PACIFIC
ENVIRONMENTAL
GROUP, INC.

Date October 4, 1989

Project No. 330-06.04

To: Ms. Cathyrn Chesick
Alameda Co. Div. Health
Haz. Materials Division.
80 Swan Way, Suite 200
Oakland, CA 94621

We have enclosed

Copies	Description
1	One copy of a workplan for additional soil and groundwater investigation at ARCO SS# 0608, located in San Lorenzo, California

For your
xx Use
____ Approval
____ Information

Comments Please find the enclosed workplan for the above-mentioned site. If there are any questions or comments about the workplan, please do not hesitate to call.

John Baldwin

1601 Civic Center Drive, Suite 202, Santa Clara, California 95050, (408) 984-6536
FAX: (408) 243-3911

PACIFIC
ENVIRONMENTAL
GROUP, INC.

October 4, 1989
Project No. 330-06.04

Mr. Kyle Christie
ARCO Petroleum Products Company
P.O. Box 5811
San Mateo, California 94403

Re: ARCO Station No. 0608
17601 Hesperian Blvd.
San Lorenzo, California

Dear Mr. Christie:

This letter presents a workplan prepared by Pacific Environmental Group, Inc. (PACIFIC) to further define the extent of gasoline hydrocarbons in the soil and groundwater at the above-referenced ARCO station. This workplan includes a brief introduction to site conditions and background as well as a proposed scope of work and a description of the proposed investigation.

BACKGROUND

ARCO Service Station No. 0608 is an operating service station located at 17601 Hesperian Boulevard at Hacienda Avenue in San Lorenzo, California (See Figures 1 and 2). The fueling facility formerly included three 6000-gallon (two unleaded gasoline and one regular gasoline) tanks located in a common excavation, and one adjacent 6000-gallon tank (super unleaded gasoline). A 550-gallon tank located southwest of the station building was used to store waste oil. All underground tanks were removed in June 1988, and were replaced with three 12,000-gallon gasoline tanks in the location of the former gasoline tank complex, and one waste oil tank in the same location as the former waste oil tank (see Figure 3).

Land use in the vicinity of the site is commercial and residential. The ground surface at the site and in the area is essentially flat, with a very gentle westward slope, toward the San Francisco Bay. San Lorenzo Creek trends generally east-west and is located approximately 4000 feet north of the site. The site is underlain by Quaternary deposits, consisting of alluvial, fluvial, and basin sediments (Helley et al., 1972).

1601 Civic Center Drive, Suite 202, Santa Clara, California 95050, (408) 984-6536
FAX: (408) 243-3911

Soil and groundwater conditions have been investigated by Emcon Associates and Applied Geosystems (AGS). Emcon, as documented in a report dated November 12, 1985, drilled four soil borings at the site, three around the old tank complex, and one adjacent to the waste oil tank. Monitoring Well MW-2 was also installed at that time. Soil samples obtained from the investigation by Emcon revealed hydrocarbons in the soil around the tank complex in concentrations up to 2,800 parts per million (ppm). Soil around the waste oil tank contained up to 10,000 ppm oil and grease. Tables 1 and 2 summarize the soil analytical results from these investigations.

During a subsequent investigation by AGS, two previously undiscovered 8-inch diameter wells (MW-3 and MW-4) were noted at the site. The purpose of these wells is unknown. AGS drilled four borings, and converted two of these (B-1 and B-2) to groundwater monitoring wells (MW-1 and MW-5). Soil samples analyzed for the AGS investigation revealed hydrocarbon concentrations between 5 and 10 ppm. As detailed below, a third 8-inch diameter well (MW-6) was discovered later by PACIFIC at the site. The locations of the monitoring wells and soil borings are shown on Figure 3.

The native soils at the site consist predominantly of moderately stiff to stiff silt. A medium dense sand was encountered in several boreholes (MW-1, MW-2, and MW-3) between 8 and 12 feet in depth. Groundwater was noted at approximately 11 feet below the ground surface, and a groundwater gradient to the southwest was calculated. A cross section is presented as Figure 4, showing the subsurface soil conditions based on information from the report by AGS.

All site monitoring wells were sampled by AGS in January 1988. Dissolved total volatile hydrocarbons (TVH) concentrations in the groundwater ranged from a low of 300 parts per billion (ppb) in Well MW-1 to a high of 62,000 ppb in Well MW-4. Benzene concentrations ranged from 20 ppb to 2,700 ppb. Total extractable hydrocarbons were detected in MW-1, adjacent to the waste oil tank, at 200 ppb. Although no floating product was present in any of the site wells during the January 1988 sampling event, free product was noted in the soils during drilling of Well MW-5. Results of groundwater sampling are presented on Table 3.

Additional soil and groundwater data was collected by PACIFIC during fuel and waste oil tank removal and replacement in June 1988; these activities were detailed in a report dated October 7, 1988 and submitted to the County of Alameda. PACIFIC collected soil samples from excavation side walls, as well as two samples from beneath each tank (one at each end). To facilitate appropriate disposal of the soils, additional soil

samples were collected as the northeastern gasoline tank excavation was enlarged to accommodate the new larger tanks. Floating product was noted on the groundwater in the gasoline tank excavation, and water samples were collected from the excavation. The groundwater and soil samples from the gasoline tank excavation were analyzed for low-boiling hydrocarbons calculated as gasoline, including benzene, toluene, xylenes and ethylbenzene (BTEX). The soil samples from the waste oil tank excavation were analyzed for high boiling hydrocarbons calculated as oil, total oil and grease, and polychlorinated biphenyls (PCBs). Results of these laboratory tests are presented on Table 4. Well MW-2 was destroyed during tank replacement; PACIFIC has been unable to locate Well MW-1 which may have been destroyed prior to tank replacement. Three vadose zone monitoring wells (V-1 through V-3) were installed during tank replacement.

PACIFIC checked Well MW-4 for depth to groundwater and presence of floating product on September 12, 1988. Approximately 1/16-inch of product was noted in the well on this date, and depth to groundwater was approximately 12.5 feet.

As part of the quarterly sampling program required by the Alameda County Water District (ACWD), PACIFIC has sampled the wells at the site on two occasions, in March and June, 1989. During the March 1989 sampling event, a third 8-inch well was discovered at the site, and designated E-1. This designation has subsequently been changed to MW-6 to keep consistency in the well nomenclature. The origin and purpose of this well is not known. The well was sampled during the June 1989 sampling event.

Laboratory results indicate dissolved hydrocarbon concentrations in Well MW-3 of up to 150,000 parts per billion (ppb) in March 1989 and 63,000 ppb in June 1989. The results of these sampling events are presented on Table 3.

SOIL GAS SURVEY

A soil gas survey was performed by PACIFIC in February 1989. The purpose of the soil gas survey was to identify the extent and possible sources of fuel hydrocarbons in the groundwater, as well as to provide guidance for further well installation and assessment.

A soil gas survey is a method of assessing the extent of hydrocarbons in the soil and groundwater. The survey is conducted by driving a hollow steel probe with a removable tip into the unsaturated soil, one to two feet above the water table or capillary fringe. A sample of the soil gas is drawn through the end of the probe and immediately analyzed by gas chromatography.

Although the absolute concentrations of hydrocarbons detected in the soil are a function of the geological conditions on site, experience has shown that the relative distribution of hydrocarbons in the soil gas approximate the pattern of their presence in the groundwater. This technique provides guidance for determination of the optimum locations for new monitoring wells to define the lateral extent of hydrocarbons in the groundwater.

Field Procedures

Nineteen exploratory probes were installed at the site on February 21-24, 1989 (see Figure 5). The on-site probes were installed to identify possible hydrocarbon source areas, as well as the lateral extent of previously detected petroleum hydrocarbons in the soil and groundwater. A total of eleven off-site probes were installed to the north and west of the site in an attempt to define the downgradient extent of the hydrocarbons.

