

January 14, 2004

ALCOHOLIC BEVERAGES
JAN 22 2004
ENVIRONMENTAL SERVICES

**INTERIM SOURCE REMOVAL
WORK PLAN**

245 8th Street
Oakland, California

Project No. 5405

Prepared For

Mr. Vic Lum
Vic's Automotive
245 8th Street
Oakland, CA 94607

Prepared By

AEI Consultants
2500 Camino Diablo Blvd., Suite 100
Walnut Creek, CA 94597
(925) 944-2899

AEI



January 14, 2004

Attention: Mr. Barney Chan
ACHCSA
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

Subject: Vic's Automotive Site
Interim Source Removal Pilot Test Work Plan
245 8th Street
Oakland, CA 94607
AEI Project No. 5405

Dear Mr. Barney Chan:

AEI Consultants (AEI) has prepared this Interim Source Removal Pilot Test Work Plan on behalf of Mr. Victor Lum, the owner of the property located at 245 8th Street in the City of Oakland, California (Figure 1). AEI has been retained by Mr. Lum to provide environmental engineering and consulting services related to the unauthorized release of fuel hydrocarbons from the former underground storage tank (UST) system at the site.

This work plan provides a scope of work for an interim source removal (Free Product) and collection of additional soil and groundwater data that will allow evaluation of potential long term remedial strategies. Following completion of free product removal, a corrective action plan (CAP) will be developed from data collected during the Interim Product Removal Pilot Test.

SITE BACKGROUND

Between June 1993 and Aug 1994, AEI removed seven underground storage tanks from the property. The tanks consisted of four 1000-gallon and two 6000-gallon gasoline tanks as well as one 250-gallon waste oil tank. Impacted soil was removed from beneath the former tank area. Groundwater was encountered beneath the former 6000-gallon tanks. Approximately 1760 cubic yards of hydrocarbon-impacted soil were transported to a landfill. Light non-aqueous phase liquid (LNAPL) gasoline product was observed on the water table beneath the southern tank. The excavation was backfilled with clean material. A new tank system was installed just west of the dispenser island.

Two groundwater-monitoring wells (MW-1 and MW-2) were installed in July 1995. The first groundwater monitoring events indicated total petroleum hydrocarbons as gasoline (TPH-g) and benzene with concentrations as high as 210,000 micrograms per liter ($\mu\text{g/L}$) and 720 $\mu\text{g/L}$, respectively in MW-2. Floating product (LNAPL) was present in MW-1, which had an apparent thickness ranging from 1.2 to 4.39 feet between 1995 and March 1996.

Three soil borings (SB-1 through SB-3) were advanced in August 1996. Groundwater samples collected from each of the borings contained TPH-g ranging from 120,000 µg/L to 140,000 µg/L. Benzene ranged from 12,000 µg/L to 19,000 µg/L. Methyl tert butyl ether (MTBE) was present in all three samples in concentrations as high as 27,000 µg/L. Although free product was not observed in the field, qualitative laboratory observations indicated non-miscible sheen. Manual bailing and pumping of LNAPL from MW-1 and MW-2 occurred intermittently through 1998.

Two additional groundwater-monitoring wells (MW-3 and MW-4) were installed in May 2001. A free product recovery pump was installed in MW-1 in June 2001. Approximately 265 gallons of LNAPL has been recovered.

In April 2003, fourteen soil borings were advanced (SB-4 through SB-17) with direct push Geoprobe® drill rig or limited access rig. The borings ranged in depth from 18 to 20 feet below ground surface. Saturated soils were observed in each boring at approximately 16 to 18 feet bgs. Petroleum hydrocarbons were detected in soil samples from three borings (SB-4, SB-7 and SB-11). Groundwater samples were collected from SB-4 through SB-15. SB-16 and SB-17 were analyzed for soil vapor only.

The highest soil contaminant concentrations were in SB-7, with TPH-g and benzene concentrations at 4,900 milligrams per kilogram (mg/kg) and 65 mg/kg, respectively at 18 feet bgs. SB-11 had TPH-g and benzene concentrations at 2700 mg/kg and 29 mg/kg, respectively. Groundwater from SB-4 and SB-7 contained the highest TPH-g with concentrations of 310,000 µg/L and 240,000 µg/L respectively. Benzene, toluene, ethyl benzene and xylenes (BTEX) analytes were found to be highest in SB-4 with concentrations of 45,000 µg/L, 65,000 µg/L, 4500 µg/L and 23,000 µg/L, respectively. MTBE was in SB-7 at a concentration of 52,000 µg/L and SB-4 at 14,000 µg/L. No vapor phase petroleum hydrocarbons were detected at method detection limits. (See Tables 1 through 5.)

ENVIRONMENTAL SETTING

The property hereafter referred to, as the 'subject property 'or' site is located on the southern corner of 8th Street and Alice Street in a mixed commercial and residential area of the City of Oakland. Vic's Automotive, an auto repair and gasoline retail business currently occupies the site. The property is approximately 9,400 square feet in area and is bounded by residential properties to the south and east and by 8th Street and Alice Street to the north and west, respectively. One structure currently exists centrally on the site, a single story 3,000 square feet building utilized for auto repair and office space.

Hydrology

The site is located at 27 to 29 feet above mean sea level (amsl). The site is flat; however, the topography of the area slopes gently to the southwest. According to logs of soil borings advanced

at the site, the native soils generally consist of fine to medium grained sands with clay present to at least 28 feet bgs.

Groundwater levels for the November 4, 2003 monitoring episode ranged from 11.29 to 12.06 feet above mean sea level (msl) in the three wells (MW-2 through MW-4). These groundwater elevations were an average of 0.63 feet lower than the previous monitoring episode. The slight decrease in water table elevation appears to be a seasonal occurrence. The groundwater flow direction at the time of measurement was south-southeast. The hydraulic gradient of the water table was 0.006 ft/ft, which is similar to the previous episode. (Note: Based on the similarity between water levels observed during drilling activities and those measured in the constructed wells, the aquifer is considered an unconfined or water table aquifer.)

