples from BBSB14, and the Army drilled four additional borings around boring BBSB14 to delineate the lateral and vertical extent of the lead and zinc (see Figure 6-36A). Concrete, asphalt, and metal debris were encountered within the fill material (Dames & Moore, 1997b).

The Army did not investigate the upper portion of Baker Beach Disturbed Area 3. Sampling was conducted by the Trust to confirm that soil in the upper portion of the site does not contain waste or debris, or have PCOCs above applicable cleanup levels. Six shallow soil samples were collected from three borings (i.e., BB3SB100, BB3SB101, and BB3SB102) at Baker Beach Disturbed Area 3 in July 2000 (EKI, 2000b). The locations of the borings are shown on Figure 6-36A. Borings BB3SB100, BB3SB101, and BB3SB102 were completed to 20 feet to investigate the fill adjacent Lincoln Boulevard. No debris was observed in any of the borings. Fill at the eastern portion of the site appears to consist of dune sand with small amounts of silt and clay. Soil samples were analyzed for metals, VOCs, SVOCs, petroleum hydrocarbons, PCBs, and pesticides. Due to high pesticide reporting limits, locations BB3SB100, BB3SB101, and BB3SB102 were resampled in August 2000 for pesticide analysis only. The samples were collected adjacent to the previous sample locations, and are identified by an "R" appended to the sample name that indicates a resampling of the previous location, e.g., BB3SB101R-0.5.

PCOCs in soil at this site are summarized in Table 6-153. To evaluate metals present in soil samples, bivariate scatter plots of concentrations of major elements from site soil samples show a distribution of concentrations that are expected for a mixture of serpentinite and beach/dune lithology. Several of the CCR Title 22 metals were detected in soil samples at concentrations above the beach/dune background screening levels. Low levels of pesticides, PCBs, and PAHs have also been detected in soil.

Arsenic was detected at a maximum concentration of 7 mg/kg, above its applicable cleanup level. However, upon review of bivariate scatter plots, stakeholders agreed that the concentration of arsenic was within the range of distributions for expected for serpentinite or beach/dune lithology. Therefore, arsenic was not retained as a COC.

Table 6-154 summarizes the COCs in soil at Baker Beach Disturbed Area 3, which include cadmium, cobalt, lead, zinc, DDT, chlordane, dieldrin, and PCBs. The COCs are posted on Figure 6-36A.

Figure 6-36B presents environmental conditions at Baker Beach Disturbed Area 3. Borings BB3SB100, BB3SB101, and BB3SB102 completed by the Trust at Baker Beach Disturbed Area 3 indicate that fill believed to be used to support Lincoln Boulevard does not appear to contain debris and is likely structural soil. Therefore, no further action is proposed for this portion of the site. The volume of fill in the lower portion of Baker Beach Disturbed Area 3 is estimated to be 32,000 cubic yards. Detected lead concentrations in soil samples suggest that some portions of Baker Beach Disturbed Area 3 may be characterized as non-RCRA hazardous waste if the fill is excavated and disposed at an off-site, permitted facility.

6.10.5.3 Baker Beach Disturbed Area 3 Nature and Extent of Chemicals in Water

An ephemeral stream or seep flows in the ravine at the bottom of Baker Beach Disturbed Area 3. The Trust sampled the seep in May 2000 at location BB3SW100 (Figure 6-36B) to assess whether debris in Baker Beach Disturbed Area 3 contains soluble constituents

above applicable cleanup levels protective of freshwater seeps (EKI, 2000b). The samples were collected from a boring completed to a depth of 4 feet bgs because adequate water for sampling was not present at the ground surface. Water samples were analyzed for metals, hexavalent chromium, VOCs, SVOCs, petroleum hydrocarbons, and PCBs and pesticides. Low levels of metals and petroleum hydrocarbons were detected in the seep sample (Table 6-155). Applicable cleanup levels for water from this seep are water quality criteria for seeps (Table 5-6). As summarized in Table 6-156, no COCs were identified in water for Baker Beach Disturbed Area 3. No further action is recommended for the seep at Baker Beach Disturbed Area 3. Baker Beach Disturbed Area 3 does not appear to have impacted water quality in the area.

6.10.6 Baker Beach Disturbed Area 4

The use history and the nature and extent of chemicals in soil and groundwater at Baker Beach Disturbed Area 4 are discussed in Sections 6.10.6.1 through 6.10.6.3.

6.10.6.1 Baker Beach Disturbed Area 4 Use History

Figure 6-37A shows the location of Baker Beach Disturbed Area 4, just north of Battery Chamberlin Road and the Baker Beach Apartments. This site reportedly consists of soil imported to stabilize Lincoln Boulevard in 1955. The Army estimated the total volume of fill at Baker Beach Disturbed Area 4 to be 4,000 cubic yards (Dames & Moore, 1997a). Land use at Baker Beach Disturbed Area 4 is considered recreational and ecological with special status species potentially present (Table 5-1).

6.10.6.2 Baker Beach Disturbed Area 4 Nature and Extent of Chemicals in Soil

The Army had characterized only the southern portion of Baker Beach Disturbed Area 4 during its RI (Dames & Moore, 1997b). Of six soil samples collected by the Army, cobalt, lead, zinc, chlordane, and DDT were detected at concentrations above cleanup levels in the samples from boring BBSB16 (Table 6-157). Cobalt was also detected above the applicable cleanup level in on sample from soil boring BBSB18. However, the sources of cobalt, lead, zinc, DDT, and chlordane in soil at Baker Beach Disturbed Area 4 were not identified. The Trust collected six shallow soil samples from three shallow soil borings (i.e., BB4SB100, BB4SB101, and BB4SB102) at Baker Beach Disturbed Area 4 in July 2000 (EKI, 2000b). The locations of the soil borings are shown on Figure 6-37A. The Trust's soil samples were analyzed for metals and pesticides. As at Baker Beach Disturbed Area 3, the Trust's locations were resampled for pesticide analysis only due to high pesticide reporting limits. DDT was detected at a concentration of 0.012 mg/kg in the 0.5 ft bgs sample from BB4SB100, but was not detected at the same location upon resampling (sample BB4SB100R).

PCOCs in soil at this site are summarized in Table 6-157. To evaluate metals present in soil samples, bivariate scatter plots of concentrations of major elements from site soil samples show a combination of distributions, depending on the laboratory that analyzed the data. For example, the cobalt results show a consistent shift to higher concentrations

when analyzed by Environmental Science and Engineering laboratory of Englewood, Colorado (Appendix C) even though the concentrations are likely to represent background for beach/dune and Colma Formation samples. The cobalt results that exceed cleanup levels appear to be an artifact of the laboratory performing the analysis (EKI, 2002a). Therefore, cobalt is not retained as a COC. Lead and zinc, which were also metals detected at concentrations greater than applicable cleanup levels (Table 5-2), were outside the background distributions for their respective metals, regardless of the laboratory analyzing the soil samples. Therefore, lead and zinc are retained as COCs. Low levels of pesticides and petroleum hydrocarbons were also detected in soil.