The probes were constructed of 1/2-inch diameter hollow steel pipe, with a removable steel tip. The probes were driven into the soil with pneumatic equipment. At the desired depth, the probes were raised roughly 4 inches, leaving the tip in the soil and exposing the end of the pipe. In concrete or asphalt, a one-inch diameter hole was drilled with an electric roto-hammer to provide access to the native soil. Due to the stiff underlying clay, probe numbers 1, 2 and 8 met refusal at eight feet. All other probes were driven to a depth of 11 feet with the sampling interval at 10.5 to 11 feet below grade. The sampling depth was chosen so as to maintain at least one foot between the static ground water (as determined by the water levels in Wells MW-3 through MW-5) and the exploratory probe.

Upon completion of the sampling procedures the exploratory probes were removed and the borings were backfilled with a bentonite and concrete seal extending to the ground surface.

Analytical Procedures

The sample of soil gas was drawn by means of a vacuum pump attached to a Teflon sampling line. The soil gas was screened qualitatively by measuring the hydrocarbon concentration of the soil gas with an HNU Model PI 101 portable trace gas analyzer equipped with a photoionization detector. This allows an accurate setting of the gas chromatograph for the soil gas analysis. The HNU photoionization detector uses a sealed ultraviolet (UV) light source to measure gas vapor concentrations. The detector is calibrated to provide direct readings of benzene, and has a detection limit of 0.5% of full scale (0.1 ppm in the 0-20 ppm range) on a volume basis.

Once the photo-ionization reading stabilized, a sample of soil gas was taken from the probe head, and then injected into a Photovac Model 10S55 portable gas chromatograph equipped with an 11-electron volt (eV) photo-ionization detector. A UV light source in the detector ionizes the chemical compounds that have an ionization potential less than that of the UV light (11 eV). The temperature-controlled chromatographic column separates the individual compounds for speciation.

The gas chromatograph was calibrated with a certified standard mixture of benzene, toluene, ethylbenzene, and xylene isomers (BTEX). The total hydrocarbon measurements obtained by the HNU trace gas analyzer were used to set the sample gain on the detector in the gas chromatograph. The carrier gas rate through the gas chromatograph was 10 cubic centimeters per minute, and the oven temperature was maintained at 30 degrees Celsius.

PACIFIC followed routine quality assurance procedures to prevent contamination of the soil gas samples. The method of installation provides for a good seal between geologic material and the probe surface to prevent leakage of surface air into the sampling zone. The sample train is tested for leaks at the beginning of each day.

To prevent cross-contamination of samples with residual hydrocarbons, the sampling equipment is made up of non-contaminating steel or Teflon tubing. All probes are steam cleaned prior to use in the field and a clean probe is used for each sample. An equipment blank, a sample of ambient air taken through the equipment, is obtained periodically and the results compared with that of an ambient air sample. In addition, syringe blanks are periodically taken with the syringe used to inject the soil gas sample into the gas chromatograph to check for possible contamination of the syringe.

The flame-ionization detector and gas chromatograph are calibrated using certified standards throughout the course of each day. At a minimum, one standard is run before the sampling begins, one in the middle of the day, and one at the conclusion of the test. Blank samples are also run periodically.

Findings

Table 5 summarizes the results obtained at the nineteen sampling locations from the Photovac portable gas chromatograph. Individual levels of benzene, toluene, p- and m-xylene, o-xylene and ethylbenzene are given, along with total BTEX. The 10-11 foot sampling data were used to generate isoconcentration maps of total BTEX and benzene (Figures 6 and 7).

The chemical contour maps were constructed by logarithmic interpolation, which assumes a logarithmic decrease in chemical concentration between sample points. When producing chemical isoconcentration contours, values reported as below reporting limit (BRL) were contoured using the detection limit value of 0.1 ppm.

Concentrations of total BTEX and benzene range from less than 1 ppm to 800 ppm and less than 1 ppm to 390 ppm, respectively.

Interpretation of Results

Both the total BTEX and benzene contour maps suggest that petroleum hydrocarbons have migrated off-site to the west under Hacienda Avenue. The source of the hydrocarbons appears to be the former underground gasoline storage tanks, and possibly the northwestern service islands. Based on the latest groundwater sampling analyses, the concentration of dissolved hydrocarbons in the monitoring wells on-site appears to be decreasing.

WELL SURVEY

A water supply well survey was performed for PACIFIC by Alameda County. This survey revealed a total of 18 water supply wells within a half-mile radius of the site. The approximate locations of the wells are shown on Figure 1. These locations were estimated based on information received from the County of Alameda. Table 6 presents the results of the well survey. Water use from the wells is primarily for irrigation purposes, though domestic use is a significant portion of total use. The wells range in depth between 25 and 202 feet. The closest water supply well is an irrigation well located 600 feet southeast of the site. The depth of this well is 25 feet. The closest well in a downgradient direction is located approximately 1200 feet southwest of the site, and is an irrigation well listed as 29 feet deep.

PROPOSED SCOPE OF WORK

Monitoring Well Installation

To further assess the extent of hydrocarbons in the groundwater, six additional groundwater monitoring wells are proposed for installation at and around the site. The locations for the monitoring wells were selected based on the results from the soil gas investigation. One well is proposed in the eastern corner of the site, for the purpose of evaluating the lateral extent of hydrocarbons in the groundwater in the upgradient direction. Four wells are proposed downgradient of the site, one on Hacienda Avenue, two near the intersection of Via Arriba

and Hacienda Avenues, and one in the alley adjacent to the site. The sixth well is proposed along Hacienda Avenue north of the site. Figure 8 shows the proposed locations of the wells.

The groundwater monitoring wells will be drilled using eight-inch diameter hollow-stem auger drilling equipment. The borings will be logged by a PACIFIC geologist using the Unified Soil Classification System and standard geologic techniques.

Soil samples for logging and chemical analysis will be collected at five-foot depth intervals by advancing a California-modified split-spoon sampler with brass liners into undisturbed soil beyond the tip of the auger. The sampler is driven a maximum of 18 inches, using a 140-pound hammer with a 30-inch drop. The hollow-stem augers and down-hole sampling equipment will be steam cleaned between borings. Steam-cleaning water will be contained for proper disposal. All soil samples will be contained in brass liners, capped with aluminum foil and plastic end caps, sealed in glass jars, labeled, and logged onto chain-of-custody documents. The samples will be placed on ice for storage in the event that laboratory analysis is needed.

Soil samples collected at five-foot intervals during drilling will be analyzed in the field for ionizable organic compounds using the HNU Model PI-101 photoionization detector with a 10.2 eV lamp. The test procedure involves measuring approximately 30 grams from an undisturbed soil sample, placing this sub-sample in a clean glass jar, and sealing the jar with aluminum foil secured under a ring-type threaded lid. The jar is warmed for approximately twenty minutes, then the foil is pierced and the head-space within the jar is tested for total organic vapor, measured in parts per million (ppm; volume/volume). The instrument will be calibrated prior to drilling using a 100-ppm isobutylene standard (in air) and a sensitivity factor of 0.7, which relates to the ionization potential of isobutylene (7.0 ppm). The results of these field tests will be recorded on the boring logs.

The borings for the monitoring wells will penetrate a maximum of 15 feet into the water-bearing zone, taking care not to penetrate a five-foot thick aquitard. The borings will then be converted to groundwater monitoring wells with the installation of 3-inch diameter, Schedule 40 PVC casing and factory-slotted screen. Casing and screen sections are joined by flush threaded ends, without the use of glue or chemical cements. The screen slot width will be 0.020 inches, selected as explained below. Screen will be placed through the entire saturated section, extending a minimum of five feet above the static water level. Graded sand pack will be placed in the annular space across the screened interval, and will extend approximately two to five feet above the screen. A 12 x 20 sand pack is proposed, as explained below.