General Subsurface Condition Assessment

Soil sample analytical data from the April 2003 data indicate a significant source of contamination is present around SB-4, SB-7 and SB-11. SB-4 (on residential property) and SB-11 (at a vacant lot) were advanced offsite.

A significant groundwater contaminant mass is also apparently migrating off site. Specifically, high dissolved hydrocarbons detected in water samples from SB-4 and SB-11 and in SB-9, SB-10 (at a vacant lot off site) indicate that LNAPL has migrated to these locations.

SCOPE OF WORK

Prior to developing a formal corrective action plan (CAP), interim free product removal activities will be conducted at the Vic's Automotive site. New and existing borings/wells are proposed for interim source removal and to allow evaluation of future bioremediation, soil vapor extraction (SVE) and air sparging as potential methods of remediation.

The interim source removal in efforts will begin in phases. Interim source removal (hot spot reduction) will be implemented first on the site. The area targeted for interim source removal is the area containing free product around MW-1, MW-2 and proposed 4-inch wells MW-5 through MW-7.

Soil vapor extraction (SVE) will be implemented in the area of SB-1 (proposed MW-5) for free product removal. The area targeted for free product removal using vapor extraction includes the areas on site around the former tank hold, MW-1, MW-2, SB-1 and SB-7. Based on the results of the vapor extraction vent testing additional SVE and air sparge wells could be advanced in this area at a later date.

At the same time, the onsite interim source removal begins; the process of acquiring access for two wells in city streets will be initiated. Upon receiving street access, one well, MW-8 will be installed in Alice Street; approximately 20 feet west of MW-6 will be used for SVE and free product

removal if necessary. The second street well, MW-9, will be installed on Seventh Street and act as a down gradient sentry well.

The third phase will commence when an access agreement is reached to allow installation on wells on the property at 708 Alice Ave and agreement to run a vacuum line from that property across the back edge of 712 and 718 Alice Street to the remediation system located on the south corner of the subject site is reached.

The rationale and location of the proposed wells is detailed below:

WELL	CASING SIZE	GENERAL LOCATION	PHASE	PROJECTED USE	RATIONALE FOR BORING SELECTION
MW-5	4"	Between MW-4 and MW-1, adjacent to SB-1	First	GW/Soil Remediation Well	Highest soil contamination
MW-6	4"	East corner of property, between MW-1 and SB-4	First	GW/Soil Remediation Well	Area of LNAPL
MW-7	4"	South edge of property near SB-7	First	GW/Soil Remediation Well	High soil contamination and LNAPL
MW-8	4"	West edge of property, near SB-2	Second	GW/Soil Remediation Well	Soil contamination and LNAPL
MW-9	2"	Down gradient off site	Second	GW Monitoring well	Down gradient Sentry well ✓
MW-10	4"	Down gradient, off site, near SB11	Third	GW/Soil Remediation Well	High soil contamination and LNAPL
MW-11	4"	Down gradient, off site, near SB11	Third	GW/Soil Remediation Well	Area of LNAPL
MW-12	4"	Down gradient, off site, near SB11	Third	GW/Soil Remediation Well	Area of LNAPL

The scope of work for each phase is outlined below:

Phase 1 Onsite source removal

- 1) Obtain the necessary permits to install Phase 1 wells and the installation of the SVE system;
- 2) Initiate process of gaining access agreements for street wells and wells on the property at 708 Alice Street;
- 3) Advance and sample onsite groundwater monitoring wells (Appendix A);
- 4) Perform quarterly groundwater analyses (Appendix B);
- 5) Conduct Interim Hot Spot-Free Product Removal Activities (Appendix B);
- 6) Collect data as necessary from onsite wells during phased pilot testing;
- 7) At end of one month, prepare summary report of well installation, pilot tests of each well and system operation to date. Decision to end long term test or continue system operation.

Phase 2 Street Wells

- 1) Advance and sample wells in Alice and 7th Street as required (Appendix A);
- 2) Evaluate use of MW-8 for product and soil vapor extraction;
- 3) If feasible and needed, connect well MW-8 to SVE system.

Phase 3

1. Advance and sample wells MW-10 through MW-12 on 708 Alice Property as required (Appendix A);
2. Connect wells to SVE system.
3. Conduct startup testing of MW-10 through MW-12 for product and soil vapor extraction;

Phase 1 - Advance and sample monitoring/extraction wells on site

Task 1

MWS, 6 & 7.

The area around SB-1, SB-7, MW-1 and MW-2 is planned for the interim source removal. Data from the source removal will allow evaluation of various approaches to final clean up of the soil and groundwater. Three new borings will be completed as vapor extraction/monitoring wells. The details including locations of proposed borings/wells are indicated in Appendix B. These 4" internal diameter (ID) wells will be advanced and sampled using a hollow stem auger (HSA) rig equipped to an estimated depth of 30 feet bgs.

Soil samples will be collected every five feet from surface to total drilled depth estimated at 30 feet below grade. One to three soil samples from each well boring will be analyzed for contaminants of concern (COCs) by EPA Method 8015/8021B. Geotechnical samples will be collected and used to evaluate what areas and stratigraphic intervals may require additional wells and if conditions are suitable for sparging, biosparging and other remediation methods.

Groundwater samples from several of the wells will be analyzed for general water chemistry parameters such as, chloride, calcium, magnesium, sodium, potassium, phosphate, nitrate, nitrite, sulfite and sulfate, total iron, BOD, COD, CO₂ and TOC. See Appendix B for complete well installation procedures.

Task 2

A vapor extraction system will be constructed and tied to the SVE system, which will be located in the area of boring SB-8. A single well pilot test will be conducted on each well at the time of its connection to the system.

Task 3

During operation of the SVE system to remove free product, air samples will be routinely collected from selected wells to monitor the composition of the air stream. This data will be used in future remediation and feasibility studies and for BAAQMD compliance reporting.

