# TARGETED SITE INVESTIGATION REPORT
# SAN PABLO ASSEMBLAGE SITE
# 3706 SAN PABLO AVENUE
# EMERYVILLE, CALIFORNIA

**PREPARED FOR:**

**CONTRACT NO. 11-T1035**
**STATE OF CALIFORNIA**
**ENVIRONMENTAL PROTECTION AGENCY**
**DEPARTMENT OF TOXIC SUBSTANCES CONTROL – REGION 2**
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# IDENTIFICATION FORM

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# APPROVAL FORM

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| | |
|---|---|
| µg/L | microgram per liter |
| µg/$m^3$ | micrograms per cubic meter |
| °C | degrees Celsius |
| 1,2-DCA | 1,2-dichloroethane |
| ASTM | American Society for Testing and Materials |
| bgs | below ground surface |
| Cal-EPA | California Environmental Protection Agency |
| CAM | California Assessment Manual |
| CDPH | California Department of Public Health |
| CHHSL | California Human Health Screening Level |
| cis-1,2-DCE | cis-1,2-dichloroethene |
| DPT | Direct-Push Technology |
| DQO | Data Quality Objective |
| DTSC | Department of Toxic Substances Control |
| ESL | Environmental Screening Level |
| LCS | laboratory control sample |
| LCSD | laboratory control sample duplicate |
| MCL | Maximum Contaminant Level |
| mg/kg | milligram per kilogram |
| mL/min | milliliter per minute |
| mmHg | millimeters of mercury |
| MS/MSD | Matrix Spike/Matrix Spike Duplicate |
| OEHHA | Office of Environmental Health Hazard Assessment |
| PCE | tetrachloroethene |
| ppb | parts per billion |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| RPD | Relative Percent Difference |
| RSL | Regional Screening Level |
| RWQCB | Regional Water Quality Control Board |
| TCE | trichloroethene |
| TEC | Tec Accutite |
| TPH | total petroleum hydrocarbons |
| TPH-d | total petroleum hydrocarbons as diesel |
| TPH-g | total petroleum hydrocarbons as gasoline |
| TPH-mo | total petroleum hydrocarbons as motor oil |
| TSI | Targeted Site Investigation |
| U.S. EPA | U.S. Environmental Protection Agency |
| URS | URS Corporation |
| USA | Underground Services Alert |
| UST | Underground Storage Tank |
| VOC | Volatile Organic Compounds |

# 1.0 INTRODUCTION

Pursuant to Contract No. 11-T1035, the California Environmental Protection Agency (Cal-EPA), Department of Toxic Substances Control (DTSC), retained URS Corporation (URS) to conduct a soil, soil gas, and groundwater investigation at the San Pablo Assemblage Site (Site), located at 3706 San Pablo Avenue, Emeryville, California (Figure 1).

## 1.1 Project Objective

The objective of this investigation was to gather data as part of a Targeted Site Investigation (TSI). A TSI is performed to determine whether current or historical activities have resulted in environmental conditions that will need to be further evaluated and/or addressed in order to move forward with Site redevelopment. The overall objective of the TSI is to evaluate whether hazardous materials are present at the Site that may pose unacceptable human health and environmental risks in the context of future unrestricted land re-use. It is anticipated that the Site will be redeveloped as multi-unit affordable and low-income housing.

Specific objectives included:

- Determining whether hazardous waste/substances exist at the Site;
- Providing Site characterization and information on the suitability of the area for use;
- Assessing the nature and extent of potential contamination at the Site; and
- Providing an order-of-magnitude cost estimate to clean up the property for unrestricted land use.

The TSI Work Plan was developed by DTSC (DTSC, 2012) and provided to URS to execute the scope of work. The DTSC work plan included the Site history and a review of the results of prior Site investigations.

## 1.2 Site Description and Background

The Site is located at 3706 San Pablo Avenue in the City of Emeryville, Alameda County, at the northeastern intersection of 37th Street and San Pablo Avenue (Figure 1). Commercial buildings and apartment buildings are across San Pablo Avenue to the west and W. MacArthur Boulevard to the north. Across 37th Street to the south are abandoned industrial buildings. The nearest residences to the site are located immediately adjacent to the Site to the east. Additional residences and businesses surround the site across West MacArthur, 37th Avenue and San Pablo Avenue. The Site includes five parcels—Assessor's Parcel Numbers 049-0951-004-02;

049-0951-005-01; 049-0951-006-01; 049-0951-007 and 012-0951-011—totaling approximately 1 acre. A Site Plan, including sample locations, is presented as Figure 2.

There are currently three vacant warehouse buildings, a small, concrete-covered parking lot, and two empty residential lots present at the Site. The Site was acquired by the City of Emeryville Economic Development and Housing Department in 2010 for the purpose of redevelopment into multi-unit affordable and low-income housing.

Historically, it is believed that the building along San Pablo Avenue may have been used as a machine shop, garage, dry cleaners, retail store, and jewelry manufacturer. The warehouses were constructed prior to 1931, and modified between 1931 and 1939. The warehouse building that parallels MacArthur Boulevard along the northern part of the Site was constructed between 1946 and 1958. The warehouse contained a novelty machine repair, and subsequently a water heater manufacturer. Along 37th Street there were two residences that have been removed.

## 1.3 Summary of Previous Investigations

Previous environmental investigations have been conducted at the Site and are summarized below:

- The Source Group, Inc., 2009. Phase I Environmental Site Assessment, November 20.
- The Source Group, Inc., 2010a. Phase II Preliminary Subsurface Investigation, April 13.
- The Source Group, Inc., 2010b. Phase II Additional Subsurface Investigation, October 12.

The Phase I Environmental Site Assessment included a record search of local government records and databases, aerial photos, and fire insurance maps to obtain the history and past uses of the Site. They also reviewed an earlier investigation conducted by TEC Accutite (TEC) in December 2003. TEC conducted the investigation to determine whether soil and groundwater had been impacted with petroleum hydrocarbons in the vicinity of a former underground storage tank (UST) that had been removed in 2002. The 700-gallon UST, formally used to store gasoline, was removed from beneath the sidewalk in front of 1043 MacArthur Boulevard. Two soil borings were drilled to a depth of 20 feet below ground surface (bgs) as part of the investigation. Groundwater was encountered at a depth of 17 feet bgs. Both soil and groundwater samples were collected from each boring. Petroleum hydrocarbons were not detected above laboratory reporting limits in any of the soil samples. Petroleum hydrocarbons were detected in groundwater at maximum concentrations of 2.7 parts per billion (ppb) benzene, 2.6 ppb toluene, 0.6 ppb ethylbenzene, and 3 ppb xylenes. Trichloroethene (TCE) was also detected in groundwater at a maximum concentration of 5.6 ppb. Based on the results of the

subsurface investigation, Alameda County Environmental Health subsequently granted case closure on February 25, 2004.

Phase II Preliminary Subsurface Investigation included drilling five soil borings in the two warehouse buildings located at the Site along San Pablo Avenue. Soil and groundwater samples were collected at the following depths:

- SB-1 – Soil collected at a depth of 15 feet bgs.
- SB-2 – Soil collected at 5 feet bgs and groundwater at 7 feet bgs (collected from a basement).
- SB-3, SB-4, SB-5 – Soil collected at 3 feet bgs and groundwater at 17 feet bgs.

Total petroleum hydrocarbons as diesel (TPH-d) was detected in all soil samples except one, at a maximum concentration of 87 milligrams per kilogram (mg/kg), at a depth of 3 feet bgs.

The maximum concentration of total petroleum hydrocarbons as gasoline (TPH-g) in groundwater was 130 micrograms per liter (μg/L). TPH-d was detected at a maximum concentration of 190 μg/L. Cis-1,2-dichloroethene (cis-1,2-DCE) was detected at a maximum concentration of 320 μg/L, and TCE was detected at a maximum concentration of 440 μg/L. Vinyl chloride was detected at a maximum concentration of 2.8 μg/L, and 1,2-dichloroethane (1,2-DCA) was detected at 15 μg/L. In general, the highest concentrations of detected compounds were found in the sample from boring SB-4, possibly indicating that activities in the building contributed to the contamination plume (Figure 2).

The Phase II Additional Subsurface Investigation included the installation of four monitoring wells to determine groundwater quality and flow. Soil samples were also collected and analyzed during this investigation. These wells have since been abandoned.

TPH-d was detected in only one soil sample at a depth of 5.5 feet bgs at a concentration of 2.7 mg/kg (PMW-4). Groundwater elevations were found to range from 15 to 18 feet bgs. TPH-d concentrations of up to 130 μg/L were found; cis-1,2-DCE concentrations of up to 16 μg/L; and TCE concentrations of up to 15 μg/L. In general, the highest concentrations of detected compounds were found in the sample from boring PMW-2. The depth to groundwater ranged from 15 to 18 feet bgs.

The investigation concluded that an offsite source was unlikely. In addition, the extent of TCE contamination in groundwater was small, and likely did not extend offsite.

## 1.4 Regulatory Involvement

The Site is listed on the Envirostor database under the DTSC's oversight.

# 2.0 SITE GEOLOGY/HYDROLOGY

The Site is located in the City of Emeryville, approximately 1 mile east of the San Francisco Bay, at an elevation of 40 feet above mean sea level (msl). The area consists of relatively flat-lying topography, with a slight slope to the west-southwest. The Site is located within the East Bay Plain Groundwater Basin. The Site is underlain by Temescal Formation, which is comprised of clayey, sandy, silty gravel, and sand-clay-silt mixtures, predominantly Quaternary and Holocene alluvium (Radbruch, 1957). Subsurface investigation work conducted onsite indicates subsurface lithology at the Site consists mainly of sandy silt units with thin sand/gravel layers. The mixed sand/gravel layers likely represent paleo stream channels that have incised the clay units, and are laterally and vertically discontinuous over the Site and surrounding area. These thinner units have higher-permeability characteristics than the clay units, and are believed to be preferential pathways for groundwater flow and contaminant migration.

A fine-grained silty sand unit was encountered at approximately 17 feet bgs. First encountered groundwater was at approximately 17 feet bgs. This unit was generally saturated from 17 to 20 feet bgs. However, due to the high silt content, no water accumulated in the borings until a clayey gravel unit was encountered at approximately 26.5 to 29 feet bgs. The thickness of the water-bearing zone is unknown.

Regionally, groundwater flows towards the west and San Francisco Bay, generally following topography. However, groundwater flow direction and velocity are also influenced by buried stream channels that are typically oriented in an overall east-west direction but can vary locally. Groundwater flow direction across the site is unknown as there are no groundwater monitoring wells present to generate groundwater elevation data to interpret groundwater flow direction. Groundwater elevation data from a site investigation conducted at 3601 Adeline Street in 2009, located approximately 300 feet to the southwest of the Site, indicates a groundwater flow direction to the southwest (Kleinfelder, 2009).

# 3.0 DESCRIPTION OF FIELD ACTIVITIES

## 3.1 Pre-Mobilization Activities

Prior to field operations, URS prepared a DTSC-approved Health and Safety Plan for the sampling investigation at the Site.

On January 9, 2012, the Alameda County Public Works Agency (ACPWA) approved URS's application for a drilling permit, and subsequently received a drilling permit for the scope of work (Appendix C).

URS marked all the drilling locations in white paint and notified Underground Services Alert (USA). A utility clearance was conducted at each of the borehole locations, including clearance of public property by USA, and additional clearance by a private utility clearance company, Sierra Nevada Ground Scan Imaging, a California-certified Disabled Veteran Business Enterprise.

## 3.2 Soil Sampling

Soil borings were installed by Vapor Tech Services of Berkeley, California, using direct-push technology (DPT), or by hand auger at twelve sample locations, SB-6 to SB-17 (Figure 2). During advancement of the DPT boreholes, a continuous core was collected at each location using 5-foot-long acetate sleeves. Samples collected for TPH-g were collected using gas-tight EnCore™ samplers. Samples for TPH-d, TPH-motor oil (TPH-mo) and metals were collected either in 4-ounce glass jars, stainless-steel sleeves, or in the acetate sleeves that were cut at the desired sampling interval and sealed with Teflon™ sheeting and end-caps. All borings were logged in accordance with the Unified Soil Classification System. Laboratory reports, data validation reports, and chain-of-custody forms are provided in Appendix A. Boring logs are included as Appendix B.

Samples were analyzed for TPH-g, TPH-d, TPH-mo, and California Assessment Manual (CAM) 17 metals. All samples were delivered under chain-of-custody to Moore Twining Associates, Inc., (Moore Twining) of Fresno, California for analysis. Sample analytical methods and locations are summarized in Table 1.

