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TRANSMITTAL

TO: MR. DENNIS BYRNE
ALAMEDA COUNTY DEPARTMENT OF
ENVIRONMENTAL HEALTH
80 SWAN WAY, ROOM 200
OAKLAND CA 94621

DATE: 3/22/91
PROJECT NUMBER: 19014.03
SUBJECT: REPORT

FROM: JOAN TIERNAN
TITLE: ENGINEERING MANAGER

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REPORT
LIMITED OFFSITE SUBSURFACE ENVIRONMENTAL INVESTIGATION

ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California

Jan 17, 1991 94605

AGS Job 19014-3

Prepared for:

ARCO Products Company
2000 Alameda de Las Pulgas
San Mateo, California 94403

by
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January 17, 1991

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REPORT
LIMITED OFFSITE SUBSURFACE ENVIRONMENTAL INVESTIGATION

ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California

Prepared for
ARCO Products Company

INTRODUCTION

At the request of ARCO Products Company (ARCO), Applied GeoSystems (AGS) conducted a limited offsite subsurface environmental investigation to evaluate the presence of gasoline and diesel derived petroleum hydrocarbons in soil at the adjacent Foothill Square Shopping Center immediately southeast of ARCO Service Station 276, in Oakland, California; and to conduct a literature review of environmental investigations in the site area. The offsite work was conducted on a portion of the Shopping Center parking lot. Boring locations were between 50 - 260 feet southeast of the ARCO Station building. This assessment was initiated after gasoline hydrocarbons were detected in soil and ground water onsite during investigations performed by AGS and others at the request of ARCO. This investigation was performed in conjunction with an AGS onsite investigation focusing on the removal of four underground storage tanks (AGS, January 18, 1991).

The investigation involved obtaining necessary permits and permissions, drilling nine soil borings, sampling and performing laboratory analyses on selected soil samples, surveying the boring locations, reviewing information from previous environmental investigations conducted in the site vicinity, and preparing a report of the findings.

SITE DESCRIPTION AND BACKGROUND

Site Description

The service station is located at the southeast corner of the intersection of MacArthur Boulevard and 106th Avenue in Oakland, California, as shown on Plate 1. Immediately adjacent to and southeast of the station property is the Foothill Square Shopping Center parking lot, the location of the offsite investigation. The schematic layout of the service station and the offsite area showing soil boring locations is presented on the Generalized Site Plan on Plate 2.

Several commercial businesses are located in the Foothill Square Shopping Center, including a grocery store, coin laundry, a dry cleaners, a drug store, offices, and another service station at Foothill Boulevard and 108th Avenue. The nearest store to the offsite investigation is the Lucky Food Store; the offsite investigation was conducted in the Lucky parking lot. Private residences are north and northeast of the offsite area and the service station.

Regional Geology and Hydrogeology

The offsite parking lot and ARCO Station 276 are located within the East Bay Plain which is situated in the San Francisco Bay depression that is in part an irregular downwarp with faulting principally along northwest trending faults (Alameda County Flood Control and Groundwater Conservation District, June 1988). The site is at an elevation of approximately 55 feet above mean sea level (MSL) and approximately 1/2 mile west of the major fault in the area, the Hayward Fault Zone as seen on Plate 1. The subsurface soils in the vicinity of the site consist of Pleistocene, highly permeable alluvium composed of poorly

consolidated to unconsolidated clay, silt, sand, and gravel. The alluvium was derived mainly from the Diablo Range and represents coalescing alluvial fans (Alameda County Flood Control and Groundwater Conservation District, June 1988). Ground-water flow direction beneath the site is generally inferred to be to the west towards San Francisco Bay, but may have components to the north and east due to recharge areas along the Hayward Fault.

Well Search

A records check of local wells within a 1/2-mile radius of the area, identified three domestic wells, two irrigation wells, and three wells used for cathodic protection (Alameda County Flood Control and Water Conservation District, 1989; AGS, August 8, 1989). The total well depths of the domestic wells ranged from 75 - 120 feet below ground surface.