Task 4

At the end of the first month operation of the system a summary report will be prepared that will include:

1. Summary of well installation including boring logs and baseline water sampling;
2. Summary of the results of geotechnical testing;
3. Summary of start of testing of the SVE system and including individual pilot tests on each well included in the SVE system;
4. Summary of the system parameters and amount of contaminants destroyed during the months operation.

Phase 2 – Installation of wells in the City of Oakland right-of-way

Permitting for Phase 2 will begin at the same time as Phase 1. Phase 2 is listed as a separate phase as it is expected that the additional permitting and insurance requirements need to install wells in the City of Oakland right-of-way will require more time than permit requirements for the onsite wells.

Task 1

As soon as all insurance and permitting requirements are met, the 4-inch well in Alice Street (MW-8) and the 2-inch well in 7th Street (MW-9) will be drilled and installed.

Soil samples will be collected every five feet from surface to total drilled depth estimated at 30 feet below grade. One to three soil samples from well MW-8 and one sample from the capillary fringe interval in MW-9 will be analyzed for contaminants of concern (COCs) by EPA Method 8015/8021B. Groundwater samples will be collected from both wells and analyzed for COCs.

Task 2

Following installation of MW-8, the well will be evaluated as a product and soil vapor extraction well. If feasible, well MW-8 will be connected to the SVE system and a single well pilot test will be carried out.

Task 3

A short letter report will be prepared summarizing well installation, which will include boring logs and baseline water sampling. A summary of the single well pilot test, if done, will be included in the periodic reports of system operation and testing.

Phase 3 - Advance and sample monitoring/extraction wells on 708 Alice Street Property

Task 1

The area around SB-10 and SB-11 is planned for the interim free product removal. Three new borings will be completed as vapor extraction/monitoring wells. The details including locations of proposed borings/wells are indicated in Appendix B. These 4" internal diameter (ID) wells will be advanced and sampled using a hollow stem auger (HSA) rig equipped to an estimated depth of 30 feet.

Soil samples will be collected every five feet from surface to total drilled depth estimated at 30 feet below grade. One to three soil samples from each well boring will be analyzed for contaminants of concern (COCs) by EPA Method 8015/8021B. Geotechnical samples will be collected and used to evaluate what areas and stratigraphic intervals may require additional wells and if conditions are suitable for sparging, biosparging and other remediation methods.

→ which well } Groundwater samples from one of the wells will be analyzed for general water chemistry parameters such as, chloride, calcium, magnesium, sodium, potassium, phosphate, nitrate, nitrite, sulfite and sulfate, total iron, BOD, COD, CO₂ and TOC.

Task 2

A vapor system will be constructed connecting each well with the SVE system on the subject site. A single well pilot test will be conducted on each well at the time of it's connection to the system.

Task 3

During operation of the SVE system to remove free product, air samples will be routinely collected from selected wells to monitor the composition of the air stream. This data will be used in future remediation and feasibility studies.

Task 4

A short letter report will be prepared following the installation of the wells that will include boring logs and the results of groundwater water sampling. A summary of the individual start up pilot tests on each well will be included in the periodic operation reports.

Phase 4 – Continued System operations

Following completion of the first three phases of the interim source removal, the SVE system will be operated on a month-to-month basis until free product is removed. During this time the data collected during well installation, pilot testing and system operations will be evaluated and a CAP and/or RFS will be prepared.

Waste Storage

Drill cuttings will be stored in 55-gallon drums, pending the results of sample analyses. Equipment rinse water and well purge water will also be stored in 55-gallon drums. Waste materials will be transported from the site, under appropriate manifest, to an approved disposal or recycling facility.

Site Safety

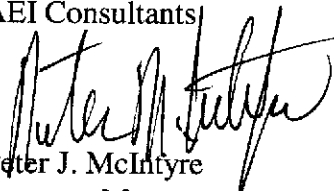
Prior to commencement of field activities, a site safety meeting will be held at a designated command post near the working area. Emergency procedures will be outlined at this meeting, including an explanation of the hazards of the known or suspected chemicals of interest. All site personnel will be in Level D personal protection equipment, which is the anticipated maximum amount of protection needed. A working area will be established with barricades and warning tape to delineate the zone where hard hats and steel-toed shoes must be worn, and where unauthorized personnel will not be allowed. A site safety plan conforming to Part 1910.120 (i) (2) of 29 CFR will be on site at all times during the project.

SCHEDULE

Once the initial scope of work has been approved and necessary permits have been obtained, the work will be scheduled as soon as rig availability allows. The ACHCSA will be notified of the schedule, so that field inspections may be scheduled if desired.

AEI requests your comments and approval to proceed with this project. Please contact the undersigned at (925) 283-6000 if you have any questions or need any additional information.

Sincerely,
AEI Consultants


Peter J. McIntyre
Program Manager

Robert F. Flory, RG
Senior Geologist

Distribution:

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1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

Mr. Vic Lum
Vic's Automotive
245 8th Street
Oakland, CA 94607



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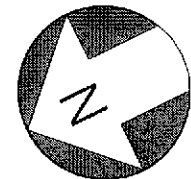
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2500 CAMINO DIABLO BLVD, STE 200, WALNUT CREEK