Duplicate samples were collected at a minimum frequency of 10 percent of the primary samples. A total of 24 soil samples and 3 duplicate samples was analyzed for metals, TPH-g, TPH-d, and TPH-mo.

## 3.3 Groundwater Sampling

Borings were advanced to approximately 20 to 30 feet bgs to collect grab groundwater samples. Grab groundwater samples were collected through dedicated 3/4-inch polyvinyl chloride pipe with 0.020-inch slotted screen. Samples were collected using a peristaltic pump and dedicated tubing, and placed into laboratory-provided glassware, as specified in the work plan.

Grab groundwater samples were analyzed for volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (U.S. EPA) Method 8260B; TPH-g, TPH-d, and TPH-mo by U.S. EPA Methods 8015M/8020; and for CAM 17 metals by U.S. EPA Methods 200.8 and 245.1. Groundwater samples analyzed for CAM 17 Metals were filtered in the field using a dedicated 0.45 micron filter. Twelve grab groundwater samples and two duplicate samples were collected from 12 onsite locations. All samples were delivered under chain-of-custody to Moore Twining of Fresno, California for analysis. Laboratory reports, data validation reports, and chain-of-custody forms are provided in Appendix A. Sample analyses are summarized in Table 1.

## 3.4 Soil Gas Sampling

Eight temporary soil vapor probes were installed by DPT and hand augering. Soil gas samples (SG-1 to SG-8) were collected and analyzed for VOCs following the U.S. EPA Method TO-15. Soil gas samples were collected at 5 feet bgs at each location. One field duplicate quality control (QC) sample was collected from location SG-5.

Soil gas samples were collected in general accordance with the DTSC/Los Angeles Regional Water Quality Control Board (RWQCB) guidance titled *"Advisory – Active Soil Gas Investigations,"* dated January 28, 2003 (DTSC and LARWQCB, 2003). Soil gas sampling was also completed in general accordance with the draft March 2010 Active Soil Gas Advisory. Although this guidance has not yet been formally adopted, it is expected to be adopted imminently, and presents the most up-to-date methodologies. Following this guidance, soil gas samples were collected from semi-permanent soil vapor monitoring points. At each location, a boring was advanced to 5 feet bgs using direct-push equipment or a 2¼-inch-outer-diameter hand auger. Tubing with a screen attached to the end was then lowered to the base of the boring, and a sand pack poured around it. When the sand was above the screened interval, 1 foot of dry bentonite pellets was placed on top of the sand pack. Hydrated bentonite slurry was then installed through a PVC tremie pipe to complete the well to the ground surface. Samples were collected directly from the tubing into a 1.0-liter SUMMA™ canister using helium as a leak-check gas. This method required use of a shroud over the sampling train and boring surface, and a semi-continuous flow of helium gas into the shroud to maintain a helium-rich atmosphere, between 80 to 100 percent helium. A helium meter was used to monitor helium concentrations

within the shroud, and laboratory analysis for helium was subsequently conducted to assess whether any leaks had occurred.

Soil gas sampling was not conducted for at least 30 minutes after the semi-permanent probe was installed, to allow subsurface conditions to equilibrate. To ensure that stagnant or ambient air was removed from the sampling system and to ensure samples were representative of subsurface conditions, three purge volumes (or "dead space volumes") were removed from the sampling system. This included air from the dedicated polyethylene tubing and the annular space around the probe tip. After installation, the soil gas wells were purged using a six-liter SUMMA™ canister, prior to sample collection using a one-liter SUMMA™ canister. Purging of the sampling system and sampling was performed at a restricted flow rate of 167 milliliters per minute (mL/min) to limit the potential for stripping, prevent ambient air infiltration, and reduce the variability of purging and sampling rates. After the purge volumes were removed, a 1.0-liter SUMMA™ canister was connected to the tubing within the helium shroud, and a soil gas sample was collected.

Soil gas samples were submitted under chain-of-custody to Air Toxics Laboratory in Folsom, California, for VOC analysis by U.S. EPA Method TO-15. The vacuum in the SUMMA canister was measured before and after shipment to the laboratory to ensure sample integrity. Helium gas is used as a sampling train leak detector. Each canister was analyzed for helium using American Society for Testing and Materials (ASTM) Method D1946 to determine whether any sampling train leakage had occurred during sample collection. Laboratory reports, data validation reports, and chain-of-custody forms are provided in Appendix A. Sample analyses are presented in Table 1.

## 3.5 Investigation-Derived Waste

The investigation-derived waste (soil cuttings and decontamination water) generated during the drilling and sampling activities was placed in four 55-gallon drum. The purge and decontamination water was disposed of as non-hazardous waste at the Liquid Environmental Solutions facility, Phoenix, Arizona. The soil cuttings were disposed of as non-hazardous waste at the U.S. Ecology facility in Beatty, Nevada. Non-hazardous waste disposal manifests are included in Appendix D.

# 4.0 DEVIATIONS FROM THE WORK PLAN

The DTSC TSI work plan was followed for the collection of soil and soil gas samples across the Site, with the deviations described below.

The TSI work plan indicated that depth to groundwater is at approximately 17 feet bgs and that groundwater sampling would be conducted at 15 to 18 feet bgs. During drilling and sampling activities, boreholes were advanced to 20 feet bgs, but groundwater did not enter the boring. After waiting 30 to 60 minutes, groundwater had not entered the boring. In these cases, borings were advanced to approximately 25 to 30 feet bgs where groundwater was encountered. Temporary PVC was installed with 10 feet of screen to facilitate groundwater sample collection. This was performed at investigation locations SB-8 through SB-17. The difference in depth to groundwater from the 2010 Phase II investigation may be attributed to changes in yearly precipitation.

The method for the analysis of CAM 17 metals in grab groundwater samples was specified in the TSI work plan to be analyzed by EPA Method 6010B, but was analyzed by EPA 200.8 and EPA 245.1 (for mercury). The analytical methodologies are similar, using inductively coupled plasma techniques, and have lower reporting limits than the 6010B method. Data quality objectives were not compromised with this analytical methodology and the results are usable as reported.

The TSI work plan indicated that soil gas samples would not be collected within a 7-day period of a major rain event. However, due to the expedited schedule for completion of the TSI project, and approximately 0.05 inch of rain, soil gas samples SG-6 through SG-8 were collected on the day following a rain event. One soil gas sample, SG-8, was not submitted for analysis due to water vapor in the probe and tubing. At sample location SG-3 a sample could not be collected within the 30-minute sample interval, as the pressure gauge indicated that little to no flow into the one-liter SUMMA™ canister had occurred. Consequently, the soil gas well was left over night and sample collection was attempted again the next morning. The soil vapor probe was left for an additional 4 hours and a sample finally collected at -7 millimeters of mercury (mmHg). With the exception of the metals groundwater analytical methodology, variations from the TSI work plan were discussed with the DTSC Project Manager prior to sample collection.

# 5.0 ANALYTICAL RESULTS

This section presents the analytical results for the soil, grab groundwater, and soil gas samples collected during this investigation. Soil samples were submitted to Moore Twining for analysis of CAM 17 Metals, TPH-g, TPH-d, and TPH-mo. Groundwater samples were submitted to Moore Twining for analysis of CAM 17 Metals, TPH-g, TPH-d, TPH-mo, and VOCs. Soil gas samples were submitted to Air Toxics for VOC analysis. The results were used to determine whether hazardous wastes/substances were present at the Site; to evaluate the nature and extent of contamination; and to estimate the potential threat to public health and/or the environment posed by existing Site conditions. Copies of the analytical data packages and data validation reports are included in Appendix A.

## 5.1 Data Quality

The DTSC TSI work plan included a Quality Assurance Project Plan (QAPP) for field and laboratory activities at the Site. The QAPP identified the procedures, objectives, and specific QA/QC activities designed to achieve data quality objectives (DQOs). The project file contains documentation of the field, laboratory, and data validation QAPP protocols.

Environmental measurements were conducted throughout the course of the project to produce data that are scientifically valid, are of known and acceptable quality, meet established project objectives, and are legally defensible.

Analytical data were evaluated to achieve an acceptable level of confidence in the decisions derived from the data, based on methods and procedures described in the QAPP. The precision, accuracy, completeness, comparability, representativeness, and required levels of sensitivity for all data generated were evaluated against the specified DQOs to provide the documentation necessary to support the investigation.

The following sections discuss the results of the data validation performed by URS chemists.

### 5.1.1 Soil Analytical Data

#### 5.1.1.1 CAM 17 Metals

**Holding Time and Sample Conditions**

The concentration of an analyte in a sample can change with time due to chemical instability, biological degradation, and volatilization. All samples were analyzed and extracted within required holding times and within the temperature range of 4 degrees Celsius (°C) ±2°C.

**Blank Contamination**

Analytes were not detected in any of the method blanks. Field blanks were not submitted.

**Field Duplicates and Laboratory Duplicates**

Three pairs of field duplicates were submitted to Moore Twining. The relative percent difference (RPD) between concentrations of lead in the duplicate pair SB-15-5 (4.4 mg/kg) and SB-150-5 (22 mg/kg) of 133.3 percent exceeded the QC limit of 50 percent. Reported concentrations of lead are flagged "J," estimated in both samples.

The details, including concentrations in duplicate pair members, as well RPDs, are shown in the tables in the validation report. The relatively poor precision shown by the field duplicates is most likely due to soil heterogeneity. No other significant discrepancies were found between duplicate pairs.

**Laboratory Control Samples**

All metals spiked for laboratory control samples (LCS) were recovered within their QC acceptance range of 80 to 120 percent.

**Matrix Spikes and Duplicates**

Two samples from this project, SB-8-5 and SB-14-5, were spiked for the matrix spike (MS)/matrix spike duplicate (MSD). In SB-8-5, cobalt, barium, antimony, and chromium had either mean percent recoveries outside of the 75 percent to 125 percent QC acceptance range, or an RPD between the MS and MSD recoveries above 20 percent. Antimony was not present, and reporting limits were flagged "UJ," estimated. Cobalt, barium, and chromium were found in all soil samples, and the reported concentrations were flagged "J," estimated. In SB-14-5, antimony was recovered (60.0 percent) below the QC acceptance range of 75 percent to 125 percent. Antimony was not reported in any of the samples. Reporting limits for antimony were flagged "UJ," estimated. The tables in the data validation reports identify the sample that was spiked, the associated analytical batch, the mean percent recovery (for the MS and MSD), and the RPD. The flagging protocol is listed at the end of each table. It is likely that both the RPD failures and the recovery failures are due to soil heterogeneity.

**Reporting Limits and Dilutions**

Samples for analysis of metals by U.S. EPA Method 6010B and mercury by U.S. EPA Method 7470 were not diluted.

### 5.1.1.2 Total Petroleum Hydrocarbons as Gasoline

**Holding Time and Sample Conditions**

All samples were analyzed and extracted within required holding times and within the temperature range of 4°C ± 2°C.

**Blank Contamination**

Analytes were not detected in any of the method blanks.

**Field Duplicates and Laboratory Duplicates**

Three field duplicate soil samples were submitted for analysis of TPH-g. There was no significant discrepancy between the results of the pair members.

**Surrogates**

The surrogate, 4-Bromoflourobenzene, in sample SB-14-2 was recovered (72.1 percent) below the QC acceptance range of 75 percent to 125 percent. The reporting limit of the non-detect was flagged "UJ," estimated.

**Laboratory Control Samples**

LCS recoveries were within their QC acceptance ranges.

**Matrix Spikes and Duplicates**

MS/MSD recoveries were within their QC acceptance ranges.

**Reporting Limits and Dilutions**

No dilutions were required.

### 5.1.1.3 Total Petroleum Hyrdocarbons as Diesel and Motor Oil

**Holding Time and Sample Conditions**

All samples were analyzed and extracted within required holding times and within the temperature range of 4°C +/- 2°C degrees.

**Blank Contamination**

Analytes were not detected in any of the method blanks.

**Field Duplicates and Laboratory Duplicates**

Three field duplicate soil samples were submitted for analysis of TPH-d and TPH-mo. Duplicate samples SB-13-2 and SB-130-2 had TPH-d concentrations of 82 mg/kg and 47 mg/kg, and TPH-mo concentrations of 58 mg/kg and 32 mg/kg, respectively. The relatively poor precision shown by these duplicates is most likely due to soil heterogeneity. In the case of samples SB-10-2, SB-13-2, SB-130-2, and SB-13-5, the chromatogram showed the presence of a heavier hydrocarbon than diesel. Therefore, the reported concentrations of diesel in these samples were flagged "J," estimated. No significant discrepancy was found between the results of the other duplicate pair members.