Logs for site monitoring wells and soil borings indicate predominantly fine-grained subsurface materials. Based on this information and a review of well construction by AGS, a sand pack graded to between a #12 and #20 sieve should be adequate to prevent infiltration of silty and clayey fines into the monitoring well casing. The well installed by AGS was constructed with a #3 Monterey sand, which is slightly coarser than the proposed 12 x 20 sand. Sampling of the well installed by AGS indicates that it has not lost any depth due to infiltration of native materials. A slightly finer sand will filter out clayey and silty fines more efficiently than a #3 Monterey sand. The 0.020-inch screen slot width is also compatible with the proposed sand pack.

A bentonite and concrete seal will be placed from the top of the sand pack to the ground surface. A locking cap and protective vault box will be installed on the top of each well. A typical well construction detail is included as Figure 9. All new monitoring wells will be surveyed by a licensed surveyor to mean sea level datum.

All drill cuttings will be encased in visqueen, protected from inclement weather conditions, and stockpiled on-site until laboratory tests are completed on soil samples. If gasoline levels in the stockpiled soil are below maximum acceptable levels, the soil will be disposed of at Class III landfill. If gasoline concentrations are above allowable levels, the soil will be disposed of at a Class I landfill or will be treated to acceptable levels prior to Class III disposal. Steam cleaning waste water and purged water will be stored in drums on-site temporarily, and will then be collected and disposed of by an outside contractor.

Groundwater Sampling and Analysis

As required by the ACWD, the monitoring wells will be sampled monthly for free product and dissolved gasoline constituents for three months after well installation. The appropriate laboratory analytical procedures will be taken from EPA Methods 8015, 8020, and 5030, involving examination of the sample using the purge and trap technique; final detection is by gas chromatography using a flame ionization detector as well as a photoionization detector. Results are calculated as gasoline, and includes benzene, toluene, ethylbenzene, and xylenes. A quarterly sampling program will be initiated after the three-month period.

Sampling protocol and equipment will conform to or exceed (if appropriate) ACWD guidelines. This involves purging each well of four to ten well volumes of water using a centrifugal pump immediately prior to sampling. During purging, temperature, pH, and electrical conductivity will be monitored to document that these parameters are stable prior to sampling. A clean Teflon

bailer will be used to collect the sample. Water samples will be placed in clean glass containers, labelled, and logged onto chain-of-custody documents for transport to the laboratory.

PACIFIC will issue a report detailing the investigation, including a brief site background, field and laboratory procedures, a summary of data collected, findings, and interpretations.

A remedial plan will be developed, dependent upon the findings of the additional soil and groundwater assessment proposed in this letter. Estimation of remediation to date will be submitted in the assessment report.

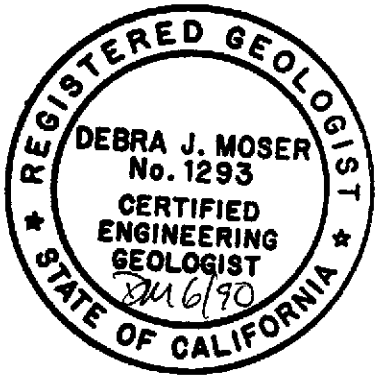
If you have any questions regarding this workplan, please call.

Sincerely,

PACIFIC ENVIRONMENTAL GROUP, INC.

Debra J. Moser
Senior Geologist
CEG 1293

enclosure



cc: Mr. Chris Winsor, ARCO
Ms. Cathryn Chesick, Alameda County

REFERENCES

Helley, E.J., Lajoie, K.R., and Burke, D.B., 1972; Geologic Map of Late Cenozoic Deposits, Alameda County, California, U.S.G.S. Miscellaneous Field Studies Map MF-429.

TABLE 1

SUMMARY OF SOIL ANALYTICAL RESULTS

ARCO Service Station No. 0608

Total Volatile Hydrocarbons and BTEX

Boring No.	Depth (feet)	TVH (ppm)	Benzene (ppm)	Toluene (ppm)	Ethyl-benzene (ppm)	Xylenes (ppm)
A-A	7-8.5	N/A	N/A	N/A	N/A	N/A
A-A	10.5-12	N/A	N/A	N/A	N/A	N/A
A-B	12.5-14	1,500	N/A	N/A	N/A	N/A
A-C	4-5.5	880	N/A	N/A	N/A	N/A
A-C	7-8.5	1,900	N/A	N/A	N/A	N/A
A-C	12.5-14	2,800	N/A	N/A	N/A	N/A
A-D	12.5-14	590	N/A	N/A	N/A	N/A
B-1	11	<5	<0.2	<0.2	<0.2	<0.2
B-2	10	<5	0.6	<0.2	<0.2	<0.2
B-3	10	<5	0.4	<0.2	<0.2	<0.2
B-4	5	10	0.8	0.5	4.1	1.2
B-4	10	5	0.4	0.2	1.0	1.0

Borings A-A through A-D from Emcon, as reported by AGS, 1988. Detection Limit not known.
Borings B-1 through B-4 from AGS, 1988. Detection limit 5 ppm for Total Volatile Hydrocarbons (TVH), 0.2 ppm for BTEX components.

TVH = Total volatile hydrocarbons
N/A = Not analyzed

TABLE 2

SUMMARY OF SOIL ANALYTICAL RESULTS

ARCO Service Station No. 0608

Oil and Grease

Boring No.	Depth (feet)	Oil and grease (ppm)
A-A	7 to 8.5	10,000
A-A	10.5 to 12	9,500
B-1	11	<30

- Boring A-A from Emcon, as reported by AGS, 1988. Detection limit not known.
- Boring B-1 from AGS, 1988. Detection limit 30 ppm for Total Oil and Grease.
- N/A - Not Analyzed

TABLE 3

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS

ARCO Service Station No. 0608

Low Boiling Hydrocarbons

Well No.	Sample Date	Gasoline (ppm)	Benzene (ppm)	Toluene (ppm)	Ethyl-benzene (ppm)	Xylenes (ppm)
MW-1	1-11-88	300	20	10	50	80
MW-2	7-5-85	32,000	1,000	690	N/A*	1,500*
MW-2	1-11-88	3,300	804	115	168	166
MW-3	1-11-88	1,800	20	20	80	60
MW-3	3-7-89	150,000	4,600	5,200	5,600	13,000
MW-3	6-21-89	63,000	2,700	5,800	3,300	12,000
MW-4	1-11-88	62,000	2,700	7,900	850	5,200
MW-4	3-7-89	84,000	2,400	3,400	2,500	7,600
MW-4	6-21-89	31,000	400	800	200	1,500
MW-5	1-11-88	31,000	4,000	2,700	3,800	5,500
MW-5	3-7-89	1,300	340	ND	140	50
MW-5	6-21-89	1,100	200	ND	130	40
MW-6	6-21-89	1,700	170	170	85	290

Note: ppm = parts per million

* = Ethylbenzene and Xylenes given as a combined value.

- 7-5-85 and 1-11-88 results from report by AGS and converted from parts per million.
- MW-1 and MW-2 destroyed prior to 3-7-89 sampling event.
- Well MW-6 is an 8-inch diameter well, previously not sampled.