SITE LOCATION MAP

245 8th STREET
OAKLAND, CALIFORNIA

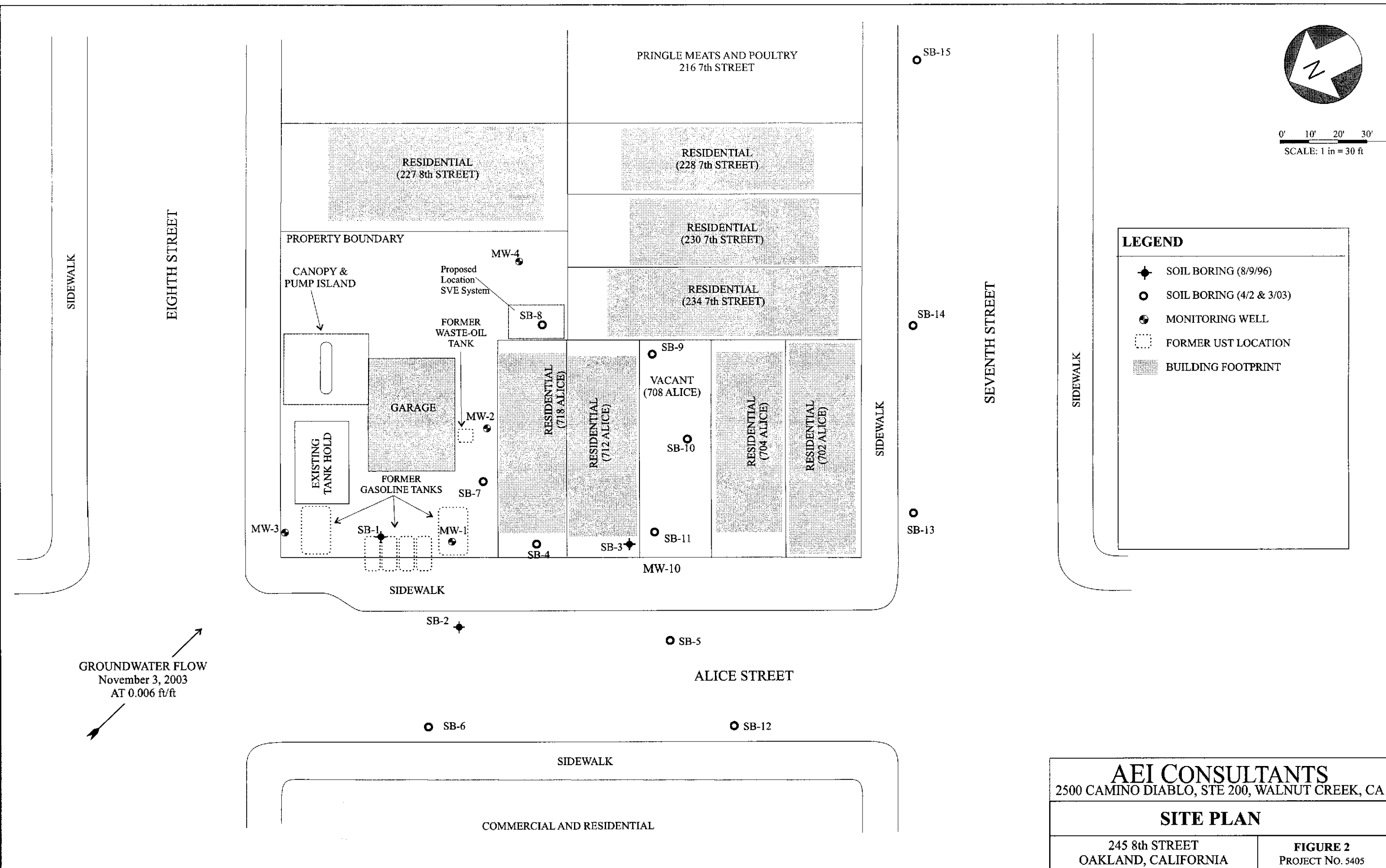
FIGURE 1
PROJECT No. 5405



0' 10' 20' 30'
SCALE: 1 in = 30 ft

LEGEND

- ◆ SOIL BORING (8/9/96)
- SOIL BORING (4/2 & 3/03)
- MONITORING WELL
- ⊖ FORMER UST LOCATION
- ▨ BUILDING FOOTPRINT

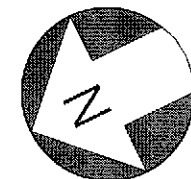


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2500 CAMINO DIABLO, STE 200, WALNUT CREEK, CA