**Surrogates**

The surrogate, o-terphenyl, in sample SB-16-5 was recovered (10.9 percent) below the QC acceptance range of 11.8 percent to 130 percent. The reporting limit of the non-detects for diesel and motor oil in that sample were flagged "UJ," estimated.

**Laboratory Control Samples**

LCS recoveries were within their QC acceptance ranges.

**Matrix Spikes and Duplicates**

The recovery of diesel of 19 percent was below the QC range of 48 percent to 131 percent. The reporting limit of diesel in the spiked sample, SB-14-5, was flagged "UJ," estimated. The results show strong matrix interference with regard to diesel.

**Reporting Limits and Dilutions**

No dilutions were required.

### 5.1.2 Grab Groundwater Analytical Data

#### 5.1.2.1 CAM 17 Metals

**Holding Time and Sample Conditions**

All samples were analyzed and extracted within required holding times and within the temperature range of 4°C ±2°C.

**Blank Contamination**

Analytes were not detected in any of the method blanks.

**Field Duplicates and Laboratory Duplicates**

Two pairs of field duplicates were submitted to Moore Twinning. No significant discrepancy was found between the results of the pair members.

**Laboratory Control Samples**

The mean percent recovery of mercury in LCS/LCSD for reports 2A31004 and 2B02002 were 66.3 percent and 77.5 percent, which was below the QC acceptance range of 80 percent to 120 percent. Mercury sample results for SB-8, SB-9, SB-10, SB-12, SB-13, SB-130, SB-14, SB-15, SB-150, SB-16, and SB-17 were flagged "UJ" estimated. No other issues were encountered.

**Matrix Spikes and Duplicates**

In two of the batches (2A31004 and 2B01004) there were matrix spike and matrix spike duplicate QC failures for mercury. Based on these batch QC failures the reporting limit for SB-6, SB-7, SB-10, SB-11, SB-12, SB-13, SB-130, and SB-14 were flagged "UJ" estimated. For laboratory report 2B02002, Barium had variable results in the MS/MSD. The sample concentration exceeded 4 times the spiking concentration, and the results were not used to qualify data.

**Reporting Limits and Dilutions**

No dilutions were required.

### 5.1.2.2 Total Petroleum Hydrocarbons as Gasoline

**Holding Time and Sample Conditions**

All samples were analyzed and extracted within required holding times and within the temperature range of 4°C ± 2°C.

**Blank Contamination**

Analytes were not detected in any of the method blanks.

**Field Duplicates and Laboratory Duplicates**

Two field duplicate grab groundwater samples were submitted for TPH-g analysis. There was no significant discrepancy between the results of the pair members.

**Surrogates**

For all samples, the surrogate was recovered within its QC acceptance limits.

**Laboratory Control Samples**

LCS recoveries were within their QC acceptance ranges.

**Matrix Spikes and Duplicates**

The sample spiked for the MS/MSD is not from this project and does reflect the matrix of these samples.

**Reporting Limits and Dilutions**

The laboratory reported that the chromatogram for sample SB-130 showed only single peaks in the gasoline range, and not gasoline. Consequently, the result of 98 µg/L was changed to a non-detect below a revised reporting limit of 98 µg/L.

### 5.1.2.3 Total Petroleum Hydrocarbons as Diesel and Motor Oil

**Holding Time and Sample Conditions**

All samples were analyzed and extracted within required holding times and within the temperature range of 4°C +/- 2°C degrees.

**Blank Contamination**

Analytes were not detected in any of the method blanks.

**Field Duplicates and Laboratory Duplicates**

Two field duplicates were submitted for TPH-d and TPH-mo analysis. The RPD for motor oil in the duplicate pair SB-130 (230 µg/L) and SB-13 (120 µg/L) of 62.9 percent exceeded the QC limit of 50 percent. Reported concentrations of TPH-mo in both samples were flagged "J," estimated.

**Surrogates**

For all samples, the surrogate was recovered within its QC acceptance limits.

**Laboratory Control Samples**

LCS recoveries were within their QC acceptance ranges.

**Matrix Spikes and Duplicates**

One sample from this project was spiked for the MS/MSD. MS/MSD recoveries were within their QC acceptance ranges.

**Reporting Limits and Dilutions**

In samples SB-6, SB-7, and SB-11, the laboratory reported a hydrocarbon heavier than diesel. Because some of this material overlaps the diesel range, in each sample, the reported concentration was flagged "J," estimated.

### 5.1.2.4 Volatile Organic Compounds

**Holding Time and Sample Conditions**

All samples were analyzed and extracted within required holding times and within the temperature range of 4°C +/- 2°C degrees.

**Blank Contamination**

Analytes were not detected in any of the method blanks or trip blanks.

**Field Duplicates and Laboratory Duplicates**

Two field duplicates were submitted for VOC analysis. There was no significant discrepancy between the results of the pair members.

**Surrogates**

For all samples, the surrogate was recovered within its QC acceptance limits.

**Laboratory Control Samples**

LCS recoveries were within their QC acceptance ranges.

**Matrix Spikes and Duplicates**

One sample from this project was spiked for the MS/MSD. MS/MSD recoveries were within their QC acceptance ranges.

**Reporting Limits and Dilutions**

No dilutions were required.

### 5.1.3 Data Quality Review

#### 5.1.3.1 Soil Gas Data

**Holding Times and Sample Condition**

Holding time for soil gas samples in SUMMA canisters is generally considered to be 30 days, although it is not specified in the TO-15 method. Air Toxics performed the analysis within 7 days of sampling. There were no issues with any of the SUMMA canisters during the laboratory log-in process. Canisters were received intact and pressures checked at the time of log in.

**Blank Contamination**

Target compounds were not detected in any of the method blanks.

**Field Duplicates**

One pair of field duplicates (SG-5 and SG-100) was collected for analysis. The duplicates were collected in parallel. There were no significant discrepancies between results of the duplicate pair.

**Surrogates**

All surrogate recoveries fell within the QC acceptance range of 70 to 130 percent.

**Matrix Spikes and Duplicates**

Matrix spikes are not used in air and gas analyses.

**Laboratory Control Samples**

The mean recovery of carbon tetrachloride of 130.5 percent exceeded the QC acceptance range of 70 percent to 130 percent. Because carbon tetrachloride was not detected in any of the samples and the recovery was high, no results were qualified.

**Reporting Limits and Dilutions**

The effective dilution factors ranging from 1.46 to 2.34. Reporting limits were increased by these dilution factors. These dilutions are shown on the laboratory reports and on the validation reports in Appendix A.

Helium gas was used during soil vapor sampling as a tracer gas inside the sampling shroud. In sample SG-3, 0.17 percent of helium was detected in the sample. This does not affect the sample results and the data is useable as reported in Table 7.

### 5.1.4 Overall Summary of Data Quality

Data validation indicates analytical results are all usable for this project. None of the analytical results were rejected. The qualified data were primarily from the soil samples, where heterogeneity is the likely cause.

## 5.2 Screening Criteria

Soil analytical results were compared to the Cal-EPA California Human Health Screening Levels (CHHSLs) and the U.S. EPA Region IX Regional Screening Levels (RSLs) for residential soil. RSLs are intended to address human health concerns regarding direct exposure to affected soils, and are generally consistent with human health risk assessment guidance prepared by the DTSC. The most recent update to the RSLs was in November 2011. The CHHSLs are soil-screening levels developed by the Office of Environmental Health Hazard Assessment (OEHHA) and released in January 2005 (a revision of the November 2004 draft publication), with subsequent revisions on September 17, 2009. The CHHSLs are not intended to be prescriptive cleanup levels; however, they are useful as an initial human-health–based screening tool.

Because CHHSL or RSL values have not been assigned for TPH compounds, these results were compared to the San Francisco Bay RWQCB Environmental Screening Levels (ESLs) for a residential land use scenario where shallow soils are impacted and groundwater is a potential drinking-water source. ESLs are conservative risk-based screening levels. ESLs are not regulatory cleanup levels, but are useful as an initial screening level to assess risk to human health and the environment. The most recent version of the ESLs was released in May 2008.

Groundwater analytical results were compared to the California Department of Public Health (CDPH) Maximum Contaminant Levels (MCLs), updated November 28, 2008, which are regulatory standards that limit contaminant concentrations in drinking water.

Soil gas analytical results were compared to the CHHSLs for VOCs assuming a conservative residential scenario and buildings constructed without engineered fill below sub-slab gravel. The CHHSLs are soil-gas screening levels developed by OEHHA and released in January 2005 (a revision of the November 2004 draft publication), with subsequent revisions on September 17, 2009. The CHHSLs are not intended to be prescriptive cleanup levels, but they are useful as an initial human-health–based screening tool.

## 5.3 Soil Analytical Results

Soil analytical results for TPH and metals are summarized in Tables 2 and 3, respectively. Laboratory analytical and data validation reports are included in Appendix A.

### 5.3.1 TPH-g, TPH-d, and TPH-mo

The analytical laboratory results for TPH-g, TPH-d, and TPH-mo analyses are summarized in Table 2. Soil samples were collected at 12 boring locations and at depths of 2 and 5 feet bgs. TPH-g was not detected in any of the samples above laboratory reporting limits. TPH-d was detected in four samples; but all the concentrations were below the residential ESL of 83 mg/kg. TPH-mo was detected in two samples, but all the concentrations were below the residential ESL of 370 mg/kg.

### 5.3.2 CAM 17 Metals

Metals analytical results are summarized in Table 3. Soil samples were collected at 12 boring locations and at depths of 2 and 5 feet bgs. Multiple metals were detected at all of the locations and depths; however, only arsenic and lead were detected at concentrations exceeding screening levels.

Arsenic was detected in all samples above the CHHSL of 0.07 mg/kg and the RSL of 0.39 mg/kg. Concentrations ranged from 2.1 mg/kg in sample SB-15-5 to 6.3 mg/kg in sample SB-7-2.

Lead was detected in four samples above the CHHSL of 80 mg/kg, but below the RSL of 400 mg/kg. Concentrations ranged from 110 mg/kg in samples SB-14-2 to 200 mg/kg in sample SB-10-2.

Other metals detected above the laboratory reporting limits were barium, beryllium, cadmium, chromium, cobalt, copper, mercury, molybdenum, nickel, vanadium, and zinc, as listed Table 3. These metals were all detected at concentrations below their applicable residential CHHSLs and RSLs.

## 5.4 Grab Groundwater Analytical Results

Groundwater analytical results for TPH, metals, and VOCs are presented in Tables 4, 5, and 6, respectively. Laboratory analytical reports and data validation reports are included in Appendix A.

### 5.4.1 TPH-g, TPH-d, and TPH-mo

Analytical laboratory results for TPH-g, TPH-d, and TPH-mo analyses are summarized in Table 4. Grab groundwater samples were collected from 12 locations at depths ranging from 18 to 30 feet bgs. At each location, the first encountered groundwater was sampled. TPH-g was not detected in any samples analyzed above laboratory reporting limits. TPH-d was detected above the laboratory reporting limits in samples SB-6, SB-7, SB-8, SB-9, SB-11, SB-13, SB-130, SB-15, SB-150, SB-16, and SB-17. However, TPH-d was only detected at concentrations exceeding the ESL of 100 µg/L in four samples (SB-6, SB-7, SB-13, and SB-130). Concentrations of TPH-d were 230 µg/L and 370 µg/L in samples SB-6 and SB-130 (duplicate sample of SB-13), respectively. TPH-mo was detected at concentrations exceeding the laboratory reporting limit in samples SB-6, SB-7, SB-13, and SB-130. Concentrations of TPH-mo ranged from 120 µg/L in sample SB-13 to 230 µg/L in samples SB-7 and SB-130 (duplicate sample of SB-13). However, these concentrations are below the TPH-mo ESL of 370 µg/L. TPH groundwater results are presented graphically on Figure 3.

### 5.4.2 CAM 17 Metals

The metals analytical results are summarized in Table 5. Grab groundwater samples were collected from 12 locations at depths ranging from 18 to 30 feet bgs. Multiple metals were detected in all of the samples; although no metals were detected at concentrations exceeding their respective CA MCL.

### 5.4.3 Volatile Organic Compounds

The analytical laboratory results for the VOC analyses are summarized in Table 6. Groundwater samples were collected from 12 locations at depths ranging from 18 to 30 feet bgs. Eight VOCs were detected in the samples analyzed as discussed below.

