ENVIRONMENTAL RISK SPECIALTIES
CORPORATION

ers

January 19, 2009

Mr. Paresh C. Khatri
Hazardous Materials Specialist
Alameda County Health Agency
Department of Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

RE: Data Gap Work Plan Addendum
Foothill Mini Mart
6600 Foothill Boulevard, Oakland, California
Fuel Leak Case No. RO0000175
GeoTracker Global ID: T0600102286

Dear Mr. Khatri:

On behalf of Mr. Ravi Sekhon and pursuant to Alameda County Environmental Health's December 5, 2008 letter, Environmental Risk Specialties Corporation (ERS) has prepared the *Data Gap Work Plan Addendum*. Attached with this electronic file, please find this document for your review and comments.

If you have questions, please fell free to call the undersigned at (925) 938-1600 ext. 108. Your assistance on this site is very appreciated.

Sincerely,
ERS

Jim Ho, Ph.D., P.E.
Principal Engineer

Cc: Ravi Sekhon, 21696 Knuppe Place, Castro Valley, CA 94552

Data Gap Work Plan Addendum

Foothill Mini Mart
6600 Foothill Boulevard
Oakland, CA 94605

Fuel Leak Case No. RO0000175
GeoTracker Global ID: T0600102286

Submitted by:

Mr. Ravi Sekhon

Prepared for:

Mr. Ravi Sekhon

Prepared by:

Environmental Risk Specialties Corporation
1600 Riviera Avenue, Suite 310
Walnut Creek, CA 94596

January 2009

Mr. Paresh C. Khatri
Hazardous Material Specialist

Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

RE: Sekhon Gas Station

6600 Foothill Boulevard
Oakland, California, 94605
Fuel Leak Case No. RO0000175
GeoTracker Global ID: T0600102286
UST Cleanup Fund Claim No. 14095

Dear Mr. Khatri:

As the responsible party of the above-referenced project location, I have reviewed the *Data Gap Work Plan Addendum*, prepared by Environmental Risk Specialties Corporation (ERS), of Walnut Creek, California. This document is requested in ACEH's December 5, 2008, letter. I declare, under penalty of perjury, that the information and/or recommendations contained in this document are true and correct to the best of my knowledge.

Sincerely,

Mr. Ravi Sekhon

Date: 1-12-09

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EXECUTIVE SUMMARY

A preliminary Site Conceptual Model (SCM) has been developed for the Sekhon Gas Station site (Foothill Mini Mart) located at 6600 Foothill Boulevard, Oakland, California, based on the results obtained from the following site characterization and investigations, in addition to quarterly groundwater monitoring data:

- June 2001 initial groundwater investigation (AARS, 2001);
- June 2002 additional site investigation (AARS, 20022); and
- August 2005 site characterization (AARS, 2005).

The developed SCM has been used to assist in the identification of the following categories of data gaps:

- Local lithology and hydrogeology
- Contaminated soil and groundwater plume
- Potential of natural attenuation

A data gap investigation work plan has been submitted (ERS, 2008b). According to the Alameda County Environmental Health's (ACEH's) technical comments for the data gap work plan, included in ACEH's December 5, 2008 letter, Environmental Risk Specialties Corporation (ERS) has prepared a *Data Gap Work Plan Addendum*. This work plan addendum is to ensure that the characteristics of the site, including lithology/hydrogeology, soil/groundwater contamination, contaminant source areas, and probable migration pathways, are properly and sufficiently identified through the data gap investigation.

The work plan addendum recommends lithologic drilling and soil/groundwater sampling using the tools that include: Membrane Interface Probe, dual-tube sampling system, direct push and Hollow Stem Auger rigs. In addition to three soil borings (continuous coring) used to confirm and further characterize the limit of the source areas, another 14 monitoring wells, including 5 well clusters and 4 single wells, have been proposed (see Table 1) to characterize the local lithology, contaminated soil, and groundwater plume. The proposed locations of soil boreholes and monitoring wells are shown in Figure 3. In order to address contaminant migration along the utility trenches on Havenscourt and Foothill Boulevards, Figure 4 shows the subsurface utilities that may constitute potential pathways and the proposed sampling locations. Instead of the aquifer pumping test proposed in the October 2008 Data Gap Work Plan, water quality parameters will be sampled to develop Stiff Diagrams. In addition to the analysis of soil and grab groundwater samples, as well as the water quality parameters, data associated with natural attenuation also will be measured and analyzed. The updated scope of work and associated schedule for the proposed data gap investigation is discussed in Sections 4 and 5.

1. INTRODUCTION

At the request of Mr. Ravi Sekhon, the UST Cleanup Fund Claimant for the Sekhon Gas Station site (Foothill Mini Mart) located at 6600 Foothill Boulevard, Oakland, California, Environmental Risk Specialties Corporation (ERS) has prepared a *Data Gap Work Plan Addendum*. This addendum is in response to the Alameda County Environmental Health's (ACEH's) technical comments, included in the December 5, 2008 letter, and revises the scope of work for the soil and groundwater investigation presented in the data gap work plan (ERS, 2008b). A Feasibility Study and Corrective Action Plan (FS/CAP) will be submitted after the completion of the soil and groundwater data gap investigation.

1.1 Purpose of the Data Gap Work Plan Addendum

A preliminary site conceptual model (SCM) for the subject site has been developed (ERS, 2008b). Based on the preliminary SCM, the data gaps for the site lithology and hydrogeology, as well as the lateral and vertical distribution of soil and groundwater contamination, have been identified. Both the preliminary SCM and the work plan for the data gap investigation are presented in the *Site Conceptual Model Report and Data Gap Work Plan* submitted in October 2008 (ERS, 2008b). Based on ACEH's technical review comments included in the December 5, 2008 letter and the well construction diagram of existing monitoring wells, as well as the subsurface cross-sections presented in the SCM Report and Data Gap Work Plan, the scope of work included in the data gap work plan has been updated.

The purpose of submitting a Data Gap Work Plan Addendum is to ensure that the characteristics of the site, including lithology/hydrogeology, soil/groundwater contamination, contaminant source areas, and preferential migration pathways, are properly and sufficiently identified through a data gap investigation.

1.2 Contents of the Data Gap Work Plan Addendum

The Data Gap Work Plan Addendum contains the following major sections:

- Section 1 – Introduction
- Section 2 – Background
- Section 3 – Updated Data Gap Work Plan – An Addendum
- Section 4 – Updated Scope of Work and Field Methods
- Section 5 – Updated Schedule of Proposed Activities
- Section 6 – Recommendations

2. BACKGROUND

The subject site is located at 6600 Foothill Boulevard, Oakland, California, on the northeastern corner of Havenscourt Boulevard and Foothill Boulevard (Figure 1). Ground surface elevation at the site is approximately 60 feet above mean sea level (msl). Regional topography of the site slopes gently toward the south-southwest. The site is located in an area with mixed commercial and residential uses. It is currently occupied by a retail gasoline station (Golden Gasoline) that includes a convenience store and two gasoline dispenser islands. Each dispenser island has two dispensers.

The property is bounded by an empty commercial building to the east (6620 Foothill Boulevard), Foothill Boulevard to the south, Havenscourt Boulevard to the west and Evergreen Cemetery to the north. Across Foothill Boulevard, south of the site, is an empty lot (6601 Foothill Boulevard) formerly used as a gas station at the southeast corner of Havenscourt Boulevard and Foothill Boulevard. East of this empty lot is a two-story residential building with a store (6619 Foothill Boulevard). The site plan is shown in Figure 2.