SITE PLAN

245 8th STREET
OAKLAND, CALIFORNIA

FIGURE 2
PROJECT NO. 5405



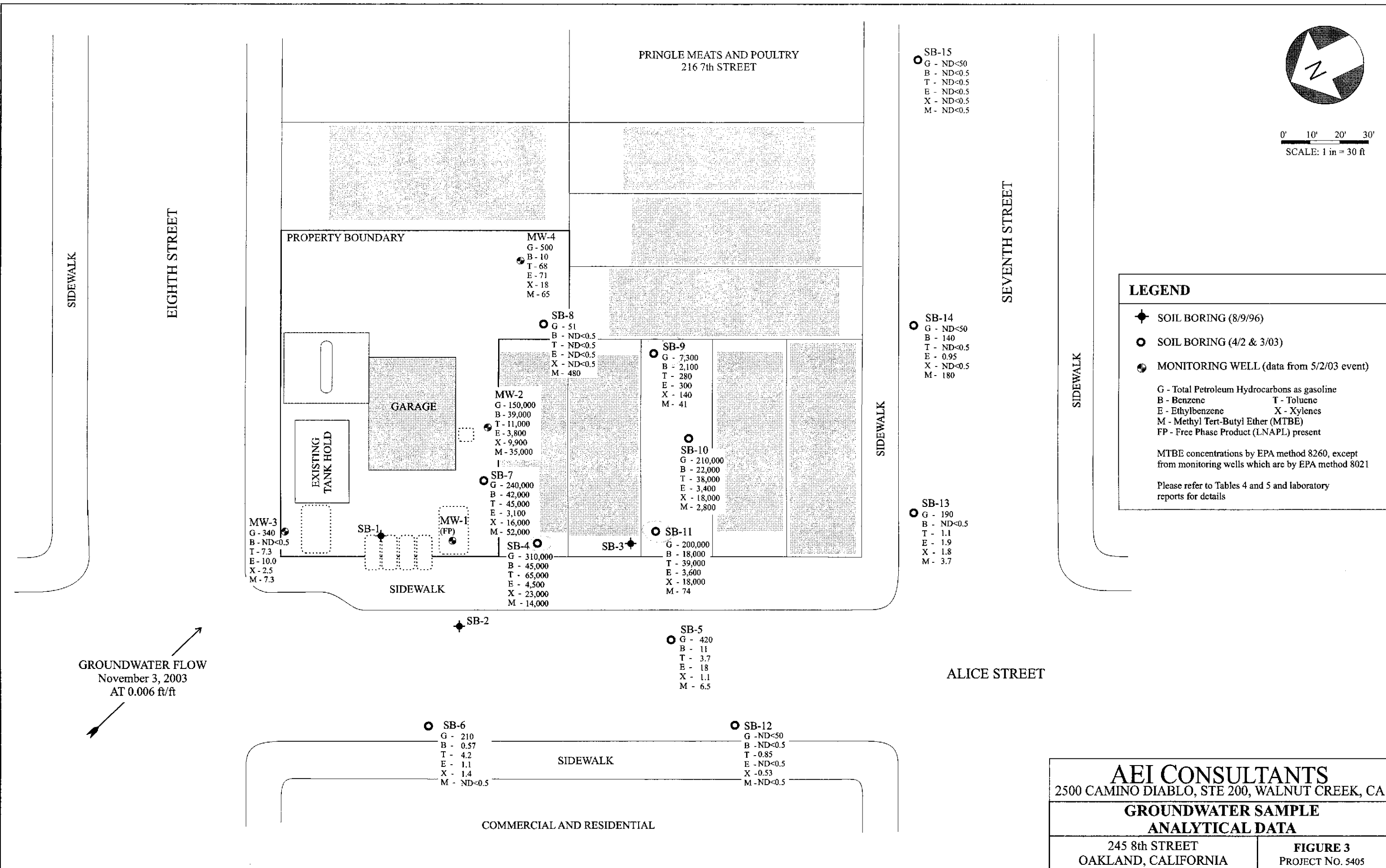
0' 10' 20' 30'
SCALE: 1 in = 30 ft

LEGEND

- ◆ SOIL BORING (8/9/96)
 - SOIL BORING (4/2 & 3/03)
 - MONITORING WELL (data from 5/2/03 event)
- G - Total Petroleum Hydrocarbons as gasoline
 B - Benzene T - Toluene
 E - Ethylbenzene X - Xylenes
 M - Methyl Tert-Butyl Ether (MTBE)
 FP - Free Phase Product (LNAPL) present

MTBE concentrations by EPA method 8260, except from monitoring wells which are by EPA method 8021

Please refer to Tables 4 and 5 and laboratory reports for details

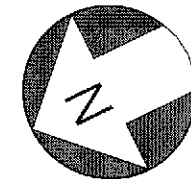


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GROUNDWATER SAMPLE ANALYTICAL DATA

245 8th STREET
OAKLAND, CALIFORNIA

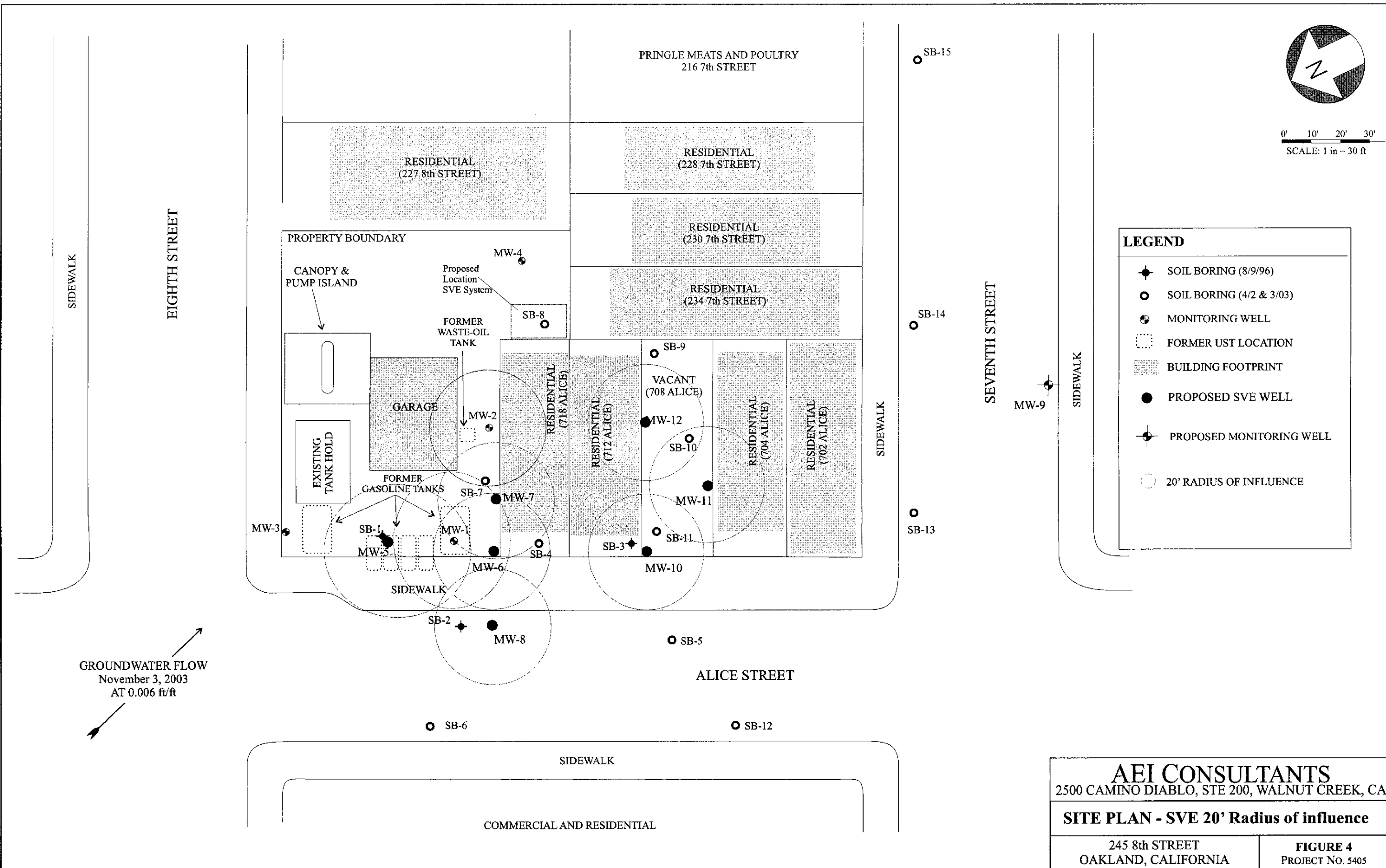
FIGURE 3
PROJECT NO. 5405



0' 10' 20' 30'
SCALE: 1 in = 30 ft

LEGEND

- SOIL BORING (8/9/96)
- SOIL BORING (4/2 & 3/03)
- MONITORING WELL
- FORMER UST LOCATION
- BUILDING FOOTPRINT
- PROPOSED SVE WELL
- PROPOSED MONITORING WELL
- 20' RADIUS OF INFLUENCE