1,2,4-trichlorobenzene was detected in two samples above the CA MCL of 5.0 µg/L. Concentrations of 1,2,4-trichlorobenzene in samples SB-13 and SB-130 (field duplicate of SB-13) were 5.1 µg/L.

1,2-dichlorobenzene was detected in two samples below the CA MCL of 600 µg/L. Concentrations of 1,2-dichlorobenzene were 40 µg/L and 53 µg/L in samples SB-13 and SB-130 (field duplicate of SB-13), respectively.

1,2-dichloroethane was detected in two samples above the CA MCL of 0.5 µg/L. Concentrations of 1,2-dichloroethane were 0.58 µg/L and 0.85 µg/L in samples SB-13 and SB-130 (field duplicate of SB-13), respectively.

1,3-dichlorobenzene was detected in two samples at concentrations of 3 µg/L and 3.9 µg/L in samples SB-13 and SB-130 (field duplicate of SB-13), respectively. There is no screening criteria for this compound.

1,4-dichlorobenzene was detected in two samples above the CA MCL of 5 µg/L. Concentrations of 1,4-dichlorobenzene were 18 µg/L and 23 µg/L in samples SB-13 and SB-130 (field duplicate of SB-13), respectively.

Chlorobenzene was detected in two samples at concentrations of 23 µg/L and 31 µg/L in samples SB-13 and SB-130 (field duplicate of SB-13), respectively. No screening criteria have been established for this compound.

Cis-1,2-dichloroethene was detected in eight samples above laboratory reporting limits, and two samples exceeded the CA MCL of 6.0 µg/L. Concentrations of cis-1,2-dichloroethene ranged from 0.59 µg/L to 22 µg/L in samples SB-7 and SB-130 (field duplicate of SB-13), respectively.

TCE was detected in nine samples above laboratory limits, and seven samples exceed the CA MCL of 5.0 µg/L. Concentrations of TCE ranged from 3.2 µg/L to 55 µg/L in samples SB-9 and SB-130 (field duplicate of SB-13), respectively.

No other VOCs were detected in the groundwater samples. VOC concentrations in groundwater samples are presented graphically on Figure 4.

## 5.5 Soil Gas Analytical Results

Soil gas samples were collected from eight locations at 5 feet bgs and analyzed for VOCs. The results are summarized in Table 7 and shown graphically on Figure 5: laboratory analytical and data validation reports are included in Appendix A. A total of 22 compounds were detected in soil gas samples, although none exceeded their respective CHHSLs. Of these 22 compounds, TCE and PCE were identified as the primary contaminants of concern (COCs) and 16 of the compounds detected are typically associated with gasoline and motor oil. Acetone, which is ubiquitous in the environment at trace levels, was detected in all of the samples analyzed at a maximum concentration of 26 micrograms per cubic meter ($\mu g/m^3$) at SG-5. Chloroform and methylene chloride were detected at low concentrations only in SG-7, and may be associated with prior usage of methylene chloride at the site (methylene chloride was a commonly used solvent and paint stripper). Both chloroform and methylene chloride may also be associated with the biodegradation of carbon tetrachloride, however carbon tetrachloride was not detected in any of the samples analyzed. Freon 12 was detected in 3 samples, and is possibly associated with automobile repair. Carbon disulfide, another solvent, was detected in two soil gas samples at the site.

Compounds detected for which CHHSLs have been established were: TCE, which was detected at concentrations up to 330 µg/$m^3$, below the residential CHHSL of 530 µg/$m^3$; tetrachloroethene (PCE), which was detected at concentrations up to 64 µg/$m^3$, below the residential CHHSL of 180 µg/$m^3$; benzene, which is associated with TPH-g, was detected at concentrations up to 19 µg/$m^3$, below the residential CHHSL of 36 µg/$m^3$; m and p-xylenes, also associated with TPH-g, was detected at concentrations up to 64 µg/$m^3$, below the residential CHHSL of 320,000 µg/$m^3$; o-xylene, also associated with TPH-g, was detected at concentrations up to 28 µg/ $m^3$, below the residential CHHSL of 320,000 µg/$m^3$; and toluene, which is also associated with TPH-g, was detected at concentrations up to 54 µg/$m^3$, below the residential CHHSL of 140,000 µg/$m^3$. In addition, other VOCs detected and related to TPH-g without established CHHSLs included: hexane, cyclohexane, heptane, toluene, ethylbenzene, propylbenzene, 4-theyltoluene, 1,3,5-trimethlybenzene, and 1,2,4-trimethlybenzene. These compounds were detected at low concentrations.

# 6.0 CONCLUSIONS AND RECOMMENDATIONS

## 6.1 Soil

The primary soil contaminant of concern is lead. TPH-d was detected at two locations on site, with a maximum concentration of 82 J (estimated) mg/kg at location SB-13-2. TPH-mo was detected only at SB-13, at a maximum concentration of 58 mg/kg at 2 feet bgs. TPH-d and TPH-mo results are below the residential ESL. TPH-g was not detected in any of the soil samples. Arsenic was detected in all soil samples, at concentrations ranging from 2.1 mg/kg to 6.3 mg/kg. Arsenic concentrations, although above risk-based screening levels, are less than the 95th percentile for background concentrations of 17 mg/kg, developed by Lawrence Berkeley National Laboratory (LBNL, 2009). The LBNL 95th percentile background concentration is a concentration that has commonly been accepted as background for arsenic in San Francisco Bay Area soils. Four samples (SB-10-2, SB-10-5, SB-11-2, and SB-14-2) contained concentrations of lead above the residential CHHSL of 80 mg/kg, but below the U.S. EPA Residential RSL of 400 mg/kg. Concentrations of lead ranged from 110 mg/kg to 200 mg/kg in samples SB-14-2 and SB-10-2, respectively. No other metals were detected at concentrations exceeding their residential CHHSL or RSL.

## 6.2 Groundwater

The primary groundwater contaminant of concern is TCE, which was detected above its CA MCL at a maximum concentration of 440 µg/L at SB-4 during the previous investigation. During the current investigation, TCE was detected in nine grab-groundwater samples, of which seven exceeded the CA MCL of 5.0 µg/L for TCE. Concentrations ranged from 3.2 µg/L to 55 µg/L in samples SB-9 and SB-130 (field duplicate of SB-13), respectively. Additionally, 1,2,4-trichlorobenzene, 1,2-DCA, 1,4-dichlorobenzene, and cis-1,2-DCE were detected above their CA MCLs in samples SB-13 and SB-130 (field duplicate of SB-13). Boring location SB-13 is just west of previous investigation boring SB-4 and the floor drain in Building 2. In the basement of Building 1, two grab-groundwater samples—SB-6 and SB-7—were collected, and had TCE concentrations of 11 µg/L and 8.6 µg/L, respectively. Locations SB-6 and SB-7 are west of the basement sump (Figure 4). The previous use of this sump is unknown. PCE was not detected in any samples during this investigation.

Concentrations of cis-1,2-DCE correlate with TCE detections at sample locations SB-6, SB-7, SB-10, SB-11, SB-12, SB-13, and SB-130 (a duplicate of sample SB-13). This likely indicates that partial, but incomplete reductive dechlorination of TCE is occurring at the Site.

| Analyte | SB-6 | SB-7 | SB-8 | SB-10 | SB-11 | SB-12 | SB-13 | SB-130 |
|---|---|---|---|---|---|---|---|---|
| TCE (µg/L) | 11 | 8.6 | 4 | 11 | 17 | 13 | 41 | 55 |
| Cis-1,2-DCE (µg/L) | 0.92 | 0.59 | 0.94 | 1.8 | 2.6 | 1.1 | 16 | 22 |

Groundwater VOC contamination is likely related to previous site operations.

TPH-g was not detected in groundwater samples, and TPH-mo was detected in four samples, but below the residential ESL of 370 µg/L. TPH-d was detected in eleven of the samples analyzed. Concentrations exceeded the residential ESL of 100 µg/L in four samples (SB-6, SB-7, SB-13, SB-130). Concentrations ranged from 230 µg/L in SB-6 to 370 µg/L in SB-130 (field duplicate of SB-13). Soil borings SB-6 and SB-7 are located in the basement of Building 1, west of the former UST that was removed in 2002 by TEC Accutite, and adjacent and down-gradient of the sump. Boring SB-13 is at the southern end of Building 2 to the west of the floor drain (Figure 3).

## 6.3 Soil Gas

The primary soil gas contaminants of concern are TCE and PCE. However, concentrations detected are below the residential CHHSLs. TCE was detected at SG-1, adjacent to the basement sump, at a concentration of 330 µg/$m^3$ at 5 feet bgs. TCE was also detected at SG-5 at a concentration of 280 µg/$m^3$. These concentrations are below the residential CHHSL for TCE (528 µg/$m^3$). PCE was detected in three samples (SG-5, SG-100 [field duplicate of SG-5], and SG-6) with a maximum concentration of 64 µg/$m^3$ at SB-6, which is below the residential CHHSL for PCE of 180 µg/$m^{\wedge 3}$. These results suggest that vapor intrusion is not a threat at the Site.

## 6.4 Potential Threat to Human Health or the Environment

TCE was detected in four samples (SG-1, SG-4, SG-5, and SG-100 [field duplicate of SG-5]). The highest TCE soil gas concentration of 330 µg/$m^3$ was detected at 5 feet bgs in the northwestern corner of the Site (SG-1), and is below the residential CHHSL. These concentrations do not pose a risk to human health and the environment. However, demolition of the on-site buildings and removal of the concrete floors could expose TCE or lead-contaminated soil. Use of the property for unrestricted development, would require additional sampling, and potentially a formal risk assessment, remedial actions, and/or engineering controls to ensure that potential risks are mitigated or minimized. TCE-contaminated soil may require remediation either before or during construction, if a TCE source area is identified on site.

TCE groundwater contamination at the Site exceeds the CA MCL of 5.0 µg/L, with a maximum concentration of 55 µg/L at SB-13 (duplicate sample SB-130). This shallow groundwater contamination is believed to be associated with previous Site operations. The location of previous Site operators within the buildings are unknown. Because groundwater at the Site is not currently used for drinking water, and soil gas concentrations do not exceed risk-based levels for vapor intrusion, the presence of elevated concentrations of TCE in groundwater at the Site does not appear to pose an immediate threat. However, continued monitoring of groundwater and/or soil gas may be required at the Site to confirm that there is no ongoing threat to human health and the environment.

Although detected contamination at the Site does not currently pose a threat to human health or the environment, it is likely, based on TCE soil gas results, a limited volume of contaminated soil is likely present above risk-based regulatory screening levels; therefore, remediation or engineering controls prior to or during redevelopment will likely be required.

# 7.0 REMEDIATION AND DATA GAP DISCUSSION

## 7.1 Data Gap Investigation

TCE soil gas data indicate the potential for a soil source in the area of or upgradient of SG-5, and also in the area of SG-1. Consequently, it is recommended that addition investigation, either soil gas sampling and/or soil sampling, be conducted at step-out locations in these areas. Additional investigation would also better delineate the lateral and vertical extent of contamination in these areas and reduce uncertainty associated with redeveloping the Site. Depending upon the nature of the redevelopment, it may be necessary to excavate soil in these areas.

Costs associated with this data gap investigation would be approximately $50,000 to $70,000 and would include: a drilling subcontractor, collection of soil and/or soil gas samples, laboratory analyses, disposal of investigation-derived waste, and a report. In addition to the data gap investigation, it is recommended that the soil boring locations be surveyed, so that their locations can be referenced once the existing structures on Site have been demolished.

## 7.2 Groundwater Remediation

TCE contamination of shallow groundwater exceeds MCLs at two areas of the Site. Prior to initiating any groundwater remedial action, additional grab-groundwater sampling is recommended to better assess concentrations in groundwater, determine the lateral extent of the shallow groundwater plume, and determine whether contamination is migrating off Site. Based on the results of the supplemental groundwater investigation, there are two potential remedial approaches. If additional soil and/or soil gas work indicates there is no source of TCE in soil and TCE concentrations are consistent with those observed in this investigation and the TCE groundwater plume does not appear to be migrating offsite, then monitored natural attenuation (MNA) may be a viable option until established groundwater goals (MCLs) are achieved. This will require the installation of permanent monitoring wells, which must be protected during construction and accessible after redevelopment.