PREVIOUS WORK

In 1988, Kaldveer Associates (KA) conducted a preliminary site history assessment at the Foothill Square Shopping Center property southeast and adjacent to the ARCO Station 276 (KA, October 3, 1988). The work focused on a survey of present and past site and near-vicinity conditions; and concluded that there was potential for soil and ground-water contamination from past uses of the site, and that several facilities within a 1-1/2 mile radius of the site had a history of releases. Recommendations included soil sampling and the installation of at least four ground-water monitoring wells.

During the site history survey, KA also conducted a subsurface environmental investigation. The work included drilling 15 soil borings, collecting soil samples, collecting "grab" water samples from a seasonally saturated perched water bearing zone encountered in the borings,

and analyzing soil and water samples. Analyses of soil and ground-water samples indicated the presence of petroleum hydrocarbons, primarily in the northwest parking lot area of the shopping center, the area which is east of Station 276 and immediately adjacent to it. Total petroleum hydrocarbons as gasoline (TPHg) in the ground-water samples ranged from non-detectable to 8.36 parts per million (ppm). Free product was present in Boring EB-1 which was located about 90 feet east of the southeast corner of the ARCO station building. Benzene, toluene, ethylbenzenes, and total xylenes (BTEX) in ground water ranged from non-detectable to 0.87 ppm. Benzene was detected in one soil sample at 0.11 ppm, and TPHg was present in trace amounts in some of the soil samples taken. Pesticides, PCBs, and semi-volatile compounds were also detected in a water sample (KA, October 7, 1988). Recommendations included the installation of additional ground-water monitoring wells and additional soil borings in the northwest area of the shopping center, which is the area southeast of ARCO Station 276.

In December 1988, Western Geologic Resources, Inc., (WGR) conducted a subsurface environmental investigation at the Foothill Square Shopping Center, which included constructing five ground-water monitoring wells (MW-1 through MW-5) and analyzing nine soil and five water samples. The WGR investigation found hydrocarbons in the soil and ground water and semi-volatile compounds in ground water (WGR, January 17, 1989). TPHg was not detected in any of the soil samples; benzene was present in one soil sample at 0.016 ppm. TPHg in ground water ranged from nondetectable (ND) up to 0.3 ppm in one sample. BTEX were also present in ground water near trace levels. The ground-water flow direction was determined to be toward the south at a gradient of about 0.04 ft/ft. Monitoring well screen intervals and ground-water elevations on January 11, 1989 are presented in the table below. Four of the offsite wells appear to be screened in a shallow water bearing zone; one appears to be screened in a deeper water bearing zone (MW-4).

Offsite Monitoring Well Number (WGR, December 1988)	Well Screen Interval (Ft Below Grade)	(Ft MSL)	Water Level Elevation on 1-11-89 (Ft MSL)
MW-1	23.5-28.0	42.4-38.0	55.77
MW-2	23.0-28.0	40.0-35.0	37.71
MW-3	22.0-27.0	35.9-30.9	37.73
MW-4	25.0-45.0	34.7-14.7	27.80
MW-5	23.5-31.5	45.4-31.4	49.94

In 1988, Pacific Environmental Group, Inc. (Pacific Environmental) removed an underground storage tank (UST) for waste-oil from the ARCO station. Hydrocarbons in soil in the vicinity of the tank pit were delineated and the soil excavated for disposal (Pacific Environmental, February 6, 1989).

In March 1989, AGS installed 5 ground-water monitoring wells onsite at the ARCO station property, and collected and analyzed soil and ground water samples. TPHg was present in four of the five wells: concentrations ranged from 0.56 in MW-3 to 165 ppm in monitoring well MW-2 (AGS, August 8, 1989). BTEX ranged from nondetectable to 21 ppm of toluene in MW-2. Tetrachloroethene was detected in the water sample from well MW-4 at 1.5 ppm. Soil samples were taken from each of the borings for the wells during drilling. TPHg in soils ranged from ND to 690 ppm in Boring 2/MW-2 at a depth of 20 feet below ground surface. TPHg was present in Boring 5/MW-5 at 220 ppm at a depth of 16 feet. BTEX were also present in soil in B-2 and B-5. In 1989 and the first quarter of 1990, AGS

conducted quarterly monitoring of the five onsite ground-water monitoring wells on ARCO property. The inferred direction of ground-water flow, disregarding MW-2 which appeared to be in a perched zone, was toward the north/northwest at a gradient of about 0.003 ft/ft. One of the wells (MW-2) is screened in the shallow water bearing zone and four of the wells are screened in the deeper water bearing zone. Onsite monitoring well screen intervals and ground-water elevations on October 13, 1989 are presented in the table below for the wells at the ARCO service station.