Soil sample analytical results indicate the fill used to support Lincoln Boulevard and Battery Chamberlin Road at Baker Beach Disturbed Area 4 is likely structural soil. Table 6-158 summarizes the COCs in soil at Baker Beach Disturbed Area 4, which include lead, zinc, DDT, and chlordane. The COCs are posted on Figure 6-37A. Only a very limited area of the site appears to be impacted with COCs. The sampling location appears to be in a drainage area. It is possible that the lead, zinc, DDT, and gamma-chlordane derive from runoff from Lincoln Boulevard. For purposes of evaluating remedial alternatives at Baker Beach Disturbed Area 4, the assumed volume of impacted soil is 180 cubic yards (Figure 6-37B).

6.10.6.3 Baker Beach Disturbed Area 4 Nature and Extent of Chemicals in Water

No seeps have been observed at Baker Beach Disturbed Area 4; therefore, no sampling of water has been performed. Impacts to water at Baker Beach Disturbed Area 4 are not likely given the absence of water, the low concentrations of metals and pesticides detected, and the fact that these PCOCs bind tightly to soil and are not prone to leach into water. No further action is recommended for water at Baker Beach Disturbed Area 4.

7. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

As discussed in Section 2, the release or threatened release of a hazardous substance into the environment provides the basis for all cleanups under CERCLA. To create a list of regulated hazardous substances for CERCLA purposes, Congress incorporated substances, elements, compounds, solutions, or mixtures subject to other federal laws, such as RCRA, CWA, CAA, and TSCA. However, CERCLA, as it was passed in 1980, did not specifically require remedial actions implemented at Superfund sites to comply with cleanup levels or management standards contained in these laws (U.S. EPA, 1988b). Congress established a risk-based threshold for cleanups at Superfund sites that was protective of human health and the environment but still afforded significant flexibility in selecting and implementing response actions (U.S. EPA, 1998c). In the absence of cleanup levels and management standards specific to CERCLA, U.S. EPA implemented a policy that remedial actions generally meet or exceed substantive requirements of existing environmental laws, including those laws that Congress had referenced to generate the list of hazardous substances.

SARA codified U.S. EPA's existing policy towards compliance with other environmental laws in 1986. As a result, the NCP at 40 CFR §300.430(f)(1)(i)(A) provides that releases of hazardous substances at a site be cleaned up to meet ARARs, unless circumstances for a waiver exist. ARARs are used in conjunction with risk-based cleanup goals to establish cleanup levels as part of RAOs for a site. According to U.S. EPA (1991d), "ARARs represent the minimum that a remedy must attain; it may sometimes be necessary, where there are multiple contaminants with potentially cumulative and synergistic effects, to go beyond what ARARs require to ensure that a remedy is protective."

As discussed in Section 2, the purpose of a feasibility study is to develop remedial alternatives that are protective of human health and the environment, cost-effective, and consistent with planned reuse. Part of this process includes an evaluation of ARARs to establish on-site cleanup standards. Potential ARARs are set forth generally for all Main Installation sites in this section. Staging areas which are used to implement the remedial activities are considered on-site for purposes of the remedy implementation.[21] Note that the ARARs described in this section are inclusive of the universe that may be applied at any Main Installation site, but the ARARs for a particular site will be finalized as part of the RAP process for each Main Installation site. Table 7-1 summarizes ARARs for Main Installation sites, including legal citations and specific locations where an ARAR may be expected to apply. In the event of a discrepancy between the text and Table 7-1, the information in the table shall prevail. An assessment of ARARs for each site is considered as part of the detailed analysis of remedial alternatives in Section 10 and in the forthcoming site RAPs.

[21] Staging Areas could include contractor vehicle or equipment storage areas, stockpiling of excavated or fill materials areas, soil or debris handling activity areas, or other areas required to implement the remedial action. Action- and chemical-specific ARARs for staging areas will be the same as the ARARs for areas encompassing the areal extent of contamination; location-specific ARARs may differ, depending on the location of the staging area.

Chemical-specific ARARs, site-specific PRGs developed by the Trust, and background concentrations of metals have been used to develop cleanup levels for locations where there are suspected chemical releases at the Presidio. The Presidio-wide Cleanup Level Document, a separate stand-alone document, presents Presidio-specific human health and ecological risk-based PRGs for PCOCs, describes naturally occurring or background concentrations of metals in soil and water at the Presidio, and presents the site-specific Presidio cleanup levels (EKI, 2002d). Remedial technologies and alternatives intended to meet site cleanup levels for COCs are evaluated in Sections 8 through 10 and screened with respect to their ability to meet the ARARs in the remedial process.

7.1 EFFECT OF ON-SITE AND OFF-SITE REMEDIAL ACTIONS ON ARARs

The scope and extent of ARARs that pertain to remedial actions will vary depending if these actions occur on-site or off-site.[22] On-site remedial actions under CERCLA must comply with ARARs, but only the substantive parts of those requirements, not administrative procedures (e.g., permits, reports, and records). In other words, on-site remedial actions are exempt from administrative procedures such as obtaining written permits or approvals of state and local regulatory agencies. Instead, the FS, Proposed Plan, ROD or RAP, Community Relations Plan, and Administrative Record document compliance with substantive requirements of federal and state environmental laws identified as ARARs (U.S. EPA, 1999d, 1988b).

Requirements of environmental laws may be either "applicable" or "relevant and appropriate" but not both. On-site remedial actions (for the purposes of this Presidio Trust Revised FS Report, limited to those Main Installation sites identified in Table 7-1 and any associated staging areas) must comply with substantive aspects of requirements that are applicable or relevant and appropriate. Off-site remedial actions must comply only with applicable requirements, but both the substantive and administrative aspects of these requirements must be met.

7.2 APPLICABLE REQUIREMENTS

The NCP at 40 CFR §300.5 defines applicable requirements as:

> …those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant,

[22] The NCP at 40 CFR §300.5 defines on-site to mean "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action." According to U.S. EPA (1988b), best professional judgment should be used to determine that the area is within "very close proximity" to the contamination and is necessary for implementation of the portion of the response or remedial action addressing the nearby contamination. "Areal extent of contamination" refers to the soil, groundwater, and air within the surface area of that part of the property that contains COCs.

> remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.

An applicable requirement is one that a party would be subject to if it were undertaking the action independently from any CERCLA authority. For example, if any type of action, regardless if it occurs under CERCLA or not, entails injecting treated water into the uncontaminated saturated zone, then compliance with State Water Resources Control Board ("SWRCB") Resolution No. 68-16 ("Antidegradation Policy") is mandatory. For a requirement to be applicable, all jurisdictional prerequisites of the requirement must be met, including; (1) the party must be subject to the law; (2) the substances or activities must fall under the authority of the law; (3) the action must occur in the time period during which the law is in effect; and (4) the action must be one of the types of activities the statute requires, limits, or prohibits (U.S. EPA, 1989a).