If TCE concentrations are significantly greater than MCLs, then in situ groundwater treatment may be warranted such as enhanced biodegradation using hydrogen release compound or emulsified oil. It is also possible that source removal may be a feasible alternative, if TCE source areas are identified on site. Groundwater analytical results indicate that limited reductive dechlorination of TCE is occurring (Section 6.0) as cis-1,2-DCE results correlate well with TCE results. Cis-1,2-DCE is a breakdown product when TCE undergoes degradation. Consequently, enhanced in-situ biodegradation may be a viable remedial measure at this site, based on the analytical data currently available. Since grab groundwater data are typically considered screening-level data, groundwater monitoring well installation should be considered after the

additional recommended data gap investigation. The objectives would be to assess the groundwater flow direction and gradient at the Site, and to provide future points for groundwater monitoring.

Additional data collection is necessary in order to develop a remediation cost estimate. However, based on prior in situ studies conducted, an order-of-magnitude estimate for in situ remediation of the TCE source areas identified during this investigation would be approximately $50,000 to $120,000. The cost of MNA will depend upon the duration of monitoring and the number of wells installed.

## 7.3 Soil Remediation

Based upon the results of the data gaps investigation, it is possible that a limited amount of TCE-contaminated soil will need to be excavated for off-site disposal. For estimating costs, it is assumed that 50 cubic yards would be excavated for off-site disposal, and that post-demolition access to the basement area is possible. The cost of excavation and disposal would be approximately $25,000 to $45,000. This estimate will need to be refined once additional site characterization data is available.

# 8.0 REFERENCES

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# TABLES

**Table 1**
**Sample Locations and Analyses**
**San Pablo Assemblage**
**Emeryville, California**

| Location | Sample ID | Matrix | Depth bgs (feet) | TPH-g EnCore Sampler (soil) 8015M | VOCs by U.S. EPA Method TO-15 | TPH-d, TPH-mo U.S. EPA Method 8015M | CAM 17 Metals by U.S. EPA Method 6010B | VOCs 8260B |
|---|---|---|---|---|---|---|---|---|
| Soil Vapor Samples | | | | | | | | |
| SG-1 | SG-1 | Soil Vapor | 5 | | X | | | |
| SG-2 | SG-2 | Soil Vapor | 5 | | X | | | |
| SG-3 | SG-3 | Soil Vapor | 5 | | X | | | |
| SG-4 | SG-4 | Soil Vapor | 5 | | X | | | |
| SG-5 | SG-5 | Soil Vapor | 5 | | X | | | |
| SG-5 | SG-100* | Soil Vapor | 5 | | X | | | |
| SG-6 | SG-6 | Soil Vapor | 5 | | X | | | |
| SG-7 | SG-7 | Soil Vapor | 5 | | X | | | |
| SG-8 | SG-8 | Soil Vapor | 5 | | X | | | |
| Subsurface Soil Samples | | | | | | | | |
| SB-6 | SB-6-2 | Soil | 2 | X | | X | X | |
| SB-6 | SB-6-5 | Soil | 5 | X | | X | X | |
| SB-7 | SB-7-2 | Soil | 2 | X | | X | X | |
| SB-7 | SB-7-5 | Soil | 5 | X | | X | X | |
| SB-8 | SB-8-2 | Soil | 2 | X | | X | X | |
| SB-8 | SB-8-5 | Soil | 5 | X | | X | X | |
| SB-9 | SB-9-2 | Soil | 2 | X | | X | X | |
| SB-9 | SB-9-5 | Soil | 5 | X | | X | X | |
| SB-10 | SB-10-2 | Soil | 2 | X | | X | X | |
| SB-10 | SB-10-5 | Soil | 5 | X | | X | X | |
| SB-11 | SB-11-2 | Soil | 2 | X | | X | X | |
| SB-11 | SB-11-5 | Soil | 5 | X | | X | X | |
| SB-12 | SB-12-2 | Soil | 2 | X | | X | X | |
| SB-12 | SB-12-5 | Soil | 5 | X | | X | X | |
| SB-13 | SB-13-2 | Soil | 2 | X | | X | X | |
| SB-13 | SB-130-2* | Soil | 2 | X | | X | X | |
| SB-13 | SB-13-5 | Soil | 5 | X | | X | X | |
| SB-13 | SB-130-5* | Soil | 5 | X | | X | X | |
| SB-14 | SB-14-2 | Soil | 2 | X | | X | X | |
| SB-14 | SB-14-5 | Soil | 5 | X | | X | X | |
| SB-15 | SB-15-2 | Soil | 2 | X | | X | X | |
| SB-15 | SB-15-5 | Soil | 5 | X | | X | X | |
| SB-15 | SB-150-5* | Soil | 5 | X | | X | X | |
| SB-16 | SB-16-2 | Soil | 2 | X | | X | X | |
| SB-16 | SB-16-5 | Soil | 5 | X | | X | X | |
| SB-17 | SB-17-2 | Soil | 2 | X | | X | X | |
| SB-17 | SB-17-5 | Soil | 5 | X | | X | X | |
| Groundwater Samples | | | | | | | | |
| SB-6 | SB-6 | Groundwater | 18 | X | | X | X | X |
| SB-7 | SB-7 | Groundwater | 18 | X | | X | X | X |
| SB-8 | SB-8 | Groundwater | 30 | X | | X | X | X |
| SB-9 | SB-9 | Groundwater | 30 | X | | X | X | X |
| SB-10 | SB-10 | Groundwater | 30 | X | | X | X | X |
| SB-11 | SB-11 | Groundwater | 30 | X | | X | X | X |
| SB-12 | SB-12 | Groundwater | 30 | X | | X | X | X |
| SB-13 | SB-13 | Groundwater | 30 | X | | X | X | X |
| SB-13 | SB-130* | Groundwater | 30 | X | | X | X | X |
| SB-14 | SB-14 | Groundwater | 25 | X | | X | X | X |
| SB-15 | SB-15 | Groundwater | 25 | X | | X | X | X |
| SB-15 | SB-150* | Groundwater | 25 | X | | X | X | X |
| SB-16 | SB-16 | Groundwater | 25 | X | | X | X | X |
| SB-17 | SB-17 | Groundwater | 25 | X | | X | X | X |

Notes:
* = Field Duplicate Sample

**Table 2**
**Soil TPH Analytical Results**
**San Pablo Assemblage**
**Emeryville, California**

| Analyte | TPH-g | TPH-d | TPH-mo |
|---|---|---|---|
| **ESL - Residential (mg/kg)** | 83 | 83 | 370 |
| **SB-6-2** | < 1.0 | < 10 | < 10 |
| **SB-6-5** | < 1.0 | < 10 | < 10 |
| **SB-7-2** | < 1.0 | < 10 | < 10 |
| **SB-7-5** | < 1.0 | < 10 | < 10 |
| **SB-8-2** | < 1.0 | < 10 | < 10 |
| **SB-8-5** | < 1.0 | < 10 | < 10 |
| **SB-9-2** | < 1.0 | < 10 | < 10 |
| **SB-9-5** | < 1.0 | < 10 | < 10 |
| **SB-10-2** | < 1.0 | **16 J** | < 10 |
| **SB-10-5** | < 1.0 | < 10 | < 10 |
| **SB-11-2** | < 1.0 | < 10 | < 10 |
| **SB-11-5** | < 1.0 | < 10 | < 10 |
| **SB-12-2** | < 1.0 | < 10 | < 10 |
| **SB-12-5** | < 1.0 | < 10 | < 10 |
| **SB-13-2** | < 1.0 | **82 J** | **58** |
| **SB-130-2** | < 1.0 | **47 J** | **32** |
| **SB-13-5** | < 1.0 | **14 J** | < 10 |
| **SB-130-5** | < 1.0 | < 10 | < 10 |
| **SB-14-2** | < 1.0 UJ | < 10 | < 10 |
| **SB-14-5** | < 1.0 | < 10 UJ | < 10 |
| **SB-15-2** | < 1.0 | < 10 | < 10 |
| **SB-15-5** | < 1.0 | < 10 | < 10 |
| **SB-150-5** | < 1.0 | < 10 | < 10 |
| **SB-16-2** | < 1.0 | < 10 | < 10 |
| **SB-16-5** | < 1.0 | < 10 UJ | < 10 |
| **SB-17-2** | < 1.0 | < 10 | < 10 |
| **SB-17-5** | < 1.0 | < 10 | < 10 |

Notes:
TPH results in milligrams/kilogram (mg/kg).
ESL = Environmental Screening Levels, California Regional Water Quality Control Board, San Francisco Bay Region
Shaded concentrations indicate that the concentration exceeds the ESL.
UJ = estimated reporting limit.
J = estimated concentration
Samples analyzed by U.S. EPA Method 8015B

# Table 3
# Soils Metals Analytical Results
# San Pablo Assemblage
# Emeryville, California

| Analyte | Antimony | Arsenic | Barium | Beryllium | Cadmium | Chromium | Cobalt | Copper | Lead | Mercury | Molybdenum | Nickel | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CHHSL Residential (mg/kg)** | 30 | 0.07 | 5,200 | 160 | 1.7 | 100,000 | 660 | 3,000 | 80 | 18 | 380 | 1,600 | 380 | 380 | 5 | 530 | 23,000 |
| **Residential RSL (mg/kg)** | 31 | 0.39 | 15,000 | 160 | 70 | 120,000 | 23 | 3,100 | 400 | 23.0 | 390 | 1,500 | 390 | 390 | 0.78 | 390 | 23,000 |
| **SB-6-2** | < 2.0 | **5.9** | **150** | **0.41** | **0.78** | **27** | **11** | **18** | **4.8** | **0.055** | **2.6** | **77** | < 5.0 | < 2.0 | < 5.0 | **29** | **39** |
| **SB-6-5** | < 2.0 | **3.0** | **96** | < 0.4 | < 0.4 | **29** | **4.9** | **13** | **3.6** | **0.062** | < 2.0 | **36** | < 5.0 | < 2.0 | < 5.0 | **23** | **39** |
| **SB-7-2** | < 2.0 | **6.3** | **160** | **0.45** | **0.68** | **28** | **13** | **22** | **6.1** | **0.059** | **3.5** | **97** | < 5.0 | < 2.0 | < 5.0 | **31** | **43** |
| **SB-7-5** | < 2.0 | **5.1** | **100** | < 0.4 | < 0.4 | **27** | **5.9** | **17** | **3.9** | **0.056** | < 2.0 | **37** | < 5.0 | < 2.0 | < 5.0 | **27** | **38** |
| **SB-8-2** | < 2.0 | **4.4** | **83** | **0.84** | < 0.4 | **38** | **10** | **20** | **6.4** | **0.043** | < 2.0 | **55** | < 5.0 | < 2.0 | < 5.0 | **34** | **42** |
| **SB-8-5** | < 2.0 | **2.2** | **59** | **0.84** | < 0.4 | **38** | **4.1** | **20** | **5.1** | **0.054** | < 2.0 | **28** | < 5.0 | < 2.0 | < 5.0 | **32** | **41** |
| **SB-9-2** | < 2.0 | **4.8** | **120** | **0.82** | < 0.4 | **38** | **9.6** | **22** | **6.4** | **0.042** | < 2.0 | **40** | < 5.0 | < 2.0 | < 5.0 | **38** | **41** |
| **SB-9-5** | < 2.0 | **5.0** | **230** | **0.82** | < 0.4 | **37** | **22** | **19** | **8.1** | **0.046** | < 2.0 | **49** | < 5.0 | < 2.0 | < 5.0 | **41** | **45** |
| **SB-10-2** | < 2.0 UJ | **4.5** | **200** | **1.7** | **1.2** | **43** | **9.0** | **68** | **200** | **0.24** | < 2.0 | **42** | < 5.0 | < 2.0 | < 5.0 | **42** | **580** |
| **SB-10-5** | < 2.0 UJ | **5.6** | **390** | **1.4** | < 0.4 | **48** | **8.2** | **21** | **150** | **0.28** | < 2.0 | **29** | < 5.0 | < 2.0 | < 5.0 | **58** | **130** |
| **SB-11-2** | < 2.0 | **4.6** | **140** | **0.49** | < 0.4 | **37** | **8.9** | **22** | **150** | **0.082** | < 2.0 | **36** | < 5.0 | < 2.0 | < 5.0 | **34** | **240** |
| **SB-11-5** | < 2.0 | **4.0** | **78** | **0.52** | < 0.4 | **39** | **4.3** | **19** | **36** | **0.04** | < 2.0 | **30** | < 5.0 | < 2.0 | < 5.0 | **37** | **39** |
| **SB-12-2** | < 2.0 UJ | **4.8** | **130** | **1.5** | < 0.4 | **49** | **8.5** | **23** | **6.4** | **0.072** | < 2.0 | **40** | < 5.0 | < 2.0 | < 5.0 | **53** | **45** |
| **SB-12-5** | < 2.0 UJ | **2.6** | **160** | **1.5** | < 0.4 | **46** | **4.5** | **16** | **4.7** | **0.062** | < 2.0 | **32** | < 5.0 | < 2.0 | < 5.0 | **45** | **33** |
| **SB-13-2** | < 2.0 UJ | **4.2** | **140** | **1.5** | < 0.4 | **52** | **16** | **24** | **7.5** | **0.072** | < 2.0 | **42** | < 5.0 | < 2.0 | < 5.0 | **53** | **45** |
| **SB-130-2** | < 2.0 UJ | **4.4** | **140** | **1.5** | < 0.4 | **51** | **5.1** | **23** | **7.9** | **0.072** | < 2.0 | **34** | < 5.0 | < 2.0 | < 5.0 | **55** | **43** |
| **SB-13-5** | < 2.0 UJ | **2.9** | **190** | **1.4** | < 0.4 | **51** | **5.9** | **24** | **6.2** | **0.28** | < 2.0 | **36** | < 5.0 | < 2.0 | < 5.0 | **53** | **42** |
| **SB-130-5** | < 2.0 UJ | **2.7** | **150** | **1.4** | < 0.4 | **51** | **5.6** | **20** | **5.4** | **0.038** | < 2.0 | **35** | < 5.0 | < 2.0 | < 5.0 | **54** | **39** |
| **SB-14-2** | < 2.0 UJ | **4.2** | **170** | **1.5** | **0.63** | **39** | **7.4** | **30** | **110** | **0.13** | < 2.0 | **34** | < 5.0 | < 2.0 | < 5.0 | **43** | **260** |
| **SB-14-5** | < 2.0 UJ | **2.7** | **91** | **1.5** | < 0.4 | **35** | **6.6** | **12** | **4.3** | **0.029** | < 2.0 | **16** | < 5.0 | < 2.0 | < 5.0 | **37** | **25** |
| **SB-15-2** | < 2.0 | **5.6** | **210** | **0.84** | < 0.4 | **35** | **15** | **19** | **7.2** | **0.059** | < 2.0 | **41** | < 5.0 | < 2.0 | < 5.0 | **41** | **34** |
| **SB-15-5** | < 2.0 | **2.1** | **140** | **0.84** | < 0.4 | **33** | **2.1** | **14** | **4.4 J** | **0.053** | < 2.0 | **18** | < 5.0 | < 2.0 | < 5.0 | **24** | **26** |
| **SB-150-5** | < 2.0 | **4.3** | **140** | **1.0** | < 0.4 | **32** | **3.8** | **19** | **22 J** | **0.068** | < 2.0 | **25** | < 5.0 | < 2.0 | < 5.0 | **32** | **40** |
| **SB-16-2** | < 2.0 | **5.2** | **17** | **1.1** | < 0.4 | **39** | **9.8** | **25** | **27** | **0.096** | < 2.0 | **36** | < 5.0 | < 2.0 | < 5.0 | **40** | **54** |
| **SB-16-5** | < 2.0 | **3.3** | **130** | **0.79** | < 0.4 | **36** | **7.5** | **18** | **6.2** | **0.039** | < 2.0 | **34** | < 5.0 | < 2.0 | < 5.0 | **35** | **34** |
| **SB-17-2** | < 2.0 | **3.8** | **150** | **0.91** | < 0.4 | **35** | **5.0** | **20** | **4.6** | **0.053** | < 2.0 | **33** | < 5.0 | < 2.0 | < 5.0 | **34** | **36** |
| **SB-17-5** | < 2.0 | **2.3** | **78** | **0.99** | < 0.4 | **32** | **3.8** | **14** | **3.9** | **0.058** | < 2.0 | **19** | < 5.0 | < 2.0 | < 5.0 | **28** | **23** |