The *Site Conceptual Model Report and Data Gap Work Plan* submitted in October 2008 (ERS, 2008b) discusses the following subjects and presents their associated data:

- Site Description and History
- Environmental Setting
- Geology and Hydrogeology
- Previous Site Investigations
- Preferential Pathway Study
- Contamination Extent and Plume Movement
- Preliminary Site Conceptual Model

Based on the available data for subsurface lithology/hydrogeology, soil/groundwater contamination, and potential pathway for plume migration, as well as the preliminary SCM, data gaps for the site and the groundwater plume have been identified.

2.1 Data Gaps

The identified data gaps include the following categories:

- Local Lithology and Hydrogeology – soil characteristics and groundwater flow in the water-bearing zone below 30 feet below ground surface (bgs), lithology under the

properties at 6601, 6619/6625, and 6620 Foothill Boulevard; and the permeability of the related water-bearing zone(s)

- Contaminated Soil and Groundwater Plume – contaminant concentration level/plume boundary north, east, southwest, and south of the subject site; bottom of the plume in the off-site area

- Potential of Natural Attenuation (NA) –the presence of petroleum hydrocarbons and methyl tertiary butyl ether (MTBE) degrader and associated water quality parameters

2.2 Summary of the Data Gap Work Plan

Based on the identified data gaps, an investigation work plan was prepared and submitted in October 2008 (ERS, 2008b). The work plan recommends soil boring/sampling and groundwater sampling, as well as a shallow water-bearing zone pumping test. A total of ten monitoring wells, including four well pairs and two single wells, have been proposed. The soil sampling and new monitoring well locations are shown in Table 5 and Figure 21 of the *Site Conceptual Model Report and Data Gap Work Plan* (ERS, 2008b).

Rationales and/or approach for the investigation of the above data gaps and their associated scope of work are presented in the data gap work plan (ERS, 2008b). The scope of work formerly proposed in the data gap work plan includes the following tasks:

Task 1 – Permit Application

Task 2 – Soil Boring and Sampling

Task 3 – Well Installation, Well Development, Well Survey, and Groundwater Sampling

Task 4 – Soil and Groundwater Sample Analysis

Task 5 – Pumping Test

Task 6 – Health and Safety Plan (completed and presented in the data gap work plan)

Task 7 – Reporting

Details of the associated work are included in the data gap work plan (ERS, 2008b).

2.3 Summary of ACEH's Technical Review Comments for the Work Plan

ACEH's December 5, 2008 letter includes the following technical comments for the *Site Conceptual Model Report and Data Gap Work Plan* submitted in October 2008 (ERS, 2008b):

Comment #1. Shallow and Deep Groundwater Monitoring Wells

1.1 Need an additional monitoring point (shallow and deep) near the southeast corner of the building located at 6619 Foothill Boulevard

1.2 Need deeper monitoring wells adjacent to existing shallow monitoring wells MW-5 and MW-6

1.3 Need to clarify the method used to identify the second water bearing unit and the method to install well pairs

Comment #2. Aquifer Pumping Test

2.1 Collect water quality data and establish Stiff Diagrams to determine whether the shallow and deeper water-bearing units are connected, which is more cost-effective than an aquifer pumping test

2.2 Postpone the proposed aquifer pumping until the pilot testing stage, after the completion of a Feasibility Study and before the preparation of a Corrective Action Plan

Comment #3. Preferential Pathway Study

3.1 Need to ensure the proposed monitoring well locations will address possible migration of contaminants along the utility corridors on Havenscourt and Foothill Boulevards

3.2 Need to include a figure illustrating the relation of the above utility corridors with the site and the sampling points

Comment #4. Contaminant Source Area Characterization

4.1 Need to assess the vertical and lateral extent of the contaminant source area, or present the data in the work plan addendum, if sufficient data are available to justify that the contaminant source areas have been adequately delineated

Comment #5. Groundwater Contaminant Plume Monitoring

5.1 ACEH recommended that Mr. Sekhon reduces the groundwater sampling frequency if ERS can propose and justify an alternate groundwater monitoring plan

2.4 Response to ACEH's Technical Review Comments

Response to Comments #1, #2, and #3. ERS concurs with ACEH's Technical Comments #1 through #3. The revised scope of work and investigation methods is discussed in Sections 3 and 4. The relation of the utility corridors to the source area and sampling points are discussed in Task 3 of Section 4.

Response to Comment #4. Data used to characterize the contaminant source area is discussed below:

- An 8,000-gallon gasoline UST, which had suspected leakage, and its associated dispensers, both were removed on December 16, 1998. The UST removal report, City of Oakland Fire Department inspection report, soil and groundwater confirmation sampling report, and UST removal work plan have been posted on ACEH's ftp site. The names of the posted electronic files are: RO0000175_UST Removal Report_2008-9-26, RO0000175_UST Removal Inspection Report (1999-2-23) 2008-10-2, RO0000175UST Removal Soil Lab Report (1998-12-16)_2008-9-26, RO0000175_UST Removal Grab GW Lab Report (1998-12-31)_2008-9-26, and RO0000175_UST Removal Work Plan_2008-9-26.

- After the removal of the 8,000-gallon gasoline tank and associated dispensers, confirmation sampling was performed on December 16, 1998. According to the data described in Section 4 of the *Preferential Pathway Evaluation Report* (ERS, 2008a), the bottom of the tank pit was approximately 8.5 feet bgs. The MTBE soil concentrations sampled at the west end and east end of the tank pit bottom were 7.6 and 12 mg/Kg, respectively. The MTBE soil concentrations, sampled from the locations south and north of the west dispenser island, as well as the east dispenser island, in depths shallower than the bottom of the tank pit, were 0.25, 0.25, and 1.3 mg/Kg, respectively. The Total Petroleum Hydrocarbons as gasoline (TPH-g) concentrations for all of the above locations were consistently less than the laboratory reporting limit of 1 mg/Kg.

- In addition to the above confirmation sampling data, three soil borings SB-7, SB-8, SB-9, and the borehole for monitoring well MW-2 near the removed UST, were drilled and sampled in June 2001 and August 2005 to a maximum depth of 27 to 29 feet bgs. Based on the soil sampling data for the above boreholes and the soil sampling data within boreholes for wells MW-1, MW-3, and MW-4, included in the previous site investigation reports (AARS, 2002; AARS, 2005), the lateral extent of the on-site source areas has been delineated and shown in Figures 12 through 14 of the *Site Conceptual Model Report and Data Gap Work Plan*. The contaminated soil (delineated on-site source areas) is located southeast of the subject site near the UST pit (see Figures 12 through 14 of the *Site Conceptual Model Report and Data Gap Work Plan*.) The maximum potential source area is approximately 3,800 square feet. The maximum depth of significant soil contamination for MTBE is above 24 feet bgs; and the maximum depth of the TPH-g contamination is between 17 and 27 feet bgs. The data used for source area characterization is included in Appendix A.

- Data from quarterly groundwater sampling for on-site monitoring wells MW-1 through MW-3 demonstrates that the concentrations of TPH-g, benzene, and MTBE have been either decreasing or non-detect since February 2004 (see Figures 18 through 20 of the *Site Conceptual Model Report and Data Gap Work Plan*). It suggests that there is no additional significant leakage from the existing upgraded UST system. The delineated on-site

source area mentioned-above represents the residual soil contamination originating from the leakage of the removed 8,000-gallon gasoline UST.