State requirements are ARARs only if they are promulgated, enforceable, of general applicability, timely identified, and more stringent than federal requirements. Ways in which state requirements may be considered more stringent than federal requirements include (U.S. EPA, 1989b; SWRCB, 1992):

- The state program does not have a federal counterpart because the program has been established under a state law only.
- State requirements are more stringent than federal requirements. More stringent state MCLs promulgated for drinking water may be ARARs.

State requirements must be identified in a timely manner to be considered as ARARs. The NCP at 40 CFR §300.515(h)(2) indicates that "in a timely manner" means as early as possible but at least before conducting detailed analysis of alternatives.

7.3 RELEVANT AND APPROPRIATE REQUIREMENTS

The NCP at 40 CFR §300.5 defines relevant and appropriate requirements as:

> …those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws, that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

According to U.S. EPA (1989a), determining whether an environmental standard is relevant and appropriate is "a site-specific decision and is based on best professional judgment, taking into account the circumstances of the release or threatened release." Greater flexibility and discretion exists in determining that an ARAR is relevant and appropriate as opposed to it being applicable. U.S. EPA (1989a) states the following:

> Only those requirements that are both relevant and appropriate are ARARs. A requirement may be relevant, but not appropriate, because of site circumstances. Such a requirement would not be an ARAR for the site. Moreover, it is possible for only a portion of a requirement to be considered relevant and appropriate, while other parts may not.

Once a requirement, or part of a requirement, is determined to be relevant and appropriate, the substantive provisions are considered to the same degree as if it were applicable.

7.4 TO-BE-CONSIDERED MATERIALS

The NCP at 40 CFR 300.400(g)(3) describes To-Be-Considered materials ("TBCs") as advisories, criteria, or guidance that may be considered for a particular action or specific issue, as appropriate. TBCs are not ARARs and do not have to be achieved by remedial actions implemented at a site. U.S. EPA (1989a) states the following regarding TBCs:

> TBCs are not potential ARARs because they are neither promulgated nor enforceable. It may be necessary to consult TBCs to interpret ARARs, or to determine preliminary remediation goals when ARARs do not exist for particular contaminants. However, identification and compliance with TBCs is not mandatory in the same way that it is for ARARs.

If no ARARs address a particular situation, or if existing ARARs do not ensure protectiveness, TBC advisories, guidances, or criteria are used as cleanup standards. The basic criterion is whether reliance on the TBC is necessary for protectiveness of human health and the environment. Use of TBCs in developing CERCLA remedies is discretionary. However, once a TBC is included in an ARARs table that is part of a CERCLA decision document, the substantive standards of the TBC necessary for protectiveness must be met.

7.5 TYPES OF ARARs and TBCs

U.S. EPA (1989a) has divided ARARs (and TBCs) into the following three types to facilitate their identification:

- **Chemical-specific ARARs:** These ARARs are generally health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in an environmentally acceptable chemical concentration, e.g., MCLs that establish safe levels in potential drinking water.

- **Location-specific ARARs:** These ARARs restrict actions or contaminant concentrations in certain environmentally sensitive areas. Examples of areas regulated under various federal laws include locations where endangered species or historically significant resources are present.

- **Action-specific ARARs:** These ARARs are usually technology- or activity-based requirements, or limitations on actions or conditions involving specific COCs.

Chemical- and location-specific ARARs are generally identified early in the RI/FS process, while action-specific ARARs are usually identified during the detailed analysis of remedial alternatives (U.S. EPA, 1988b). Table 7-1 is organized by chemical-specific, location-specific, and action-specific ARARs and TBCs.

7.6 ARARs AND TBCs FOR MAIN INSTALLATION SITES

CWA, Safe Drinking Water Act ("SDWA"), TSCA, RCRA, and CAA, are some of the environmental laws with requirements that are frequently applicable or relevant and appropriate. ARARs and TBCs associated with these and other laws that pertain to Main Installation sites are discussed below. The following discussion provides an overview of the ARARs and TBCs associated with these and other laws and guidance that pertain to Main Installation sites. Table 7-1 provides a more specific listing of the ARARs and TBCs that pertain to Main Installation sites, as well as a list of locations where a specific ARAR or TBC may be pertinent. ARARs and TBCs in this table have been grouped by type. Numerical criteria associated with chemical-specific and action-specific ARARs are summarized in Tables 7-2 through 7-4 and 7-5, respectively.

7.6.1 Chemical-Specific ARARs and TBCs

Chemical-specific ARARs and TBCs that may pertain to Main Installation sites are described in Sections 7.6.1.1 through 7.6.1.7.

7.6.1.1 Safe Drinking Water Act

The SDWA of 1974, as amended in 1977, 1986, and 1996, establishes minimum national primary drinking water standards known as federal Maximum Contaminant Levels or MCLs. Federal MCLs and MCLs established specifically for drinking water in California are regulated under Title 22 of the CCR. The NCP at 40 CFR §§300.430(e)(2)(i)(B)-(D) states that Maximum Contaminant Level Goals ("MCLGs"), established under the SDWA, that are set at levels above zero, will be attained by remedial actions for surface water or groundwater that are current or potential sources of

drinking water. For groundwater containing COCs that do not have MCLGs, or if the MCLGs have been set at zero, remedial actions shall achieve MCLs. For groundwater containing COCs without non-zero MCLGs, MCLs, or state standards; freshwater quality criteria may be potential ARARs when that groundwater is discharged to surface water (U.S. EPA, 1991a). Non-zero MCLGs, federal MCLs, State of California MCLs, and freshwater quality criteria for PCOCs at Main Installation sites are summarized in Table 7-2. In addition to MCLGs and MCLs, U.S. EPA issues secondary MCLs. However, secondary MCLs are not enforceable and are therefore TBCs. Secondary MCLs are described in Section 7.6.1.2.

MCLs are federally enforceable limits for COCs in drinking water. The MCL for a given COC is set as close to the corresponding MCLG as feasible. When issuing an MCL, U.S. EPA identifies an analytical method with a reporting limit that is set according to the desired MCL. U.S. EPA also identifies the Best Available Technology ("BAT") for removing the chemical to attain the MCL (U.S. EPA, 2000e). BAT for chemicals found in surface water or groundwater at Main Installation sites is further discussed in Section 8.3.9.

Surface water in Lobos Creek is used as potable supply at the Presidio. Review of available information does not suggest that Main Installation sites have the potential to impact Lobos Creek. Groundwater is the water resource most likely to be affected by releases of hazardous substances at Main Installation sites. MCLs are not considered applicable to groundwater at the Presidio because this water resource is not currently used as potable supply and MCLs apply to water supplied at the tap (U.S. EPA, 1991e). MCLGs are never applicable because they are not enforceable "standards" or "levels of control" (U.S. EPA, 1991e). Consequently, non-zero MCLGs and MCLs promulgated under Title 22 of the CCR are **chemical-specific ARARs** that are **relevant and appropriate** to Main Installation sites where underlying groundwater or nearby surface water presents a current or potential drinking water source.