Notes:

Results are in milligrams/kilogram (mg/kg).

CHHSL = California Human Health Screening Level from the Office of Environmental Health Hazard Assessment (OEHHA), September 2009.

RSL = Regional Screening Level from the U.S. Environmental Protection Agency (U.S. EPA) November, 2011.

mg/kg = milligrams per kilogram (parts per million).

Bold concentrations indicate that the analyte was detected above the laboratory reporting limit.

Less than sign (<) indicates that the analyte was not detected above the laboratory reporting limit.

Shaded concentrations indicate that the concentration exceeds the CHSSL or RSL.

UJ = estimated reporting limit.

SB-130-2 is a field duplicate of SB-13-2.

SB-130-5 is a field duplicate of SB-13-5.

SB-150-5 is a field duplicate of SB-15-5.

Samples analyzed by U.S. EPA Method 6010B; U.S. EPA Method 7471A (Mercury).

**Table 4**
**Grab Groundwater TPH Analytical Results**
**San Pablo Assemblage**
**Emeryville, California**

| Analyte | TPH-g | TPH-d | TPH-mo |
|---|---|---|---|
| **ESL (Residential) - µg/L** | **100** | **100** | **370** |
| **SB-6** | < 50 | **230 J** | **170** |
| **SB-7** | < 50 | **320 J** | **230** |
| **SB-8** | < 50 | **62** | < 100 |
| **SB-9** | < 50 | **53** | < 100 |
| **SB-10** | < 50 | < 50 | < 100 |
| **SB-11** | < 50 | **66 J** | < 100 |
| **SB-12** | < 50 | < 50 | < 100 |
| **SB-13** | < 50 | **240** | **120 J** |
| **SB-130** | < 98 | **370** | **230 J** |
| **SB-14** | < 50 | < 50 | < 100 |
| **SB-15** | < 50 | **56** | < 100 |
| **SB-150** | < 50 | **69** | < 100 |
| **SB-16** | < 50 | **100** | < 100 |
| **SB-17** | < 50 | **83** | < 100 |

Notes:
µg/L = micrograms per liter.

ESL = Environmental Screening Levels, California Regional Water Quality Control Board, San Francisco Bay Area.

Bold concentrations indicate that the analyte was detected above the laboratory reporting limit.

Shaded concentrations indicate that the analyte concentration exceeds the ESL.

SB-130 is a field duplicate of SB-13.
SB-150 is a field duplicate of SB-15.
Samples analyzed by U.S. EPA Method 8015B.

**Table 5**
**Groundwater Metals Analytical Results**
**San Pablo Assemblage**
**Emeryville, California**

| Analyte | Antimony | Arsenic | Barium | Beryllium | Cadmium | Chromium | Cobalt | Copper | Lead | Mercury | Molybdenum | Nickel | Selenium | Silver | Thallium | Vanadium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CA MCLs (µg/L)** | 6.0 | 10 | 1,000 | 4.0 | 5.0 | 50 | NV | 1,300 | 15 | 2.0 | NV | 100 | 50 | NV | 2.0 | NV | NV |
| **SB-6** | <1.0 | <1.0 | **62** | <1.0 | <0.2 | **4.8** | **1.6** | **2.4** | <0.5 | < 0.2 UJ | **2.9** | **6.2** | **2.0** | <1.0 | <1.0 | **3.6** | **6.1** |
| **SB-7** | <1.0 | <1.0 | **69** | <1.0 | <0.2 | **2.5** | **11** | <2.0 | <0.5 | < 0.2 UJ | **3.2** | **6.8** | **2.9** | <1.0 | <1.0 | **2.2** | <5.0 |
| **SB-8** | <1.0 | <1.0 | **71** | <1.0 | <0.2 | <1.0 | **6** | **3.6** | <0.5 | < 0.2 UJ | **23** | **10** | **1.7** | <1.0 | <1.0 | **1.7** | <5.0 |
| **SB-9** | <1.0 | <1.0 | **210** | <1.0 | <0.2 | **2.4** | **5.7** | <2.0 | <0.5 | < 0.2 UJ | **7.3** | **20** | **1.3** | <1.0 | <1.0 | **2.2** | <5.0 |
| **SB-10** | <1.0 | <1.0 | **58** | <1.0 | <0.2 | **1.0** | **3.2** | <2.0 | <0.5 | < 0.2 UJ | **7.6** | **7.8** | **1.3** | <1.0 | <1.0 | <1.0 | <5.0 |
| **SB-11** | <1.0 | <1.0 | **110** | <1.0 | <0.2 | **1.3** | **1.4** | <2.0 | <0.5 | < 0.2 UJ | **6.6** | **4.0** | <1.0 | <1.0 | <1.0 | **1.1** | <5.0 |
| **SB-12** | <2.0 | <2.0 | **62** | <2.0 | <0.2 | **2.1** | **5.8** | <4.0 | <1.0 | < 0.2 UJ | **5.2** | **12** | <2.0 | <2.0 | <2.0 | <2.0 | **10** |
| **SB-13** | <1.0 | <1.0 | **51** | <1.0 | <0.2 | <1.0 | **4.7** | <2.0 | <0.5 | < 0.2 UJ | **4.7** | **12** | **1.1** | <1.0 | <1.0 | <1.0 | <5.0 |
| **SB-130** | <1.0 | <1.0 | **52** | <1.0 | <0.2 | **1.1** | **5.1** | <2.0 | <0.5 | < 0.2 UJ | **4.8** | **12** | **1.1** | <1.0 | <1.0 | <1.0 | <5.0 |
| **SB-14** | <1.0 | <1.0 | **110** | <1.0 | <0.2 | <1.0 | **6.1** | <2.0 | <0.5 | < 0.2 UJ | **7.2** | **20** | **1.3** | <1.0 | <1.0 | <1.0 | <5.0 |
| **SB-15** | <1.0 | <1.0 | **82** | <1.0 | <0.2 | **1.2** | **4.7** | <2.0 | <0.5 | < 0.2 UJ | **7.0** | **12** | **1.1** | <1.0 | <1.0 | <1.0 | <5.0 |
| **SB-150** | <1.0 | <1.0 | **76** | <1.0 | <0.2 | <1.0 | **4.8** | <2.0 | <0.5 | < 0.2 UJ | **7.5** | **12** | **1.3** | <1.0 | <1.0 | <1.0 | <5.0 |
| **SB-16** | <1.0 | <1.0 | **92** | <1.0 | <0.2 | <1.0 | **9.7** | <2.0 | <0.5 | < 0.2 UJ | **23** | **20** | **2.1** | <1.0 | <1.0 | <1.0 | <5.0 |
| **SB-17** | <1.0 | <1.0 | **90** | <1.0 | <0.2 | <1.0 | **3.4** | <2.0 | <0.5 | < 0.2 UJ | **10** | **7.2** | **1.8** | <1.0 | <1.0 | <1.0 | <5.0 |

Notes:
Results are in micrograms per liter (µg/L).
SB-130 is a field duplicate of SB-13.
SB-150 is a field duplicate of SB-15.
CA MCL = California Department of Public Health, Maximum Contaminant Level.
Bold concentrations indicate that the analyte was detected above the laboratory reporting limit.
Shaded concentrations indicate that the analyte concentration exceeds the MCL.
Samples analyzed by U.S. EPA Method 200.8; U.S. EPA Method 245.1 (Mercury).
Less than sign (<) indicates that the analyte was not detected above the laboratory reporting limit.
NV = No MCL available for this analyte.
UJ = Estimated reporting limit.

