November 9, 2006

Mr. Don Hwang
Alameda County Health Care Services Agency (ACHCSA)
Environmental Health Services
Environmental Protection (LOP)
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Former Exxon Station
5175 Broadway
Oakland, California
ACHCSA Fuel Leak Case No. RO0000139
SFRWQCB Site No. 01-0958
UST Fund Claim No. 003406

Dear Mr. Hwang:

I, Mr. Gary Feiner of Rockridge Heights, LLC, have retained Pangea Environmental Services, Inc. (Pangea) as the environmental consultant for the project referenced above. Pangea is submitting the *Addendum to Preliminary Results of Site Characterization: Proposed Additional Activities* dated November 8, 2006, on my behalf.

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached report is true and correct to the best of my knowledge.

Sincerely,

Gary Feiner
Rockridge Heights, LLC

November 8, 2006

Mr. Don Hwang
Alameda County Health Care Services Agency (ACHCSA)
Environmental Health Services
Environmental Protection (LOP)
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: **Addendum to Preliminary Results of Site Characterization: Proposed Additional Activities**
Former Exxon Station
5175 Broadway
Oakland, California
ACHCSA Fuel Leak Case No: RO0000139
SFRWQCB Site No. 01-0958
UST Fund Claim No. 003406

Dear Mr. Hwang:

On behalf of site owner Rockridge Heights, LLC, Pangea Environmental Services is submitting this site investigation addendum (Addendum) for the site referenced above. The Addendum is a modification to the report titled *Preliminary Results of Site Characterization: Proposed Additional Activities-former Exxon Station, 5175 Broadway, Oakland, California* dated May 8, 2006, and submitted to you by Golden Gate Tank Removal, Inc (GGTR Report) on behalf of the former owner, Ms. Mojdeh Mehdizadeh.

INTRODUCTION

The Addendum is being issued for the following reasons:

1. The GGTR report did not provide a site conceptual model (SCM) as requested in your December 22, 2005 letter.

2. The long screen lengths (15 to 20 feet) of existing onsite monitoring wells and the sparsity of wells do not provide sufficient lateral or vertical delineation of onsite contamination, and make scoping of remedial measures subject to considerable uncertainty. Sufficient characterization data are available to site appropriately located and screened monitoring wells that will provide the appropriate degree of lateral and vertical delineation. Also, since direct-push methods are not feasible for penetrating the fractured, competent bedrock underlying surficial materials, hollow-stem augering will be required. Due to this requirement, and the likely low yields of boreholes installed into bedrock, the boreholes should be completed as monitoring wells to allow the collection of representative and regular data from deeper materials at the site. Monitoring wells installed at multiple depths with shorter screens will allow better determination of the vertical extent of contamination and refinement of SCM.

3. The proposed number of offsite grab groundwater sampling points recommended in the GGTR report is considered excessive and incorrectly targeted. The initial number of grab groundwater borings should be reduced and stepout borings should be installed in a dynamic manner based on initial results.

4. Downgradient offsite wells should be installed during this phase of the investigation rather than waiting until completion of further grab sampling, since the plume is known to have migrated offsite, the gradient direction is known, and there are limited accessible locations to place the wells.

5. With contamination likely extending under the commercial building immediately adjacent to the downgradient edge of the site, soil gas sampling is merited to evaluate the potential risk to human health via hydrocarbon volatilization into indoor air.

6. Feasibility testing of interim remedial measures should be conducted in highly impacted onsite areas.

A detailed description of each of these six items is given below. All scope items that are not summarized above and detailed in the following sections will be conducted as described in the "Recommended Additional Site Characterization Activities" Section of the GGTR report *Preliminary Results of Site Characterization: Proposed Additional Activities-former Exxon Station, 5175 Broadway, Oakland, California* dated May 8, 2006. Figure 4R of this Addendum supercedes Figure 4 of the cited GGTR report (which is included herein as Appendix A), and shows the locations of proposed new borings, new monitoring wells, and wells proposed for destruction or reconstruction. In addition, Figure 4R incorporates sampling results from the most recent quarterly groundwater monitoring event (3rd quarter 2006). The analytical data for that event will be presented in a Pangea quarterly monitoring report for the subject site.

Field operations recommended herein will be conducted in accordance with Pangea's Standard Operating Procedures, which are presented in Appendix B. After well installation, all monitoring wells will be developed prior to sampling. All new monitoring wells and grab boring samples will be sampled after completion. Monitoring of the new wells will thereafter be conducted during routine site quarterly groundwater monitoring events. Pangea will measure the depth to water and dissolved oxygen concentrations, and submit the groundwater samples for analysis for TPHg/BTEX by EPA Method EPA Method 8015m/8021. All grab groundwater borings and monitoring well borings will be logged for lithology and soil type, with the exception of borings that are being completed immediately adjacent to

previously logged borings. Since comprehensive onsite soil sampling has previously been completed, soil samples will not be submitted for laboratory analysis unless field screening of offsite samples using a photoionization detector (PID) or odor or staining characteristics indicate the presence of petroleum hydrocarbons in offsite vadose zone soil. In such cases, selected samples will be submitted for analysis for TPHg/BTEX by EPA Method EPA Method 8015m/8021.

ITEM NO. 1 –SITE CONCEPTUAL MODEL

As noted in your letter of December 22, 2005, an initial site conceptual model (SCM) should be developed in order to guide future characterization and remediation efforts, and should then be refined based on the results of ongoing characterization work. This requirement was not addressed in the GGTR report, with the exception of descriptive information on site geology and site history. To address this requirement, an initial SCM is included below, and will be utilized and refined in future reports pertaining to site characterization and remediation.

1.1 Site Conceptual Model Overview

A site conceptual model (SCM) is a representation of site conditions that is used to summarize important site issues and provide a guide for future assessment and/or remediation. Historical soil and groundwater analytical data and groundwater elevation data used to develop the SCM were derived primarily from Tables 1A, 1B, 2A and 2B of the GGTR Report. Maps showing the lateral distribution of onsite groundwater contamination determined from the recent grab groundwater sampling program are presented as Figure 4 of the GGTR Report. The GGTR tables and figure are included as Appendix A of this Addendum. Based on the previous investigations described in the GGTR report, the site and adjacent areas have been subject to past releases of petroleum hydrocarbons that have impacted shallow groundwater and may pose a potential threat to workers at and adjacent to the site. The releases are associated with operation of the site as a gasoline station until 1979. The top of the saturated zone is typically at approximately 10 to 15 feet bgs and groundwater is found within fractured bedrock that underlies the site at shallow depth, and in places within clay, silt, sand and gravel that constitutes native soil and fill overlying the bedrock. The lateral and vertical extent of contamination is not yet adequately defined. The following sections describe the SCM, including discussions of the geology and hydrogeology, source of contamination, distribution of groundwater contamination, and potential receptors.

1.2 Site Location and Description

The subject property is located at 5175 Broadway Street, at the southwest corner of the intersection of Broadway and Coronado Avenue in Oakland, California in Alameda County (Figure 1). The site is approximately 0.6 miles south-southeast of Highway 24 and approximately 2.3 miles east of Interstate

80 and the San Francisco Bay. The property is relatively flat lying, with a slight slope to the south-southwest, and lies at an elevation of approximately 160 feet above mean sea level. Topographic relief in the area surrounding the site also slopes generally towards the south-southwest. The western site boundary is the top of an approximately 10 foot high retaining wall that separates the site from an adjacent apartment complex.

The property has been vacant since 1979 and was formerly occupied by an Exxon Service Station used for fuel sales and automobile repair. The site is approximately 13,200 square feet in area with about 10% of the area occupied by a vacant station/garage structure. The majority of the ground surface is paved with concrete and/or asphalt. Land use to the west and northwest consists is residential, including apartment buildings and single family homes. Properties to the northeast, east and south of the site are commercial. The site and adjacent properties are shown on Figure 2.

1.3 Geology and Hydrogeology

Regional Geology and Hydrogeology

The site lies at the foot of the Oakland Hills on a low ridge composed of Cretaceous sandstone, siltstone, and serpentinite of the Franciscan Complex, as mapped by Graymer (2000). The bedrock is onlapped several hundred feet to the west and southwest of the site by Pleistocene and younger alluvial and fluvial deposits derived from westward flowing streams draining the hills to the east. The Hayward Fault, a major active regional fault of the San Andreas fault system, lies 1.5 miles northeast of the site.

The site lies immediately east of the East Bay Plain groundwater basin. Most of the East Bay Plain is underlain by deep Tertiary depositional basins whose current depocenters are the San Francisco Bay (the San Francisco Basin) and San Pablo Bay (San Pablo Basin) (Figuers, 1998). The site lies on bedrock forming the eastern boundary of the San Francisco Basin. Groundwater in the San Francisco Basin is designated beneficial for municipal and domestic water supply and industrial process, service water, and agricultural water supply.

Local Hydrogeology

Most of the site is underlain at relatively shallow depths by impermeable bedrock composed of fractured Cretaceous sandstone, serpentinite and siltstone of the Franciscan Complex. The bedrock is overlain by variable thicknesses (from 2 to 20+ feet) of unconsolidated clay, silt, sand and gravel that constitutes both native soil and artificial fill. Figure 3 is a geologic cross section showing the distribution of these units in the subsurface. The location of the geologic cross section is shown on Figure 2. Prior investigations indicate that the water table intersects the contact between the unconsolidated units and

bedrock units, so in some areas shallow groundwater is present in both the unconsolidated units and the bedrock, and in other areas groundwater is present only within the bedrock. During drilling of the onsite monitoring wells for which the entire saturated zone is in bedrock (MW-1, MW-2 and MW-3), thin relatively productive water-bearing zones were encountered between 20 and 22 feet bgs in MW-1 and MW-2, and no water was encountered in MW-3. Water levels rose substantially in all of these wells shortly after completion, and stabilized water levels define a piezometric surface with a southwestward gradient of approximately 0.045 ft/ft. These observations indicate that the bedrock is relatively impermeable, and that the thin water-bearing zones within the bedrock are permeable layers or fracture zones of unknown continuity and orientation. These thin zones are under confined or semiconfined conditions on the scale of the well borings, but may be unconfined at the scale of the site. Groundwater within the unconsolidated units is presumed to be present under unconfined conditions.

Groundwater Flow

Based on a review of depth-to-water data collected during past groundwater monitoring events, the groundwater flow direction is consistently westwards to southwestwards. Groundwater elevation data and the inferred groundwater flow direction for the most recent quarterly monitoring event (third quarter 2006) are shown on Figure 2, and are consistent with previous monitoring results.

Surface Water

The site lies approximately midway between the southward flowing Broadway and Rockridge branches of Glen Echo Creek, which discharges to Lake Merritt and eventually San Francisco Bay (Sowers, 2000). The Rockridge Branch lies approximately 800 feet west of the site and the Broadway Branch is approximately 800 feet southeast of the site. Both creek branches flow through culverts along much of their lengths. The confluence of the two branches is approximately 2,000 feet south-southwest of the site.

1.4 Source of Contamination

Three 8,000-gallon gasoline USTs and one 500-gallon waste oil UST were located beneath the site at the approximate locations shown in Figure 2. The tanks and associated piping were removed, and approximately 700 tons of gasoline-contaminated soil was excavated by Tank Protect Engineering, Inc. (TPE) in 1990. Groundwater was reportedly observed to stabilize in the UST excavation between 10.5 and 11 feet bgs. The soil was subsequently treated onsite and used to backfill the excavation.

Residual soil contamination detected in 20 soil samples collected from 10 recently drilled onsite soil borings reported in the GGTR Report was relatively minor. That report compared results from the soil

borings to California Regional Water Quality Control Board (CRWQCB) Environmental Screening Levels (ESLs) for shallow or deep soil at a residential land use permitted site with groundwater that is a potential source of drinking water. Land use at the site and adjacent buildingsalong Broadway is currently commercial, so commercial ESLs would generally be applicable to the site, although adjacent crossgradient properties and some downgradient properties are residential, so cleanup to residential ESLs would apply to contaminants that might migrate from the site. However, the Final ESLs for TPHg and benzene are the same for commercial and residential land use for shallow and deep soil where groundwater is a potential source of drinking water. Contaminant concentrations were less than ESLs for all soil samples except for those collected at a depth of 9 feet in borings B-3, B-4 and B-9. TPHg in these borings ranged from 140 to 180 mg/kg, slightly exceeding the ESL of 100 mg/kg. Benzene was detected at 0.65 mg/kg in B-3, exceeding the ESL of 0.044 mg/kg. Benzene was not detected in either B-4 or B-9, although the detection level for the samples collected at 9 feet bgs was 0.5 mg/kg due to sample dilution, so it is not known whether the ESL for benzene was exceeded in those borings. Based on the results of the soil boring program, residual vadose zone soil contamination does not appear to be a concern at the site, though the presence of residual hydrocarbons in several soil boring samples close to the water table elevation suggests that a zone of capillary fringe soil contamination at concentrations slightly exceeding ESLs is probably present, as depicted on Figure 3.

1.5 Hydrocarbon Distribution in Groundwater

The existing onsite wells were constructed with relatively long screens (typically 10 to 20 feet in length), and may result in interconnection between deeper water-bearing zones and shallower zones. Therefore, it is not known whether contaminated groundwater is primarily present within only shallow fill, soil and bedrock, or within deeper bedrock where flow may be controlled primarily by fractures. The two wells close to the former USTs and dispenser islands that encountered relatively productive water-bearing zones at 20 feet or greater depth (MW-1 and MW-2) have relatively low groundwater contaminant concentrations in comparison to nearby wells and to grab groundwater sampling points that sampled water primarily from shallower water-bearing soil and fill units. This observation suggests that deep groundwater may be substantially less contaminated than shallow groundwater and that the analytical results from these two wells may not be comparable to data from the other monitoring wells and from the shallow grab groundwater sampling points. Unfortunately, because of the long screens in wells MW-1 and MW-2, the veracity of this tentative conclusion is uncertain.

The primary contaminants at the site are total petroleum hydrocarbons as gasoline (TPHg) and benzene, which substantially exceed CRWQCB Tier 1 Final ESLs for groundwater that is a potential source of drinking water, as noted in the GGTR Report. Secondary contaminants that also exceed ESLs are toluene, ethylbenzene, xylenes, and 1,2-dichloroethane (EDC). The lateral distribution of TPHg and

benzene in groundwater at the site is illustrated on Figure 2. During the most recent (3rd quarter 2006) groundwater monitoring event, the maximum detected concentrations in site wells were 25,000 micrograms per liter (µg/L) TPHg and 960 µg/L benzene in well STMW-4. However, the grab groundwater sampling study conducted by GGTR in February 2006 indicated that maximum TPHg concentrations at the downgradient edge of the site were 230,000 µg/L TPHg and 13,000 µg/L benzene, and that TPHg concentrations exceeding 10,000 µg/L and benzene concentrations exceeding 100 µg/L are present over much of the eastern portion of the site and also in the area west of the station building. This is illustrated in the isoconcentration contour map presented as Figure 4 of the GGTR Report (Appendix A). The isoconcentration map excludes data from existing site monitoring wells, so is representative of shallow, not deep groundwater conditions. No offsite wells are present, so the downgradient extent of the contamination detected at the downgradient boundary of the site is not currently known.