Onsite Monitoring Well Number (AGS, March 1989)	Well Screen Interval (Ft Below Grade)	(Ft MSL)	Water Level Elevation on 10-13-89 (Ft MSL)
MW-1	19.0-39.0	36.9-16.9	18.72
MW-2	15.5-26.5	39.9-28.9	35.18
MW-3	20.0-40.0	36.6-16.6	18.95
MW-4	30.0-50.0	25.9- 5.9	18.91
MW-5	32.5-47.5	22.9- 7.9	19.10

In June, 1989, Pacific Environmental conducted a soil-vapor survey at the ARCO Station immediately adjacent to and southeast of the station in Lucky's parking lot area (Pacific Environmental, July 17, 1989) (Refer to Appendix F for a copy of this report). At depths of 21 - 24 feet below ground surface the total hydrocarbon gas concentration ranged as follows: in P-1, 20 feet south/southeast of the Station 276 building, TPH gas was 20,000 ppm; in P-12, 70 feet south/southeast of the station building, the TPH gas concentration was 33,500 ppm; in P-15, 125 feet south of the station building, the TPH gas concentration

P-15

was 40,000 ppm; and in P-13, 140 feet south/southeast of the station building, the TPH gas concentration was 24,500 ppm. At depths of 17 - 21 feet below ground surface, P-1 had a higher TPH gas concentration of 31,900 ppm than it had at 21 - 24 feet; P-12 had a significantly lower TPH gas concentration of 10 ppm; and P-15 had a lower soil gas concentration of 23,500; and P-13 had a much lower TPH gas concentration of 60 ppm than at 21 - 24 feet. Borings drilled during the current investigation were sited, based in part, on the spatial distribution of hydrocarbon vapors detected during the soil-vapor survey.

Other work which was conducted at the site by AGS during the last half of 1989 and the first half of 1990 and which will be discussed in other reports, included: removal of four underground storage tanks and associated product line piping, and tank pit soil sampling; drilling of three exploratory soil borings and collecting soil samples from the proposed replacement tank pit area; aeration of soil excavated from the former tank pit and collection of samples of the aerated soil; quarterly sampling, analysis, and reporting; meeting with the Alameda County Department of Environmental Health to discuss the status and future direction of the investigation; completion of a soil vapor extraction system pilot plant study, and conceptual design of a soil vapor extraction system to be used for removing onsite and offsite hydrocarbon compounds from the unsaturated zone.

FIELD INVESTIGATION

Drilling

The field work was conducted in accordance with the field procedures described in Appendix A, and according to the Site Safety Plan (AGS, March 6, 1989). Prior to beginning the field work, a Ground Water Protection Ordinance Permit for well construction

was acquired from the Alameda County Flood Control and Groundwater Conservation District, Zone 7. A copy of the permit is included in Appendix B. The locations selected for the borings were based on previous work at Station 276 and in the Shopping Center, including the soil gas survey tests conducted in June 1989 (Pacific Environmental, July 17, 1989).

Nine borings (B-1 through B-9) were drilled on August 3, 4, and 16, 1989 to depths of 31 - 36 feet below the existing grade. Their locations are shown on Plate 2. Boring elevations were surveyed by a licensed surveyor.

Soil Sampling

Soil samples were collected at 5-foot intervals from the ground surface to a depth of 20 feet, and at 2-1/2 foot intervals from a depth of 20 feet to the total depth of the boring. One of the samples at each sampling interval that was not selected for laboratory analysis was removed from the brass sleeve and used by an Applied GeoSystems geologist to describe the soil type using the Unified Soil Classification System (USCS) (Plate 5). The USCS descriptions of the soils are indicated on the Logs of Borings, Plates 6 through 23 in Appendix D. Sampling procedures are described in detail in Appendix A. The boring logs also show the organic vapor meter (OVM) readings under the column entitled "P.I.D." (photoionization detector).