**Table 6**
**Groundwater VOC Analytical Results (µg/L)**
**San Pablo Assemblage**
**Emeryville, California**

| Analyte | CA MCLs (µg/L) | SB-6 | SB-7 | SB-8 | SB-9 | SB-10 | SB-11 | SB-12 | SB-13 | SB-130 | SB-14 | SB-15 | SB-150 | SB-16 | SB-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,1,1,2-Tetrachloroethane | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,1,1-Trichloroethane | 200 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,1,2,2-Tetrachloroethane | 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 1,200 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,1,2-Trichloroethane | 5.0 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,1-Dichloroethane | 5.0 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,1-Dichloroethene | 6.0 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,1-Dichloropropene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,2,3-Trichlorobenzene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,2,3-Trichloropropane | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,2,4-Trichlorobenzene | 5.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | **5.1** | **5.1** | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2,4-Trimethylbenzene | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 1,2-Dibromo-3-Chloropropane | 0.2 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 | < 5.0 |
| 1,2-Dichlorobenzene | 600 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | **40** | **53** | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,2-Dichloroethane | 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | **0.58** | **0.85** | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,2-Dichloropropane | 5.0 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,3,5-Trimethylbenzene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,3-Dichlorobenzene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | **3.0** | **3.9** | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,3-Dichloropropane | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 1,4-Dichlorobenzene | 5.0 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | **18** | **23** | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 2,2-Dichloropropane | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Butanone (MEK) | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 2-Chlorotoluene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 2-Hexanone | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Chlorotoluene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| 4-Isopropyltoluene | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| 4-Methyl-2-pentanone (MIBK) | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Acetone | NV | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Benzene | 1.0 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Bromobenzene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Bromoform | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Bromomethane | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Carbon disulfide | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Carbon tetrachloride | 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Chlorobenzene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | **23** | **31** | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Chlorobromomethane | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Chlorodibromomethane | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Chloroethane | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Chloroform | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Chloromethane | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| cis-1,2-Dichloroethene | 6.0 | **0.92** | **0.59** | **0.94** | < 0.5 | **1.8** | **2.6** | **1.1** | **16** | **22** | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| cis-1,3-Dichloropropene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |

**Table 6**
**Groundwater VOC Analytical Results (µg/L)**
**San Pablo Assemblage**
**Emeryville, California**

| Analyte | CA MCLs (µg/L) | SB-6 | SB-7 | SB-8 | SB-9 | SB-10 | SB-11 | SB-12 | SB-13 | SB-130 | SB-14 | SB-15 | SB-150 | SB-16 | SB-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dibromomethane | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Dichlorobromomethane | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Dichlorodifluoromethane | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Ethylbenzene | 300 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Ethylene Dibromide | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Hexachlorobutadiene | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Isopropylbenzene | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Methyl tert-butyl ether | 13 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Methylene Chloride | 5.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Naphthalene | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| n-Butylbenzene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| N-Propylbenzene | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| sec-Butylbenzene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Styrene | 100 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| tert-Butylbenzene | NV | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Tetrachloroethene | 5.0 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Toluene | 150 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| trans-1,2-Dichloroethene | 10 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| trans-1,3-Dichloropropene | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Trichloroethene | 5.0 | **11** | **8.6** | **4** | **3.2** | **11** | **17** | **13** | **41** | **55** | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Trichlorofluoromethane | 150 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 | < 1.0 |
| Vinyl acetate | NV | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Vinyl chloride | 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Xylenes, Total | 1,750 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 | < 2.0 |

Notes:

µg/L = micrograms per liter.
CA MCL = California Department of Public Health, Maximum Contaminant Level.
VOCs = volatile organic compounds.
Shaded and bolded values exceed the MCL.
SB-130 is a field duplicate of SB-13.
SB-150 is a field duplicate of SB-15.
Samples analyzed by U.S. EPA Method 8260B
Less than sign (<) indicates that the analyte was not detected above the laboratory reporting limit.

**Table 7**
**Soil Gas Analytical Results**
**San Pablo Assemblage**
**Emeryville, California**

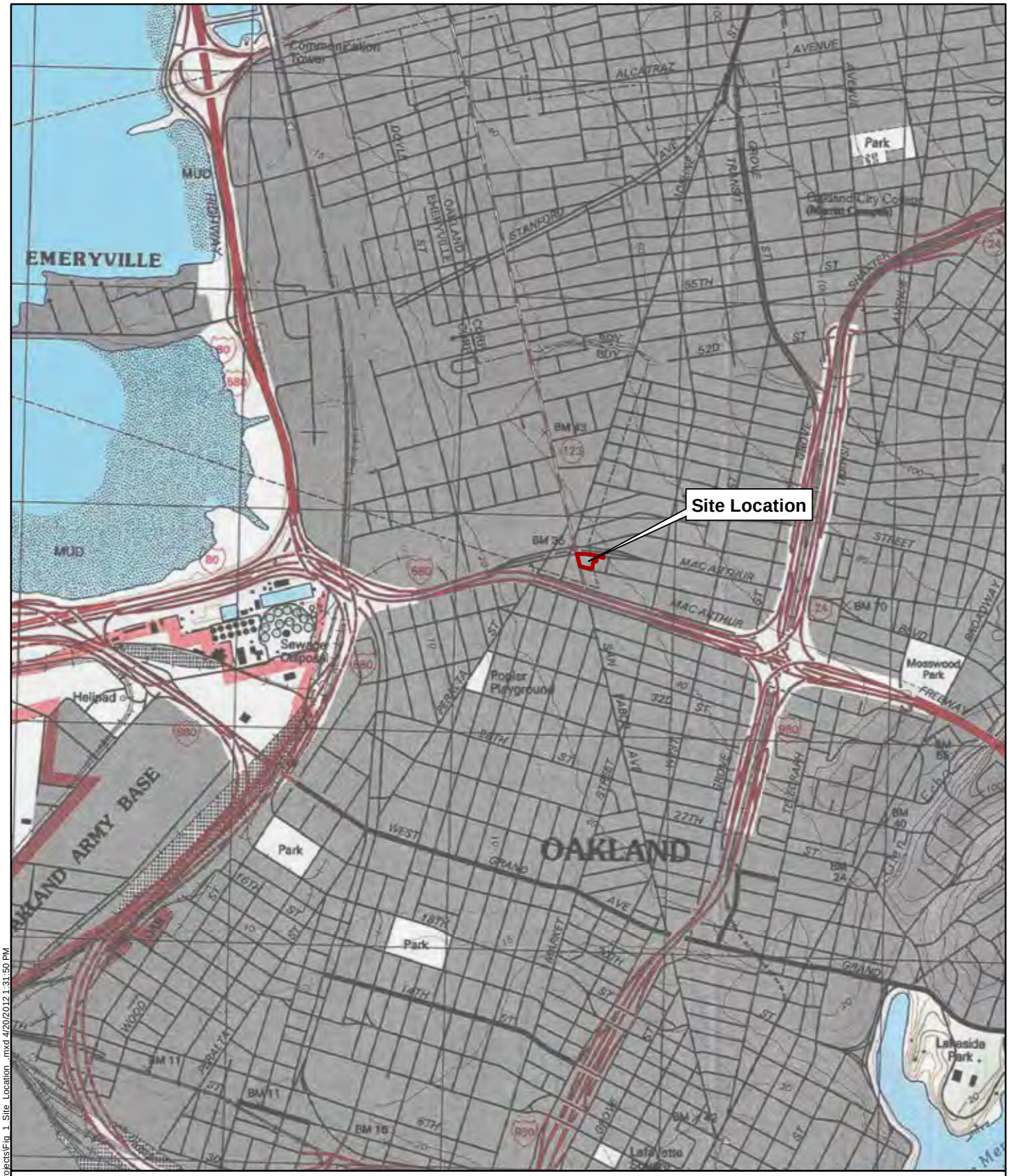
| Analyte | CHHSL (µg/m3) | SG-1 (µg/m3) | SG-2 (µg/m3) | SG-3 (µg/m3) | SG-4 (µg/m3) | SG-5 (µg/m3) | SG-100 (µg/m3) | SG-6 (µg/m3) | SG-7 (µg/m3) |
|---|---|---|---|---|---|---|---|---|---|
| Freon 12 | NV | **4.6** | **4.2** | **7.0** | <4.4 | <4.0 | <4.0 | 5.0 | 4.5 |
| Freon 114 | NV | < 5.8 | <5.3 | <8.2 | <6.3 | <5.7 | <5.7 | <5.2 | <5.1 |
| Chloromethane | NV | <6.8 | <6.3 | <9.7 | <7.4 | <6.8 | <6.8 | <6.2 | <6.0 |
| Vinyl Chloride | 13 | <2.1 | <1.9 | <3.0 | <2.3 | <2.1 | <2.1 | <1.9 | <1.9 |
| 1,3-Butadiene | NV | <1.8 | <1.7 | <2.6 | <2.0 | <1.8 | <1.8 | <1.6 | <1.6 |
| Bromomethane | NV | <3.2 | <3.0 | <4.5 | <3.5 | <3.2 | <3.2 | <2.9 | <2.8 |
| Chloroethane | NV | <8.8 | <8.0 | <12 | <9.5 | <8.6 | <8.6 | <7.9 | <7.7 |
| Freon 11 | NV | <4.7 | <4.3 | <6.6 | <5.0 | <4.6 | <4.6 | <4.2 | <4.1 |
| Ethanol | NV | <6.2 | <5.7 | **12** | <6.8 | <6.2 | <6.2 | **9.6** | <5.5 |
| Freon 113 | NV | <6.4 | <5.8 | <9.0 | <6.9 | <6.3 | <6.3 | <5.7 | <5.6 |
| 1,1-Dichloroethene | NV | <3.3 | <3.0 | <4.6 | <3.6 | <3.2 | <3.2 | <3.0 | <2.9 |
| Acetone | NV | **12** | **14** | **71** | **13** | **26** | **20** | **8.2** | **9.6** |
| 2-Propanol | NV | <8.2 | <7.5 | <12 | <8.8 | <8.1 | <8.1 | <7.3 | <7.2 |
| Carbon Disulfide | NV | <10 | <9.5 | **55** | <11 | <10 | <10 | <9.3 | **13** |
| 3-Chloropropene | NV | <10 | <9.5 | <15 | <11 | <10 | <10 | <9.2 | <9.1 |
| Methylene Chloride | NV | <2.9 | <2.6 | <4.1 | <3.1 | <2.8 | <2.8 | <2.6 | **2.9** |
| Methyl tert-butyl ether | 4000 | <3.0 | <2.7 | <4.2 | <3.2 | <3.0 | <3.0 | <2.7 | <2.6 |
| trans-1,2-Dichloroethene | 32000 | <3.3 | <3.0 | <4.6 | <3.6 | <3.2 | <3.2 | <3.0 | <2.9 |
| Hexane | NV | **3.8** | **2.8** | **15** | <3.2 | **5.4** | **5.2** | <2.6 | **3.7** |
| 1,1-Dichloroethane | NV | <3.4 | <3.1 | <4.7 | <3.6 | <3.3 | <3.3 | <3.0 | <3.0 |
| 2-Butanone (Methyl Ethyl Ketone) | NV | <9.8 | **11** | **22** | <11 | **9.7** | **9.7** | <8.8 | <8.6 |
| cis-1,2-Dichloroethene | 16000 | <3.3 | <3.8 | <4.6 | <3.6 | <3.2 | <3.2 | <3.0 | <2.9 |
| Tetrahydrofuran | NV | <2.4 | <3.2 | 3.6 | <2.6 | <2.4 | <2.4 | <2.2 | <2.2 |
| Chloroform | NV | <4.0 | <3.7 | <5.7 | <4.4 | <4.0 | <4.0 | <3.6 | **3.9** |
| 1,1,1-Trichloroethane | 991000 | <4.5 | <4.1 | <6.4 | <4.9 | <4.5 | <4.5 | <4.1 | <4.0 |
| Cyclohexane | NV | <2.8 | <2.6 | **16** | <3.1 | <2.8 | <2.8 | <2.6 | <2.5 |
| Carbon Tetrachloride | 25 | <5.2 | <4.8 | <7.4 | <5.7 | <5.2 | <5.2 | <4.7 | <4.6 |
| 2,2,4-Trimethylpentane | NV | **4.3** | <3.6 | **7.4** | <4.2 | **5.0** | **5.1** | <3.5 | **5.2** |
| Benzene | 36 | **2.6** | **2.8** | **19** | <2.9 | **3.4** | **3.5** | <2.4 | **2.9** |
| 1,2-Dichloroethane | 50 | <3.4 | <3.1 | <4.7 | <3.6 | <3.3 | <3.3 | <3.0 | <3.0 |
| Heptane | NV | <3.4 | <3.1 | **10** | <3.7 | <3.4 | <3.4 | <3.0 | <3.0 |
| Trichloroethene | 530 | **330** | <4.1 | <6.3 | **92** | **280** | **280** | <4.0 | <3.9 |
| 1,2-Dichloropropane | NV | <3.8 | <3.5 | <5.4 | <4.2 | <3.8 | <3.8 | <3.4 | <3.4 |
| 1,4-Dioxane | NV | <12 | <11 | <17 | <13 | <12 | <12 | <11 | <10 |
| Bromodichloromethane | NV | <5.6 | <5.1 | <7.8 | <6.0 | <5.5 | <5.5 | <5.0 | <4.9 |
| cis-1,3-Dichloropropene | NV | <3.8 | <3.4 | <5.3 | <4.1 | <3.7 | <3.7 | <3.4 | <3.3 |
| 4-Methyl-2-pentanone | NV | <3.4 | <3.1 | <4.8 | <3.7 | <3.4 | <3.4 | <3.0 | <3.0 |
| Toluene | 140000 | **12** | **14** | **54** | **10** | **39** | **37** | <2.8 | **9.8** |
| trans-1,3-Dichloropropene | NV | <3.8 | <3.4 | <5.3 | <4.1 | <3.7 | <3.7 | <3.4 | <3.3 |
| 1,1,2-Trichloroethane | NV | <4.5 | <4.1 | <6.4 | <4.9 | <4.5 | <4.5 | <4.1 | <4.0 |
| Tetrachloroethene | 180 | <5.6 | <5.2 | <7.9 | <6.1 | **12** | **12** | **64** | <5.0 |
| 2-Hexanone | NV | <14 | <12 | <19 | <15 | <13 | <13 | <12 | <12 |
| Dibromochloromethane | NV | <7.1 | <6.5 | <10 | <7.7 | <7.0 | <7.0 | <6.3 | <6.2 |
| 1,2-Dibromoethane (EDB) | NV | <6.4 | <5.8 | <9.0 | <6.9 | <6.8 | <6.8 | <5.7 | <5.6 |
| Chlorobenzene | NV | <3.8 | <3.5 | <5.4 | <4.1 | <3.8 | <3.8 | <3.4 | <3.4 |
| Ethyl Benzene | postponed | <3.6 | <3.3 | **13** | <3.9 | **6.6** | **7.1** | <3.2 | **9.5** |
| m,p-Xylene | 320000 | **5.0** | <3.3 | **64** | <3.9 | **44** | **43** | <3.2 | **38** |
| o-Xylene | 320000 | <3.6 | <3.3 | **28** | <3.9 | **20** | **20** | <3.2 | **12** |
| Styrene | NV | <3.5 | <3.2 | <5.0 | <3.8 | <3.5 | <3.5 | <3.2 | <3.1 |
| Bromoform | NV | <8.6 | <7.8 | <12 | <9.3 | <8.5 | <8.5 | <7.7 | <7.5 |
| Cumene | NV | <4.1 | <3.7 | <5.8 | <4.4 | <4.0 | <4.0 | <3.7 | <3.6 |
| 1,1,2,2-Tetrachloroethane | NV | <5.7 | <5.2 | <8.0 | <6.2 | <5.6 | <5.6 | <5.1 | <5.0 |
| Propylbenzene | NV | <4.1 | <3.7 | <5.8 | <4.4 | <4.0 | <4.0 | <3.7 | **13** |
| 4-Ethyltoluene | NV | <4.1 | <3.7 | **11** | <4.4 | **5.0** | **4.8** | <3.7 | **55** |
| 1,3,5-Trimethylbenzene | NV | <4.1 | <3.7 | <5.8 | <4.4 | <4.0 | <4.0 | <3.7 | **28** |
| 1,2,4-Trimethylbenzene | NV | <4.1 | <3.7 | **5.9** | <4.4 | **7.4** | **7.3** | <3.7 | **98** |
| 1,3-Dichlorobenzene | NV | <5.0 | <4.6 | <7.0 | <5.4 | <4.9 | <4.9 | <4.5 | <4.4 |
| 1,4-Dichlorobenzene | NV | <5.0 | <4.6 | <7.0 | <5.4 | <4.9 | <4.9 | <4.5 | <4.4 |