Review of the historical concentration data presented in Table 2A of the GGTR Report indicates that although substantial concentration fluctuations have occurred in site wells since monitoring began in 1989, no consistent concentration trends have been observed, and concentration data collected in 2006 are generally of similar magnitude to concentration data collected at the beginning of monitoring. This observation suggests that groundwater velocities at the site are very low and that natural attenuation mechanisms have not been effective in reducing contaminant concentrations.

1.6 Conduit Study

To evaluate the potential for contaminant migration via preferential pathways, GGTR surveyed subsurface utilities in the vicinity of the site and compared utility depths to groundwater depth in site monitoring wells. This survey was reported in the GGTR *Workplan for Additional Site Characterization* dated September 12, 2005. No utilities likely to serve as preferential pathways for migration of contaminated groundwater were found.

1.7 Potential Receptors

A risk assessment study conducted by SOMA (*Conducting Human Health Risk Assessment*, dated February 17, 2004) concluded that the primary human health risk was inhalation by residential receptors of benzene volatilized from site groundwater, and that concentrations measured in site monitoring wells were below thresholds of concern for those receptors with the exception of well STMW-4. In an October 6, 2004 letter, the ACHCSA requested modifications to the risk assessment method used by SOMA and consideration of soil exposure pathways not considered by SOMA in future risk assessment work. ACHSA also indicated that further risk assessment efforts should be postponed until additional site characterization work was completed. In addition, the recent grab groundwater sampling data collected

by GGTR indicates that chemicals of concern may be present at the downgradient edge of the site at concentrations exceeding those found in site monitoring wells. Therefore, Pangea concurs with the ACHSA's statement that additional risk assessment should not be conducted until further downgradient characterization recommended in the following sections has been completed. It should also be noted that the high levels of petroleum hydrocarbons (230,000 ug/L TPHg, 13,000 ug/L benzene) detected in the grab groundwater sample (B-11) collected at the downgradient edge of the site significantly exceed those previously detected onsite, therefore increasing the possibility that vapor intrusion hazards are present for the residential pathway discussed by SOMA, or potentially for workers in commercial buildings, since the ESL for the commercial or industrial land use vapor intrusion pathway is 1,800 ug/L.

1.8 Site Conceptual Model Summary

The information given above is the basis for the following conceptual model describing the distribution and fate of contaminants for the site.

- The primary source of contamination was apparently leaks associated with the USTs and/or product piping at the site. The USTs and piping were removed in 1990 and contaminated soil was excavated, remediated onsite and replaced.

- Groundwater is apparently present under unconfined conditions within the surficial soil and fill, and under semi-confined or unconfined conditions within bedrock fractures. Groundwater flows generally westwards and southwestwards primarily through clay, silt, sand and gravel near the water table, and through fractures in relatively impermeable bedrock below approximately 10 to 15 feet bgs. In parts of the site, the top of bedrock is above the water table, so groundwater in those locations flows only within the bedrock.

- The primary chemical of concern (COCs) at the site is benzene, which could potentially represent a vapor intrusion hazard. Secondary COCs are TPHg, toluene, ethylbenzene, xylenes, and 1,2 dichloroethane, which all exceed Final ESLs for residential and/or commercial sites where groundwater is a potential drinking water source.

- Vadose zone soil is relatively uncontaminated and is unlikely to represent a significant threat to human health. Several soil samples slightly exceeded ESLs, but these samples were from 9 ft bgs and likely represent the top of the capillary fringe. Saturated soil impact is likely greatest within the range of the historical capillary fringe, although additional impact is also likely present with bedrock fractures.

- Concentrations of COCs in groundwaterhave stayed relatively constant over more than a decade, suggesting that groundwater velocities are low and natural attenuation mechanisms are not effective.

- COC concentrations in soil and groundwater exceed Final ESLs for sites where groundwater is a potential drinking water source. Land use at the site and adjacent buildings along Broadway is currently commercial, so commercial ESLs would generally be applicable to the site, although

adjacent crossgradient properties and some downgradient properties are residential, so cleanup residential ESLs would apply to contaminants that might migrate from the site. Final ESLs for TPHg and benzene are the same for commercial and residential land use for shallow and deep soil where groundwater is a potential source of drinking water.

- Potential receptors include indoor residents and workers who might inhale petroleum vapors migrating from groundwater into buildings. An initial study indicated that groundwater concentrations in only one well slightly exceeded risk thresholds of concern for residents, which are present at properties adjacent to the site. However, the ACHSA has asked that the risk assessment be postponed until additional data is collected, that methods used for risk assessment be modified, and that soil pathways be considered. In addition, recent grab groundwater data indicates that ESLs for the vapor intrusion pathway for commercial/industrial land use may be exceeded at the downgradient edge of the site.

- The lateral and vertical extent of the plume is not well characterized. Deep wells at the site have long screens that may allow hydraulic communication and therefore contaminant cross-contamination between shallow and deep water-bearing zones. No downgradient offsite wells or grab groundwater sampling points have been installed.

1.9 Site Conceptual Model References

Figuers, S., 1998, Groundwater study and water supply history of the East Bay Plain, Alameda and Contra Costa Counties, California: Norfleet Consultants, June 15.

Graymer, R.W., 2000, Geologic map and map database of the Oakland metropolitan area, Alameda, Contra Costa and San Francisco Counties, California, U.S. Geological Survey Miscellaneous Field Studies Map MF-2342, 1:50,000 scale. (http://geopubs.wr.usgs.gov/map-mf/mf2342/mf2342f.pdf).

Sowers, J. M., 2000, Guide to San Francisco Bay Area Creeks: Ettie St. Pump Station Watershed Map, the Oakland Museum of California. (http://www.museumca.org/creeks/oakmap.html).

ITEM NO. 2 –VERTICAL DELINEATION OF ONSITE GROUNDWATER CONTAMINATION

The existing onsite wells were constructed with relatively long screens (from 10 to 20 feet in length), and may result in interconnection between deeper water-bearing zones and shallower, less productive zones. Therefore, it is not known whether contaminated groundwater is primarily present within only soil, fill and shallow bedrock, or within deeper bedrock where flow may be controlled primarily by fractures. The two wells close to the former USTs and dispenser islands that encountered relatively productive water-bearing zones at 20 feet or greater depth (MW-1 and MW-2) have relatively low groundwater contaminant concentrations compared to nearby wells and grab groundwater sampling points

that sampled water primarily from shallower water-bearing zones, indicating that deep groundwater may be substantially less contaminated than shallow groundwater, but this hypothesis cannot be verified based on existing data. This lack of information makes selection of final remedial measures subject to uncertainty. Therefore, Pangea proposes to destroy or reconstruct existing site wells that have screened sections considered inappropriate for delineating site contamination, and install several paired sets of wells that will better characterize site contamination. For downgradient well location MW5A/5B/5C, a trio of wells will be installed to sample the three separate potential water-bearing zones (the capillary fringe zone from approximately 11 to 14 feet, the gravel section from approximately 16 to 20 feet, and a productive clayey gravelly section encountered at 22 feet) logged at that location. In addition, a trio of wells will be installed at the MW-7A/7B location if similar conditions are encountered to those found at the MW-5A/5B/5C location. Collection of grab groundwater samples using direct push methods is not considered feasible for the deep zones due to the strength of site bedrock which previously resulted in direct-push refusal and in some cases insufficient water to sample. This necessitates the use of hollow-stem auger methods and installation of monitoring wells to sample within bedrock underlying the site. The wells proposed for destruction or reconstruction are listed in Table 1. To help control costs, Pangea plans to use the boreholes for destroyed wells for new wells screened more appropriately, to the extent practical. Proposed new wells are listed in Table 2 and shown in map view on Figure 4R. A geologic cross section illustrating the approximate screen intervals for the new wells is shown in Figure 5.

Table 1 – Existing Monitoring Wells

Well Number	Screened Interval in feet bgs (Screen Length, ft)	Water Depth Range (feet)	Discussion	Recommendation
MW-1	13 – 23 (10)	8–10.5	Water-bearing zone encountered at 23 feet bgs in bedrock. Groundwater rose to 10 feet bgs 2 hours after installation. Samples primarily represent deep water-bearing zone.	Retain well as representative of deep contamination, with proposed well MW-4A targeting shallower contamination.
MW-2	8 – 23 (15)	8.5–11.5	Water-bearing zone encountered at 20 feet bgs in bedrock. Groundwater immediately rose. Samples primarily represent deep water-bearing zone.	Reconstruct well as deep-zone well MW-2B screened from 18 to 23 feet.
MW-3	7 – 27 (20)	9.5–13.5	Constructed dry in bedrock. Low yielding well. Wellhead not currently locatable. Depth of	Locate and destroy well. Replace with

			primary water-bearing zone unknown.	wells MW-3A (screened from 7 to 17 feet) and MW-3B (screened from 22 to 27 feet).
STMW-4	8 – 19.5 (11.5)	8.5 – 12	Poor descriptive log. Groundwater encountered at 13 feet bgs.	Reconstruct well as shallow-zone well MW-4A screened from 8 to 15 feet.
STMW-5	8- 24 (16)	11.5 -15	Poor descriptive log. Apparently didn't drill into bedrock. Immediately above retaining wall (over 10 feet high). Possibly completed in retaining wall backfill. Groundwater encountered at 22 feet bgs.	Destroy well. Replace with well MW-5A (screened from 11 to 16 feet) and 5B (screened from 20 to 25 feet.)

Table 2 – Proposed New Onsite Monitoring Wells

Well Number	Approximate Screened Interval* (feet)	Rationale
MW-2B	18-23 (B)	Reconstruction of well MW-2. Productive zone was previously observed at 22 feet bgs. To help control costs, an additional shallower well is not proposed at this time.
MW-3A/3B	8-16 (A) 20-25 (B)	Well pair replacement for MW-3.
MW-4A	8-15 (A)	Reconstruction of well STMW-4, with well MW-1 monitoring deeper zone.
MW-5A/5B/5C	9-14 (A) 16-20 (B) 22-27 (C)	Well trio replacement for STMW-5. MW-16B will be located at least 10 feet laterally from MW-16A and MW-16B to ensure that cross connection of the three different zones does not occur.
MW-6A/6B	8-16 (A) 20-25 (B)	Well pair located within previously uncharacterized main tank excavation area, where excavated soil was treated and reused.
MW-7A/7B	6-16 (A) 20-25 (B)	Well pair located adjacent to hydropunch boring B11 that had the maximum detected hydrocarbon concentrations during the most recent investigation. A third well (MW-7C) will be installed in the event that three potential water-bearing zones, similar to those found in STMW-5, are encountered.

MW-8A/8B	8-16 (A) 20-25 (B)	Well pair located adjacent to hydropunch boring B14 that had elevated hydrocarbon concentrations, located adjacent offsite residence.

*Note that screened intervals may be modified based on conditions observed in the field.

ITEM 3. INSTALLATION OF DOWNGRADIENT MONITORING WELLS

Four offsite downgradient grab groundwater borings were proposed by GGTR within the commercial properties southwest of the site to delineate the downgradient extent of the plume. However, since the maximum detected onsite contaminant concentrations are present at the downgradient edge of the site, sufficient data are already available to scope installation of downgradient monitoring wells. In addition, with limited offsite locations readily accessible, scoping of downgradient monitoring wells is appropriate at this time. Therefore, monitoring wells MW-9A and MW-10A will be installed in lieu of two of the GGTR offsite borings, as shown on Figure 4R. In addition, if elevated initial contaminant concentrations are detected in onsite well MW-5B or offsite well MW–9A, then deep stepout well MW-9B will be installed to assess the vertical distribution of downgradient contamination. Likewise, if elevated concentrations are detected in onsite well MW-7B or offsite well MW–10A, then deep stepout well MW-10B will be installed. A more distant downgradient stepout well pair (MW-11A/B) will be installed in the event that any of these wells contain groundwater contaminant concentrations exceeding Final ESLs.

Details and rationale for each of the proposed new offsite monitoring wells are listed in Table 3.

Table 3 – Proposed New Offsite Monitoring Wells

Well Number	Approximate Screened Interval* (feet)	Rationale
Initial Wells		
MW-9A	10-15 (A)	Downgradient from onsite well STMW-5 that contains groundwater with hydrocarbon concentrations exceeding ESLs. Evaluate shallower conditions.
MW-10A	10-15 (A)	Downgradient from onsite boring B11 that contained grab groundwater with hydrocarbon concentrations exceeding ESLs. Evaluate shallower conditions.
Stepout Wells		
MW-9B	20-25 (B)	Downgradient from onsite well STMW-5 that contains groundwater with hydrocarbon concentrations exceeding ESLs. Will install this well to evaluate

		deeper conditions only if groundwater detected above ESLs in well MW-5B or well MW-9A
MW-10B	20-25 (B)	Downgradient from onsite boring B11 that contained grab groundwater with hydrocarbon concentrations exceeding ESLs. Will install to evaluate deeper conditions only if groundwater detected above ESLs in well_MW-7B or well MW-10A.
MW-11 A/11B	10-15 (A) 20-25 (B)	More distant downgradient well. Will only install if contaminant concentrations exceeding ESLs are detected at MW-9A, MW-9B, MW-10A or MW-10B. If contamination is not detected in B-zone wells, then MW-11B will not be installed.

*Note that screened intervals may be modified based on conditions observed in the field.

ITEM 4. REDUCE NUMBER OF INITIAL OFFSITE GRAB GROUNDWATER BORINGS AND INSTALL ADDITIONAL BORINGS USING DYNAMIC ASSESSMENT METHOD

Fourteen offsite "hydropunch" borings were proposed by GGTR to collect grab groundwater samples to assess the lateral extent of the plume and address the possible presence of offsite sources of contamination. To provide a more cost effective and proactive investigation plan, Pangea proposes to reduce the total number of initial borings, implement a dynamic assessment method for installing further stepout borings, and replace two downgradient borings with monitoring wells. The borings proposed by Pangea are shown on Figure 4R, and the rationale for the change in scope is discussed below.

Note that the "hydropunch" borings are referred to herein as grab groundwater borings since GGTR noted that the presence of hard bedrock at shallow depth at some of the prior boring locations required the use of a hollow-stem auger rig rather than the direct-push hydropunch system originally scoped. Therefore, depending on site conditions, grab groundwater borings will be installed using either a direct-push rig with hydropunch sampler, or with a small diameter hollow-stem auger rig to install a temporary PVC well casing. All field procedures for installing both grab groundwater borings and groundwater monitoring wells will be conducted in accordance with the Standard Operating Procedures detailed in Appendix B. Due to the low groundwater yields of subsurface materials, it is anticipated that some grab groundwater borings and monitoring well borings may need to be drilled dry and left open for several hours to several days in order to collect groundwater samples.