Sufficient data has been collected to demonstrate the approximate vertical and lateral extent of the source areas. Three soil borings, SB-15, SB-16, and SB-17, are proposed to confirm and further delineate the delineated source area. The proposed soil boring locations are shown in Figure 3. The updated scope of work and investigation methods is described in Sections 3 and 4.

Response to Comment #5. Although groundwater under the subject site has been sampled since June 2001, the groundwater was not monitored and sampled between December 2005 and July 2008. Groundwater data with defensible data quality is not sufficient. Since low flow rate purging and sampling began in August 2008, it is premature to modify the existing groundwater sampling frequency. Consequently, a number of deep and shallow monitoring wells proposed in the work plan addendum will be installed; and will be included in the quarterly groundwater monitoring program.

3. UPDATED DATA GAP WORK PLAN – AN ADDENDUM

To determine the soil characteristics and horizontal groundwater flow direction under the subject site and the properties at 6601, 6619, and 6620 Foothill Boulevard, as well as to characterize the lithology and vertical groundwater gradient in shallow and deep groundwater, two shallow monitoring wells, two deep monitoring wells, and five well clusters will be installed. Wells in the well clusters will be installed in different boreholes with approximately 5 feet distance between centers of shallow and deep wells, to minimize the potential of cross-contamination between shallow and deep groundwater. All the proposed locations for shallow wells and well clusters are shown in Figure 3. The rationale and well construction data for the proposed new wells are included in Table 1.

The data gap investigation will focus on the collection and assembly of the following categories of data. The investigation approaches are described below:

Contaminated Soil and Groundwater Plume

Contaminant concentration level and plume boundary in the northern, eastern, southwestern, and southern directions will be characterized through grab groundwater sampling within the boreholes of the proposed new wells included in Table 1. Prior to the drilling of monitoring wells and the collection of grab groundwater samples, a Membrane Interface Probe (MIP) will be inserted into a pilot hole at the proposed well location to identify the vertical plume distribution and possible bottom of the plume. The MIP is versatile field equipment used to delineate the vertical distribution of volatile organic compounds, such as TPH-g and benzene, as well as to assist in the identification of soil types and lithology through the soil electrical conductivity/resistivity profile. A field Gas Chromatography (GC) instrument containing a Photon Ionization Detector (PID), a Flame Ionization Detector (FID) and an Electron Capture Detector (ECD) will be used in conjunction with the MIP for the detection of different groups of volatiles. All the contaminant and soil data can be obtained quickly in the field. Use of the MIP in a pilot hole allows the determination of the vertical distribution of volatiles, the relative concentration of volatiles (vertical boundary of the volatile plume), and the soil in which the contaminant is located. The MIP can also be used to determine the depth at which a screen interval should be placed, and the depth grab samples should be collected. The results of the MIP survey will assist in judging the depth intervals where soil and groundwater contamination may exist and samples should be collected.

Local Lithology and Hydrogeology

Based on the currently available subsurface lithology, although relatively continuous gravelly/sandy layers exist on- and off-site (see cross-sections A-A', E-E', and G-G' presented in the *Site Conceptual Model Report and Data Gap Work Plan*), it is not clear whether a separate deeper water-bearing zone exists underneath the existing shallow water-bearing zone, which is

above 20 – 25 feet bgs. Thus, boreholes for 14 monitoring wells will be continuously drilled and logged from the ground surface to the specific depths included in Table 1. In addition to the proposed wells, boreholes SB-15, SB-16, and SB-17 will be drilled with continuous coring and sampled at selected intervals to depths where clean soil is identified through the PID reading. A dual-tube sampling system will be direct-pushed into the subsurface so that both soil and groundwater within any specific depth interval can be collected within the borehole without the adverse impact of cross-contamination from upper depth intervals. Elevation/interval of the well screen of each proposed monitoring well will be determined after soil logging, so that cross-screening of sediments with drastic contrast of permeability can be avoided. After soil logging/sampling and the selection of a proper screening interval, the same borehole will be reamed and a monitoring well will be installed using a Hollow Stem Auger.

Potential of Natural Attenuation (NA)

The preliminary SCM developed for the subject site indicates that MTBE has not only been dispersed/diffused by groundwater flow, it is very likely that it has been naturally biodegraded. In order to determine the existence of biodegradation and to evaluate the relative contribution of biodegradation to natural attenuation, it is essential to identify the subsurface environmental conditions. The following water quality parameters can be measured in the field or analyzed in a fixed laboratory to evaluate the existence and the potential of natural biodegradation:

- Dissolved oxygen (DO)
- Oxidation and reduction potential (ORP)
- pH and conductivity
- Alkalinity
- Total organic carbon (TOC) and Total inorganic carbon (TIC)
- Total dissolved solids (TDS)
- Nitrate
- Total iron and ferric ions (Fe^{+3})
- Sulfate
- Orthophosphate and ammonia nitrogen
- Biological oxygen demand (BOD_5)
- Chemical oxygen demand (COD)
- Soil oxygen demand (SOD)

The data collected from the data gap investigation will be used to update the preliminary SCM and to assist in the design of cost-effective site cleanup measures.

4. UPDATED SCOPE OF WORK AND FIELD METHODS

Specifically, the data gap investigation includes the following tasks:

Task 1 – Permit Application

Off-site access permits will be obtained from the following property owners: the owner of 6601 Foothill Boulevard for wells MW-8A and MW-8B, the owner of 6619/6625 Foothill Boulevard for wells MW-9A, MW-9B, MW-13A, and MW-13B, the owner of 6620 Foothill Boulevard for wells MW-12A and MW-12B, and the owner of 6615 Brann Street for wells MW-11A and MW-11B. An encroachment permit will be obtained from the City of Oakland, Public Works Department for wells MW-7, MW-5B, and MW-6B.

Task 2 – Lithologic Drilling, Soil and Grab Groundwater Sampling

Prior to soil sampling and well installation, locations for pilot holes, boreholes SB-15, SB-16, and SB-17, and possible well locations will be marked and cleared by Underground Service Alert (USA). Further clearance will be performed by hand augering to 5 feet bgs. A direct push rig and/or limited access rig will be used to drill the boreholes for soil sampling.

Prior to soil boring and sampling, a direct push rig and an MIP mobile laboratory will be mobilized to the field. An MIP will be pushed into the soil at a rate of approximately one foot per minute, and then the MIP will be stationary for one minute before advancing to another interval. Volatile contaminant concentrations and soil conductivity will be analyzed and recorded by the field GC mounted in a medium size truck. The data will be interpreted in the field.

After the MIP measurement, a dual-tube sampling system will be pushed into a different hole nearby to collect soil and grab groundwater samples in order to prevent cross contamination between intervals. Soil cores will be collected in an acetate inner sample barrel. The plastic barrel will be cut and the soil sample within the barrel will be screened with a volatile organic calibrated PID. In addition to the required grab groundwater samples specified under Task 3, at least two grab groundwater samples should be collected within the clayey and gravely/sandy sediments, at specific depths determined in the field, from each well/soil boring locations shown in Figure 3. Grab groundwater will be sampled with a peristaltic pump. Soil will be logged according to the Unified Soil Classification System (USCS). Soil samples will be collected at the intervals where lithologic changes are observed and where an elevated PID reading is recorded, as well as in the interval where the capillary fringe is encountered. Selected soil samples in the liners will be collected using EPA Method 5035. A minimum of one soil sample from each boring will be analyzed. All of the soil samples will be labeled, packed in a chilled cooler, and documented with a Chain-of-Custody prior to delivering to a California certified laboratory for chemical analysis. The sampling collection and handling method is included in Appendix C of the *Site Conceptual Model Report and Data Gap Work Plan* (ERS, 2008b).