TABLE 4

Summary of Analytical Results
Soil and Groundwater Samples from beneath Fuel Tanks

ARCO Service Station No. 0608

Soil Sample	Depth (Feet)	Gasoline	Benzene	Toluene	Xylenes and Ethylbenzene
E1-N	12.5	60.	0.2	<0.3	2.
E1-S	NR	2,300.	3.	5.	20.
E2-N	12	330.	1.6	6.	48.
E2-S	12	370.	1.3	11.	45.
E3-N	NR	7.	1.0	0.1	0.6
E3-S	12	2,800.	6.	23.	120.
W4-NE	NR	260.	1.2	2.	13.
W4-SW	15	500.	3.5	6.	87.
Groundwater Sample					
E1-S	NA	15.	1.4	2.3	4.7
E2-S	NA	22.	1.9	3.9	4.9
E3-N	NA	8.	0.44	1.1	2.3

* Soil results reported in parts per million, dry soil basis
Water results reported in parts per million (milligrams per liter)

NR - not recorded
NA - not applicable

TABLE 4, Cont'd

Summary of Analytical Results
Soil Samples from Fuel Tank Excavation Side Walls

ARCO Service Station No. 0608

Soil Sample	Depth (Feet)	Gasoline	Benzene	Toluene	Ethylbenzene and Xylenes
ESW-W	8	9.	0.12	<0.1	0.4
ESW-N	8	60.	0.10	<0.6	1.3
CESW-N	NR	<5.	0.06	<0.1	<0.4
ESW-E	8	<5.	<0.05	<0.1	<0.4
ESW-S	8	350.	1.2	5.	50.
W4SW-NW	8	<5.	<0.05	<0.1	<0.4
W4SW-NW2	12.5	730.	<3.	<6.	100.
W4SW-NW3	16.5	<5.	<0.05	<0.1	<0.4

Results reported in parts per million, dry soil basis

TABLE 4, Cont'd

Summary of Analytical Results
Soil Samples from Beneath Waste Oil Tank

ARCO Service Station No. 0608

Soil Sample	Depth (Feet)	Polychlorinated Biphenyls Aroclor Mixtures	Polychlorinated Biphenyls Total	Total Oil and Grease
OS-SW	9	None	<0.1	6,100
WOS-SW	9	None	<0.1	13,000

Results reported in parts per million, dry soil basis

Summary of Analytical Results
Soil Sample from Waste Oil Tank Side Walls

ARCO Service Station No. 0608

Soil Sample	Depth (Feet)	High Boiling Hydrocarbons	Oil and Grease
WOSW-NE	8	<10	10.
WOSW-NW	9	<10.	10.
WOSW-SE	8	10.	60.
WOSW-SW	9	30.	200.
WOSW-SW2	NR*	10.	20.
WO-BOH	13	10.	20.

Results in Parts per Million - Dry Soil Basis
* NR - not reported

Project No. 330-06.04

TABLE 5
Summary of Soil-Gas results
Sampled on February 21-24, 1989

PROBE #	DEPTH (in feet)	BENZENE (ppm)	TOLUENE (ppm)	E-BENZENE (ppm)	P,M-XYLENE (ppm)	O-XYLENE (ppm)	THC (ppm)	TOTAL BTEX (ppm)
1	7-8	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2	7-8	BRL	BRL	BRL	BRL	BRL	BRL	BRL
3	10-11	390	<6.9	32	65	17	110	510
4	10-11	120	280	BRL	BRL	BRL	110	400
5	10-11	BRL	1.0	BRL	BRL	BRL	BRL	1.0
6	10-11	110	110	BRL	BRL	BRL	110	220
7	10-11	BRL	.1	BRL	BRL	BRL	BRL	.1
8	7-8	BRL	BRL	BRL	BRL	BRL	BRL	BRL
9	10-11	72	370	51	1.1	BRL	130	460
10	10-11	<190	550	BRL	33	20	120	800
11	10-11	BRL	.4	BRL	.1	BRL	5	.5
12	10-11	BRL	BRL	BRL	BRL	BRL	BRL	BRL
13	10-11	<12	250	41	14	18	130	310
14	10-11	<9.2	310	BRL	BRL	BRL	100	320
15	10-11	<7.3	300	BRL	BRL	12	110	320
16	10-11	BRL	.1	BRL	BRL	BRL	BRL	.1
17	10-11	BRL	BRL	BRL	BRL	BRL	BRL	BRL
18	10-11	<4.8	170	12	.4	30	110	220
19	10-11	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Reporting Limit:		.1	.1	.1	.1	.1	1	.1

BRL: Below Reporting Limit.
ppm: parts per million on a volume to volume basis.
< : Due to hydrocarbon interference these values are an adjusted reporting limit.