ANALYTICAL METHODS

Selected soil samples collected from the borings were delivered to one of two State certified laboratories for analysis, either Applied Analytical (Hazardous Waste Testing Laboratory Certification No. 153) in Fremont, California; or to Anametrix, Inc. (Hazardous Waste Testing Laboratory Certification No. 151) in San Jose, California. Chain of Custody protocol was followed for all samples.

The samples were analyzed for total petroleum hydrocarbons as gasoline (TPHg) by Environmental Protection Agency (EPA) Method 5030 and modified EPA Method 8015; for total petroleum hydrocarbons as diesel (TPHd) using EPA Method 3550; for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Methods 5030 and 8020/602; and for volatile organic compounds (VOCs) by EPA Methods 624/8240. Chain of Custody Records and copies of original laboratory Analysis Reports are included in Appendix E.

ANALYTICAL RESULTS

The results of the chemical analyses are reported in Tables 1 and 2. Geologic results are reported in the section following this one. The nine boring locations are shown in Plate 2. All soil samples were analyzed for TPHg and BTEX. Four samples were analyzed for TPHd, and eight samples for VOCs other than BTEX. Six of the nine borings were tested for VOCs (B-1 through B-6), which included a scan for 41 VOCs. Only the positive results for VOCs are reported in Table 2. All VOC samples were taken at or below a 26-1/2 feet depth. Results of the TPHg analyses are summarized in the cross sections in Plates 3 and 4.

A total of 43 samples were submitted for analysis. Of these, 33 samples, or 77 %, showed no detectable concentrations of the compounds tested. Ten of the samples showed some contamination. This contamination was found to be present 20 feet or more below ground surface, in six of the nine borings; but no contamination was detected above 20 feet.

Three borings showed no evidence of the contaminants being analyzed: B-2, B-3, and B-9. TPHg, TPHd, BTEX, and VOCs were not detected in any of the fourteen samples taken from these borings.

Two borings, B-5 and B-8, did not contain detectable concentrations of TPHg, but showed some BTE or X. This contamination was found at 21 feet and 23 feet below ground surface. TPHd was not analyzed in these borings.

As seen in Table 1, low levels of TPHg and BTEX were present in two of the nine samples taken from Borings B-1 and B-4. Contamination was present at 29 feet in B-1 and at 26.5

feet in B-4. Tentatively identified volatile organic compounds were detected in B-4 at the 26-1/2 foot depth (Table 2).

Two borings, B-6 and B-7, showed elevated levels of TPHg, TPHd, and BTEX below a depth of 20 feet. A total of 10 samples were analyzed from these two borings, and 5 samples showed the presence of petroleum hydrocarbons. Elevated TPHg concentrations were detected in B-6 at a depth of 26-1/2 feet (1,400 ppm), and in B-7 at a depth of 21 feet (530 ppm). The sample collected from B-6 at 26-1/2 feet also contained TPHd at 320 ppm. BTEX concentrations in contaminated samples from B-6 ranged from ND to 63 ppm total xylenes. BTEX concentrations in contaminated samples from B-7 ranged from ND to 30 ppm total xylenes. B-6 and B-7 are located at the MacArthur Boulevard driveway entrance to the Foothill Square Shopping Center as seen in Plate 2 at distances of about 50 feet and 65 feet southeast of the ARCO station building, respectively. Tentatively identified volatile organic compounds were also detected in B-6 at the 26-1/2 foot depth.

The tentatively identified volatile organic compounds (TICs) are significant chromatographic peaks other than priority pollutants. TIC spectra are compared with entries in the National Bureau of Standard mass spectral library, and the values calculated are laboratory estimates only. The TICs detected are gasoline based compounds as identified in the State of California Leaking Underground Fuel Tank (LUFT) Field Manual.

GEOLOGIC RESULTS

Two geologic cross sections (Plates 3 and 4) were constructed based on the geologic data in the boring logs, and on previous data collected by AGS on behalf of ARCO. Analytical results are also summarized on the sections. The plan view locations of Section A-A' and B-B' were previously seen in Plate 2.