Once the soil sampler is advanced to the specified depth of the hole, after soil sampling, the outer tube will be pulled back to expose the target zone. The outer casing will be pulled to at least one foot above ground surface to prevent soil from falling down hole. A pre-cleaned 0.01-inch slotted PVC pipe, connected to a blank PVC casing to the surface, will be lowered down hole through the outer casing. Groundwater elevation will be measured using a clean water level indicator prior to grab groundwater sampling. Water samples will be collected using dedicated tubing attached to a peristaltic pump. Groundwater in gravel/sand lenses with significant thickness will be sampled during lithologic drilling.

In addition to the soil and groundwater sampling criteria mentioned above, data from the MIP survey will be used to assist in the identification of the thickness and elevation of gravel/sand lenses prior to lithologic drilling and soil/groundwater sampling. The elevations and number of soil and groundwater samples will be determined in the field after the MIP data is interpreted and the soil is logged.

All down-hole direct push sampling equipment will be decontaminated before mobilizing to the next sampling/well location. Soil cuttings will be contained in 55-gallon D.O.T.-approved drums on site. Waste soil will be sampled to chemically profile it for disposal, and hauled by a licensed waste hauler to an appropriate landfill. All waste stored on site will be properly labeled at the time of production.

Task 3 – Characterizing the Source Areas and Contaminant Migration Through High Hydraulic Conductivity Pathways

Although soil under the subject site is generally clayey and silty, the existence of sandy/gravelly lenses may significantly influence the spread of the contaminant plume, the speed of contaminant migration, and the contaminant concentration levels detected in monitoring wells. Soil boring logs and subsurface cross-sections presented in the *Site Conceptual Model Report and Data Gap Work Plan* (ERS, 2008b) indicate that wells MW-1, MW-4, MW-5, and MW-6 are partially screened in clayey gravels and clean gravels, which are more permeable and productive than clayey sediment and may also transport contaminants from far locations through the high conductivity lenses. This situation is most notable for monitoring wells MW-1, MW-2, and MW-4 in subsurface cross-section A-A', and possibly in cross-section B-B', included in the 2008 October Data Gap Work Plan.

Cross-section A-A' suggests that leakage from the former 8,000-gallon gasoline UST may have contaminated the underlying gravelly and clayey soils. Cross-sections B-B' and A-A', respectively, explain the contamination of MW-1 and MW-4. Based on the historical groundwater monitoring data, monitoring well MW-1 has been either upgradient or downgradient from well MW-2, which is located within the source area. However, monitoring well MW-4 often is located upgradient well MW-2. Thus, contamination of MW-4 cannot be explicitly explained by cross-section A-A'. In addition, wells MW-2 and MW-3 are both

screened in the clayey soil. Although MW-3 is often downgradient from the source area and the dispensing islands, MW-3 has never been significantly impacted.

Thus, dual-tube soil sampling system described under Task 2 will be employed for soil borings SB-15, SB-16, and SB-17, to confirm and further characterize the lateral and vertical extent of the source area shown in Figures 12, 13, and 14 of the *Site Conceptual Model Report and Data Gap Work Plan* (ERS, 2008b); and also to assist in the delineation of the range of the gravelly lenses. Grab groundwater above, within, and below the gravelly layer identified in soil borings SB-15, SB-16, and SB-17 will be collected.

Since soil under the subject site is generally clayey and silty, trenches for the underground utilities, especially storm drains and water mains, can also constitute potential migration pathways for contaminants, in addition to the permeable sediment lenses. According to the investigation results presented in the *Preferential Pathway Evaluation Report* (ERS, 2008a), a 48-inch water aqueduct and an 8-inch water main under Havenscourt Boulevard, and a 15-inch storm drain and two 8-inch/6-inch water pipes under Foothill Boulevard, may become potential high hydraulic conductivity pathways for contaminants if local groundwater ranging between 5 and 11 feet bgs occurs and the contaminant plume migrates to Foothill Boulevard and Havenscourt Boulevard. Locations of the above subsurface utilities are shown in Figure 4. Existing monitoring wells MW-2, MW-3, MW-4, MW-5, and MW-6 are located near to the 15-inch storm drain and 8-inch/6-inch water pipes under Foothill Boulevard; and the slope of the storm drains and water pipes is in the west-east direction, which is opposite the hydraulic gradient of local groundwater. Both continuous coring and grab groundwater sampling from soil borings SB-16/SB-17 and shallow well MW-12A will assist in evaluating whether a gravely layer exists near Foothill Boulevard and the 15-inch storm drain is the potential migration pathway for the contamination of well MW-4.

Similarly, grab groundwater in boreholes for wells MW-5B and MWE-6B, within the depth intervals of 5 to 11 feet and within the clayey gravel lenses shown in cross-section H-H', should be collected to determine whether the 6-inch water pipe is a preferential pathway for contaminant migration and a gravelly layer exists at 15 feet bgs.

Task 4 – Well Installation, Well Development, Well Survey, and Groundwater Sampling

An 8-inch Hollow Stem Auger rig will be used to drill and construct monitoring wells. A 10-foot or 15-foot long well screen with 0.01-inch slot sizes attached to the bottom of a 2-inch or a 1.5-inch diameter Schedule 40 PVC blank casing, will be installed within the 8-inch borehole. Graded sand filter pack will be filled within the annular space and extended one to two feet above the screen. A minimum two-foot seal of bentonite will be placed above the sand pack. Neat cement or a cement/bentonite grout mixture will seal the remaining annular space to the surface. A watertight locking cap and a protective traffic-rated vault box will be installed on top of each wellhead. The proposed depths of boreholes and screen intervals are included in Table 5.

All newly installed monitoring wells will be developed to remove fine-grained sediments from the well and to stabilize the filter pack and the disturbed aquifer materials prior to quarterly groundwater sampling. Development takes place at least 48 hours after setting the seal on the well, unless otherwise directed by the oversight agency. Well development will be conducted by surging with a surge block and removing water from the well with a pump until the well is free of sediment, or until at least 10 well casing volumes of groundwater have been removed. All development equipment will be cleaned prior to use and between wells with a non-phosphate cleaning solution, then rinsed in potable water. All data collected during development will be recorded on the Well Development Data Sheet and, if necessary, the Purging Data Sheet.

Both the wellhead elevation and well coordinates for all new wells will be surveyed, according to the GeoTracker standard by a registered surveyor, prior to being included in the quarterly groundwater monitoring program. Groundwater will be sampled following the Standard Operating Procedures for Groundwater Monitoring and Sampling included in Appendix D of the *Site Conceptual Model Report and Data Gap Work Plan* (ERS, 2008b).

Task 5 – Soil and Groundwater Sample Analysis

All soil and groundwater samples collected from boreholes/wells will be analyzed by Kiff Analytical - a California-certified analytical laboratory located in Davis, California - for total petroleum hydrocarbons as gasoline (TPH-g) using EPA Method 8015M; benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl tertiary butyl ether (MTBE), and Tertiary Butyl Alcohol (TBA) using EPA Method 8260B.