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SITE PLAN - SVE 20' Radius of influence

245 8th STREET
OAKLAND, CALIFORNIA

FIGURE 4
PROJECT NO. 5405

Table 1: Groundwater Elevation Data
Vic's Automotive, 245 8th Street, Oakland, CA 94607

Well ID	Date Collected	Well Elevation (ft amsl)	Depth to Water (ft)	Groundwater Elevation (ft amsl)	Depth to LNAPL (ft)	Apparent LNAPL Thickness (ft)
MW-1	6/29/2001	27.73	16.52	*	14.89	1.63
	10/10/2001	27.73	15.45	*	15.37	0.08
	1/9/2002	27.73	12.61	15.12*	-	<0.01
	4/24/2002	27.73	13.35	14.38*	-	<0.01
	7/24/2002	27.73	14.19	13.44*	-	<0.01
	11/5/2002	27.73	14.85	12.88*	-	<0.01
	2/4/2003	27.73	14.91	12.82*	-	<0.01
	5/2/2003	27.73	14.43	13.30*	-	0.08
	8/4/2003	27.73	15.24	12.49*	15.01	0.23
	11/3/2003	27.73	16.94	10.79*	15.67	1.27
MW-2	6/29/2001	28.16	16.14	12.02	-	-
	10/10/2001	28.16	16.43	11.73	-	-
	1/9/2002	28.16	13.50	14.66	-	-
	4/24/2002	28.16	14.40	13.76	-	-
	7/24/2002	28.16	14.91	13.25	-	-
	11/5/2002	28.16	16.96	11.20	-	-
	2/4/2003	28.16	15.42	12.74	-	-
	5/2/2003	28.16	15.24	12.92	-	-
	8/4/2003	28.16	15.98	12.18	-	-
	11/3/2003	28.16	16.60	11.56	-	Sheen
MW-3	6/29/2001	29.21	16.60	12.61	-	-
	10/10/2001	29.21	16.92	12.29	-	-
	1/9/2002	29.21	14.20	15.01	-	-
	4/24/2002	29.21	15.07	14.14	-	-
	7/24/2002	29.21	16.40	12.81	-	-
	11/5/2002	29.21	16.47	12.74	-	-
	2/4/2003	29.21	16.92	12.29	-	-
	5/2/2003	29.21	15.45	13.76	-	-
	8/4/2003	29.21	16.46	12.75	-	-
	11/3/2003	29.21	17.15	12.06	-	-
MW-4	6/29/2001	29.38	17.71	11.67	-	-
	10/10/2001	29.38	18.00	11.38	-	-
	1/9/2002	29.38	15.02	14.36	-	-
	4/24/2002	29.38	15.74	13.64	-	-
	7/24/2002	29.38	16.69	12.69	-	-
	11/5/2002	29.38	17.64	11.74	-	-
	2/4/2003	29.38	16.02	13.36	-	-
	5/2/2003	29.38	16.72	12.66	-	-
	8/4/2003	29.38	17.51	11.87	-	-
	11/3/2003	29.38	18.09	11.29	-	-

Table 1: Groundwater Elevation Data
Vic's Automotive, 245 8th Street, Oakland, CA 94607

Episode #	Date	Average Water Table Elevation**	Change from Previous Episode	Flow direction (gradient)
1	6/29/2001	12.10	-	SSE (0.0074)
2	10/10/2001	11.80	-0.30	SSE (0.0071)
3	1/9/2002	14.68	2.88	SE (0.0054)
4	4/24/2002	13.85	-0.83	SSW (0.005)
5	7/24/2002	12.92	-0.93	NE (0.021)
6	11/5/2002	11.89	-1.02	SW (0.019)
7	2/4/2003	12.80	0.90	NNW (0.01)
8	5/2/2003	13.11	0.32	SSE (0.01)
9	8/4/2003	12.27	-0.85	SSE(0.007)
10	11/3/2003	11.64	-0.63	SSE (0.006)

LNAPL = light non-aqueous phase liquid (floating free product)

* = Measured groundwater level affected by LNAPL and/or pump presence, not used to calculate water table elevation

All well elevations are measured from the top of the casing

- = not applicable

ft amsl = feet above mean sea level

Note = Historical groundwater elevation and quality data for wells MW-1 and MW-2 was not available

Table 2: Groundwater Sample Analytical Data
Vic's Automotive, 245 8th Street, Oakland, CA 94607