7.6.1.2 Secondary MCLs

Secondary MCLs are established under the SDWA to protect public welfare. Secondary MCLs, which generally pertain to the aesthetic quality of the drinking water, apply to chemicals in drinking water that adversely affect its odor, taste, or appearance and therefore cause people to discontinue using the water. Secondary MCLs are desirable goals. They are not based upon direct adverse health effects and are not enforceable. Secondary MCLs for COCs detected at Main Installation sites are summarized in Table 7-2. Secondary MCLs are **chemical-specific** guidelines that are **TBCs** for certain Main Installation sites where underlying groundwater or nearby surface water presents a current or potential drinking water source.

7.6.1.3 Toxic Substances Control Act

TSCA was enacted in 1976 to regulate the introduction and use of new hazardous chemicals. TSCA was amended in 1987. As part of these amendments, U.S. EPA added

Subpart G that established criteria to determine the adequacy of cleanup of PCB spills. U.S. EPA has concluded that Subpart G is a potential TBC for PCBs released at Superfund sites (U.S. EPA, 1998c, 1989c).

Requirements governing cleanup of PCB-containing soil and wastes were broadened by amendments to TSCA in 1998. As part of these amendments, U.S. EPA added 40 CFR §761.61 to Subpart D of TSCA, which provides cleanup and disposal provisions for PCB-containing soil and other types of remediation wastes. This section of Subpart D sets cleanup levels for high occupancy areas (e.g., residences) and low occupancy areas (e.g., electrical equipment vaults and unoccupied areas outside a building). The cleanup level for unrestricted use of high occupancy areas is 1 mg/kg of PCBs in soil and the cleanup level for unrestricted use of low occupancy areas is 25 mg/kg of PCBs in soil. Subpart D also requires that excavated soil that contains greater than 50 mg/kg of PCBs be managed as a RCRA or TSCA waste.

The 5 January 2001 *Federal Register* stated that effective 6 March 2001, Section 403 of TSCA (40 CFR Part 745) was amended to establish a hazard standard of 400 mg/kg lead in bare residential soil. A cleanup level of 400 mg/kg of lead in soil is being used as a not-to-exceed value for residential areas at the Presidio.[23]

Although U.S. EPA (63 FR 35407) considers Subpart D to be an ARAR, 40 CFR §761.61(a)(1)(ii) indicates that these requirements are not binding upon CERCLA remedial actions. Cleanup of PCBs to more stringent levels can be enforced. Subpart D of TSCA is a **chemical-specific ARAR** that is **relevant and appropriate** for certain Main Installation sites where soil is impacted with PCBs. The Subpart G spill cleanup policy is a **chemical-specific** policy that is a **TBC** for certain Main Installation sites where soil is impacted with PCBs. Section 403 of TSCA is a **chemical-specific ARAR** that is **relevant and appropriate** for Main Installation sites where soil in residential areas is impacted with lead.

7.6.1.4 Clean Water Act

The CWA of 1972 is the principal federal law governing discharges to surface waters and adjoining shorelines. Even before passage of the CWA, the State of California was protecting its surface water and groundwater through enactment of the Porter-Cologne Water Quality Act ("Porter-Cologne") under the California Water Code in 1967. The SWRCB and nine Regional Boards are responsible for oversight of Porter-Cologne and CWA requirements. Unlike the CWA, Porter-Cologne does not restrict water quality standards to surface waters and point source discharges authorized by NPDES permits. Porter-Cologne requires that each of the nine Regional Boards adopt *Water Quality Control Plans*, which are applicable to groundwater and non-point sources, as well. *Water Quality Control Plans* are often called Basin Plans because they apply to waters within specific watershed boundaries or drainage basins. The Basin Plan and SWRCB resolutions that have been promulgated to implement Porter-Cologne and CWA

[23] The Trust cleanup level for lead in soil at residential sites is based on the TSCA value as well as a maximum average concentration of 370 mg/kg, calculated with DTSC's LeadSpread.

requirements, and that pertain to remedial actions at Main Installation sites, are identified below.

7.6.1.4.1 RWQCB Water Quality Control Plan

The RWQCB's (1995) *Water Quality Control Plan* sets forth concentration levels of organic and inorganic chemical constituents appropriate for groundwater designated for use as domestic or municipal water supply. These concentration levels are **chemical-specific ARARs** that are **applicable** to certain Main Installation sites where underlying groundwater or nearby surface water presents a current or potential drinking water source.

7.6.1.4.2 California Toxics Rule

The following plans prepared by SWRCB provided water quality criteria for toxic compounds in enclosed bays, estuaries, and inland surface waters throughout California:

- SWRCB. 11 April 1991. *California Enclosed Bays and Estuaries Plan, Water Quality Control Plan for Enclosed Bays and Estuaries of California* ("EBEP").

- SWRCB. 11 April 1991. *California Inland Surface Waters Plan, Water Quality Control Plan for Inland Surface Waters of California* ("ISWP").

RWQCB enforced the criteria in these plans from 1992 to 1994, at which time the Superior Court of California ordered that numerical water quality criteria in the EBEP and ISWP be rescinded based upon a legal challenge by various municipalities and regulated industries in the state. To replace the standards that were rescinded, U.S. EPA has issued new freshwater and saltwater quality criteria for inland surface waters, enclosed bays, and estuaries in California. These new water quality criteria became effective on 18 May 2000 and are promulgated under 40 CFR §131.38, *Establishment of Numerical Criteria for Priority Toxic Pollutants for the State of California*, also known as the California Toxics Rule ("CTR"). SWRCB (2000) has adopted measures to implement these criteria throughout California. The Basin Plan and the California Toxics Rule are **chemical-specific ARARs** that are **applicable** to Main Installation sites with freshwater or saltwater resources (including groundwater emerging as seeps).

7.6.1.5 <u>Site Cleanup Requirements for Petroleum Hydrocarbons</u>

RWQCB issued Order No. 96-070 – *Site Cleanup Requirements for the Cleanup of Petroleum Impacted Soil* to the Army in 1996. This order identifies the Tennessee Hollow riparian corridor and the Crissy Field wetlands as sensitive habitats requiring more stringent petroleum hydrocarbon cleanup levels than elsewhere on the Presidio. The area where more stringent cleanup levels apply to the Tennessee Hollow riparian corridor is designated as the freshwater ecological protection zone. The area where more stringent cleanup levels apply to the Crissy Field wetlands and shoreline is designated as the saltwater ecological protection zone.