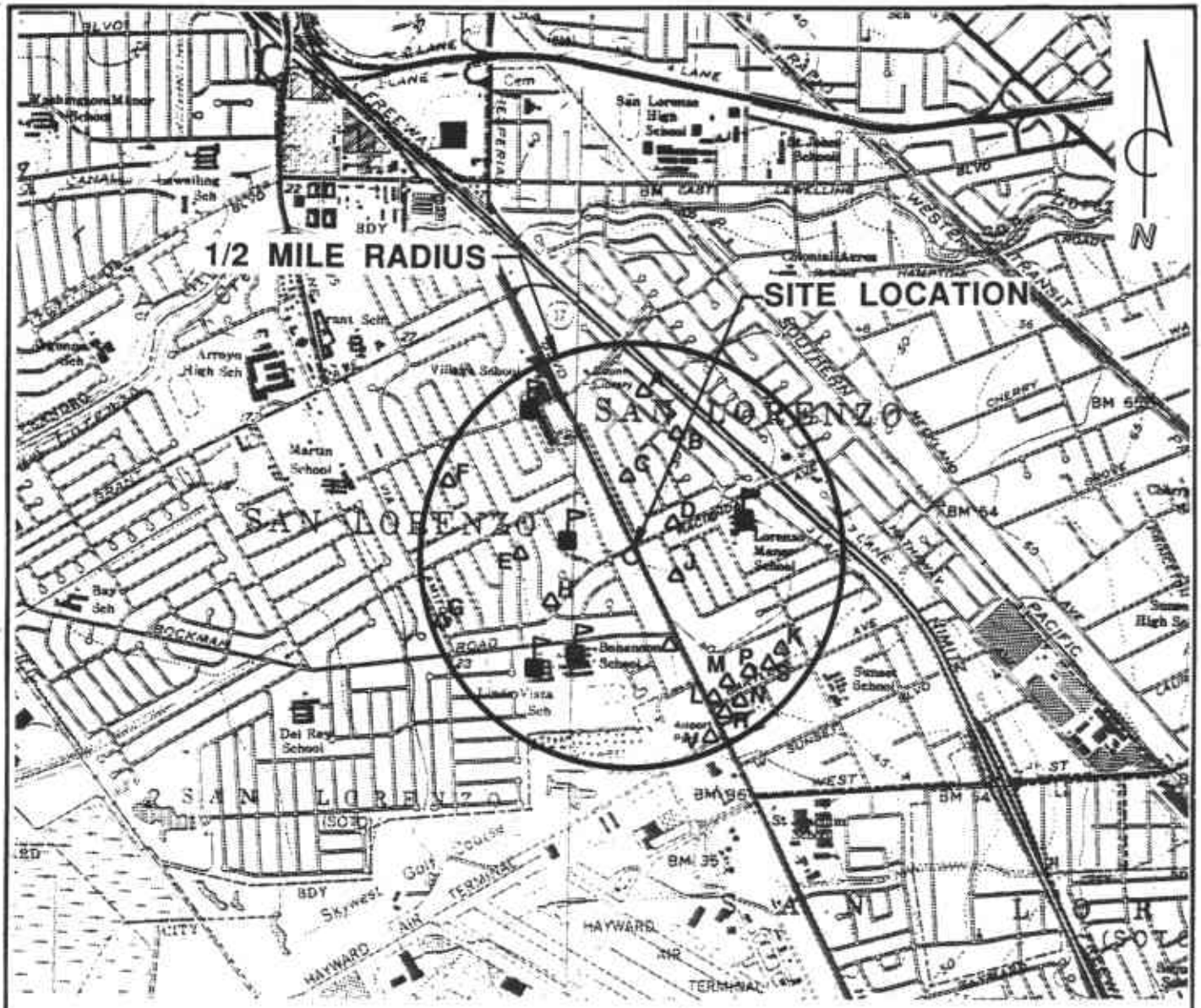
TABLE 6

1/2 Mile Radius Water Supply Well Survey

ARCO Service Station No. 0608

Well ID	Well Loc.	Year Drilled	Depth (ft.)	Use	Diameter (in.)
A	T3SR2W7Q80	1977	138	U	-
B	T3SR2W18B1	1950	34	IRR	6
C	T3SR2W18B3	1978	40	IRR	6
D	T3SR2W18B4	1977	31	IRR	6
E	T3SR2W18C1	1977	25	IRR	4
F	T3SR2W18D1	1953	98	DOM	6
G	T3SR2W18E1	--	--	IRR	-
H	T3SR2W18F3	1977	29	IRR	4
J	T3SR2W18G1	1977	26	IRR	4
K	T3SR2W18J1	1953	202	DOM	8
L	T3SR2W18J3	--	100	DOM	8
M	T3SR2W18J4	1918	90	IRR	8
N	T3SR2W18J5	1939	55	DOM	6
P	T3SR2W18J6	1946	95	IRR	6
R	T3SR2W18J7	1929	65	IRR	8
S	T3SR2W18J8	1951	75	DOM	6
T	T3SR2W18K1	1950	108	DOM	10
U	T3SR2W18K3	1978	155	IRR	8

KEY
U - unknown
IRR - Irrigation
DOM - Domestic



QUADRANGLE LOCATIONS

LEGEND:

SCHOOL

WATER SUPPLY WELL DESIGNATION AND APPROXIMATE LOCATION

REFERENCE:

USGS 7.5 MIN. TOPOGRAPHIC MAP
TITLED: HAYWARD, CALIFORNIA
DATED: 1959 REVISED: 1980
TITLED: SAN LEANDRO, CALIFORNIA
DATED: 1959 REVISED: 1980

SCALE

2000 0 2000 FEET

PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO STATION #0608
17601 Hesperian Boulevard
San Lorenzo, California

SITE LOCATION MAP

FIGURE: 1

PROJECT: 330-06.04

PROJECT NUMBER 330-06.04

DRAWN BY ET
DATE/NUMBER 9-88

REVISIONS

CHURCH AND SCHOOL
RESIDENTIAL
RESTAURANT
RESTAURANT
VIA MAGDELENA
HACIENDA AVE.
ROBSCOTT AVE.
RESTAURANT
ARCO STATION
RESIDENTIAL
RESIDENTIAL
ALLEY
HESPERIAN BOULEVARD
STORE
VIA ENCINO
RESIDENTIAL
SHOPS
VIA ALAMO
VIA ARRIBA
BANK
CAR WASH
SHOPS
RESIDENTIAL
VIA ROSAS

N

BASED ON AERIAL PHOTO
BY PACIFIC AERIAL SURVEY

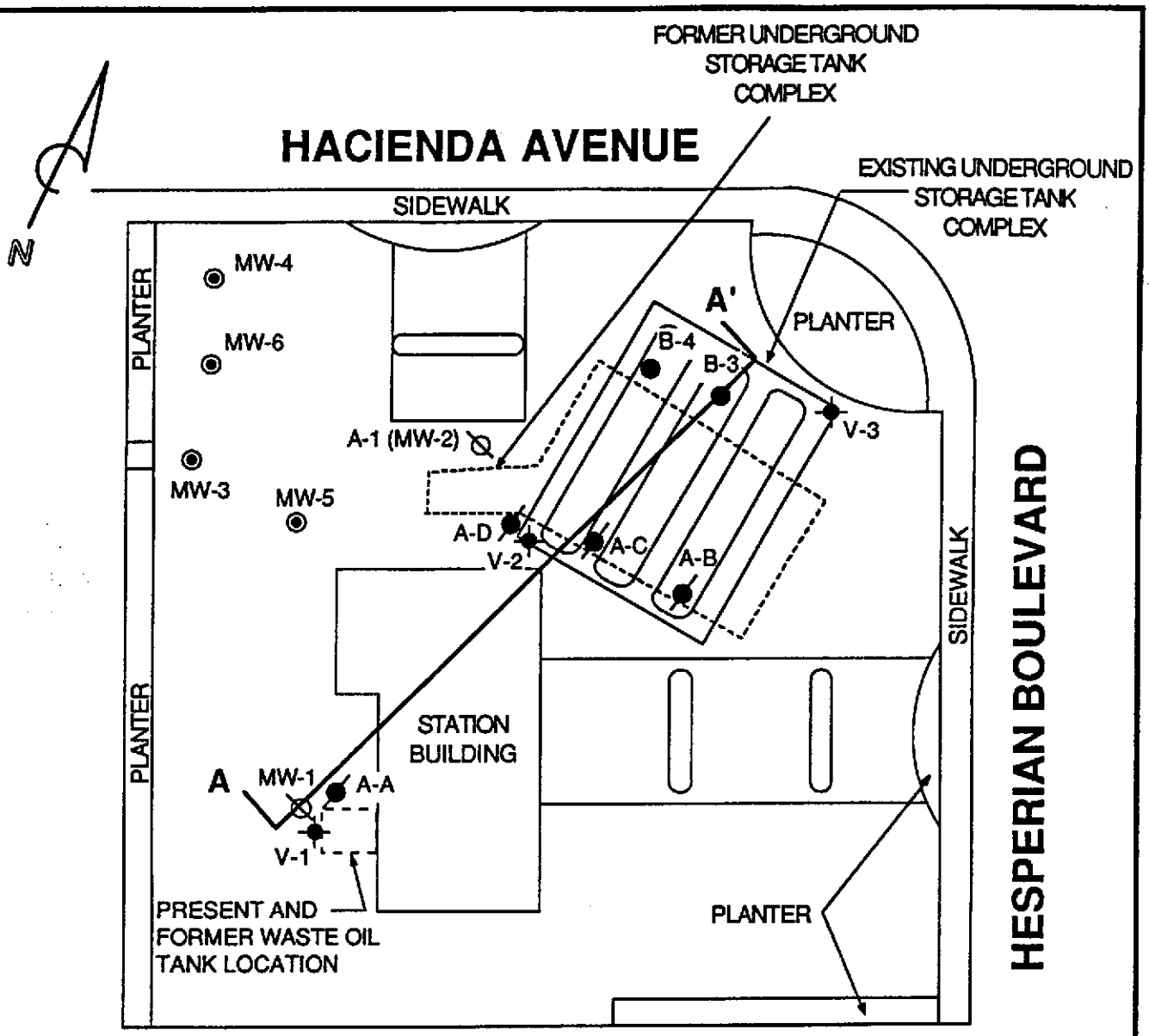
PACIFIC ENVIRONMENTAL GROUP, INC.