Task 6 – Characterizing the Connection Between Shallow and Deep Groundwater

The following factors influence the fate and transport of contaminants in the subsurface, in addition to the potential for natural attenuation:

- Permeability and heterogeneity of the shallow water-bearing zone media;
- Existence of high hydraulic conductivity "conduits" delineated in subsurface cross-sections A-A' through H-H'; and
- Hydraulic connection between the shallow and deep groundwater.

ERS concurs with postponing the aquifer pumping test proposed in the Data Gap Work Plan until after the completion of a Feasibility Study and before the preparation of a Corrective Action Plan. In order to identify the existence of hydraulic connection, in addition to measuring the heads in the shallow and deep wells, Stiff Diagrams for the shallow and deep groundwater will be developed. Groundwater samples collected from the proposed well clusters MW-12A/MW-12B, MW-8A/MW-8B, and MW-13A/MW-13B will be analyzed for the following water

quality constituents/parameters: Ca, Mg, K, Na, Cl, CO_3, H CO_3, SO_4, and TDS. The similarity of the Stiff Diagrams developed for the shallow and deep groundwater will indirectly demonstrate the level of exchange of water between shallow and deep groundwater zones.

Task 7 – Analysis of Natural Biodegradation Parameters

In order to evaluate the existence and potential of natural biodegradation, a basic array of water quality parameters will be collected and analyzed. The parameters include: temperature, DO, ORP, pH, conductivity, alkalinity, TOC, TIC, nitrate, Fe^{+3}, sulfate, BOD_5, and COD. The above water quality parameters will be measured and/or sampled in the existing or proposed wells MW-1, MW-2, MW-4, MW-5, MW-6, MW-7, MW-8A, MW-9A, MW-11A, MW-12A, and MW-13. In addition to the above water quality parameters, total heterotrophic plate count and the concentrations of the petroleum hydrocarbons and MTBE degraders in soil sampled from the boreholes of MW-9A, MW-11A, and MW-12A will also be determined. The collected soil samples will be cultivated and the microbial mass will be counted in a biological laboratory. The above parameters will constitute a line of evidence for the existence and potential of natural biodegradation of petroleum hydrocarbons and MTBE in the subsurface under and in the vicinity of the subject site.

Task 8 – Health and Safety Plan (completed)

As required by the Occupational Health and Safety Administration (OSHA) 29 CFR 1910.120, Hazardous Waste Operation and Emergency Responses, a site Health and Safety Plan (H&SP) has been prepared for use while conducting proposed field drilling, sampling, well installation, and testing activities. The H&SP has been read and approved by the ERS Project Manager and a Quality Assurance Reviewer. It will be read and approved by the On-site Safety Officer of all subcontractors working at the subject property. The site-specific H&SP is included in Appendix E of the *Site Conceptual Model Report and Data Gap Work Plan* (ERS, 2008b).

Task 9 - Reporting

A technical report will be submitted to Mr. Ravi Sekhon and ACEH within eight weeks following receipt of all analytical data. Boring logs will be generated. Chemical data for the groundwater and soil samples will be evaluated and interpreted relative to the purpose and objectives of this Data Gap Work Plan Addendum. Analytical data will be summarized, tabulated and, as appropriate, presented graphically to assess the lateral and vertical extent of off-site soil and groundwater contamination and the nature and potential of natural attenuation. Stiff Diagrams will also be developed. The report will generate findings regarding the assessment of soil and groundwater, as well as propose recommendations and conclusions for future remediation activities and/or additional investigation, if needed. An updated SCM also will be included in the same technical report.

5. UPDATED SCHEDULE OF PROPOSED ACTIVITIES

Prior to the approval of this data gap work plan addendum, the schedule for the completion of Tasks 1 through 7 and Task 9 is proposed below:

Tasks	Scope of Work	Time Duration
N/A	Approval of the data gap work plan addendum	30 days
1	Permit application (including obtaining off-site access permits from property owners)	20 days
2, 3	Lithologic drilling, soil and grab groundwater sampling	10 days
4	Well installation, well development, well survey, and groundwater sampling	12 days
5, 6, 7	Soil/groundwater sample analysis, water quality/biological sampling and analysis	12 days
9	Reporting	24 days
Total Duration	**(Does not include regulatory approval of the data gap work plan addendum)**	**78 days**

This schedule will be revised pending receipt of the off-site access permits from the property owners and the other permits required from the regulatory agencies. All fieldwork will be coordinated with ACEH and inspectors of the permits before it starts.

6. RECOMMENDATIONS

Both the boring logs and subsurface cross-sections included in Appendix A and Figures 3 through 11 of the *Site Conceptual Model Report and Data Gap Work Plan* (ERS, 2008b) show that existing monitoring wells MW-1, MW-4, MW-5, and MW-6 have intercepted gravelly material with a higher hydraulic conductivity. As a result, the gravel lenses can influence both the measured groundwater head and sampled contaminant concentration within those wells. Although clay and gravel are likely hydraulically connected within the groundwater zone, especially when the thickness and horizontal extent of the gravel/sand lenses are limited, gravel lenses may still become a major "conduit" for contaminant transport if the lenses are relatively continuous.

In the event the adverse impact from gravel/sand lenses mentioned above is clearly found during the data gap investigation, ERS will recommend abandoning existing monitoring wells MW-1, MW-4, MW-5, and MW-6, and installing replacement wells at the same locations in the soil and groundwater data gap investigation report.

7. REFERENCES

AARS, *Groundwater Quality Investigation*, July 2001.

AARS, *Additional Site Investigation*, September 2002.

AARS, *Site Characterization and Quarterly Groundwater Monitoring and Sampling Report,* December 2005.

ERS, *Preferential Pathway Evaluation Report*, September 2008a.

ERS, *Site Conceptual Model Report and Data Gap Work Plan*, October 2008b.

8. DOCUMENT DISTRIBUTION LIST

Ravi Sekhon (via U.S. Mail)
21696 Knuppe Place
Castro Valley, CA 94552

Paresh Khatri (via electronic transmittal)
Hazardous Materials Specialist
Alameda County Environmental Health Services

CERTIFICATION

This report was prepared under the supervision of a State of California Professional Engineer at Environmental Risk Specialties Corporation (ERS). All statements, conclusions, and recommendations are based solely upon published results from previous consultants, field observations by ERS, and laboratory analysis performed by a California DHS-certified laboratory related to the work performed by ERS.

Information and interpretation presented herein are for the sole use of the client and regulating agency. The service performed by ERS has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions in the area of the property. No other warranty, expressed or implied, is made.