Six offsite upgradient and crossgradient (southeast) grab groundwater borings were proposed by GGTR along the east side of Broadway and north side of Coronado Avenue to assess potential offsite upgradient sources and address the crossgradient (southeast) extent of contamination. However, the single upgradient boring previously drilled by GGTR (Boring B1) only contained relatively low contaminant

concentrations (Figure 4R), suggesting that an offsite source does not exist. In addition, the property located upgradient of the site near GGTR's northeasternmost proposed boring is the California College of Arts campus, which has occupied the large property east of the site since 1922, and is unlikely to constitute a source of hydrocarbons. A Union 76 gasoline station is present northeast of the campus, and approximately 700 feet to the northeast of the site, but the topography indicates that it is unlikely that this potential source is hydrologically upgradient of the site. Therefore, Pangea proposes to install only two upgradient borings (B16 and B17), with provision for installing an additional stepout boring (B23) if hydrocarbon concentrations exceeding ESLs are detected in boring B16. Pangea also proposes to install boring B20 directly crossgradient (southeast) from the onsite boring with the maximum detected contaminant concentrations (B11) to assess the lateral extent of the onsite plume. The additional borings proposed by GGTR are not considered to be necessary, and will therefore not be installed.

Three offsite grab groundwater borings within the residential properties west of the site were proposed by GGTR to delineate the western crossgradient extent of the plume. The boring along Coronado Street (B18) will be retained. The easternmost GGTR-proposed boring in the rear yard of 5230 Coronado Street is very close to, and therefore duplicative of, boring B13, and therefore unnecessary. Proposed boring B21 in the rear yard of 5220-5222 Coronado Street would only be useful for defining the lateral extent of contamination if the contaminant plume extended beyond proposed boring B19. Therefore, Pangea proposes to install only one boring (B19), with the provision for installing an additional stepout boring (B21) if contaminant concentrations exceeding residential ESLs are detected in boring B19.

Stepout boring B22 will be installed within the commercial property south of the site to assess the southeastern lateral extent of the downgradient portion of the plume in the event that contaminant concentrations exceeding commercial ESLs are detected in initial samples collected from monitoring well MW-10A or MW-10B.

Details and rationale for each of the proposed grab groundwater sample locations are listed in Table 4.

Table 4 – Proposed Grab Groundwater Sample Locations

Well Number	Rationale
Initial Locations	
B16	Upgradient sampling point to verify lack of upgradient sources suggested by low concentrations detected in B1.

B17	Upgradient sampling point to verify lack of upgradient sources. Located approximately upgradient from onsite boring (B11) with maximum detected hydrocarbon concentrations, and at corner of developed shopping center property adjacent to California College of Arts.
B18	Crossgradient sampling point to assess whether a component of flow is directed northwest down Coronado Avenue. It would also assess the extent of any upgradient sources in the vicinity of B16.
B19	Crossgradient sampling point to assess lateral extent of contamination detected at STMW-5 and B13.
B20	Crossgradient sampling point to assess lateral extent of contamination detected in onsite boring (B11) with maximum detected hydrocarbon concentrations.
Stepout Locations	
B21	Crossgradient sampling point to assess lateral extent of contamination detected at STMW-5 and B13. Will only install if elevated concentrations are detected in B19.
B22	Crossgradient sampling point to assess lateral extent of downgradient contamination. Will only install if elevated concentrations are detected in MW-10A or MW-10B.
B23	Boring to provide further assessment of upgradient sources. Will only install if elevated concentrations are detected in B16.

ITEM 5. SOIL GAS SAMPLING

Since groundwater containing petroleum hydrocarbons exceeding vapor intrusion ESLs may extend beneath the commercial building immediately adjacent to the downgradient edge of the site, Pangea proposes to conduct soil gas sampling on both the upgradient and downgradient edges of the building to screen for possible vapor intrusion concerns. An additional soil gas sample is proposed for the residential property immediately west of the site. Temporary sampling probes will be set at approximately 5-foot depth to collect each sample. Proposed soil gas sampling locations are illustrated on Figure 4R. All soil gas samples will be collected using the methods described in the Standard Operating Procedures for Soil Gas Sampling (Appendix B) and will be analyzed at a California-certified laboratory for TPHg using EPA Method TO-3 and for BTEX and MTBE using EPA Method TO-15 or TO-14A.

ITEM 6. FEASIBILITY TESTING OF INTERIM REMEDIAL MEASURES

Given the presence of separate-phase hydrocarbons in well STMW-4 (and historically in well MW-3) and elevated (above ESLs) hydrocarbon concencentrations in soil and groundwater, additional interim remediation is merited (prior soil excavation is considered the only prior interim remediation). Sufficient onsite data have been collected to allow preliminary assessment of likely remedial technologies. The following is a brief review of several techniques for site remediation that are generally applicable to petroleum-contaminated sites with shallow groundwater. This evaluation has been conducted to provide a recommendation regarding remedial methods that should be feasibility tested in order to assess their potential effectiveness prior to selecting final remedial measures. The objective of implementing these techniques would be to remove sources of groundwater contamination and lower groundwater contaminant concentrations to levels that could potentially be amenable to natural attenuation, or enhanced bioremediation techniques.

Excavation

Excavation is a proven and effective technique for remediation of petroleum hydrocarbons. Excavation is most appropriate for shallow soil and rock and especially for low permeability materials where in situ remedial techniques have very limited effectiveness. This method is also a cost-effective option for undeveloped sites, where the excavation area is accessible and not beneath site facilities. Excavation can remove unsaturated soil, capillary fringe soil, and saturated soil. Soil is usually transported offsite for disposal, but soil can be treated and reused at the site in accordance with regulatory guidelines and approval. This method, including onsite treatment and reuse, was utilized for shallow soil from the former tank excavations at the site.

Further excavation could potentially be a cost-effective and feasible method at this site, especially if multi-level onsite groundwater sampling (described under Item 2 above) indicates that groundwater contamination is primarily present in relatively shallow horizons and that the fracture permeability of the bedrock limits the utility of insitu remedial methods. However, further evaluation of the feasibility of this method can not be conducted until further assessment of insitu methods and completion of tasks described in Item 2.

Groundwater Extraction

Groundwater extraction (GWE) is common approach for remediating hydrocarbon impacts to groundwater, especially where hydraulic control is required. GWE relies on submersible groundwater pumps to extract subsurface groundwater for aboveground, treatment and disposal, which can be costly. GWE was used extensively in the 1980's and early 1990's before being displaced by more cost-effective

insitu treatment methods, such as soil vapor extraction (SVE), air sparging (AS), oxidation, and enhanced biodegradation.

However, GWE is often implemented to facilitate remediation and hydraulic control of MTBE, given MTBE's high solubility and low adsorption rates. GWE is also conducted in conjunction with SVE (sometimes called dual-phase extraction) to help dewater the hydrocarbon smear zone and expose hydrocarbons to vapor extraction. This approach requires a network of extraction and discharge piping and equipment to extract, treat and dispose of the extracted water and vapor. Pangea does not recommend GWE alone as a remedial solution for this site for the following reason: (1) MTBE is not a constituent of concern at this site, (2) hydrocarbons are present in fine-grained soil which is not amenable to remediation by GWE, (3) the subsurface consists of very low permeability materials in the saturated zone (clay and fractured rock).

Soil Vapor Extraction

Soil vapor extraction is a common approach for remediating unsaturated soil. This approach uses an aboveground blower to extract vapor-phase hydrocarbons from the site subsurface. SVE also remediates hydrocarbons adsorbed to unsaturated soil that could pose a risk to groundwater quality. At sites with a fairly permeable capillary fringe and saturated zone, SVE can improve groundwater quality and can remove floating, separate-phase hydrocarbons. When saturated zone remediation is required, SVE is commonly combined with other technologies such as air sparging or groundwater extraction. Extracted vapors are typically treated aboveground with oxidizers or activated carbon. Since shallow vadose zone soils at the site do not appear to contain a significant contaminant mass at concentrations exceeding ESLs, and since the vadose zone consists of clay at much of the site, SVE is not recommended as a sole remedial solution.

Dual Phase Extraction

Dual-phase extraction (DPE) consists of the simultaneous extraction of groundwater and soil vapor, generally from the same wells. DPE can be implemented generally by one of three methods: 1) using submersible pumps to draw down the water table within the wells while using a vacuum pump system to extract soil vapor; 2) using a powerful vacuum pump system to extract both groundwater and vapor from the wellhead (generally used only on small diameter wells); 3) using a powerful vacuum pump and "stinger" (vacuum tube inserted below the water table) to both depress the water table and extract soil vapor from the vadose zone. Method 1 is generally used in relatively permeable environments, where groundwater extraction using pumps is feasible. However, site soils are relatively impermeable, so methods 2 and 3 are more likely to be effective. A benefit of using either method 2 or 3 at sites where

groundwater is confined or semi-confined is that the pressure-drop produced in the well casing can often enhance the rate of extraction of groundwater from the water-bearing zone in comparison to use of submersible pumps. In addition, these methods can often recover SPH from site soils that are not recoverable by bailing and pumping.

DPE is a common technique for remediating sites impacted with elevated concentrations of petroleum hydrocarbons and impacted with separate-phase hydrocarbons (free product), or at sites where the hydrocarbon smear zone at the capillary fringe represents a significant source of groundwater contamination. The presence of sheen in association with petroleum odor in some site monitoring wells (MW-3 and STMW-4) indicates that hydrocarbons in the smear zone may constitute an ongoing source of contamination. Therefore, dual-phase extraction might be a viable alternative because the fracture permeability of rock in the saturated zone may be amenable to dewatering of the hydrocarbon smear zone so that simultaneous SVE could reduce the mass present.

Pangea recommends a two-day DPE feasibility test. The test will be conducted using a portable aboveground vacuum pump equipped with a water/vapor separator, granular activated carbon (GAC) canister vapor treatment system or a catalytic oxidizer, and a tank for collection of groundwater. Pangea will notify the Bay Area Air Quality Management District (BAAQMD) prior to feasibility testing. The feasibility test will be conducted separately on wells MW-3A, MW-4A, MW-6A, and MW-7A. These wells are located in areas where shallow groundwater in several areas where shallow groundwater samples had high contaminant concentrations and/or sheen was observed in groundwater samples. Testing will consist of extraction of both vapor and groundwater from the test wells using the aboveground vacuum pump. During testing, Pangea will monitor wellhead vacuum in the test well and both vacuum and water levels in nearby "A" and "B" wells to attempt to assess the radius of influence and magnitude of response in the lateral and vertical directions. The testing will be conducted until responses stabilize or approximately 1 to 2 hours in each well. Pangea anticipates that testing on Day 1 will involve testing of individual wells, and testing on Day 2 will consist of more lengthy feasibility testing on one or more wells to optimize removal and to monitor response. Vapor samples will be periodically collected from the vapor extraction line and analyzed using a PID or organic vapor analyzer. At least one air sample will be collected for laboratory analysis from each well, with the sample typically collected near the end of the well test after readings have stabilized. In addition, air flow and groundwater extraction rates will be measured to use in estimating the mass removal rate. Collected groundwater would be disposed offsite or via permitted discharge to the local sanitary sewer. If elevated dissolved contaminant concentrations are detected in deeper "B" wells, the DPE testing will be conducted on one or more "B" wells.

Air Sparging

Air sparging (AS) is common technique for cost-effectively remediating petroleum hydrocarbons from saturated soil and groundwater. AS involves the injection of compressed air into the saturated zone to 'strip' hydrocarbons from saturated soil and groundwater for capture by SVE or DPE. AS also oxygenates groundwater and thereby stimulates hydrocarbon degradation. AS is routinely more cost effective than groundwater extraction because no large extraction and treatment equipment is required with AS, and operation and maintenance costs are low. AS wells are typically constructed with well screen starting approximately 10 feet or more below the water table, and well screen intervals are carefully selected to allow capture of hydrocarbon vapors created by sparging if low permeability units are present. Low flow AS is also a cost effective technique to stimulate hydrocarbon degradation of residual contamination that slowly diffuses out of the fine-grained materials at a given site.

AS appears to be an appropriate technique for this site. Therefore, Pangea recommends implementing an AS feasibility test at this site using a portable aboveground compressor system. Pangea recommends conducting AS testing on proposed deep-zone wells MW-1 and MW-3B. These wells are/will be located in areas where shallow groundwater groundwater samples had high contaminant concentrations, will be proximate to other site wells to be used for vapor capture and monitoring, and are located away from buildings on adjacent properties. In addition, feasibility testing will be conducted on MW-6B if contaminant concentrations in the MW-6A/MW-6B well pair are found to be elevated.

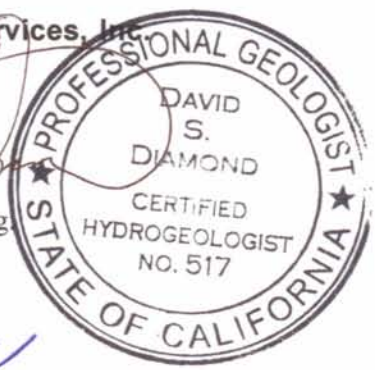
Testing will consist of injection of air into the test wells while monitoring wellhead pressures at the test wellhead and both pressure and water levels in nearby wells to attempt to assess the radius of influence and magnitude of response. Testing will be conducted until responses stabilize, or for approximately 30 minutes. AS testing will be conducted in conjunction with DPE testing to allow capture of hydrocarbon vapors created by sparging. During AS testing, Pangea will look for increasing vapor-phase hydrocarbon concentrations in DPE test effluent.

CLOSING

Pangea appreciates your efforts to review this Addendum in a timely manner. As noted in the GGTR report, the results of the investigation and feasibility testing will be presented in a site investigation report. As requested by your December 2005 letter, the report will include an updated Site Conceptual Model (SCM) incorporating detailed geologic cross sections.

If you have any questions or comments, please contact me at (510) 918-3399 or ddiamond@pangeaenv.com. You may also contact Bob Clark-Riddell at (510) 435-8664 or briddell@pangeaenv.com.

Sincerely,
Pangea Environmental Services, Inc.