The Army conducted several studies and worked closely with RWQCB to develop cleanup levels for petroleum hydrocarbons and related constituents (e.g., BTEX, PAHs) at the Presidio. Human health and ecological cleanup levels for soil and groundwater were developed by Montgomery Watson and presented in its *Fuel Product Action Level Development Report* ("FPALDR"), dated October 1995. In Order No. 96-070, the RWQCB subsequently adopted the soil cleanup levels in the FPALDR for all areas of the Presidio except the freshwater and ecological protection zones. The RWQCB requested that the Army conduct bioassay studies to develop cleanup levels for the saltwater ecological protection zone. IT Corporation (1997) conducted these studies on behalf of the Army and proposed saltwater and sediment cleanup levels for protection of marine organisms. The Army worked collaboratively with RWQCB to develop cleanup levels for the freshwater protection zone. RWQCB conducted bioassay studies, and Montgomery Watson (1999f) interpreted the results and reviewed toxicological data published in scientific literature, which led to the proposal of freshwater and sediment cleanup levels for protection of freshwater aquatic organisms.

Cleanup levels for petroleum hydrocarbons and related constituents in soil, sediment, surface water, and groundwater within the saltwater and freshwater ecological protection zone, and at other areas of the Presidio, are summarized in Table 7-4. These cleanup levels are **chemical-specific TBCs** for Main Installation sites containing petroleum hydrocarbons and related constituents.

7.6.1.6 RWQCB Risk-Based Screening Levels

In December 2001 RWQCB (2001a) released interim final soil and groundwater RBSLs for over 100 chemicals commonly found at sites where releases of hazardous substances have occurred. Like U.S. EPA Region IX Preliminary Remediation Goals, RBSLs are generally not cleanup levels. RBSLs are used to evaluate whether a chemical release may pose a risk at the site that warrants further investigation. In addition, RBSLs can be used, if appropriate, as cleanup levels if site-specific cleanup levels are not available.

To develop Presidio-specific cleanup levels for VOCs, RBSLs were used to assess potential human health risks due to vapor intrusion into indoor air and leaching to groundwater. RBSL values for VOCs for indoor air and potential leaching to groundwater are summarized in Table 7-3. The RWQCB RBSLs are **chemical-specific TBCs** for Main Installation sites containing VOCs.

7.6.1.7 SWRCB Resolution No. 88-63

SWRCB Resolution No. 88-63 – *Adoption of Policy Entitled "Sources of Drinking Water"* states that all surface water and groundwater in California should be designated suitable, or potentially suitable, sources of drinking water unless the surface water or groundwater contains greater than 3,000 mg/L of total dissolved solids ("TDS"), is not capable of producing an average, sustained yield of 200 gallons per day, or has naturally high concentrations of contaminants. Certain areas of the Presidio, such as portions of

Crissy Field, have groundwater with elevated TDS concentrations, or are near San Francisco Bay and the restored wetlands, such that designation of surface water and groundwater as potential drinking water supply is not likely to pertain.

U.S. EPA (1986) has developed guidelines for determining future use of groundwater at a site for purposes of evaluating the appropriateness of remedial actions under CERCLA. However, U.S. EPA (1997j) will generally defer to a state's groundwater use determination, e.g., Resolution No. 88-63, provided it results in cleanup levels that are at least as stringent as would be derived using U.S. EPA's groundwater classification guidelines. Therefore, to the degree Resolution No. 88-63 is more stringent than the federal standards, it is a **chemical-specific ARAR** that is **applicable** for Main Installation sites.

7.6.2 Location-Specific ARARs and TBCs

Location-specific ARARs and TBCs that may pertain to Main Installation sites are described in Sections 7.6.2.1 through 7.6.2.18.

7.6.2.1 RWQCB Water Quality Control Plan

The Basin Plan sets forth discharge prohibitions throughout the San Francisco Bay Region (RWQCB, 1995). In addition, the Basin Plan reaffirms the California Wetlands Conservation Policy of ensuring no net loss of wetlands. Certain provisions of the Basin Plan identified in Table 7-1 are **location-specific ARARs** that are **applicable** for the Main Installation sites that may affect wetlands.

7.6.2.2 National Historic Preservation Act

The federal National Historic Preservation Act ("NHPA") requires consideration of the potential effects that remedial actions will have on historic properties included, or eligible for inclusion, on the National Register of Historic Places ("National Register"). The National Register lists historic properties (i.e., cultural resources), which include districts, sites, buildings, structures, and objects that are significant in American history or culture for their architectural, archeological, engineering, or other aspects (U.S. EPA, 1989c). The entire Presidio is listed on the National Register and has been determined to contain 510 historic buildings (NPS, 1994). The substantive requirements to survey sites for, and minimize harm to, cultural resources are **location-specific ARARs** that are **applicable** for Main Installation sites.

7.6.2.3 Archeological Resources Protection Act

The Archeological Resources Protection Act ("ARPA") prohibits excavation of, damage to, or destruction of archeological resources on public lands without a permit issued by the federal land manager. However, no permit is required if the activities in question take place under another permit, license, or entitlement for use, and the activities are exclusively for purposes other than the excavation and removal of archeological

resources. Shown on Figure 7-1 are areas of the Presidio where buried archeological resources may exist. The Archeological Resources Protection Act is a **location-specific ARAR** that is **applicable** for Main Installation sites located in the areas shown on Figure 7-1 or wherever archeological resources as defined by ARPA may be found.

7.6.2.4 Endangered Species Act

The federal Endangered Species Act ("ESA") requires consultation with the United States Fish and Wildlife Service, as appropriate, to ensure that remedial actions do not jeopardize the continued existence of threatened or endangered species, or adversely modify or destroy their habitats. Substantive requirements of the ESA include determining whether a threatened or endangered species, or their habitat, will be affected by a proposed response action. Depending on the circumstances at each site, the Trust may need to consult with NPS natural resources staff and/or the U.S. Fish and Wildlife Service ("USFWS") as to whether an endangered or threatened species or their habitat will be significantly impacted by the planned action. Early in the planning processes tied to remedial efforts at the Presidio, the Trust intends to conduct a consultation with USFWS to discuss all areas where remedial actions will be taken to provide advance notice and to plan for appropriate mitigation measures.

The California Endangered Species Act ("CESA") generally parallels the main provisions of the ESA. Depending on the circumstances, California Department of Fish and Game may need to be consulted to ensure that remedial actions are not likely to jeopardize the continued existence of any endangered or threatened species, or result in destruction or adverse modification of essential habitat. The federal ESA is a **location-specific ARAR** that is **applicable** for Main Installation sites where endangered species or their habitat are present, and the CESA is a **location-specific ARAR** that is **applicable** for Main Installation sites where endangered species or their habitat are present, to the extent species are present and protected under CESA and are found in Main Installation sites.

7.6.2.5 Archeological and Historic Preservation Act

The federal Archeological and Historic Preservation Act provides for conservation of historical and archeological data that might otherwise be destroyed as a result of construction projects. If such a project may cause irreparable loss or destruction to significant scientific, pre-historical, historical, or archeological data, the Archeological and Historic Preservation Act requires that the agency undertaking the project preserve the data or request the Secretary of the Interior to do so (U.S. EPA, 1989c). The Archeological and Historic Preservation Act differs from the NHPA in that it encompasses a broader range of resources than those listed on the National Register and mandates only the conservation, analysis, and publication of the data, as opposed to preservation of the resources or artifacts themselves. The Archeological and Historic Preservation Act is a **location-specific ARAR** that is **applicable** for Main Installation sites in which the federal agency's construction or other licensed project may cause irreparable loss of historical or archeological resources.