Sincerely,

ENVIRONMENTAL RISK SPECIALTIES CORPORATION

Jim Ho, PE #C68639

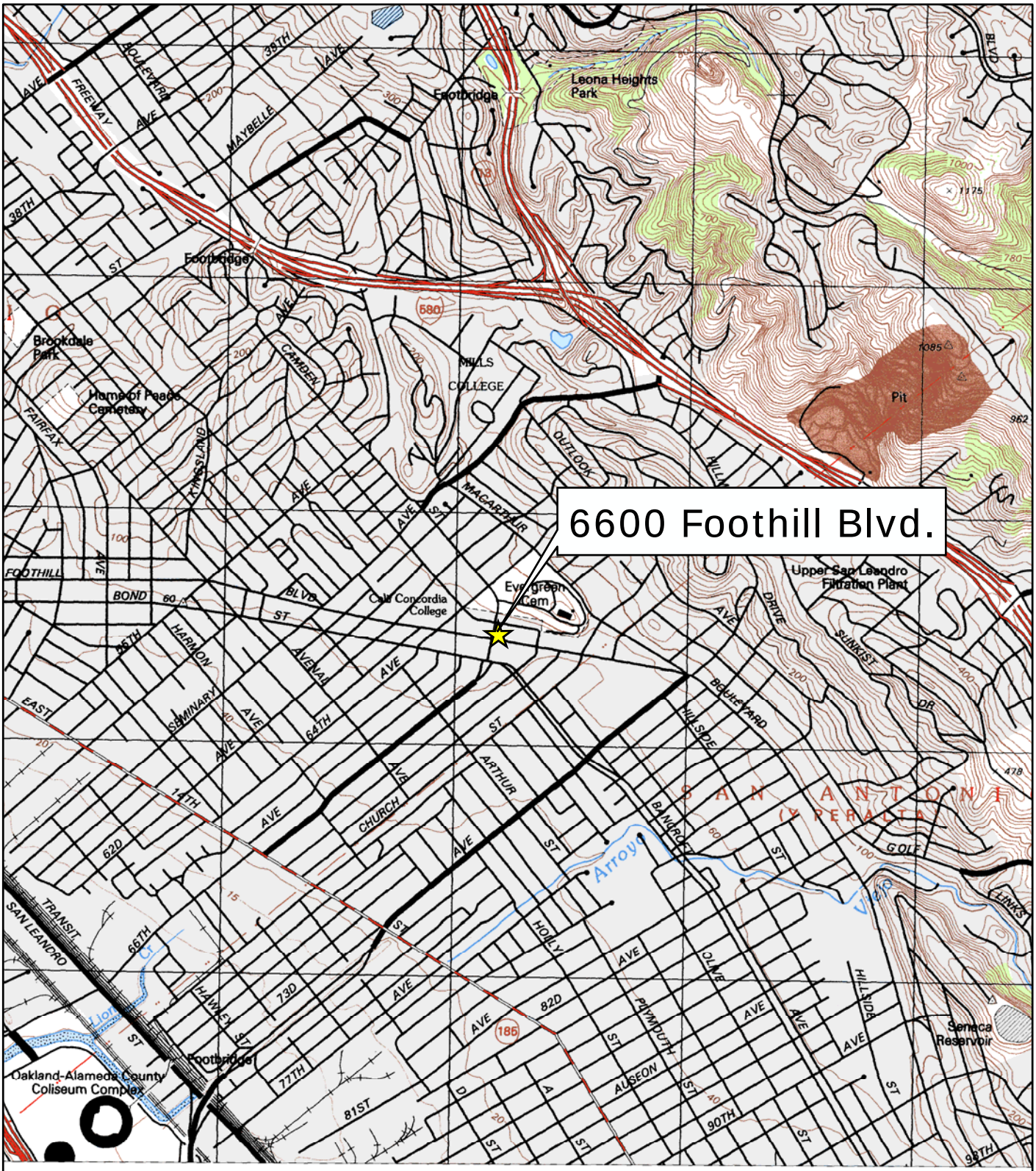
TABLES

Table 1. Well Construction Data and Rationale for the Proposed New Wells

Well ID	Well Type	Well Depth (feet bgs)	Screen Interval (feet bgs)	Rationale
MW-5B	Deep well	50	40 - 50	• Assess the vertical boundary of the contaminant plume • Delineate vertical flow direction
MW-6B	Deep well	50	40 - 50	• Assess the vertical boundary of the contaminant plume • Delineate vertical flow direction
MW-7	Shallow well	20	10 - 20	• Monitor plume migration and lateral extent in the southwestern direction • Delineate horizontal flow direction
MW-8A, MW-8B	Shallow and deep well	25 (A), 50 (B)	10 – 25 (A), 40 - 50 (B)	• Monitor plume migration and boundary under 6601 Foothill Blvd in shallow and deep groundwater • Delineate flow directions • Delineate lithology in shallow and deep groundwater
MW-9A, MW-9B	Shallow and deep well	25 (A), 50 (B)	10 – 25 (A), 40 - 50 (B)	• Monitor plume migration and boundary under 6619/6625 Foothill Blvd in shallow and deep groundwater in the southern direction • Delineate flow directions • Delineate lithology in shallow and deep groundwater
MW-10	Shallow well	20	10 – 20	• Monitor plume migration and lateral extent in the northern direction • Delineate horizontal flow direction
MW-11A, MW-11B	Shallow and deep well	25 (A), 50 (B)	10 – 25 (A), 40 - 50 (B)	• Monitor plume migration and boundary in shallow and deep groundwater in the

MW-11B	(1.5-inch well casing)		- 50 (B)	northern direction • Delineate flow directions • Delineate lithology in shallow and deep groundwater
MW-12A, MW-12B	Shallow and deep well	25 (A), 50 (B)	10 – 25 (A), 40 - 50 (B)	• Monitor plume migration and boundary under 6620 Foothill Blvd in shallow and deep groundwater in the eastern direction • Delineate flow directions • Delineate lithology in shallow and deep groundwater
MW-13A, MW-13B	Shallow and deep well	25 (A), 50 (B)	10 – 25 (A), 40 - 50 (B)	• Monitor plume migration and boundary under 6619 Foothill Blvd in shallow and deep groundwater in the southeastern direction • Delineate flow directions • Delineate lithology in shallow and deep groundwater

FIGURES



Vicinity Map

6600 Foothill Blvd, Oakland, CA

Figure 1

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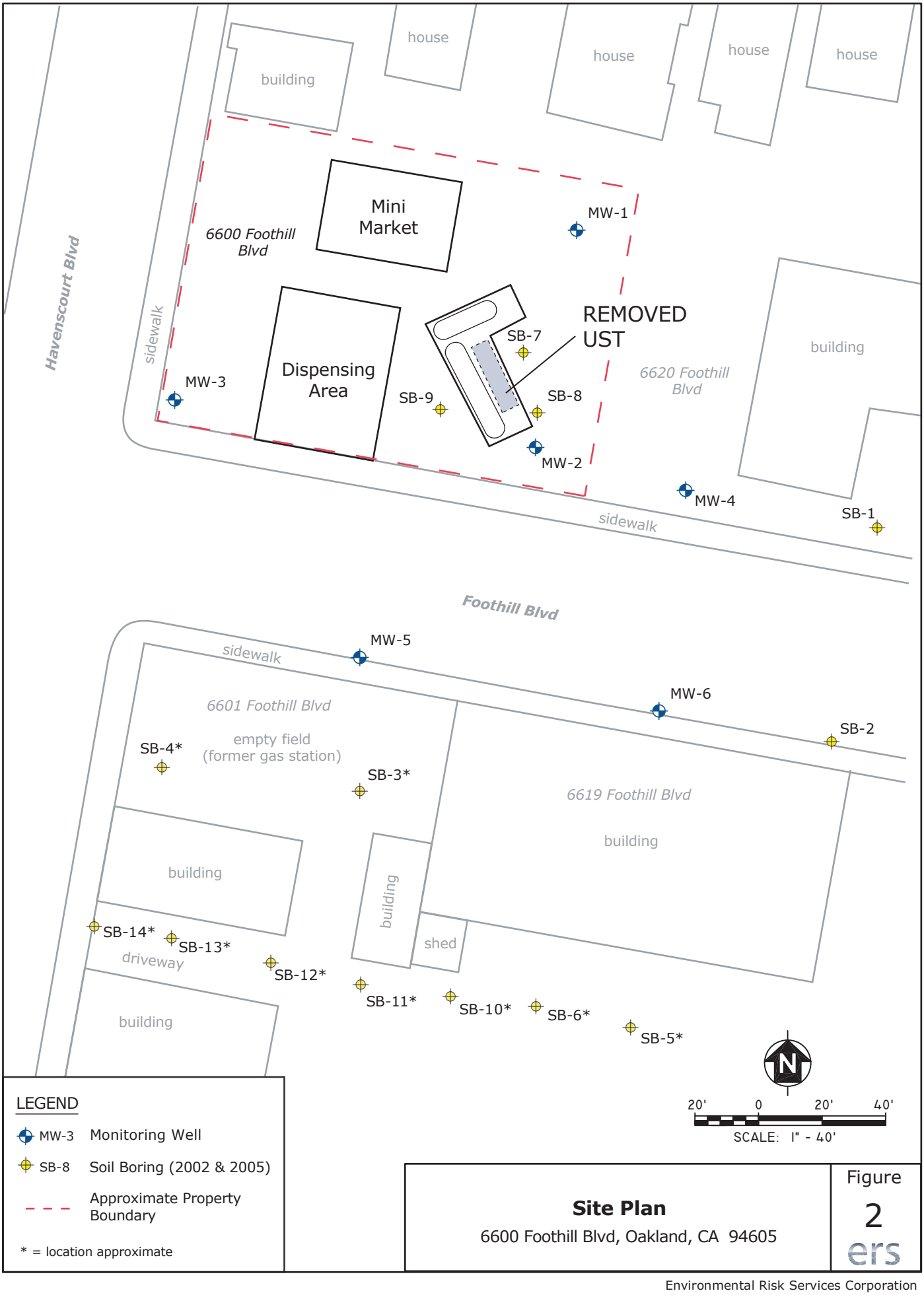