David S. Diamond, Ph.D., C.Hg.
Senior Hydrogeologist

Bob Clark-Riddell, P.E.
Principal Engineer

Attachments:

Figure 1 – Site Location Map
Figure 2 - Petroleum Hydrocarbon Isoconcentration and Groundwater Elevation Map
Figure 3 – Geologic Cross Section C-C'
Figure 4R – Locations of Proposed New Monitoring Wells, Monitoring Wells to be Destroyed/Reconstructed, and Grab Groundwater Boring Locations
Figure 5 - Geologic Cross Section C-C' Showing Proposed Well Locations

Appendix A – Tables and Figures from GGTR Report (Tables 1A, 1B, 2A, 2B; Figure 4)
Appendix B – Standard Operating Procedures

CC: Gary Feiner, Rockridge Heights, LLC, 34 Shooner Hill, Oakland, California 94618

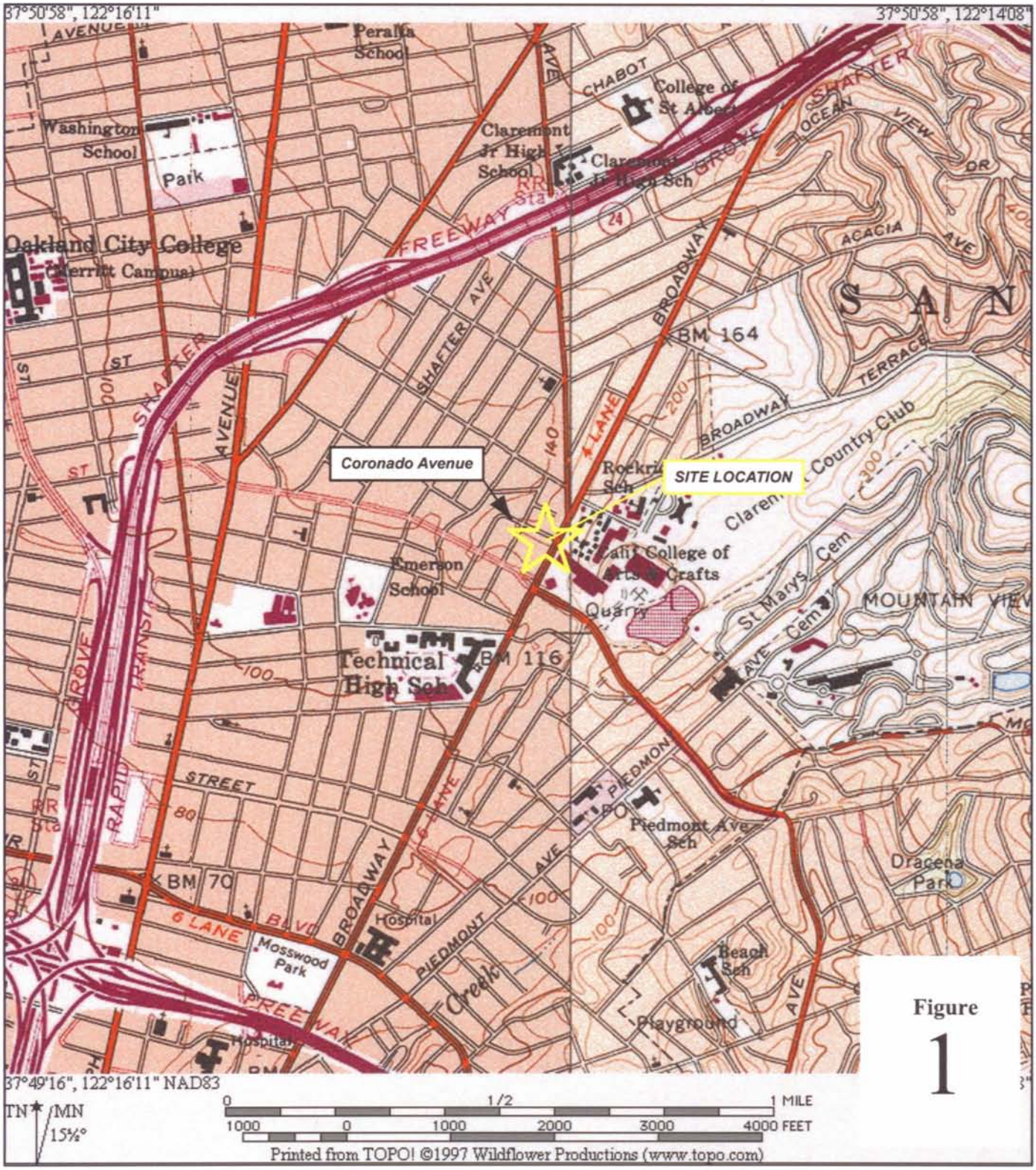


Figure 1

Former Exxon Station
5175 Broadway
Oakland, California

PANGEA

Site Location Map

FeinerBroadwaysite loc.ai 8/30/06

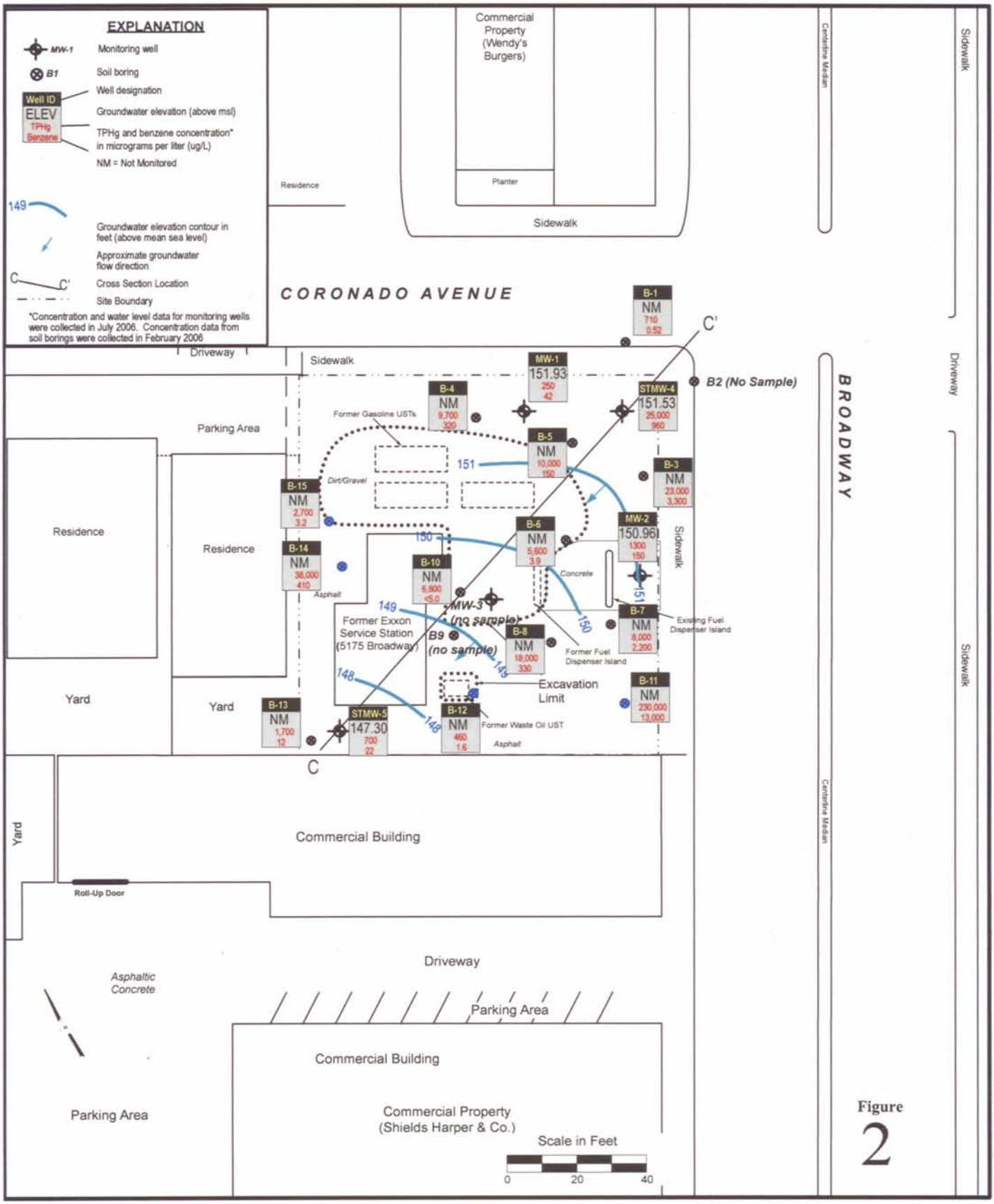


Figure 2

Former Exxon Station
5175 Broadway
Oakland, California

Petroleum Hydrocarbon Isoconcentration and Groundwater Elevation Map

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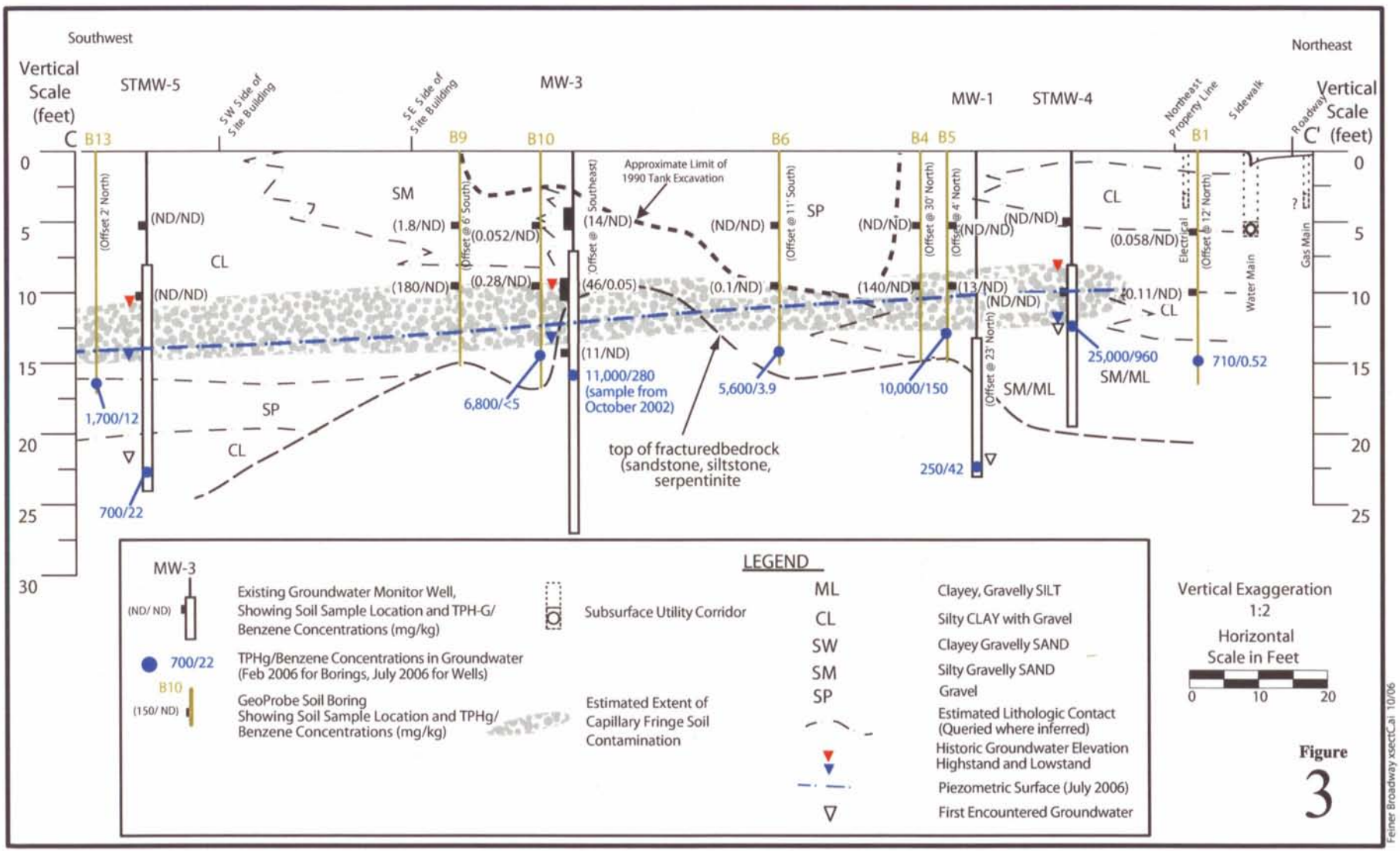

Former Exxon Station
5175 Broadway
Oakland, California

Geologic Cross Section C-C'

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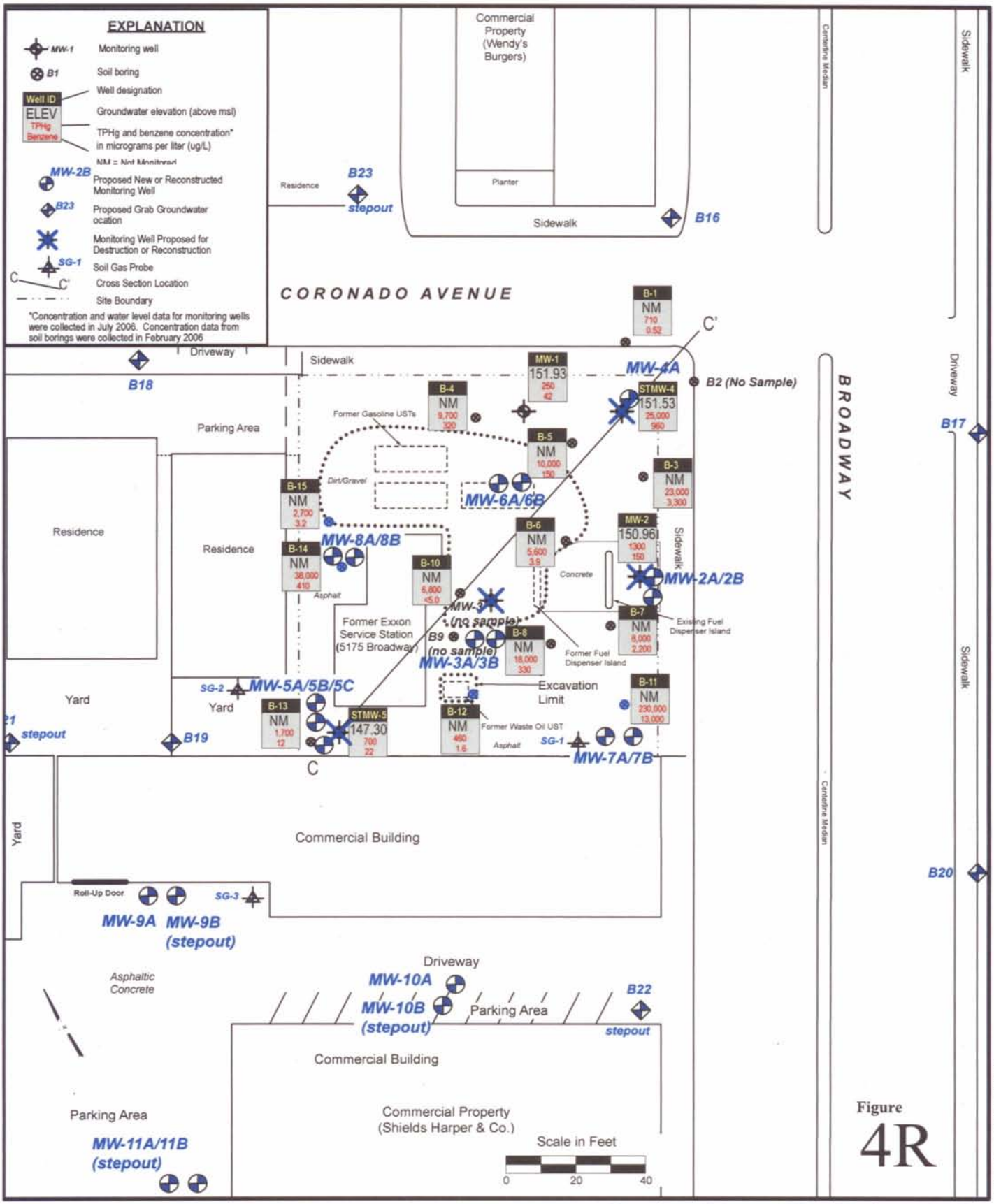
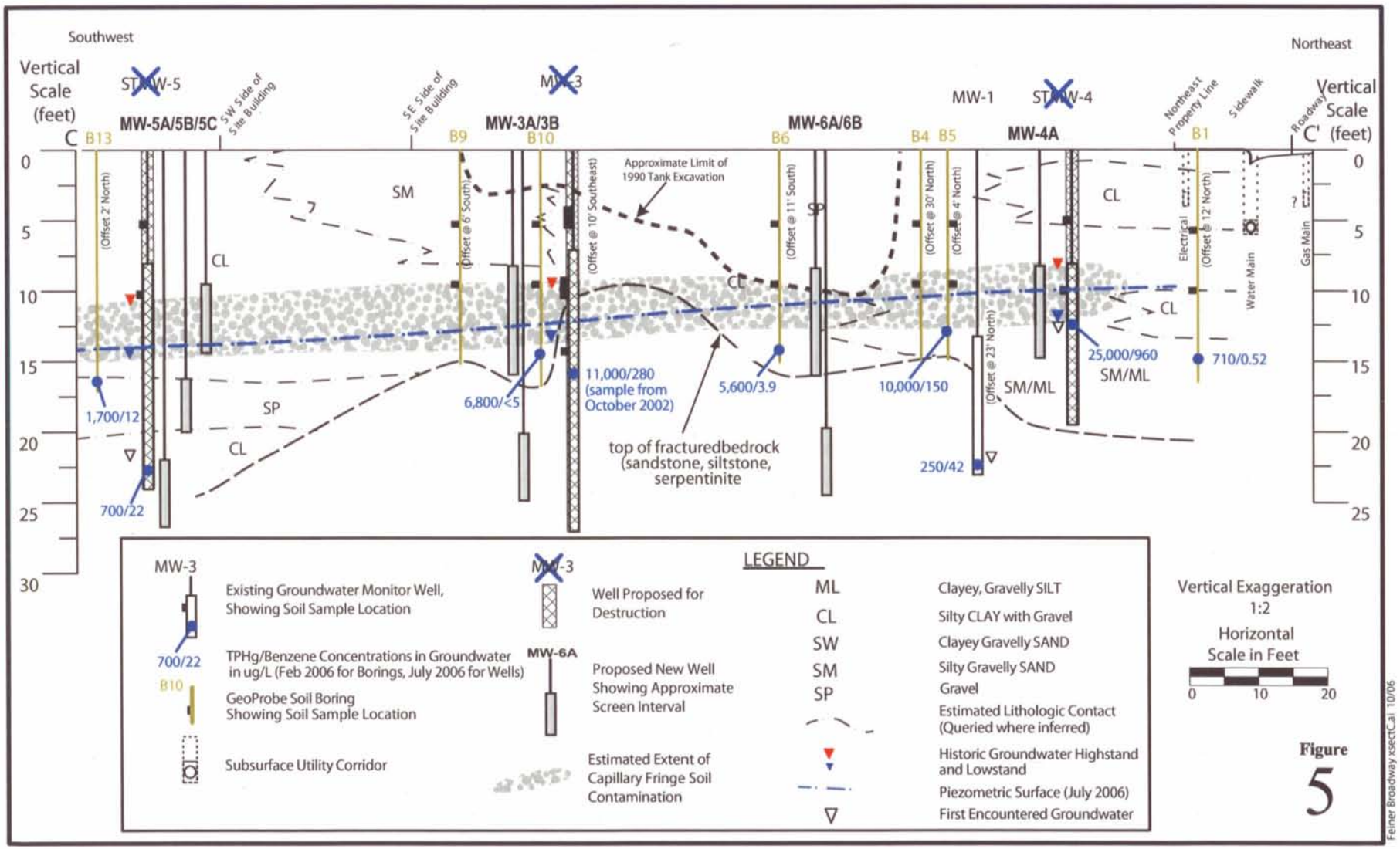