7.6.2.6 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act ("NAGPRA") requires that when a planned activity results in the movement or excavation of human remains, funerary objects, sacred objects, or objects of cultural patrimony from federal land, the Indian tribes or Native Hawaiian organizations that are likely to be culturally affiliated with the artifacts must be notified and consulted regarding the appropriate treatment of the discovery. Following such a discovery, work in this area must cease immediately, and the discovery must be reported to the responsible federal land manager. Shown on Figure 7-1 are areas of the Presidio where buried archeological resources may exist. The NAGPRA is a **location-specific ARAR** that is **applicable** for Main Installation sites where Native American cultural items are discovered.

7.6.2.7 Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act and the California Fish and Game Code prevent the taking, killing, or possessing of migratory and other fully protected birds, and their nests, eggs, and young unless permitted by the Secretary of the Interior. The Migratory Bird Treaty Act and certain requirements of the Fish and Game Codes regarding protection of birds are **location-specific ARARs** that are **applicable** for Main Installation sites where tree removal or other actions that would impact migratory birds, their nests, or their eggs are required for the remediation of the site.

7.6.2.8 Presidio Trust Act

The Presidio Trust Act states in part that the Trust shall manage the leasing, maintenance, rehabilitation, repair, and improvement of property within the areas of the Presidio under its administrative jurisdiction. These activities shall be performed in accordance with the purposes set forth in the Golden Gate National Recreation Area Act (see Section 7.6.2.10) and in accordance with the general objectives of the General Management Plan for the Presidio (see Section 7.6.2.12). The Presidio Trust Act is a **location-specific ARAR** that is **applicable** for sites in Area B.

7.6.2.9 National Park Service Organic Act

The National Park Service Organic Act is intended to protect park resources. The National Park Service Organic Act grants authority to NPS to manage national park land in a manner that conserves the scenery and natural and historic objects and wildlife therein, so that such resources are left unimpaired for the enjoyment of future generations. These requirements are **location-specific ARARs** that are **applicable** for Main Installation sites in Area A and within 100 feet of the Area A/B boundary.

7.6.2.10 Golden Gate National Recreation Area Act

The GGNRA was established in 1972. The land that constitutes the GGNRA extends north of the Golden Gate to Tomales Bay in Marin County and south to the San Francisco

watershed in San Mateo County. The GGNRA's boundaries encompass 77,000 acres of land and water, including 50 miles of bay and ocean shoreline. The GGNRA represents one of the nation's largest coastal preserves, which attracts 20 million visitors each year, more than any other place in the national park system (NPS, 1994). The Presidio is part of the GGNRA.

The federal Golden Gate National Recreation Area Act was enacted to preserve the GGNRA, as much as possible, in its natural setting, and to protect it from development and uses which would destroy the scenic beauty and natural character of the area. The purposes contained in the Act are **location-specific ARARs** that are **applicable** for the entire Presidio (Areas A and B). The substantive requirements contained in the Act are **location-specific ARARs** that are **applicable** to Main Installation sites in Area A and **relevant and appropriate** within 100 feet of the Area A/B boundary, as identified in Table 7-1.

7.6.2.11 National Park Service Management Policies

In 2001, NPS adopted management policies pertaining to natural resource preservation. These policies include general principles for managing biological resources, restoring native plant and animal species, managing natural landscapes, maintaining altered plant communities, and managing and removing non-native species. The NPS Management Policies are **location-specific TBCs** for Main Installation sites.

7.6.2.12 General Management Plan Amendment

NPS developed a general management plan for the GGNRA that was approved in 1980. The GMPA for the Presidio is an amendment to the 1980 plan. The GMPA (NPS, 1994) provides guidelines for the management and improvement of the Presidio and is the foundation plan for overall land use in Area A. Remedial actions at Main Installation sites in Area A and within 100 feet of the Area A/B boundary should be compatible with the land uses described in the GMPA. The GMPA is a **location-specific TBC** for Area A and within 100 feet of the Area A/B boundary.

Part of the implementation of the GMPA included the development of the VMP, prepared jointly by the Trust and NPS and finalized in May 2001. The VMP establishes vegetation zoning and standards for the Presidio. The VMP is a **location-specific TBC** for Main Installation sites.

7.6.2.13 Presidio Trust Management Plan

The Trust finalized the Presidio Trust Management Plan ("PTMP") for Area B of the Presidio in May 2002. The PTMP provides guidelines for the management and improvement for Area B of the Presidio. The PTMP emphasizes preservation and enhancement of the Presidio's cultural, natural, scenic, and recreational resources for public use. As provided by the PMTP, the Trust will replace pavement with green space, improve and enlarge the park's trail system, restore stream corridors and natural habitats,

and reuse historic structures for the public, as well as for residential and office use. The PTMP serves as the foundation plan for Area B, and remedial actions at Main Installation sites in Area B should be compatible with the land uses described in the PTMP. The PTMP is a **location-specific TBC** for Area B.

7.6.2.14 Memorandum of Agreement between the Trust and NPS for Environmental Restoration of Presidio

With certain exceptions discussed in Section 2.4, the Trust assumed responsibility for remediation of both Areas A and B of the Presidio on 24 May 1999 by signing the Presidio MOA among the Trust, Army, and NPS, and the Area A MOA between the Trust and NPS. The Area A MOA establishes responsibilities and procedures for cleanup of chemical releases at the Presidio. Accordingly, the Area A MOA is a **location-specific TBC** for Main Installation sites in Area A and within 100 feet of the Area A/B boundary**.**

7.6.2.15 Coastal Zone Management Act

The federal Coastal Zone Management Act ("CZMA") requires that activities directly affecting the coastal zone be performed in a manner that is consistent with the state coastal zone management plan. The San Francisco Bay Conservation and Development Commission ("BCDC") is responsible for administering the CZMA for the portion of the California coast within the San Francisco Bay.

Before 1965, roughly 2,300 acres of San Francisco Bay were being filled each year. BCDC was established in 1965 under the McAteer-Petris Act to regulate development in and around San Francisco Bay. BCDC's jurisdiction extends to the first 100 feet from the shoreline around San Francisco Bay, and to most creeks, rivers, sloughs and other tributaries that flow into San Francisco Bay. BCDC became the federally designated state agency for conservation of the San Francisco Bay with passage of CZMA in 1972.

Remedial actions performed in areas under the jurisdiction of BCDC must comply with the substantive requirements of the CZMA and BCDC's *San Francisco Bay Plan*, amended June 1998, and may require a permit. The CZMA and BCDC's *San Francisco Bay Plan* are **location-specific ARARs** that are **applicable** for Main Installation sites located within 100 feet of the shoreline around San Francisco Bay and along creeks or other tributaries into San Francisco Bay.