**Table 7**
**Soil Gas Analytical Results**
**San Pablo Assemblage**
**Emeryville, California**

| Analyte | CHHSL (µg/m3) | SG-1 (µg/m3) | SG-2 (µg/m3) | SG-3 (µg/m3) | SG-4 (µg/m3) | SG-5 (µg/m3) | SG-100 (µg/m3) | SG-6 (µg/m3) | SG-7 (µg/m3) |
|---|---|---|---|---|---|---|---|---|---|
| alpha-Chlorotoluene | NV | <4.3 | <3.9 | <6.0 | <4.6 | <4.2 | <4.2 | <3.8 | <3.8 |
| 1,2-Dichlorobenzene | NV | <5.0 | <4.6 | <7.0 | <5.4 | <4.9 | <4.9 | <4.5 | <4.4 |
| 1,2,4-Trichlorobenzene | NV | <25 | <22 | <35 | <27 | <24 | <24 | <22 | <22 |
| Hexachlorobutadiene | NV | <35 | <32 | <50 | <38 | <35 | <35 | <32 | <31 |
| Helium | -- | <0.074% | <0.076% | 0.17% | <0.074% | <0.082% | <0.082% | <0.074% | <0.073% |

Notes:
µg/$m^3$ = micrograms/cubic meter.
NV = No CHHSL available for this compound.
Bold concentrations indicate that the analyte was detected above the laboratory reporting limit.
Less than sign (<) indicates that the analyte was not detected above the laboratory reporting limit.
CHHSL = California Human Health Screening Level from the Office of Environmental Health Hazard Assessment.
SG-100 = field duplicate of SG-5
Samples analyzed by method TO-15 and ASTM D1946 (Helium).
-- = No definition for this.

# FIGURES




**SITE LOCATION**

San Pablo Assemblage
3706 San Pablo Avenue
Emeryville, California

April 2012
28068039

URS

**FIGURE 1**

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Sources: USGS 7.5-minute topo series


Soil Gas Sample Location
Soil and Groundwater Sample Location
Previous Investigation Sample Locations (2010)
Former Sump/UST Location
Subject Property
Building Outline

Note: Soil samples were collected at 2 feet and 5 feet bgs

0 25 50 FEET N

Sources: Aerial imagery, Bing, 2010.

U:\GIS\Emeryville_San_Pablo_Ave\Projects\Fig_2_Sample_locations.mxd 4/20/2012 1:40:12 PM

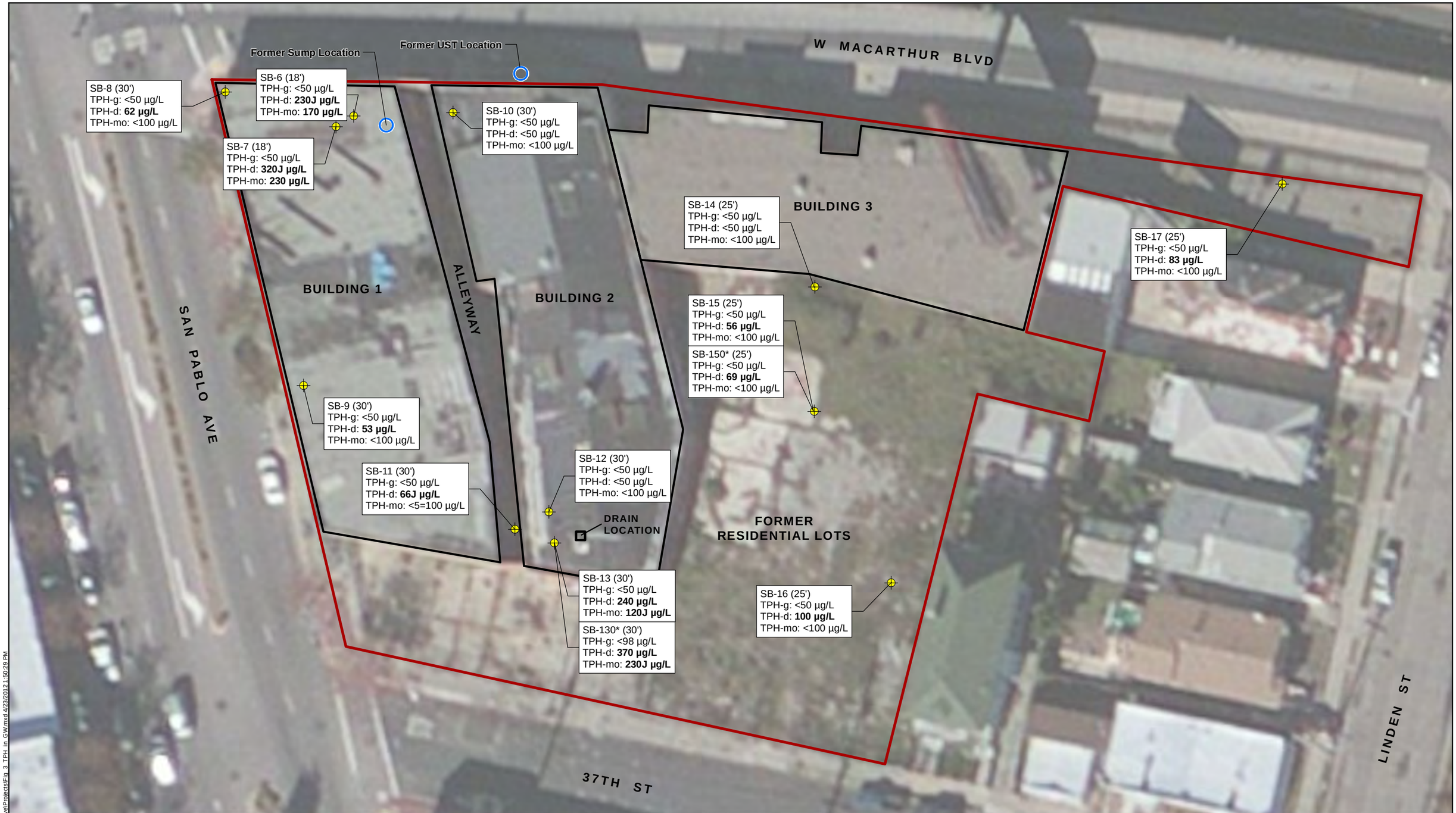
**SAMPLE LOCATIONS**

San Pablo Assemblage
3706 San Pablo Avenue
Emeryville, California

April 2012
28068039

URS

**FIGURE 2**




Soil and Groundwater Sample Location

Former Sump/UST Location

Subject Property

Building Outline

SG-1, SB-6, and SB-7 are in basement, approximately 11 feet bgs

**Bold** results exceed residential environmental screening levels (ESLs)
**J** = "j" flagged - estimated

TPH-g = Total petroleum hydrocarbons as gasoline
TPH-d = Total petroleum hydrocarbons as diesel
TPH-mo = Total petroleum hydrocarbons as motor oil

*SB-130 is a field duplicate of SB-13
*SB-150 is a field duplicate of SB-15

0 25 50 FEET

N

Sources: Aerial imagery, Bing, 2010.

U:\GIS\Emeryville_San_Pablo_Ave\Projects\Fig_3_TPH_in_GW.mxd 4/23/2012 1:50:29 PM

# TPH DETECTIONS IN GROUNDWATER (µg/L)

April 2012
28068039

San Pablo Assemblage
3706 San Pablo Avenue
Emeryville, California

URS

**FIGURE 3**


Soil and Groundwater Sample Location

Former Sump/UST Location

Subject Property

Building Outline

TCE = Trichloroethene
PCE = Tetrachloroethene
cis-1,2 = cis-1,2-Dichloroethene
1,2,4-TCBZ = 1,2,4-Trichlorobenzene
1,2-DCBZ = 1,2-Dichlorobenzene
1,4-DCBZ = 1,4-Dichlorobenzene
1,2,-DCA = 1,2-Dichloroethane
CBZ = Chlorobenzene

**Bold** values above MCLs

*SB-130 is a field duplicate of SB-13
*SB-150 is a field duplicate of SB-15

0 25 50 FEET

N

Sources: Aerial imagery, Bing, 2010.

I:\cf\vsa\ U:\GIS\Emeryville, San Pablo Ave\Projects\Fig 4_VOCs_in_GW.mxd 4/30/2012 9:52:52 AM

## VOC DETECTIONS IN GROUNDWATER (µg/L)

April 2012
28068039

San Pablo Assemblage
3706 San Pablo Avenue
Emeryville, California

URS

**FIGURE 4**


Soil Gas Sample Location

Former Sump/UST Location

Subject Property

Building Outline

SG-1 collected from basement, approximately 11 feet bgs

ND = analyte not detected above laboratory reporting limit

TCE = Trichloroethene
PCE = Tetrachloroethene

* SG-100 is a field duplicate of SG-5
** SG-8 not analyzed

No analytes detected above residential CHHSLs

0 25 50 FEET

N

**VOC DETECTIONS IN SOIL GAS (µg/m³)**
**COLLECTED AT 5 FEET BGS**

April 2012
28068039

San Pablo Assemblage
3706 San Pablo Avenue
Emeryville, California

URS

**FIGURE 5**

J:\GIS\Emeryville San Pablo Ave\Projects\Fig 5 VOCs in Soil Gas.mxd 4/20/2012 1:44:47 PM

Sources: Aerial imagery, Bing, 2010.