Well/Sample ID	Date Collected	Apparent LNAPL thickness (ft)	TPHg $\mu\text{g/L}$	MTBE $\mu\text{g/L}$	Benzene $\mu\text{g/L}$	Toluene $\mu\text{g/L}$	Ethylbenzene $\mu\text{g/L}$	Xylenes $\mu\text{g/L}$
MW-1	6/29/2001	1.63	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
	10/10/2001	0.08	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
	1/9/2002	<0.01	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
	4/24/2002	<0.01	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
	7/24/2002	-0.01	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
	11/5/2002	-0.01	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
	2/4/2003	-0.01	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
	5/2/2003	0.08	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
	8/4/2003	0.23	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
11/3/2003	1.27	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp	ns/fp
MW-2	6/29/2001	0.0	69,000	4,100	7,200	6,100	1,500	7,000
	10/10/2001	0.0	87,000	14,000	22,000	12,000	2,700	9,100
	1/9/2002	0.0	130,000	11,000	30,000	19,000	3,800	14,000
	4/24/2002	Sheen	210,000	32,000	38,000	23,000	4,600	19,000
	7/24/2002	Sheen	170,000	36,000	48,000	12,000	3,700	8,600
	11/5/2002	Sheen	190,000	36,000	45,000	25,000	4,600	16,000
	2/4/2003	Sheen	150,000	27,000	51,000	24,000	4,200	14,000
	5/2/2003	Sheen	150,000	35,000	39,000	11,000	3,800	9,900
	8/4/2003	Sheen	120,000	29,000	32,000	5,000	3,200	7,200
11/3/2003	Sheen	120,000	24,000	33,000	4,300	3,200	5,400	
MW-3	6/29/2001	0.0	550	ND<5.0	ND<0.5	3.1	3.2	1.2
	10/10/2001	0.0	470	ND<5.0	0.77	5.3	3.3	5.9
	1/9/2002	0.0	1,000	ND<5.0	0.90	7.6	7.8	25
	4/24/2002	0.0	1,500	ND<5.0	0.64	7.2	12	14
	7/24/2002	0.0	1,200	ND<5.0	10	17.0	11	25
	11/5/2002	0.0	1,800	ND<25	33	43.0	18	31
	2/4/2003	0.0	450	ND<5.0	ND<0.5	5.0	ND<0.5	0.77
	5/2/2003	0.0	340	ND<5.0	7.3	10.0	2.5	7.3
	8/4/2003	Sheen	170	ND<5.0	5.8	5.9	1.5	4.9
11/3/2003	0.0	54	ND<5.0	ND<0.5	ND<0.5	ND<0.5	ND<0.5	
MW-4	6/29/2001	0.0	50	ND<5.0	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	10/10/2001	0.0	50	ND<5.0	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	1/9/2002	0.0	50	ND<5.0	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	4/24/2002	0.0	50	ND<5.0	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	7/24/2002	0.0	50	ND<5.0	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	11/5/2002	0.0	50	ND<5.0	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	2/4/2003	0.0	50	ND<5.0	ND<0.5	ND<0.5	ND<0.5	ND<0.5
	5/2/2003	0.0	500	10	68	71	18	65
	8/4/2003	Sheen	270	ND<5.0	30	29	9.2	32
11/3/2003	0.0	50	ND<5.0	ND<0.5	ND<0.5	ND<0.5	ND<0.5	

$\mu\text{g/L}$ micrograms per liter

TPHg total petroleum hydrocarbons as gasoline

MTBE methyl tertiary butyl ether

* samples re-analyzed by EPA Method 8260 (expressed as EPA 8020 / EPA 8260)

ns/fp = not sampled / free product

ND = not detected

Please refer to Appendix B: Lab Results for further detailed lab information including dilution factors

LNAPL = Light Non Aqueous Phase Liquid

APPENDIX B
WELL INSTALLATION PROCEDURES

APPENDIX B – WELL INSTALLATION PROCEDURES

SCOPE OF WORK

The proposed work consists of:

1. Obtain Necessary Permits;
2. Develop a Health and Safety Plan;
3. Conduct Pre-Field Activities;
4. Install Wells;
5. Perform Soil Sampling and Analysis Activities;
6. Conduct Well Development Activities;
7. Perform Groundwater Sampling and Analysis Activities;
8. Conduct Disposal Activities;
9. Conduct Well Surveying Activities; and
10. Prepare summary Report Report.

Task descriptions follow.

Task 1 – Obtain Necessary Permits

Well construction and drilling permits will be obtained from the Alameda County Public Works Agency (ACPWA) at least five days prior to conducting any well drilling activities. Underground Service Alert (USA) North will be notified that a utility clearance is required prior to conducting any subsurface activities and will identify underground utility locations in the streets and sidewalk areas. The property owner will also be notified of the drilling schedule.

For those wells located in the City of Oakland right-of-way, permits will be obtained from the City of Oakland. An inspection with the City of Oakland will be scheduled prior to inspection if /as required by permit.

A well completion report will be submitted to the ACPWA within 60 days after completion.

Task 2- Develop a Health and Safety Plan

A site health and safety plan (HASP) will be developed for all planned field activities. Emergency procedures, routes to the nearest emergency treatment center or hospital and safety precautions will be addressed in the plan. An explanation of the hazards of the known or suspected chemicals of interest will be described in the plan. The site safety plan will conform to Part 1910.120 (i) (2) of 29 Code of Federal Regulations (CFR).

Task 3 - Conduct Pre-Field Activities

Prior to commencement of field activities, a site safety meeting will be held at a designated command post near the working area. Emergency procedures will be outlined at this meeting, including an explanation of the hazards of the known or suspected chemicals of interest. All site

personnel will be in Level D personal protection equipment, which is the anticipated maximum amount of protection needed. A working area will be established with barricades and warning tape to delineate the zone where hard hats and steel-toed shoes must be worn, and where unauthorized personnel will not be allowed.

Task 4 - Install Wells

The borings for 4-inch wells will be advanced using a hydraulic rotary drill rig using a minimum of 10-inch diameter hollow stem augers, 2-inch wells will be drilled with nominal 8-inch augers. The borings will be advanced a minimum depth of 10 feet below to the top of groundwater, approximately 26 to 30 feet below ground surface. Samples of undisturbed soil will be collected from each boring at approximately 5-foot intervals from the entire length of each boring and below groundwater at the groundwater-capillary fringe interface, for soil classification and physical properties, and chemical analysis. Soil samples will be screened in the field using a portable organic vapor meter. The wells will be logged according to the Unified Soil Classification System (USCS) and standard geological techniques.

These wells will be constructed of 4" inside diameter (ID) flush-threaded, Schedule 40 poly vinyl chloride (PVC) casing with 16 to 20 feet of 0.10" to 0.02" factory-slotted well screen and the remaining 10 feet of blank casing. The well casing will be factory fitted with a bottom cap.