Site Plan

6600 Foothill Blvd, Oakland, CA 94605

Figure 2

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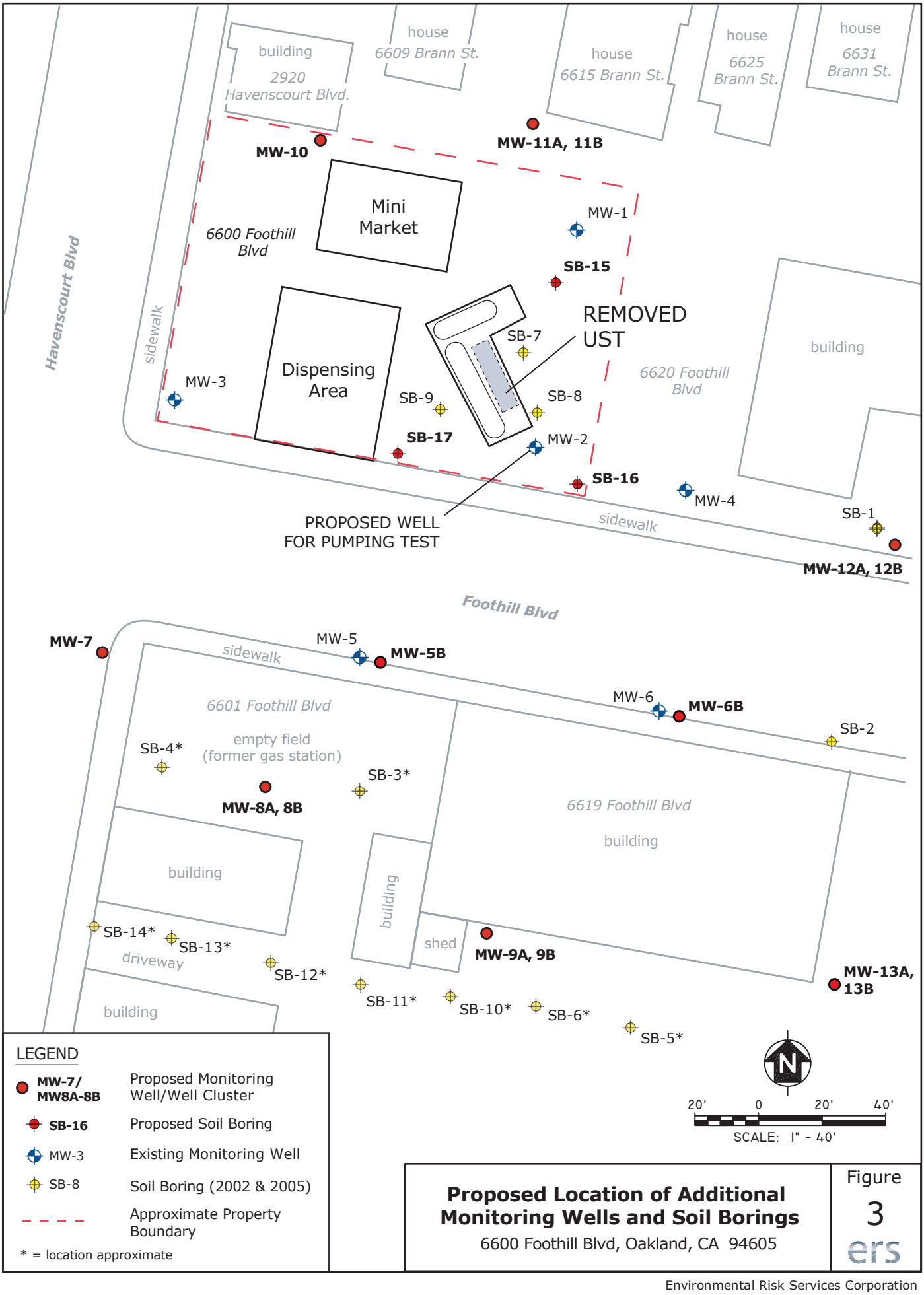