SCALE
100 0 100 FEET

ARCO STATION #0608
17601 Hesperian Boulevard
San Lorenzo, California

EXTENDED SITE MAP

FIGURE : 2
PROJECT: 330-06.04



LEGEND

MW-1 — GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

A-1 (MW-2) — DESTROYED MONITORING WELL LOCATION AND DESIGNATION

B-3 — SOIL BORING LOCATION AND DESIGNATION (AGS, 1988)

A-A — SOIL BORING LOCATION AND DESIGNATION (EMCON, 1985)

V-1 — VADOSE ZONE MONITORING WELL LOCATION AND DESIGNATION

A A' — LINE OF CROSS SECTION (SEE FIGURE 4)

NOTE: MW-3, MW-4, MW-6 OF UNKNOWN ORIGIN, MW-5 BY AGS, 1988

APPROXIMATE DIRECTION OF REGIONAL GROUNDWATER FLOW

SCALE

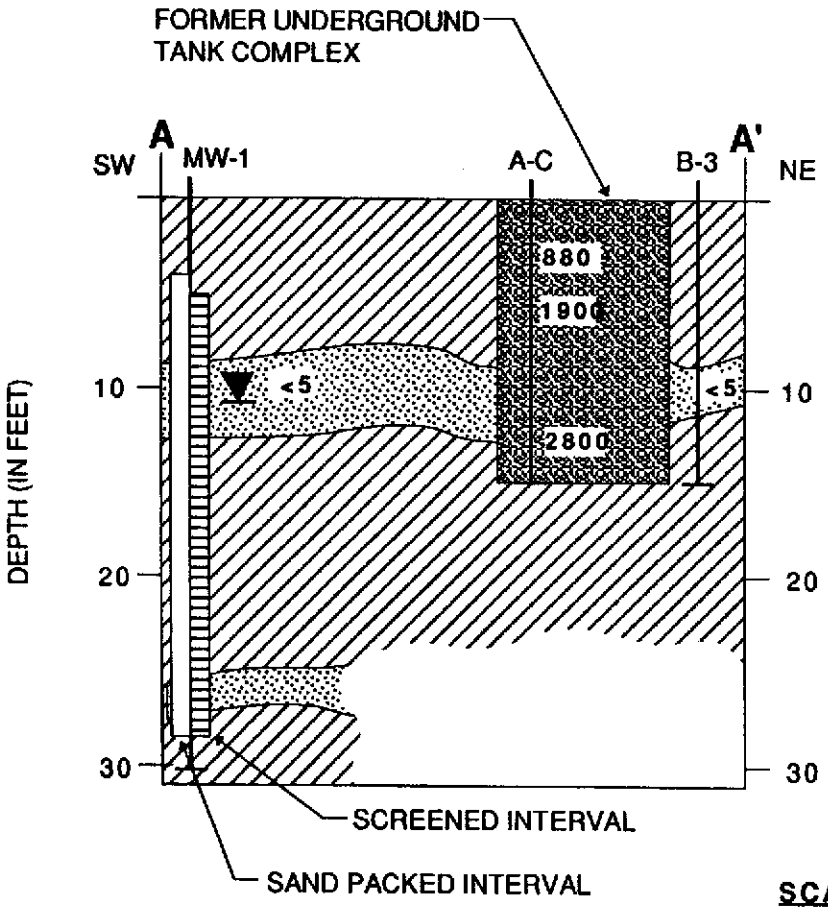
0 30 60 FEET

PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO STATION #0608
17601 Hesperian Boulevard
San Lorenzo, California

SITE MAP

FIGURE: 3
PROJECT: 330-06.04



LEGEND:

	CLAY AND SILT
	SILTY SAND
800	HYDROCARBON CONCENTRATON IN SOIL (PPM)
	STATIC WATER LEVEL, MARCH 1988
MW-1	MONITORING WELL DESIGNATION
A-C, B-3	SOIL BORING DESIGNATION

SCALE:

HORIZONTAL: 1"=40'
VERTICAL: 1"=10'

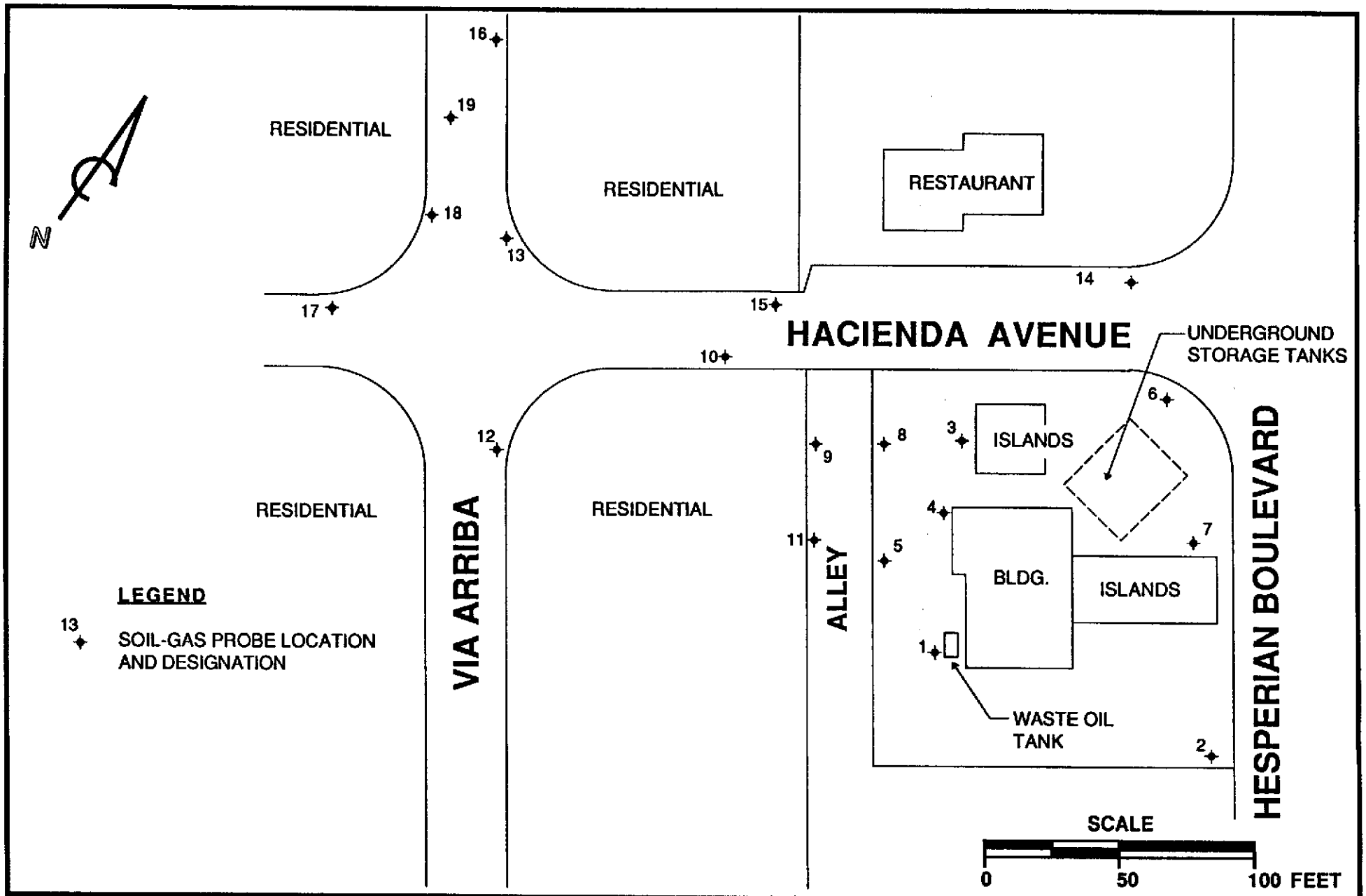
PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO SERVICE STATION #0608
17601 Hesperian Boulevard
San Lorenzo, California

CROSS-SECTION A-A'