Figure
4R

Former Exxon Station
5175 Broadway
Oakland, California

Locations of Proposed New Monitoring Wells, Monitoring Wells to be Destroyed/Reconditioned, and Grab Groundwater Boring Locations

PANGEA



Former Exxon Station
5175 Broadway
Oakland, California

Geologic Cross Section C-C'
Showing Proposed Well Locations

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APPENDIX A

Tables and Figures from GGTR Report
(Tables 1A, 1B, 2A, 2B; Figure 4)

TABLE 1A

Results of Tank Removal, Over-Excavation & Well Installation Soil Sample Analysis

5175 Broadway Street, Oakland, CA

Sample ID	Sample Depth (fbg)	Sample Date	TPH-G (ppm)	TPH-D (ppm)	TOG (ppm)	HVOCs (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Total Xylenes (ppm)
S-1-W	7	1/10/90	ND	ND	ND	ND	ND	ND	ND	ND
S-2-N	10		970	--	--	--	ND	ND	13	15
S-3-N	10		120	--	--	--	ND	ND	ND	ND
S-3-S	10		930	--	--	--	ND	ND	ND	14
S-4-N	10		12	--	--	--	ND	ND	ND	0.13
S-4-S	10		55	--	--	--	ND	ND	ND	0.8
L1-L4 (Water)	10.5		6.9	--	--	--	0.053	ND	ND	0.81
S-P-1	2-3	1/31/90	ND	--	--	--	ND	ND	ND	ND
S-P-2	2-3		ND	--	--	--	ND	ND	ND	ND
S-P-3	2-3		34	--	--	--	ND	ND	ND	ND
MW-1	8-8.5	4/17/90	190	--	--	--	0.24	0.21	0.92	0.6
	13.5-14		180	--	--	--	1.7	1.4	2.4	6.4
MW-2	3-4.5	4/24/90	ND	--	--	--	0.0061	0.005	0.0057	0.026
	8-9		ND	--	--	--	0.006	0.005	0.0089	0.013
MW-3	4-5.5	4/17/90	14	--	--	--	ND	ND	ND	0.1
	9-10.5		46	--	--	--	0.05	ND	0.4	0.2
	14-14.5		11	--	--	--	ND	ND	ND	0.1
STMW-4	5	6/21/91	ND	--	--	--	ND	ND	ND	ND
	10		ND	--	--	--	ND	ND	ND	ND
STMW-5	5		ND	--	--	--	ND	ND	ND	ND
	10		ND	--	--	--	ND	ND	ND	ND
Laboratory Detection Limit			≤5	10	30	≤0.001	≤5.0	≤5.0	≤5.0	≤5.0
CRWQCB ESL – Shallow Soil			100	100	500	Varies	0.044	2.9	3.3	2.3
CRWQCB ESL – Deep Soil			100	100	1,000	Varies	0.044	2.9	3.3	2.3

NOTES:

TPH-G = total petroleum hydrocarbons (TPH) as gasoline (EPA Method 8015M)

TPH-D = TPH as diesel (EPA Method 3510); TOG = total oil & grease (SM 5030A)

HVOCs = halogenated volatile organic compounds (EPA Method 8010)

BTEX = benzene, toluene, ethylbenzene, total xylenes (EPA Method 8020)

fbg = feet below grade; mg/kg = milligrams per kilogram (parts per million); ND = concentration below associated laboratory reporting limit

-- = not analyzed for this constituent

CRWQCB/ESL = California Regional Water Quality Control Board's Interim Final – February 2005, Tier 1 Environmental Screening Level for shallow (<10 fbg) or deep (>10 fbg) soil at a residential land use permitted site with groundwater that is a potential source of drinking water

TABLE 1B

Boring Soil Sample Analysis - Additional Site Characterization, February 2006

5175 Broadway Street, Oakland, CA

Sample ID	Sample Depth (fbg)	Sample Date	TPH-G (ppm)	TPH-D (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Total Xylenes (ppm)	MTBE (ppm)	Fuel Oxygenates (ppm)
B1-6	6	2/1/06	0.058	ND<100	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B1-10	10		0.11	ND<100	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B2-6	6		0.15	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B2-9	9		ND<0.05	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B3-5	5	2/6/06	0.22	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B3-9	9		160	--	0.65	ND<0.500	ND<0.500	ND<1.000	ND<0.500	ND≤20
B4-5	5		ND<0.05	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B4-9	9		140	--	ND<0.500	ND<0.500	0.66	ND<1.000	ND<0.500	ND≤20
B5-5	5		ND<0.05	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B5-9[1]	9		13	ND<2.5	ND<0.25	ND<0.25	ND<0.25	ND<0.5	ND<0.25	ND≤10
B6-5	5		ND<0.05	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B6-9	9		0.1	ND<2.5	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B7-5	5		ND<0.05	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B7-9	9		ND<0.05	ND<2.5	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B8-5	5		0.053	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B8-9	9		22	--	ND<0.25	ND<0.25	ND<0.25	ND<0.5	ND<0.25	ND≤10
B9-5	5		1.8	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B9-9	9		180	ND<2.5	ND<0.500	ND<0.500	ND<0.500	ND<1.000	ND<0.500	ND≤20
B10-5	5		0.052	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
B10-9[2]	9		0.28	--	ND<0.005	ND<0.005	ND<0.005	ND<0.01	ND<0.005	ND≤0.200
CRWQCB ESL – Shallow Soil			100	100	0.044	2.9	3.3	2.3	0.023	Varies

NOTES:

TPH-G = total petroleum hydrocarbons (TPH) as gasoline (EPA Method 5035A/GCMS)

TPH-D = TPH as diesel (EPA Method 3510C/8015M)

BTEX = benzene, toluene, ethylbenzene, total xylenes (EPA Method 8260)

MTBE = Methyl Tertiary-Butyl Ether (EPA Method 8260)

Fuel Oxygenates by EPA Method 8260B

fbg = feet below grade; mg/kg = milligrams per kilogram (parts per million); ND = concentration below associated laboratory reporting limit

CRWQCB/ESL = California Regional Water Quality Control Board's Interim Final – February 2005, Tier 1 Environmental Screening Level for shallow soil (<10 fbg) at a residential land use permitted site with groundwater that is a potential source of drinking water

[1] Sample also analyzed for cadmium (ND<1.0), chromium (22), lead (14), nickel (36), and zinc (87)

[2] Sample also analyzed for cadmium (ND<1.0), chromium (40), lead (10), nickel (32), and zinc (24)

TABLE 2A

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / MW-1

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
MW-1	4/30/89	97.71	--	--	No sheen or odor	200	--	--	--	18 / 5 / 2 / 12
	5/17/90	97.71	9.26	88.45	--	--	--	--	--	-- / -- / -- / --
	9/26/90	97.71	9.92	87.79	No sheen Mild petroleum odor	1300	--	--	--	55 / 31 / 120 / 100
	1/14/91	97.71	9.54	88.17	No sheen Mild petroleum odor	3100	--	--	--	350 / 83 / 86 / 130
	7/3/91	102.04	9.42	92.62	No sheen Light petroleum odor	580	--	--	--	32 / 41 / 40 / 55
	11/11/91	102.04	9.45	92.59	No sheen Mild petroleum odor	330	--	--	--	20 / 2 / 2 / 11
	3/4/92	101.83	7.93	93.9	No sheen Light petroleum odor	810	--	--	--	11 / 5 / 10 / 23
	6/2/92	101.83	8.98	92.85	No sheen Mild sewage odor	2200	--	--	--	93 / 32 / 40 / 120
	9/28/92	101.83	9.29	92.54	No sheen Mild sewage odor	2900	--	--	--	24 / 78 / 19 / 37
	1/11/93	101.83	7.56	94.27	No sheen Light sewage odor	1700	--	--	--	5.7 / 6 / 11 / 28
	8/15/94	101.83	9.19	92.64	No sheen Mild sewage odor	2000	--	--	--	120 / 3 / 6 / 16
Laboratory Reporting Limit						≤500	50	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A (Cont'd)

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / MW-1

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
MW-1	11/7/96	97.5	8.73	88.77	No sheen Light sewerage odor	1200	270	--	ND<0.5	3 / 1.1 / 1.5 / 3.8
	2/12/97	97.5	7.92	89.58	No sheen Light sewerage odor	1800	ND<50	--	ND<0.5	13 / 5.7 / 4.8 / 17
	6/16/97	97.5	9.04	88.46	No sheen/Very Light sewerage odor	330	ND<50	--	ND<0.5	2.7 / ND<0.5 / ND<0.5 / 1.2
	9/30/97	97.5	7.56	89.94	No sheen or odor	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	1/27/98	97.5	7.96	89.54	No sheen or odor	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	4/24/98	97.5	7.98	89.52	Light rainbow sheen Light sewage odor	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	8/17/98	97.5	8.98	88.52	No sheen Light sewage odor	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	11/16/98	97.5	8.9	88.9	No sheen Light sewage odor	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	2/16/99	97.5	8.64	88.86	Light rainbow sheen Slight sewage	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	5/17/99	97.5	8.5	89	No sheen Strong sewage	280	--	120 (DIPE)	ND<0.5	1.1 / 0.6 / ND<0.5 / ND<0.5
	8/17/99	97.5	9.24	88.26	Light sheen Sewage odor	790	86	ND	ND<5	5.6 / 4.3 / 4.5 / 11
Laboratory Reporting Limit						≤500	50	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A (Cont'd)

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / MW-1

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
MW-1	11/17/99	97.5	10.44	87.06	Light rainbow sheen Light sewage odor	1300	--	ND	ND<1	3.6 / 1.9 / 2.7 / 6.6
	2/17/00	97.5	8.48	89.02	Light rainbow sheen Light sewage odor	580	--	ND	ND<5	1.1 / 2.3 / 3.6 / 4.9
	5/17/00	97.5	8.24	89.26	Light rainbow sheen Light sewage odor	1500	--	130 (DIPE)	ND<5	130 / 6.8 / 6.1 / ND<5
	8/17/00	97.5	8.77	88.73	Rainbow sheen Light sewage odor	550	--	ND	ND<25	160 / ND<25 / ND<25 / ND<25
	11/15/00	97.5	9.04	88.46	Light rainbow sheen Light sewage odor	130	--	22 (DIPE)	ND<5	ND<5 / ND<5 / ND<5 / ND<5
	2/16/01	97.5	7.6	89.9	No sheen Light sewage odor	400	--	110 (DIPE)	ND<5	26 / ND<5 / ND<5 / ND<5
	1/11/02	97.5	8.08	89.42	No sheen Sewage odor	600	160A	110 (DIPE)	52 (7.9)	74 / 53 / 14 / 52
	7/1/02	161.03 (resurveyed)	9.02	152.01	No sheen Sewage odor	670	280LY	ND	ND<5	25 / ND<5 / ND<5 / ND<5
	10/4/02	161.03	9.74	151.29	Rainbow sheen Sewage odor	1800	520	60 (DIPE)	14	130 / 7.8 / 8.1 / 14
Laboratory Reporting Limit						≤500	50	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / MW-2