Proposed Location of Additional Monitoring Wells and Soil Borings

6600 Foothill Blvd, Oakland, CA 94605

Figure 3

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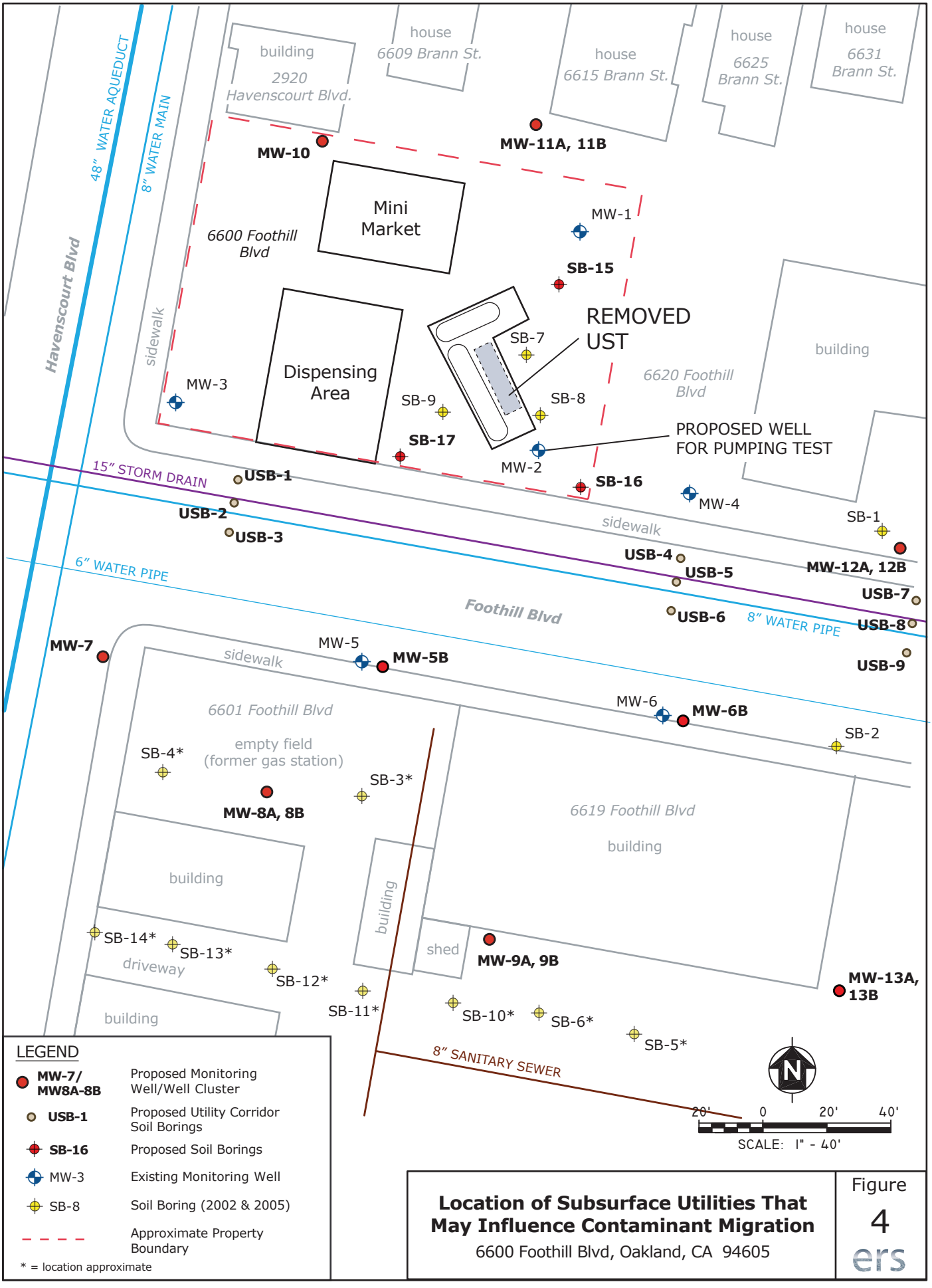

Location of Subsurface Utilities That May Influence Contaminant Migration

6600 Foothill Blvd, Oakland, CA 94605

Figure 4

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APPENDIX A

TABLE 2: SUMMARY OF ANLYTICAL RESULTS OF SOIL SAMPLING
SEKHON GAS STATION
6600 Foothill Blvd.
Oakland, California

Sample ID	Date of Sampling	TPHg (mg/kg)	MTBE (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethlybenzene (mg/kg)	Xylenes (mg/kg)
MW-1-S@15'	6/4/01	2.3**	0.009	ND	ND	ND	ND
MW-2-S@8'	6/4/01	870	0.29*	4.3	3.8	12	69
MW-3-S@10'	6/4/01	1.1**	0.016	ND	ND	ND	ND
MW-4-S@10'	6/26/02	ND	593	ND	ND	6	15
MW-5-S@10'	6/26/02	533	4290*	ND	ND	ND	24
MW-6-S@10'	6/26/02	16300	1160	138	37	318	456
SB-1-S@10'	6/27/02	ND	105	ND	ND	ND	ND
SB-2-S@10'	6/27/02	1100	502*	140	ND	67	207
RL	6/14/01	0.5	0.005	0.005	0.005	0.005	0.01

Notes:
ND- Not Detected NA- Not Analyzed RL- Reporting Limit
mg/kg- Milligram per kiolograms (parts per million)
TPHg- Total petroleum hydrocarbon as gasoline (EPA method modified 8015)
MTBE- Methyl Tertiary Butyl Ether (EPA method 8020)
Benzene, toluene, ethlybenzene, and total xylenes(EPA method 8020)
* Confirmed by CG/MS method 8260
** Laboratory reported does not match gasoline pattern

TABLE 2: SUMMARY OF ANLYTICAL RESULTS OF SOIL SAMPLING
SEKHON GAS STATION
6600 Foothill Blvd.
Oakland, California

Sample ID	Date of Sampling	TPHg (mg/kg)	MTBE (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethlybenzene (mg/kg)	Xylenes (mg/kg)
SB-3/S-11'	8/10/2005	ND	ND	ND	ND	ND	ND
SB-4/S-11'	8/10/2005	4.7**#	ND	ND	ND	ND	ND
SB-5/S-12'	8/10/2005	ND	ND	ND	ND	ND	ND
SB-6/S-11½'	8/10/2005	ND	ND	ND	ND	ND	ND
SB-7/S-7½'	8/11/2005	1.7*	ND	ND	0.0087	0.037	0.047
SB-7/S-13'	8/11/2005	1.3	0.50	0.0063	0.0067	0.047	0.077
SB-7/S-17'	8/11/2005	3.2	ND	ND	ND	ND	ND
SB-7/S-24'	8/11/2005	ND	3.2	ND	0.0097	0.015	0.034
SB-7/S-29'	8/11/2005	ND	ND	ND	ND	ND	ND
SB-8/S-6'	8/11/2005	ND	1.9	ND	ND	ND	ND
SB-8/S-10'	8/11/2005	ND	3.2	0.0061	0.006	0.0098	0.034
SB-8/S-13½'	8/11/2005	8.4**	0.65	0.014	0.14	0.089	0.32
SB-8/S-19'	8/11/2005	ND	3.4	ND	ND	0.011	0.036
SB-8/S-27'	8/11/2005	18	ND<1.0	0.014	0.14	0.089	0.32
SB-9/S-6'	8/11/2005	200**#	ND<0.50	ND<0.50	0.5	ND<0.50	0.2
SB-9/S-10'	8/11/2005	ND	4.9	ND	ND	ND	ND
SB-9/S-12'	8/11/2005	190**#	1.2	ND<0.10	1.3	ND<0.10	0.33
SB-9/S-17'	8/11/2005	12**#	0.97	ND	0.085	ND	0.033
SB-9/S-21'	8/11/2005	39**#	ND<1.0	0.012	0.18	ND	0.077
SB-9/S-27½'	8/11/2005	5.6**#	0.59	ND	0.051	ND	0.0075
SB-10/S-11'	8/10/2005	ND	ND	ND	ND	ND	ND
SB-11/S-11'	8/10/2005	ND	ND	ND	ND	ND	ND
SB-12/S-11'	8/10/2005	ND	ND	ND	ND	ND	ND
SB-13/S-12'	8/10/2005	ND	ND	ND	ND	ND	ND
SB-14/S-11'	8/10/2005	ND	ND	ND	ND	ND	ND
RL	8/12-17/2005	1	0.05	0.005	0.005	0.005	0.005

Notes:
ND- Not Detected NA- Not Analyzed RL- Reporting Limit
mg/kg- Milligram per kiologram (parts per million)
TPHg- Total petroleum hydrocarbon as gasoline (EPA method modified 8015Cm)
MTBE- Methyl Tertiary Butyl Ether (EPA method 8021B)
Benzene, toluene, ethlybenzene, and total xylenes(EPA method 8021B)
* Heavier gasoline range compounds are significant (aged gasoline?)
** Strongly aged gasoline or diesel range compounds are significant
# no recognizable pattern