FIGURE: 4

PROJECT: 330-06.04



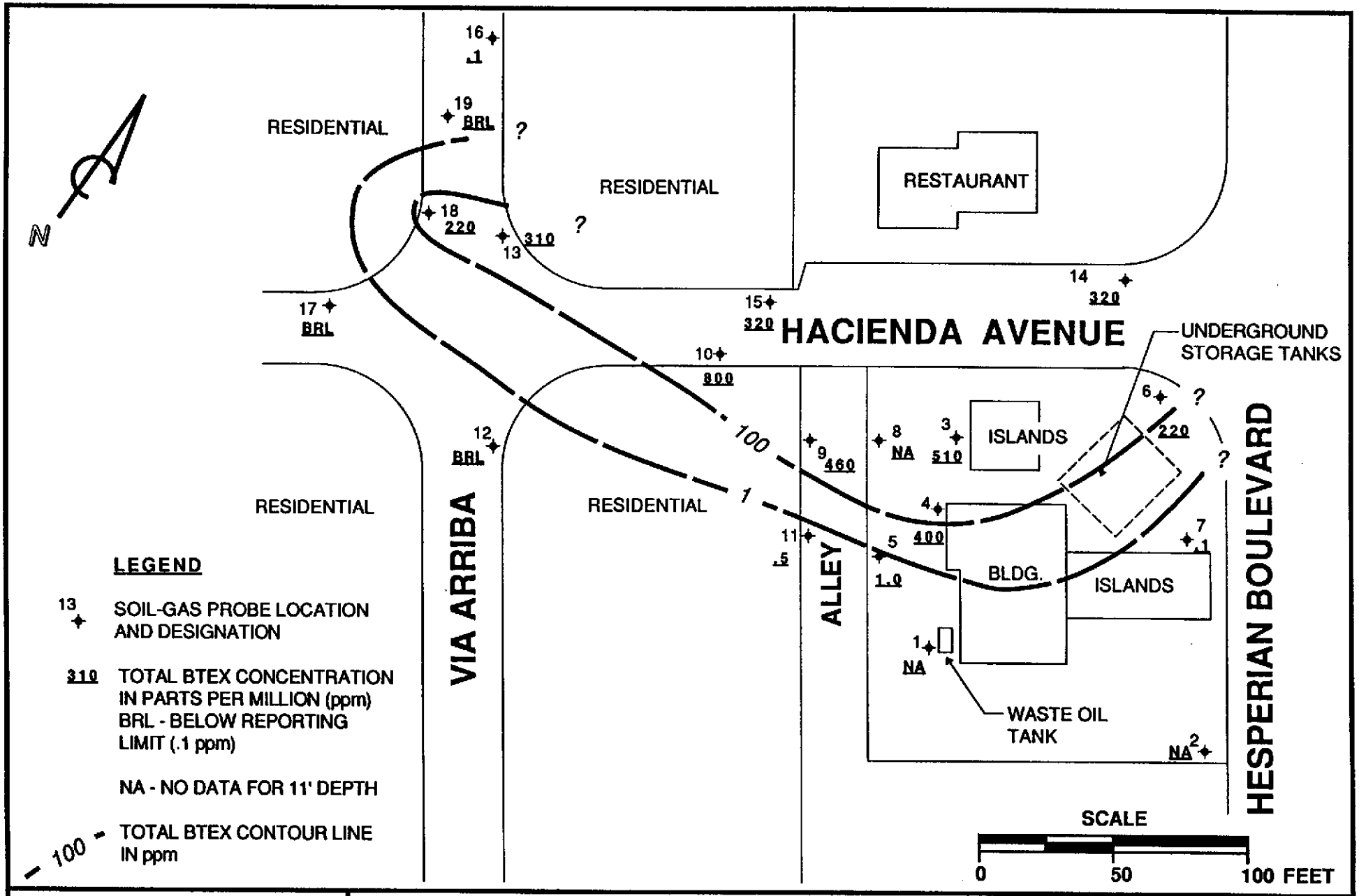
PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO STATION #608
17601 Hesperian Boulevard
San Lorenzo, California

SOIL-GAS LOCATION MAP

FIGURE: 5

PROJECT: 330-06.04



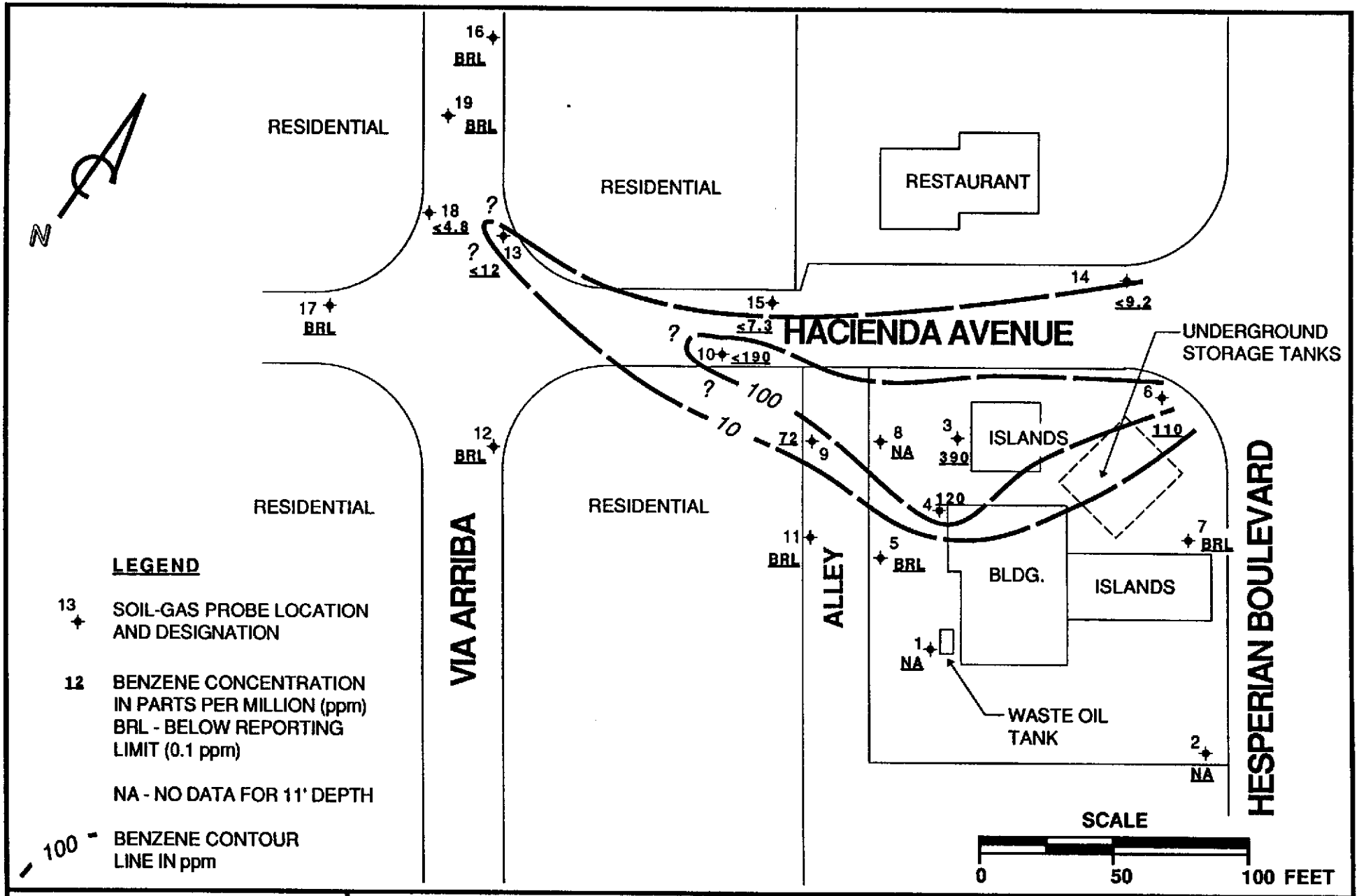
PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO STATION #608
17601 Hesperian Boulevard
San Lorenzo, California