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
MW-2	4/30/89	97.78	--	--	No sheen or odor	230	--	--	--	39 / 18 / 5 / 23
	5/17/90	97.78	--	--	--	--	--	--	--	-- / -- / -- / --
	9/29/90	97.78	10.83	86.95	No sheen Mild petroleum odor	850	--	--	--	940 / 5 / 25 / 47
	1/14/91	97.78	10.63	87.15	No sheen or odor	3100	--	--	--	30 / 52 / 24 / 34
	7/3/91	102.02 (resurveyed)	10.08	91.94	No sheen Light petroleum odor	1590	--	--	--	30 / 52 / 24 / 34
	11/11/91	102.02	10.21	91.81	No sheen Mild petroleum odor	960	--	--	--	320 / 15 / 4 / 29
	3/4/92	102.02	8.7	92.97	No sheen Light petroleum odor	1500	--	--	--	9.5 / 8.4 / 9.8 / 22
	6/2/92	102.02	9.52	92.15	No sheen Mild sewage odor	2800	--	--	--	84 / 41 / 59 / 95
	9/28/92	102.02	10.09	91.58	No sheen Mild sewage odor	1600	--	--	--	47 / 20 / 47 / 97
	1/11/93	102.02	8.52	93.15	No sheen Light sewage odor	2500	--	--	--	8.6 / 10 / 17 / 32
	8/15/94	97.49 (resurveyed)	9.91	91.76	No sheen Light petroleum odor	6000	--	--	--	450 / 60 / 100 / 95
Laboratory Reporting Limit						≤500	50	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A (Cont'd)

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / MW-2

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
MW-2	11/7/96	97.49	10.02	87.47	No sheen/Very Light sewage odor	4200	780	--	ND<0.5	25 / 4.9 / 8.1 / 14
	2/12/97	97.49	8.91	88.58	No sheen/Very Light sewage odor	1800	5700	--	ND<0.5	16 / 3.1 / 3.4 / 8.8
	6/16/97	97.49	9.75	87.74	No sheen/Very Light sewage odor	2500	ND<50	--	ND<0.5	22 / 5.1 / 7.8 / 11
	9/30/97	97.49	7.89	89.51	No sheen or odor	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	1/27/98	97.49	8.38	89.11	No sheen or odor	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	4/24/98	97.49	8.68	88.81	No sheen Slight sewage odor	2100	1400	--	ND<0.5	18 / 6.5 / 4.8 / 21
	8/17/98	97.49	9.74	87.75	No sheen or odor	2900	ND<50	--	ND<0.5	5.1 / 4.5 / 5.8 / 17
	11/16/98	97.49	10.14	87.35	No sheen Light sewage odor	1400	ND<50	--	ND<0.5	2.1 / 1.9 / 2.3 / 4.8
	2/16/99	97.49	8.92	88.57	No sheen Slight sewage odor	1600	ND<50	--	ND<2.5	82 / 16 / ND<2.5 / 40
	5/17/99	97.49	9.26	88.23	No sheen Mild sewage odor	8200	--	ND	ND<250	43 / 73 / 140 / 100
	8/17/99	97.49	10.04	87.45	No sheen sewage odor	2900	260	ND	ND<5	20 / 81 / 17 / 38
Laboratory Reporting Limit						≤500	50	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A (Cont'd)
Historical Results of Groundwater Sample Analysis & Fluid-Level Data / MW-2
5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
MW-2	11/17/99	97.49	11.52	85.97	Light rainbow sheen Light sewage odor	2600	ND<50	ND	ND<1	7 / 3.7 / 5.3 / 12.9
	2/17/00	97.49	9.5	87.99	Light rainbow sheen Light sewage odor	1700	--	ND	ND<5	3.2 / 6.8 / 11 / 12.3
	5/17/00	97.49	8.84	88.65	No sheen Light sewage odor	3800	--	ND	ND<25	450 / 65 / 110 / 80
	8/17/00	97.49	8.5	88.99	No sheen or odor	4300	--	ND	ND<50	440 / ND<50 / 78 / ND<50
	11/15/00	97.49	9.94	87.55	No sheen Light sewage odor	5800	--	ND	ND<25	320 / 41 / 78 / 64
	2/16/01	97.49	8.52	88.97	No sheen or odor	2200	--	ND	ND<5	110 / 20 / 38 / 33
	1/11/02	97.49	8.82	88.67	No sheen or odor	3100	620A	ND	ND<50	280 / 86 / 84 / 110
	7/1/02	160.98 (resurveyed)	9.64	151.34	No sheen or odor	2600	940LY	ND	ND<10	300 / 29 / 45 / 27
	10/4/02	160.98	10.52	150.46	No sheen sewage odor	4000	390	ND	ND<25	440 / 66 / 140 / 120
Laboratory Reporting Limit						≤500	50	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / MW-3

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
MW-3	4/30/90	98.14	--	--	No sheen Mild petroleum odor	56000	--	--	--	3600 / 8600 / 1300 / 7200
	5/17/90	98.14	12.42	85.72	--	--	--	--	--	-- / -- / -- / --
	9/26/90	98.14	13.5	84.64	No sheen Mild petroleum odor	54000	--	--	--	5100 / 420 / 1600 / 8000
	1/14/91	98.14	12.58	85.56	Light sheen Strong petroleum odor	35000	--	--	--	2600 / 6600 / 1500 / 5700
	7/3/91	102.46 (resurveyed)	12.08	90.38	Rainbow sheen Strong petroleum odor	33000	--	--	--	4120 / 4300 / 1400 / 4800
	11/11/91	102.46	12.29	90.17	Very light rainbow sheen/Mild petroleum odor	57000	--	--	--	3900 / 8400 / 2100 / 14000
	3/4/92	102.18 (resurveyed)	10.26	91.92	Brown sheen Strong petroleum odor	57000	--	--	--	720 / 870 / 81 / 3100
	6/2/92	97.94 (resurveyed)	11.4	90.78	Rainbow sheen Mild petroleum odor	50000	--	--	--	240 / 240 / 220 / 740
	9/28/92	97.94	12.64	89.54	Rainbow sheen spots Strong petroleum odor	64000	--	--	--	110 / 93 / 97 / 250
	1/11/93	97.94	10.1	92.08	Rainbow sheen Mild petroleum odor	68000	--	--	--	210 / 280 / 360 / 990
	8/15/94	97.94	12.2	89.98	Brown sheen spots Mild petroleum odor	50000	--	--	--	870 / 1200 / 1300 / 3000
Laboratory Reporting Limit						≤500	≤250	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2A Continued on Following Page

TABLE 2A (Cont'd)

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / MW-3

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
MW-3	11/7/96	97.49	12.4	85.54	Very thin layer of brown sheen/ Light petroleum odor	68000	470	--	ND<0.5	33 / 27 / 63 / 120
	2/12/97	97.49	10.23	87.71	Brown sheen spots Light petroleum odor	25000	3500	--	ND<0.5	39 / 43 / 15 / 91
	6/16/97	97.49	11.79	86.15	Light brown sheen spots/Very light petroleum odor	9700	ND<50	--	ND<0.5	26 / 29 / 45 / 81
	9/30/97	97.49	9.4	88.54	No sheen or odor	6000	1600	--	ND<0.5	43 / 36 / 12 / 11
	1/27/98	97.49	9.8	88.14	No sheen or odor	380	560	--	ND<0.5	5.7 / 4.1 / 1.7 / 9.1
	4/24/98	97.49	9.9	88.04	Rainbow sheen Light sewerage odor	ND<50	680	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	8/17/98	97.49	11.46	86.48	No sheen or odor	16000	ND<50	--	ND<0.5	200 / 18 / 31 / 82
	11/16/98	97.49	12.4	85.54	Rainbow sheen Strong sewerage odor	68000	ND<50	--	ND<0.5	86 / 54 / 69 / 130
	2/16/99	97.49	10.72	87.2	Rainbow sheen Strong sewerage odor	33000	ND<50	--	170	270 / 110 / ND<5 / 770
	5/17/99	97.49	10.54	87.4	Rainbow sheen Strong petroleum odor	72000	--	ND	ND<250	280 / 230 / 320 / 890
	8/17/99	97.49	11.92	86.02	Rainbow sheen Strong petroleum odor	20000	1800	ND	ND<5	51 / 41 / 61 / 130
Laboratory Reporting Limit						≤500	≤250	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2A Continued on Following Page

TABLE 2A (Cont'd)

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / MW-3

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
MW-3	11/17/99	97.49	13.6	84.34	Rainbow sheen Strong petroleum odor	1700	--	ND	ND<1	39 / 22 / 31 / 84
	2/17/00	97.49	10.68	87.26	Rainbow sheen Strong petroleum odor	8800	--	ND	ND<5	16 / 39 / 74 / 90
	5/17/00	97.49	10.25	87.69	Rainbow sheen Strong petroleum odor	22000	--	ND	ND<5	300 / 260 / 410 / 940
	8/17/00	97.49	11.84	86.1	Rainbow sheen Strong petroleum odor	15000	--	ND	ND<50	230 / 140 / 470 / 750
	11/15/00	97.49	11.82	86.12	Rainbow sheen Strong petroleum odor	12000	--	ND	ND<25	250 / 210 / 390 / 700
	2/16/01	97.49	9.68	88.26	Rainbow sheen Strong petroleum odor	7400	--	ND	ND<5	40 / 72 / 100 / 250
	1/11/02	97.49	9.58	88.36	Rainbow sheen Petroleum odor	9300	1900B	ND	ND<25	230 / 200 / 290 / 580
	7/1/02	161.43 (resurveyed)	11.14	150.29	Rainbow sheen Sewerage odor	13000	5200LY	ND	ND<13	230 / 220 / 450 / 890
	10/4/02	161.43	12.82	148.61	Rainbow sheen Petroleum odor	11000	4900	ND	ND<25	280 / 170 / 450 / 730
Laboratory Reporting Limit						≤500	≤250	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / STMW-4

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
STMW-4	7/3/91	103.581	11	92.58	Light rainbow sheen Mild petroleum odor	3100	--	--	--	610 / 62 / 39 / 150
	11/11/91	103.58	11.08	92.5	Light rainbow sheen Strong petroleum odor	3600	--	--	--	990 / 15 / 2.6 / 180
	3/4/92	101.08 (resurveyed)	9.44	91.64	Rainbow sheen spots Mild petroleum odor	5000	--	--	--	35 / 20 / 22 / 71
	6/2/92	98.8 (resurveyed)	10.32	92.76	No sheen Light petroleum odor	13000	--	--	--	140 / 45 / 63 / 210
	9/28/92	98.8	10.76	92.32	Brown sheen spots Mild petroleum odor	40000	--	--	--	35 / 20 / 48 / 110
	1/11/93	98.8	9.28	93.8	Brown sheen spots Mild petroleum odor	24000	--	--	--	26 / 88 / 92 / 280
	8/15/94	98.8	10.54	92.54	Light rainbow sheen spots/Light petroleum odor	9000	--	--	--	500 / 34 / 46 / 130
	11/7/96	98.8	10.37	88.43	Rainbow sheen spots Very light petroleum odor	13000	180	--	ND<0.5	40 / 2.9 / 7.8 / 19
	2/12/97	98.8	9.36	89.44	Rainbow sheen spots Very light petroleum odor	5300	5700	--	ND<0.5	95 / 5.3 / 5.9 / 18
	6/16/97	98.8	10.4	88.4	No sheen/Very light sewerage odor	5300	ND<50	--	ND<0.5	37 / 6.2 / 1.7 / 11
	9/30/97	98.8	8.5	90.3	No sheen or odor	2700	ND<50	--	ND<0.5	42 / 7.7 / 5.7 / 26
Laboratory Reporting Limit						≤1,250	≤250	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A (Cont'd)

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / STMW-4

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
STMW-4	1/27/98	98.8	8.9	89.9	No sheen or odor	3000	300	--	ND<0.5	60 / 17 / 12 / 49
	4/24/98	98.8	9.5	89.3	Rainbow sheen Strong sewerage odor	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	8/17/98	98.8	10.36	88.44	Rainbow sheen Light petroleum odor	29000	ND<50	--	ND<0.5	36 / 24 / 59 / 160
	11/16/98	98.8	10.56	88.24	Rainbow sheen Strong petroleum odor	13000	ND<50	--	--	26 / 21 / 20 / 41
	2/16/99	98.8	9.64	89.16	Rainbow sheen Strong petroleum odor	32000	ND<50	--	ND<100	660 / 16 / 16 / 150
	5/17/99	98.8	9.96	88.84	Rainbow sheen Strong petroleum odor	13000	--	ND	ND<250	1600 / 30 / 45 / 78
	8/17/99	98.8	10.64	88.16	Rainbow sheen Light petroleum odor	12000	990	ND	ND<5	260 / 22 / 33 / 72
	11/17/99	98.8	12.02	86.78	Rainbow sheen Light petroleum odor	7900	--	ND	ND<1	21 / 12 / 17 / 40
	2/17/00	98.8	9.32	98.48	Rainbow sheen Light petroleum odor	4900	--	ND	ND<5	8.9 / 21 / 38 / 50
	5/17/00	98.8	9.65	89.15	Rainbow sheen Strong petroleum odor	9600	--	ND	ND<50	840 / ND<50 / 60 / ND<50
	8/17/00	98.8	10.34	88.46	Rainbow sheen Strong petroleum odor	5100	--	ND	ND<50	680 / ND<50 / 62 / ND<50
Laboratory Reporting Limit						≤1,250	≤250	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A (Cont'd)

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / STMW-4

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
STMW-4	11/15/00	98.8	10.52	88.28	Rainbow sheen Strong petroleum odor	3900	--	34 (DIPE)	ND<25	640 / ND<25 / 26 / 27
	2/16/01	98.8	9.2	89.6	Rainbow sheen Light petroleum odor	5700	--	26 (DIPE)	ND<25	560 / ND<25 / ND<25 / ND<25
	1/11/02	98.8	9.58	89.22	No sheen or odor	4900	930	ND	ND<250	560 / 59 / 25 / ND<25
	7/1/02	162.31 (resurveyed)	10.28	152.03	Rainbow sheen Sewerage odor	6700	6700	ND	ND<13	470 / 18 / 32 / 45
	10/4/02	162.31	11.08	151.23	Rainbow sheen Petroleum odor	13000	2900	35 (DIPE)	ND<25	590 / 26 / 65 / 110
Laboratory Reporting Limit						≤1,250	≤250	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

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TABLE 2A (Cont'd)
Historical Results of Groundwater Sample Analysis & Fluid-Level Data / STMW-5
5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
STMW-5	7/3/91	101.99	13.29	88.07	No sheen or odor	690	--	--	--	99 / 81 / 19 / 98
	11/11/91	101.99	14	87.99	No sheen/Very light petroleum odor	410	--	--	--	61 / 2.4 / 1.4 / 20
	3/4/92	101.36 (resurveyed)	11.8	89.56	No sheen/Very light petroleum odor	460	--	--	--	13 / 6.5 / 11 / 18
	6/2/92	101.36	13.06	88.3	No sheen Mild petroleum odor	1800	--	--	--	27 / 20 / 21 / 43
	9/28/92	101.36	14.04	87.32	No sheen Mild sewerage odor	1500	--	--	--	14 / 6.1 / 18 / 22
	1/11/93	101.36	11.61	89.75	No sheen Light sewerage odor	800	--	--	--	1.8 / 3 / 3.1 / 9.4
	8/15/94	101.36	13.85	87.51	No sheen Mild sewerage	3000	--	--	--	320 / 62 / 34 / 220
	11/7/96	97.14 (resurveyed)	13.67	83.47	Rainbow sheen spots Very light petroleum odor	1200	330	--	ND<0.5	11 / 1.7 / 4.4 / 13
	2/17/97	97.14	12.07	82.07	Rainbow sheen spots Very light petroleum odor	1000	3700	--	ND<0.5	11 / 17 / 1.7 / 9.7
	6/19/97	97.14	13.33	83.81	No sheen /Very light sewerage odor	950	2300	--	ND<0.5	7.4 / 1 / 1 / 7.2
	9/30/97	97.14	11.24	85.9	No sheen Light sewerage odor	710	1100	--	ND<0.5	5.8 / 4 / 1 / 1
Laboratory Reporting Limit						≤250	50	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