The well casings will be installed through the augers to a point a few inches of the boring terminus where they will be suspended until the well is secured within the sand pack. No. 2/16 Monterey sand or other appropriate size sand (i.e., depending on slot and grain size) will be poured through the augers to form a sand pack from the bottom of the well to approximately 2 feet above the screened interval. A bentonite seal 2 feet in thickness will be placed above the sand. The remainder of the boring will be filled to about two - three feet below grade with neat cement grout. An appropriately sized flush-mounted, traffic-rated remediation well box will be installed to house the well, and an expanding, locking inner cap will be placed on the casing top.

Task 5- Perform Soil Sampling and Analysis Activities

Soil sampling and analyses activities are described in this task. There are two main contaminated intervals (1) Lowermost sands of the saturated zone; 2) Clayey sands within the lower vadose zone and capillary fringe) that are of concern.

Soil samples will be collected, at a minimum every five feet, from surface to the top of the transition zone in the all wells. Selected wells may be sampled continuously through the transition and smear zones. ✓ Yes

Soil samples will be screened in the field, at a minimum every five feet, using a portable organic vapor meter. Samples retained for possible analysis will be sealed within brass liners using Teflon® tape and plastic caps, and stored on ice pending transportation to the laboratory.

Selected soils will be analyzed for Total Petroleum Hydrocarbons as gasoline (TPH-g), benzene, ethyl benzene, and xylenes (BTEX), and methyl tertiary butyl ether (MTBE) by EPA-8015Cm/8021B. The geologist on-site will select soil samples for chemical testing at the time of sampling. The samples will be labeled, stored with chain of custody documents, and transported to a state certified laboratory. Two to four soil samples from each well will be analyzed for contaminants of concern (COCs) and geotechnical parameters. Specifically, a minimum of one to two samples from each zone will be analyzed. Any remaining samples collected will be placed on hold at the laboratory.

A geotechnical evaluation will be used to evaluate what areas/contaminants and stratigraphic intervals require additional wells or well completions and if conditions are suitable for bioremediation and bioaugmentation. Several soil samples will be analyzed for geotechnical parameters such as grain size, permeability and porosity.

Task 6 – Conduct Well Development Activities

No sooner than 72 hours after the construction of a well and setting of the grout, the well will be developed. The development will serve to stabilize the annular sand pack and the surrounding formation and to clear the well screen of the fines. The well will be developed initially by using a surge block and bailer/pump to remove accumulated fines from the casing and sand pack until clear. A minimum of ten well volumes of water will then be pumped from the well until the purge water appears relatively clear.

Task 7 – Perform Groundwater Sampling and Analysis Activities

Groundwater sampling and analyses activities are described in this task. The first episode of groundwater monitoring of the wells will follow well development activities. Prior to any sampling activities, depth to groundwater will be measured from the top of the casing with an electric water level meter. The well will then be purged of at least three well volumes of water, until the purged water appears reasonably clear and water quality measurements are relatively stable. During purging, the following water quality parameters will be measured: temperature, pH, specific conductivity, dissolved oxygen, and oxidation-reduction potential (ORP). Turbidity will be visually noted during purging of the well.

Once the water levels return to at least 90% of their original levels, water samples will be collected using clean disposable plastic bailers. Water will be poured from the bailers into 40 ml Volatile Organic Analysis (VOA) vials or 1-liter amber bottles as appropriate and capped so that there is no headspace or visible air bubbles within the sample containers.

The samples will be labeled, placed on ice and transported under chain of custody protocol for analysis to a state certified laboratory. The water samples will be analyzed for TPH-g/BTEX/MTBE by EPA-8015Cm/8021B. Selected groundwater samples will also be analyzed for general water chemistry parameters such as, chloride, calcium, magnesium, sodium, potassium, phosphate, nitrate, nitrite, sulfite and sulfate, total iron, BOD, COD, CO₂ and TOC.

Task 8 - Conduct Disposal Activities

Drill cuttings and well debris will be stored temporarily on site in 55-gallon drums or a 20-cubic yard roll-off, pending the results of sample analyses. Purged well water, well development and rinse water will also be stored on-site in 55-gallon drums or a poly tank. Upon receipt of analytical data, the waste will be profiled into an appropriate disposal facility. The waste will then be transported from the site to the approved facility, under appropriate waste manifest by a properly licensed waste hauler.

Fluids generated during the routine groundwater monitoring activities will also be placed in 55-gallon drums and stored temporarily on site. After receipt of analytical data, the wastes will then be transported from the site to the approved facility, under appropriate waste manifest by a properly licensed waste hauler.

Task 9 - Conduct Well Surveying Activities

Following installation, each newly constructed well will be surveyed relative to a known datum, other wells, and to mean sea level by a California licensed land surveyor. Survey data will be obtained utilizing GPS equipment, and will be in a format acceptable for submission to the California GeoTracker database. The locations of local landmarks (roads, property lines, etc.) will be included in the survey.

Task 10 - Prepare a Report

A written report will be prepared detailing the results of the SVE and AS well installation and first groundwater monitoring activities following receipt of all analytical and survey data. It is anticipated that the well installation report will be issued in approximately 30 days after the final analytical data has been received. The report will include boring/well completion logs, tables, figures showing the well location, laboratory analyses, conclusions and recommendations. The first report will be issued following well installation and the first monitoring event. Copies of the well installation permits obtained during this project will be included in the report on field activities.

Reports will be provided approximately one month after sample collection activities in conjunction with scheduled ground water monitoring events and reporting activities. All reports will be reviewed and stamped by a California Registered Geologist or Civil Engineer

Task 11 – Conduct Project Management and Scheduling Activities

Upon approval of this work plan by the ACHCSA and after the permitting process is completed, the fieldwork will be scheduled and notifications will be made. AEI anticipates scheduling and completing the initial drilling within 6 to 8 weeks of completion of permitting.

Routine monitoring and sample collection of the AS wells will occur quarterly (every three months) to coincide with the sample collection and analysis of existing groundwater monitoring wells.