TOTAL BTEX ISOCONCENTRATION MAP AT 10'-11' DEPTH

FIGURE: 6

PROJECT: 330-06.04



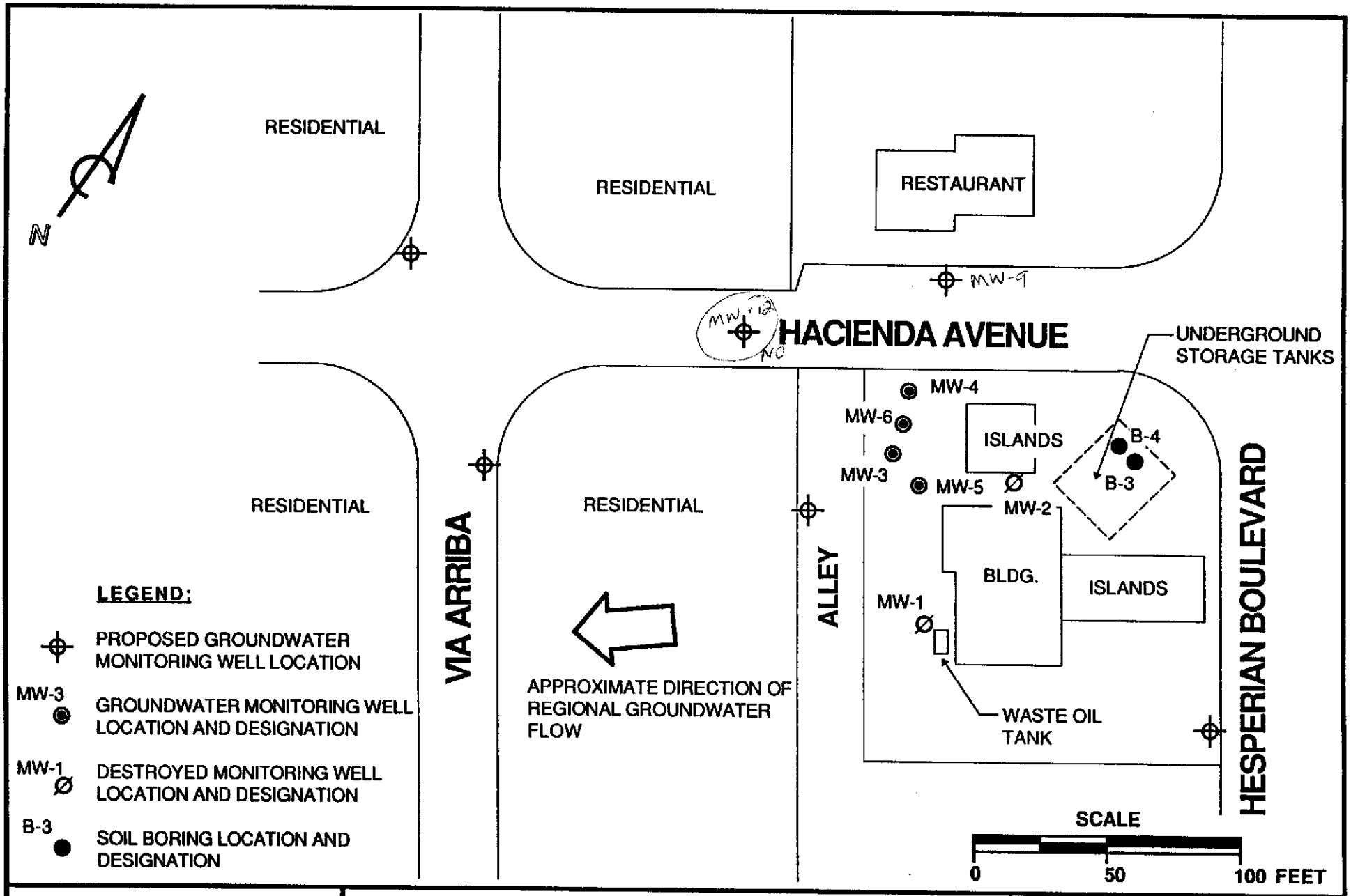
PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO STATION #608
17601 Hesperian Boulevard
San Lorenzo, California

BENZENE ISOCONCENTRATION MAP AT 10'-11' DEPTH

FIGURE: 7

PROJECT: 330-06.04



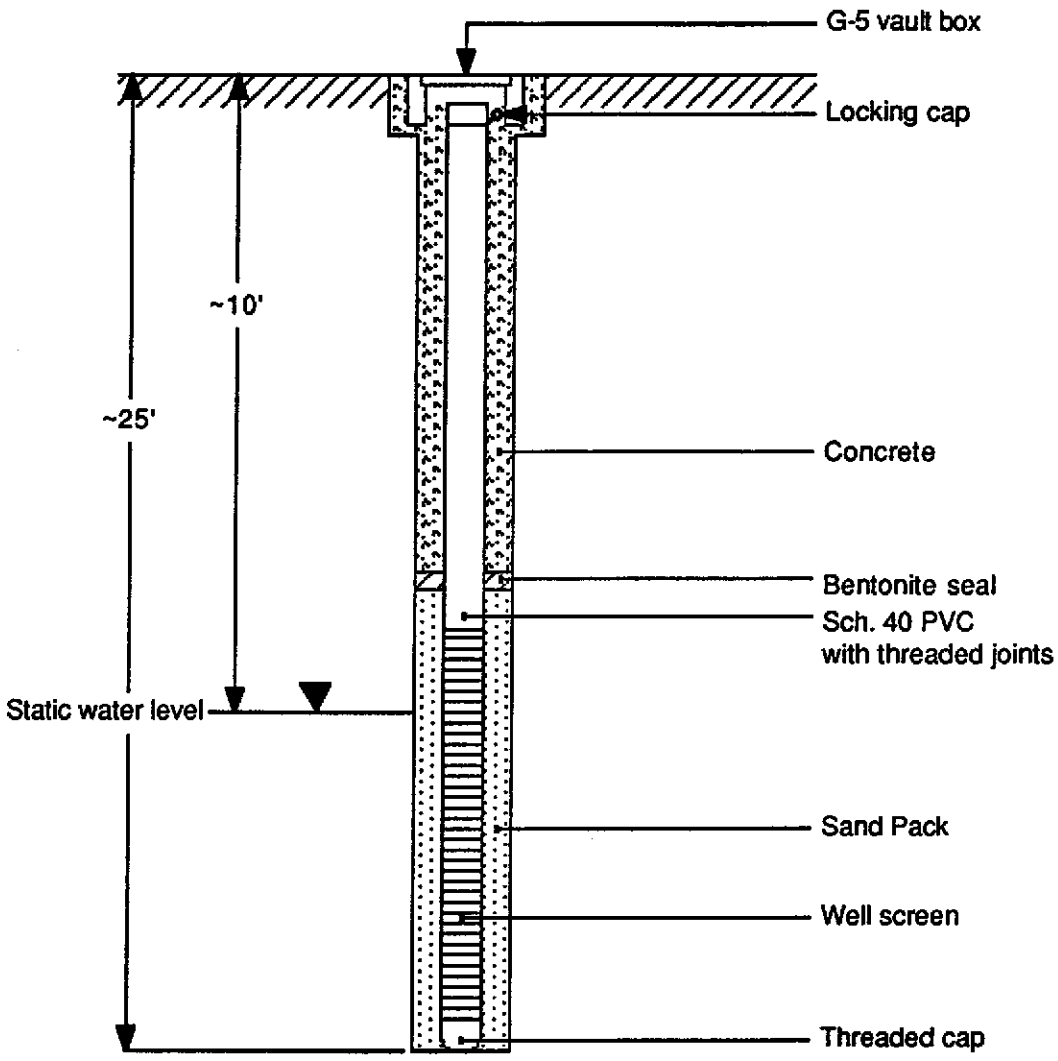
PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO STATION #608
17601 Hesperian Boulevard
San Lorenzo, California

PROPOSED MONITORING WELL LOCATIONS

FIGURE: 8

PROJECT: 330-06.04



Not to Scale

PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO SERVICE STATION #0608
17601 Hesperian Boulevard
San Lorenzo, California

WELL DETAIL

FIGURE: **9**
PROJECT: 330-06.04