TABLE 2A (Cont'd)

Historical Results of Groundwater Sample Analysis & Fluid-Level Data / STMW-5

5175 Broadway Street, Oakland, CA

Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
STMW-5	1/27/98	97.14	11.64	85.5	No sheen Light sewerage odor	340	1100	--	ND<0.5	2 / 1.8 / 1.6 / 8.2
	4/24/98	97.14	11.84	85.3	Rainbow sheen Strong petroleum odor	3300	ND<50	--	ND<0.5	12 / 9.4 / 8.5 / 37
	8/17/98	97.14	13.2	83.94	Rainbow sheen Light sewerage odor	5300	ND<50	--	ND<0.5	26 / 17 / 14 / 39
	11/16/98	97.14	13.74	83.4	Rainbow sheen Strong sewerage odor	ND<50	ND<50	--	ND<0.5	ND<0.5 / ND<0.5 / ND<0.5 / ND<0.5
	2/16/99	97.14	12.22	84.92	Rainbow sheen Strong sewerage odor	950	ND<50	--	11	150 / 3.8 / 1.4 / 14
	5/17/99	97.14	12.58	84.56	Rainbow sheen Mild petroleum odor	2800	--	ND	30	67 / 9.4 / ND<2.5 / 16
	8/17/99	97.14	13.48	83.66	Rainbow sheen Light petroleum odor	2800	230	ND	ND<5	18 / 17 / 18 / 36
	11/17/99	97.14	14.88	82.26	Rainbow sheen Light petroleum odor	1600	--	ND	ND<1	3.9 / 2.3 / 3.2 / 7.5
	2/17/00	97.14	12.56	84.58	Rainbow sheen Light petroleum odor	770	--	ND	ND<5	1.5 / 3.2 / 5.8 / 7
	5/17/00	97.14	12.08	85.06	Rainbow sheen Strong petroleum odor	4500	--	ND	ND<25	ND<25 / ND<25 / ND<25 / ND<25
	8/17/00	97.14	13.56	83.58	Rainbow sheen Strong petroleum odor	2900	--	ND	ND<10	170 / 64 / 100 / 250
Laboratory Reporting Limit						≤250	50	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

Table 2 Continued on Following Page

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Well	Sample Date	TOC Elevation (Feet MSL)	DTW* (Feet TOC)	GW Elevation (Feet MSL)	Product/Odor/Sheen	TPH-G (ug/l)	TPH-D (ug/l)	Fuel Oxygenates (ug/l)	MTBE (ug/l)	B/T/E/X (ug/l)
STMW-5	11/15/00	97.14	13.28	83.86	Rainbow sheen Strong petroleum odor	2100	--	ND	ND<5	120 / 24 / 40 / 54
	2/16/01	97.14	11.6	85.54	Rainbow sheen Light petroleum odor	850	--	ND	ND<5	58 / 9.8 / 9.4 / 18
	1/11/02	97.14	11.72	85.42	Rainbow sheen Sewerage odor	920	ND<50	ND	13	76 / 16 / 16 / 28
	7/1/02	160.65 (resurveyed)	13.14	147.51	Rainbow sheen Sewerage odor	4300	1500LY	ND	ND<5	71 / 14 / 14 / 36
	10/4/02	160.65	14.52	146.13	Rainbow sheen Petroleum odor	1400	60	ND	ND<5	71 / 17 / 26 / 35
Laboratory Reporting Limit						≤250	50	≤50	0.5 (1)	0.5 / 0.5 / 0.5 / 1.0
CRWQCB MSWQO (MCL)						NC	NC	Varies	5	1 / 150 / 700 / 1,750
CRWQCB February 2005 Tier 1 ESL						100	100	Varies	5	1.0/40/30/13

NOTES: TOC - top of well casing (north side)

DTW - depth to water relative to TOC

ug/L - micrograms per liter (parts per billion)

TPH-G - Total Petroleum Hydrocarbons as Gasoline (SW8020F)

TPH-D – TPH as Diesel (EPA Method 8015M)

Fuel Oxy – Fuel Oxygenates by EPA Method 8260B

MTBE - Methyl Tertiary Butyl Ether (EPA Method 8260)

BTEX - Benzene / Toluene / Ethylbenzene / Total Xylenes (SW8020F)

MSL - Mean Sea Level

ND - not detected above laboratory reporting limit

NC - no criteria established

-- - not analyzed for this constituent

fbg - feet below grade surface

L - Lighter hydrocarbons contributed to quantitation; Y - Sample exibits non-standard fuel pattern

CRWQCB MSWQO (Primary MCL) = California Regional Water Quality Control Board, Municipal Supply Water Quality Objective; Primary Maximum Contaminant Level

CRWQCB/ESL = CRWQCB's February 2005 Tier 1Environmental (Risk-Based) Screening Level; Levels shown are for Groundwater, which IS considered a threatened drinking water resource (residential land use)

TABLE 2B

Grab Groundwater Sample Analysis - Additional Site Characterization, February 2006

5175 Broadway Street, Oakland, CA

Sample ID	Sample Date	Depth to Water*	TPH-G (ug/l)	TPH-D (ug/l)	Benzene (ug/l)	Toluene (ug/l)	Ethylbenzene (ug/l)	Total Xylenes (ug/l)	MTBE (ug/l)	Fuel Oxygenates (ug/l)
B1-W	2/1/06	9.5	710	ND<84	0.52	0.59	ND<0.50	0.66	ND<1.0	ND≤100
B3-W	2/8/06	*9.63*	23,000	ND<280	3,300	660	170	910	ND<50	380 (DIPE)
B4-W	2/8/06	*8.24*	9,700	--	320	13	200	180	ND<20	1,300 (DIPE), 12 (EDC)
B5-W	2/8/06	*6.96*	10,000	--	150	11	210	190	ND<10	ND≤1,000
B6-W	2/6/06	12.1	5,600	--	3.9	3.1	54	61	ND<5.0	ND≤500
B7-W	2/8/06	*11.72*	8,000	--	2,200	300	240	830	ND<20	53 (EDC)
B8-W	2/8/06	*9.97*	18,000	--	330	53	440	1,200	ND<20	11 (EDC)
B10-W	2/6/06	13.3	6,800	--	ND<5.0	5.7	170	69	ND<10	ND≤1,000
B11-W	2/10/06	14.3	230,000	--	13,000	19,000	960	20,000	ND<200	150 (EDC)
B12-W	2/3/06	7.92	460	--	1.6	2.1	1.6	3.5	ND<1.0	0.62 (EDC)
B13-W	2/3/06	11.67	1,700	ND<60	12	9.4	18	22	ND<5.0	ND≤500
B14-W	2/6/06	13.1	38,000	--	410	25	290	95	ND<50	ND≤5,000
B15-W	2/1/06	8.75	2,700	ND<620	3.2	2.7	22	4.3	ND<5.0	ND≤500
CRWQCB ESL			100	100	1	40	30	20	5	NC (DIPE) 0.5 (EDC)

NOTES:

TPH-G = total petroleum hydrocarbons (TPH) as gasoline (EPA Method 5030C/GCMS)

TPH-D = TPH as diesel (EPA Method 3510C/8015M)

BTEX = benzene, toluene, ethylbenzene, total xylenes (EPA Method 5030C/8260B)

MTBE = Methyl Tertiary-Butyl Ether (EPA Method 5030C/8260B)

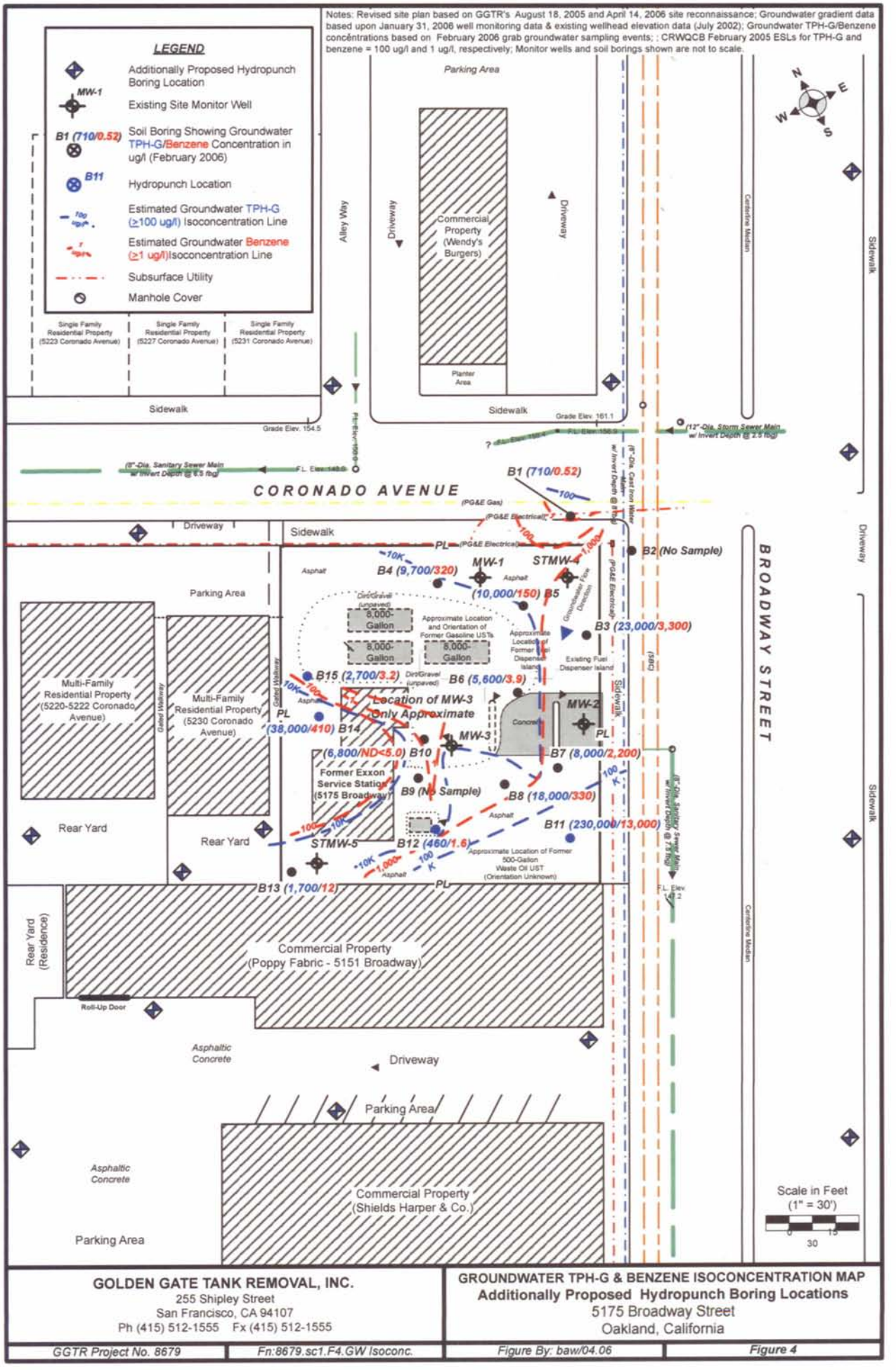
Fuel Oxygenates by EPA Method 5030C/8260B (DIPE - diisopropyl ether, EDC - 1,2-dichloroethane)

ND = concentration below associated laboratory reporting limit; NC = no criteria established

fbg = feet below grade; ug/l = micrograms per liter (parts per billion); ND = concentration below associated laboratory reporting limit

* static groundwater levels shown in italics

CRWQCB/ESL = California Regional Water Quality Control Board's Interim Final – February 2005, Tier 1 Environmental Screening Level (Final) for groundwater that **is** a potential source of drinking water (residential land use permitted site)



GOLDEN GATE TANK REMOVAL, INC.
255 Shipley Street
San Francisco, CA 94107
Ph (415) 512-1555 Fx (415) 512-1555

GROUNDWATER TPH-G & BENZENE ISOCONCENTRATION MAP
Additionally Proposed Hydropunch Boring Locations
5175 Broadway Street
Oakland, California

GGTR Project No. 8679	Fn:8679.sc1.F4.GW Isoconc.	Figure By: baw/04.06	Figure 4

APPENDIX B

Standard Operating Procedures

STANDARD OPERATING PROCEDURE FOR SOIL GAS SAMPLING FROM TEMPORARY VAPOR PROBES

1.0 PURPOSE

This standard operating procedure (SOP) describes the procedures for collecting soil gas samples from temporary vapor probes using evacuated, stainless-steel Summa canisters for the purpose of assessing risk to occupants of nearby or future site buildings. The SOP is modified from procedures and information presented in Cal/EPA 2004; DTSC and CRWQCB-LA, 2003; and from discussions (September 2006) with K Prime (Santa Rosa, California) laboratory staff.

2.0 REQUIRED EQUIPMENT

- Equipment for coring hard surfaces (if necessary)
- Equipment for driving and pulling vapor probes
- Stainless-steel soil gas probes with threaded fittings for sample tubing.
- Powdered bentonite
- 6-Liter Summa canister (evacuated with approximately 30" Hg vacuum) with vacuum gauge for purging and leak testing
- 6-Liter Summa canister with vacuum gauge for each sample (including duplicates)
- 1-Liter Summa canister for leak-check compound
- K Prime Inc. stainless-steel sampling manifold (see Figure 1) (request that laboratory leak-check manifold prior to mobilization)
- Leak-check compound (e.g. isopropyl alcohol) and absorbent material (e.g. gauze)
- Photoionization detector (PID)
- Isobutylene for PID calibration
- Leak-check enclosure (plastic container with flexible weatherstripping and openings for vapor probe tubing and for sampling enclosure atmosphere)
- Record-keeping materials
- Latex or nitrile gloves

3.0 PROCEDURES

3.1 Boring Clearance and Notifications

Prior to installing soil gas probes, ensure that a utility clearance has been conducted to ensure that subsurface utility and rebar locations have been identified and marked. Notify property owners, tenants and regulators of impending field operations schedule.

3.2 Temporary Vapor Probe Construction

1. Core hard surfaces (e.g. concrete) prior to installing vapor probes.
2. Sampling tubing should be installed to the soil gas probes so that there is a continuous leak-proof connection from the probe tip to the sampling assembly (e.g. sampling tubing attached to a screw connector sealed to tip with an O-ring).
3. Drive soil gas probe to target depth (generally 5-feet or greater) using rotohammer, Geoprobe rig, or other method.
4. Withdraw soil gas probe approximately 6-inches to great void space and/or to separate probe from drop-off or telescoping tip.
5. Use hydrated bentonite to seal around the probe rod at the ground surface.