7.6.2.16 Marine Mammal Protection Act

The federal Marine Mammal Protection Act prohibits the taking, including harassment, of marine mammals, in the seas and on land. In the unlikely event that marine mammals would enter remedial areas, this Act prohibits their taking. The Marine Mammal Protection Act is a **location-specific ARAR** that is **applicable** for Main Installation sites where the implementation of the remedial actions would require beach access or may

impact or affect marine mammals (e.g., Baker Beach Disturbed Areas 1, 2, and 3, and the area of Lobos Creek adjacent to the shoreline).

7.6.2.17 Federal Wetlands Regulations and State Wetland Policy

Executive Order 11990 and 40 CFR §6.302(a) require federal agencies conducting certain activities to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands. U.S. EPA determines if the proposed actions will affect wetlands. Adverse impacts shall be either avoided or minimized if no practicable alternative to the action exists. Portions of these requirements to protect wetlands are **location-specific ARARs** that are **relevant and appropriate** for Main Installation sites that may affect wetlands. The California Fish and Game Commission's wetlands policy instructs the Department of Fish and Game to recommend protection, preservation, restoration, enhancement, and expansion of wetlands when the Department of Fish and Game acts in an advisory role. The State Wetlands Policy is a **location-specific** guideline that is a **TBC** for Main Installation sites that may affect wetlands.

7.6.2.18 California Native Plant Protection Act

The intent of the California Native Plant Protection Act is to preserve, protect, and enhance rare or endangered plants native to California. The Act forbids taking, possessing, or selling rare or endangered native plants unless authorized by an incidental take permit. The California Native Plant Protection Act is a **location-specific ARAR** that is **applicable** for certain Main Installation sites, to the extent species identified in the Act's relevant list are not protected under the federal ESA and are found in Main Installation sites.

7.6.3 Action-Specific ARARs and TBCs

Action-specific ARARs and TBCs that may pertain to Main Installation sites are described in Sections 7.6.3.1 through 7.6.3.7.

7.6.3.1 Toxic Substances Control Act

TSCA and its regulations (40 CFR §761.61) govern the transport and off-site disposal of PCB-containing wastes (i.e., wastes with greater than 50 mg/kg PCBs). If soil at a Main Installation site is excavated and contains greater than 50 mg/kg PCBs, then this section of TSCA may be relevant and appropriate. TSCA is an **action-specific ARAR** that may be **relevant and appropriate** for Main Installation sites as described above.

7.6.3.2 Stream and Wildlife Protections

Specific sections of federal law and the California Fish and Game Code seek to protect streams and wildlife. These sections are identified in detail in Table 7-1. These provisions include requiring state or federal agency consultation if stream realignment or modification is proposed; prohibiting dumping of materials into waters of the state; and

restricting certain means of "taking" birds or animals. These requirements are **action-specific ARARs** that are **relevant and appropriate** for certain Main Installation sites as identified in Table 7-1 where the remedial action realigns or modifies a stream,.

7.6.3.3 Basin Plan and SWRCB Resolution No. 68-16

The RWQCB's (1995) *Water Quality Control Plan* outlines strategies to achieve the state's policy of maintaining the existing high quality of surface water and groundwater in the San Francisco Bay Area. As discussed in Section 7.6.1.7, this policy is set forth in the SWRCB's Antidegradation Policy. The Basin Plan identifies beneficial water uses and adopts water quality criteria to protect those uses. The Basin Plan contains numerical limits for conventional pollutant objectives (e.g., dissolved oxygen, temperature, pH), and limits for metals and PAHs in discharges to freshwater and saltwater in the San Francisco Bay Area.

The CWA requires every state to establish surface water antidegradation regulations (U.S. EPA, 1990a). Although not specifically required by U.S. EPA, the majority of states have also established some form of groundwater antidegradation provisions. The State of California's Antidegradation Policy is set forth in SWRCB Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality of Waters in California*, which pertains to both surface water and groundwater. Resolution No. 68-16 applies to CERCLA remedial actions that involve extracting, treating, and discharging treated groundwater. Under this resolution, no discharge of chemical-containing groundwater is allowed to high quality groundwater (i.e., groundwater that contains only naturally occurring substances), unless it is in the public interest to allow such a discharge. If the discharge of groundwater is allowed, Resolution No. 68-16 states that the groundwater or waste must:

> …meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

RWQCB enforces this policy by issuing waste discharge requirements for treated water that is reinjected or allowed to percolate into the subsurface and NPDES permits for treated water that is pumped directly to streams, lakes, or other water bodies.

Waste discharge requirements may also be issued to chemical-containing soil to protect the beneficial uses of groundwater and surface water from COCs that may leach or otherwise migrate from impacted soil. RWQCB (1995) states in its Basin Plan that its objective is to have COCs released to soil removed or treated to naturally occurring or background concentrations. For those sites where it is impracticable to remove COCs to background concentrations in soil, RWQCB will consider site-specific recommendations for cleanup levels based upon the physical characteristics of the site, and mobility and toxicity of chemicals released. Certain sections of the Basin Plan addressing effluent

limitations and groundwater discharge and Resolution No. 68-16 are **action-specific ARARs** that are **applicable** for Main Installation sites with a potential for storm water discharge during implementation of remedial actions or in which extracted groundwater needs to be discharged to a storm drain or surface water body.

7.6.3.4 Resource Conservation and Recovery Act

Enacted in 1976, RCRA established the first comprehensive federal program for managing hazardous waste. RCRA emphasizes the conservation and recycling of wastes whenever practical. RCRA also sets standards for the handling of hazardous wastes within a cradle-to-grave framework that originates with the generator and follows the wastes through its handling, transportation, treatment, and final disposal (Wentz, 1989). Congress significantly broadened the scope of RCRA through passage of the Hazardous and Solid Waste Amendments ("HSWA") in 1984. HSWA introduced several new requirements, including upgraded criteria for disposing of municipal solid wastes in landfills. Municipal solid wastes are defined to be non-hazardous solid wastes in the State of California. Classification of hazardous and non-hazardous waste, and requirements governing management and disposal of these wastes off-site, are further discussed below and in Section 8.3.6.

7.6.3.4.1 Hazardous Waste Requirements Under Title 22 of CCR

RCRA Subtitle C (40 CFR §§260-299) sets forth criteria for determining what are federal hazardous wastes, and specifies minimum national requirements for facilities that generate, transport, store, or dispose of hazardous wastes. U.S. EPA has delegated to the State of California (DTSC) the authority to oversee and implement RCRA. DTSC has promulgated regulations in Title 22 of the California Code of Regulations ("CCR") that govern the management of wastes that are hazardous under RCRA or are hazardous under criteria specific to California for the definition of hazardous wastes. These latter types of hazardous wastes are referred to as non-RCRA hazardous wastes, and include wastes that contain metals or organic compounds at concentrations greater than their respective Total Threshold Limit Concentration ("TTLC") or Soluble Threshold Limit Concentration ("STLC"), as measured by the Waste Extraction Test ("WET"). TTLC and STLC limits for PCOCs at Main Installation sites are summarized in Table 7-5.