3.3 Vapor Sampling

During vapor sampling, record all valve open/close times and canister/manifold vacuum readings at each step.

Setup

1. Ensure that at least 30 minutes has elapsed since installation of the soil gas probe(s) and that at least 5 days have elapsed since significant (1/2 inch or greater) precipitation or irrigation of areas adjacent to the building.
2. Calculate and record the volume of the sampling assembly, tubing and vapor probe.

   Volume =3.14 x (1/2*ID) x (1/2*ID) *L,

   where ID = tubing or manifold inside diameter and L = length of tubing/manifold segment.
3. Wear latex or nitrile gloves while handling sampling equipment. Change gloves whenever a new sample is collected and after handling leak-check compound.
4. Connect the sampling manifold to the vapor probe, sample Summa canister and purge Summa canister using Swagelok fittings and stainless-steel, Teflon or Tygon tubing. Check all fittings for tightness (do not overtighten).
5. Close all valves. Record pre-test vacuum readings on both canisters.

Flow and Leak Check

1. Open both manifold valves and valve on purge Summa canister. Do *not* open valve on sample port. Allow manifold/tubing vacuum to stabilize at approximately 30" Hg.
2. Close purge canister valve and wait at least 10 minutes. Monitor manifold vacuum gauge to test for leaks. If the vacuum decreases, rectify the leak before proceeding.
3. If vacuum is stable, open purge canister valve and open vapor probe valve. After approximately *5 seconds*, close the canister valve and estimate flow rate by recording the elapsed time after valve closure for manifold vacuum to drop to 5" vacuum, as indicated on the following chart (specific to K-Prime sampling manifold)

K PRIME, INC. SOIL GAS MANIFOLD FLOW RATE AND VACUUM LEVEL ESTIMATES

T (seconds)	PV	F (ml/minute)
5	0	135
10	5	115
15	10	90
30	15	60
120	20	40
480	25	20

Source: K Prime, Inc. – July 24, 2006

NOTES:
T = Time duration from full vacuum to less than 5" vacuum after closing purge canister.
PV = Approximate vapor probe vacuum level based on measured T
F = Approximate sampling Flow rate based on measured T

4. This procedure should also be conducted several times at the beginning of sampling to ensure that flow rate is sufficient. If no significant flow is attained, either the sampling line is plugged or the vapor probe is positioned in an impermeable or saturated layer. Such a situation should be rectified before sample collection.
5. Place absorbent materials (e.g., gauze) *lightly* moistened (e.g., five drops) with leak-check compound (isopropyl alcohol) around each connection at the vapor probe/slab interface. Do not allow liquid to come in direct contact with tubing or sampling assembly. Aluminum foil may be used to help secure absorbent material adjacent to vapor probe.
6. Place leak-check enclosure over vapor probe and seal to ground using weatherstripping or duct tape. Ensure that PID has been calibrated with isobutylene gas. Note that the isopropyl alcohol response factor is approximately 5.6 (i.e. a reading of 2 ppm on the PID indicates 5.6 x 2 = 11.2 ppm of isopropyl alcohol in the sample). Record both the observed PID reading and the calculated isopropyl alcohol concentration. If the PID reading is below 10 ppm, slowly reapply leak-check compound.
7. Record PID reading for leak-check enclosure at least once every 5 minutes during purging and sampling. Slowly reapply leak-check compound if PID reading drops more than 20% below initial readings in an attempt to return to the initial readings.

Purge and Sample

1. Open purge canister valve and vapor probe valve and purge 3 purge volumes of the tubing and sampling assembly. Do *not* over-purge. Include the purging conducted during the leak-check step above in the purge volume.
2. Close purge canister valve and open sample canister valve. Sampling should take approximately 30 minutes for a 6-liter Summa canister.
3. During sampling, the integrated flow rate may be checked periodically by closing the sample canister valve and checking the elapsed time versus the sampling volume. Sampling volume for a 6-liter canister can be estimated based on the following table.

Relationship between Final Canister Vacuum and Volume Sampled

Final Vacuum ("Hg)	0	2.5	5	7.5	10	12.5	15	17.5	20
Volume Sampled (L)	6	5.5	5	4.5	4	3.5	3	2.5	2

Source: Air Toxics, Inc.

4. Close sampling canister valve when vacuum decreases to between 1" and 5" mercury. Do *not* allow vacuum to fall below this range.
5. Use a 1-liter Summa canister to collect a sample from the leak-check enclosure. Submit canister for analysis of leak-check compound only.
6. Disassemble sampling assembly, and cap (or remove and restore) vapor sampling point.
7. Fill out chain-of-custody form, including analysis for chemicals of concern and leak-check compound. The detection level of the leak check compound should be 10 µg/L or less Include final vacuum reading and serial numbers of canister and flow restrictor.
8. Collect at least one duplicate sample per site per sampling event from the sampling point with the anticipated highest vapor concentrations. The duplicate sample should be collected by attaching a fresh sample canister following collection of the initial sample without further purging, using the same sampling procedures used for the original sample

Decontamination

9. Use separate sampling assembly and tubing for each sample location. Return equipment to laboratory for decontamination.
10. Reused vapor probes should be decontaminated with a 3-stage wash and rinse with non-phosphate detergent, water and distilled water, or by steam cleaning.

REFERENCES

Cal/EPA, 2004, Interim final guidance for the evaluation and mitigation of subsurface vapor intrusion to indoor air, California Environmental Protection Agency, Department of Toxic Substances Control,December 15 (revised February 7, 2005).

DTSC, and California Water Resources Control Board, Los Angeles Region, (CRWQCB-LA), 2003, Advisory – Active Soil Gas Investigations, January 28.

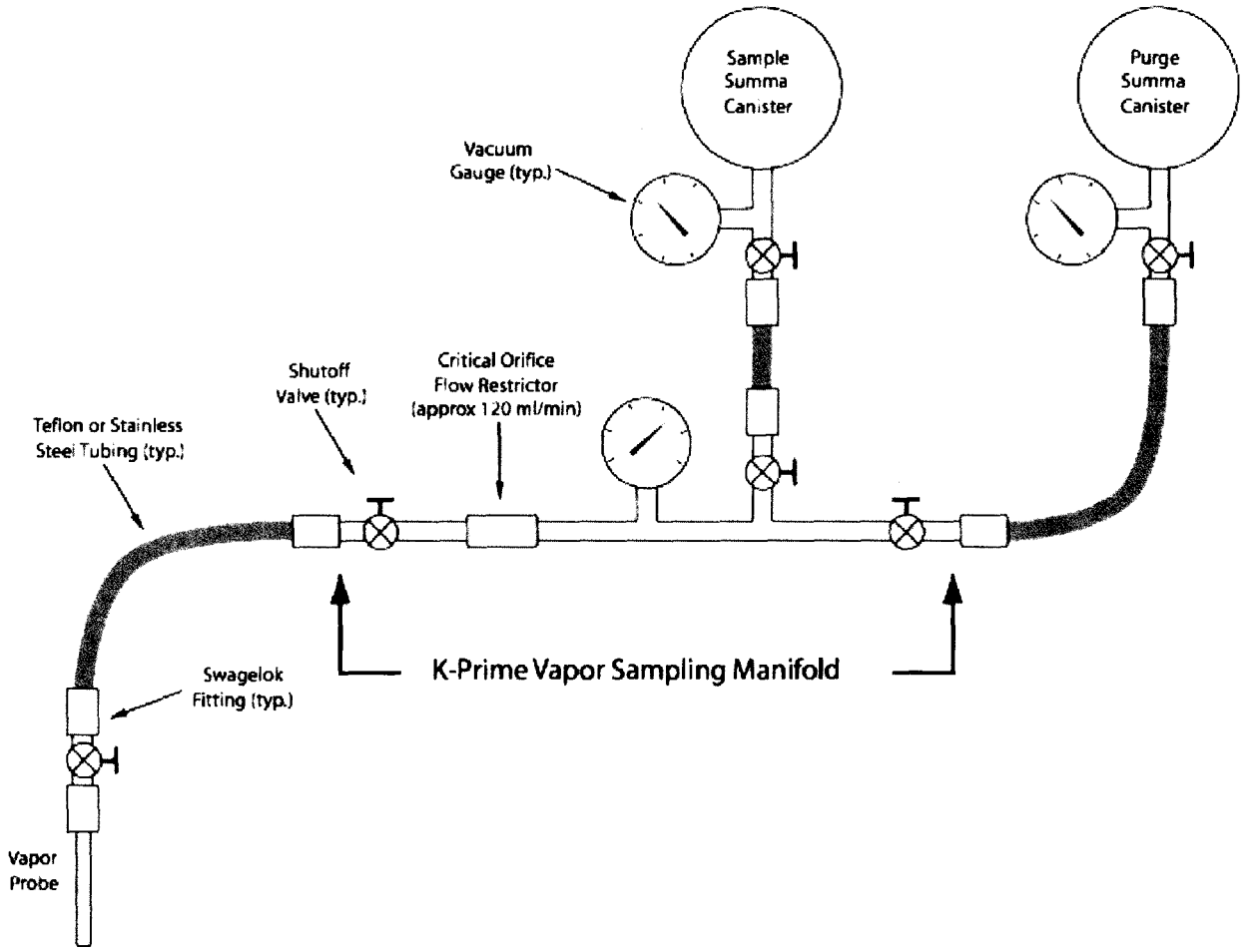


Figure
1

Subslab and Soil Vapor Sampling Manifold Schematic

PANGEA

STANDARD FIELD PROCEDURES FOR MONITORING WELLS

This document describes Pangea Environmental Services' standard field methods for drilling, installing, developing and sampling groundwater monitoring wells. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Well Construction and Surveying

Groundwater monitoring wells are installed in soil borings to monitor groundwater quality and determine the groundwater elevation, flow direction and gradient. Well depths and screen lengths are based on groundwater depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines. Well screens typically extend 10 to 15 feet below and 5 feet above the static water level at the time of drilling. However, the well screen will generally not extend into or through a clay layer that is at least three feet thick.

Well casing and screen are flush-threaded, Schedule 40 PVC. Screen slot size varies according to the sediments screened, but slots are generally 0.010 or 0.020 inches wide. A rinsed and graded sand occupies the annular space between the boring and the well screen to about one to two ft above the well screen. A two feet thick hydrated bentonite seal separates the sand from the overlying sanitary surface seal composed of Portland type I, II cement.

Well-heads are secured by locking well-caps inside traffic-rated vaults finished flush with the ground surface. A stovepipe may be installed between the well-head and the vault cap for additional security. The well top-of-casing elevation is surveyed with respect to mean sea level and the well is surveyed for horizontal location with respect to an onsite or nearby offsite landmark.

Well Development

Wells are generally developed using a combination of groundwater surging and extraction. Surging agitates the groundwater and dislodges fine sediments from the sand pack. After about ten minutes of surging, groundwater is extracted from the well using bailing, pumping and/or reverse air-lifting through an eductor pipe to remove the sediments from the well. Surging and extraction continue until at least ten well-casing volumes of groundwater are extracted and the sediment volume in the groundwater is negligible. This process usually occurs prior to installing the sanitary surface seal to ensure sand pack stabilization. If development occurs after surface seal installation, then development occurs 24 to 72 hours after seal installation to ensure that the Portland cement has set up correctly.

All equipment is steam-cleaned prior to use and air used for air-lifting is filtered to prevent oil entrained in the compressed air from entering the well. Wells that are developed using air-lift evacuation are not sampled until at least 24 hours after they are developed.

Groundwater Sampling

Depending on local regulatory guidelines, three to four well-casing volumes of groundwater are purged prior to sampling. Purging continues until groundwater pH, conductivity, and temperature have stabilized. Groundwater samples are collected using bailers or pumps and are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.

STANDARD FIELD PROCEDURES FOR SOIL BORINGS

This document describes Pangea Environmental Services' standard field methods for drilling and sampling soil borings. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate ground water depth and quality, and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist, scientist or engineer working under the supervision of a California Registered Engineer, California Registered Geologist (RG) or a Certified Engineering Geologist (CEG). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e. sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or product saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e. cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or hydraulic-push technologies. At least one and one half ft of the soil column is collected for every five ft of drilled depth. Additional soil samples are collected near the water table and at lithologic changes. With hollow-stem drilling, samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments beyond the bottom of the borehole. With hydraulic-push drilling, samples are typically collected using acetate liners. The vertical location of each soil sample is determined by measuring the distance from the middle of the soil sample tube to the end of the drive rod used to advance the split barrel sampler. All sample depths use the ground surface immediately adjacent to the boring as a datum. The horizontal location of each boring is measured in the field from an onsite permanent reference using a measuring wheel or tape measure.

Drilling and sampling equipment is steam-cleaned prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling and Transport

Sampling tubes or cut acetate liners chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

Soil samples collected during drilling will be analyzed in the field for ionizable organic compounds using a photo-ionization detector (PID) with a 10.2 eV lamp. The screening procedure will involve placing an undisturbed soil sample in a sealed container (either a zip-lock bag, glass jar, or a capped soil tube). The container will be set aside, preferably in the sun or warm location. After approximately fifteen minutes, the head space within the container will be tested for total organic vapor, measured in parts per million on a volume to volume basis (ppmv) by the PID. The PID instrument will be calibrated prior to boring using hexane or isobutylene. PID measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

Water Sampling

Water samples collected from borings are either collected from the open borehole, from within screened PVC inserted into the borehole, or from a driven Hydropunch-type sampler. Groundwater is typically extracted using a bailer, check valve and/or a peristaltic pump. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory.

Pangea often performs electrical conductivity (EC) logging and/or continuous coring to identify potential water-bearing zones. Hydropunch-type sampling is then performed to provide discrete-depth grab groundwater sampling within potential water-bearing zones for vertical contaminant delineation. Hydropunch-type sampling typically involves driving a cylindrical sheath of hardened steel with an expendable drive point to the desired depth within undisturbed soil. The sheath is retracted to expose a stainless steel or PVC screen that is sealed inside the sheath with Neoprene O-rings to prevent infiltration of formation fluids until the desired depth is attained. The groundwater is extracted using tubing inserted down the center of the rods into the screened sampler.

Duplicates and Blanks

Blind duplicate water samples are collected usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled.

Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory QA/QC blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Waste Handling and Disposal

Soil cuttings from drilling activities are usually stockpiled onsite on top of and covered by plastic sheeting. At least four individual soil samples are collected from the stockpiles for later compositing at the analytic laboratory. The composite sample is analyzed for the same constituents analyzed in the borehole samples. Soil cuttings are transported by licensed waste haulers and disposed in secure, licensed facilities based on the composite analytic results.

Ground water removed during sampling and/or rinsate generated during decontamination procedures are stored onsite in sealed 55 gallon drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification and consultant contact. Disposal of the water is based on the analytic results for the well samples. The water is either pumped out using a vacuum truck for transport to a licensed waste treatment/disposal facility or the individual drums are picked up and transported to the waste facility where the drum contents are removed and appropriately disposed.