Investigations of Main Installation landfills and miscellaneous sites have not identified significant amounts of wastes and soil with COCs that would render these materials hazardous wastes if they were excavated. Although the majority of wastes and soil to be generated by remedial actions performed at Main Installation sites are anticipated to be non-hazardous, some materials may be managed as hazardous waste. Consequently, hazardous waste requirements under Title 22 of the CCR, generation, transport, and disposal regulations and closure, maintenance, and land use controls, are **action-specific ARARs** that are **relevant and appropriate** for Main Installation sites that require off-site disposal of materials that meet the definition of a hazardous waste.

7.6.3.4.2 Non-hazardous Waste Requirements Under Title 27 of CCR

RCRA Subtitle D (40 CFR §§257-258) specifies minimum national requirements for municipal solid waste landfills that apply to new and existing waste management units that have received such wastes after 9 October 1991. Prior to the development of these national requirements, the SWRCB and the California Environmental Protection Agency's Integrated Waste Management Board promulgated regulations that pertain to the management of non-hazardous wastes and municipal solid waste landfills. Titles 14 and 23 of the CCR were amended to incorporate RCRA Subtitle D and approved for implementation by U.S. EPA. The State of California subsequently consolidated most of the requirements in Titles 14 and 23 that relate to non-hazardous wastes under Title 27 of the CCR.

Title 14 retains requirements for active transfer stations. These include permitting and notification requirements, but no substantive cleanup provisions. However, the transfer station provisions of Title 14 do not appear to apply to transfer stations no longer in use (14 CCR §17400 et. seq.).

Title 27 of the California Code of Regulations identifies and defines an inert waste as follows:

> Inert waste does not contain hazardous waste or soluble pollutants in excess of applicable water quality objectives and does not contain significant quantities of decomposable waste.

Because Title 27 does not require inert wastes to be discharged at classified disposal facilities, the classification of waste as inert will influence the selection of a remedy for certain Main Installation landfills or fill sites.

Title 27 of the CCR also specifies the requirements for "clean closure" of a landfill, which includes the removal of all waste, waste residues, contaminated containment system components, contaminated subsoils, and all other contaminated materials so they no longer pose a threat to water quality.

Title 27 of the CCR specifies water quality monitoring, gas monitoring and control, and closure and post-closure maintenance requirements for non-hazardous solid waste management units. According to 27 CCR §20080(d), these requirements apply only to existing landfills that were operating or had received permits necessary for construction and operation on or before 27 November 1984. Review of the Army's RI (Dames & Moore, 1997b) and *Enhanced Preliminary Assessment Report* (Argonne National Laboratory, 1989) indicates that Main Installation landfills ceased operating before 1984. Consequently, as discussed in Section 7.2, the requirements cannot be considered applicable because they were not in effect during the period that the Main Installation landfills were in operation. Non-hazardous waste requirements under Title 27 of the CCR are **action-specific ARARs** that are **relevant and appropriate** for Main

Installation sites that contain solid non-hazardous waste, inert waste (e.g., concrete debris), or achieve clean closure.

7.6.3.5 Medical Waste Handling Requirements

Under the California Health & Safety Code and City of San Francisco Health Code, medical waste is required to undergo certain treatment prior to disposal so that it can be characterized as "solid waste." Without such treatment, land disposal of medical waste is not permitted. Once properly treated, medical waste may be disposed of in accordance with the solid waste provisions of Title 27 of the CCR. Medical wastes may potentially be encountered during the remediation of some Main Installation landfills. These requirements would be **action-specific ARARs** that are **relevant and appropriate** for Main Installation sites if medical wastes are encountered.

7.6.3.6 Clean Air Act

The CAA consists of old programs with new requirements layered on top that can be likened to a patchwork quilt (Elsevier Science, Inc., 1995). The first federal air pollution-related statute was established in 1967, although not a great deal of regulatory activity resulted. The CAA of 1970 consisted of amendments to the legislation passed in 1967 and laid the foundation for the federal air pollution regulatory programs in existence today. Further amendments to the CAA were passed in 1977 and 1990. A key concept in the federal approach to maintaining and improving ambient air quality involves the relationship between federal and state regulatory agencies. Although the CAA sets overall standards for the nation, the states ultimately have primary responsibility for achieving compliance with these standards.

State compliance with the CAA is based upon a State Implementation Plan ("SIP") that designates regions for effective air quality management, and contains enforceable provisions to attain compliance with ambient air quality standards and other federal emission limitations. The SIP incorporates rules and regulations of the state and local districts involved in air pollution control. The California Air Resources Board is responsible for developing the SIP and ensuring that local air pollution control districts are complying with the plan. County and unified air pollution control districts enforce the SIP through permitting and regulation of emissions from stationary and mobile sources. The Bay Area Air Quality Management District ("BAAQMD") is the local regulatory agency responsible for maintaining and improving air quality in the San Francisco Bay Area.

Available soil and groundwater analytical data compiled for Main Installation sites do not suggest that COCs are at high enough concentrations to volatilize or otherwise become airborne at levels that would adversely impact air quality under current conditions at the sites. Impacts to air quality, if any, are likely to result from the implementation of remedial actions. Several BAAQMD rules and regulations may apply to remedial actions during implementation. For example, impacted wastes and soil at Main Installation landfills may require control of particulates (Regulation 6), odorous substances

(Regulation 7), organic compounds (Regulation 8, Rule 40), or hydrogen sulfide (Regulation 9, Rule 2).

The construction and operation of treatment systems that discharge emissions to the atmosphere may also be subject to permitting and the installation of air pollution controls. For example, air stripping and soil vapor extraction operations are subject to Regulation 8, Rule 47. BAAQMD rules and regulations are **action-specific ARARs** that are **applicable** or **relevant and appropriate** for specific Main Installation sites, where, for example, particulates, odorous substances, or organic compounds may impact air quality.

7.6.3.7 City and County of San Francisco Sanitary Sewer Discharge Limitations

The City and County of San Francisco, Department of Public Works ("SFDPW") operates the sanitary sewers and publicly owned treatment works ("POTW") in San Francisco. State and local agencies have delegated authority to implement and enforce the federal Clean Water Act pretreatment discharge standards. The City and County of San Francisco, Public Utilities Commission (1999) sets discharge limitations for remedial actions that involve the discharge of extracted surface water or groundwater to the sanitary sewer system. Sanitary sewer discharge limitations for PCOCs detected at Main Installation sites are summarized in Table 7-5. These limitations are **action-specific ARARs** that are **relevant and appropriate** for certain Main Installation sites where contaminated groundwater or dewatering water will be discharged to the sanitary sewer (remedial alternatives for Landfill E, Sewer Lift Station No. 1, and Nike Facility have the option to discharge groundwater to the sanitary sewer).