The earth materials encountered in the borings consisted primarily of sandy and silty clay, containing discontinuous lenses of silty sand and gravel. Saturated soil was encountered in Borings B-1, B-4, and B-7 through B-9 at depths of approximately 22-27 feet below ground surface (BGS) (about 34 to 38 feet MSL). Standing water did not accumulate in the borings before they were backfilled, suggesting that this may be a perched water bearing zone.

Section A-A' (Plate 3) shows that in the Foothill Square Shopping Center area, a shallow, perched water bearing zone is apparent and is encountered at an elevation of about 30 to 33 feet MSL (about 25-26 BGS). But in the northwestern half of the ARCO station property, the perched, shallow water bearing zone appears to be absent and the subsurface geology is primarily silty clay until a deeper water bearing zone is reached. This deeper water bearing zone is encountered at an elevation between about 18 to 20 feet MSL (about 40 feet BGS). Contaminant soil concentrations are nondetectable along Section A-A'.

In Section B-B' (Plate 4) the shallow perched water bearing zone is present in the southeastern half of the ARCO property and is also present in the Foothill Square Shopping Center which is adjacent to and southeast of the ARCO property. MW-2 is the most southeasterly well on ARCO property. It is screened in the shallow, variably saturated zone, and it occasionally goes dry. The ground-water elevation in MW-2 on October 13, 1989 was

about 35 feet MSL (AGS, August 7, 1990). In August 1989, the shallow water bearing zone contained saturated soils which were first encountered between 30 - 36 feet MSL. The deeper zone water table elevation in well MW-5 is encountered at about 19 feet MSL. It appears from the data and from previous investigations that two water bearing zones exist in the study area: a variably saturated shallow perched zone which does not contain ground water during part of the dry season, and a deeper saturated zone which contains ground water year round. Plate 4 also shows the areas of elevated TPHg concentrations in Borings B-6 and B-7. Boring elevations were surveyed and the elevations are contained in Appendix C.

A resistant area of drill rig refusal was encountered at a depth of 3 - 4 feet below grade in a portion of the investigated area. Borings B-1, B-3 and B-9 were drilled through this area which was determined to be concrete as noted on the boring logs. The thickness of the subsurface concrete ranged from about 1 to 3 feet. The approximate location and size of this subsurface concrete area is shown on Plate 2 and has been previously noted by others (Pacific Environmental, July 17, 1989). The subsurface concrete may be part of an abandoned building foundation or other concrete structure.

SUMMARY AND CONCLUSIONS

The conclusions of the offsite investigation in the Foothill Square Shopping Center parking lot and the literature review of previous offsite and onsite environmental investigations are as follows:

- Subsurface soils near borings B-2, B-3, and B-9 do not appear to be impacted by detectable hydrocarbons at the depths and locations investigated.

- Borings B-1, B-4, B-5, and B-8 contain trace amounts of TPHg or/and BTEX at depths below 20 feet.

- Elevated concentrations of hydrocarbons are present in borings B-6 and B-7 at depths between 20 and 32 feet. The maximum TPHg concentration observed in B-6 was 1400 ppm, and 530 ppm in B-7. Peak TPHd in B-6 was 320 ppm. The field and analytical data suggest a zone of hydrocarbons centralized around borings B-6 and B-7 at and below 20 feet below ground surface. Borings B-6 and B-7 are located, respectively, about 50 feet and 65 feet south/southeast of the ARCO Station building at the MacArthur Boulevard driveway entrance to the Foothill Square Shopping Center.

- Two water bearing zones appear to be present at the ARCO Station site, primarily in the southeastern portion of the site, as well as in the offsite adjacent property at the Foothill Square Shopping Center southeast of the station. One is a variably saturated shallow perched zone which occasionally

goes dry, and the second is a deeper zone which contains ground water throughout the year. The northwestern portion of the ARCO Station site appears to contain a silty clay at the shallower depths so that the shallow perched water bearing zone is not seen, although the deeper water bearing zone is present.

- The literature review on previous environmental investigations in the Foothill Square Shopping Center and on the ARCO station property determined that the hydraulic gradients and the ground-water flow directions appear to be different for each of the two water bearing zones. The shallow perched zone has a relatively steep gradient of about 0.04 (4 feet vertical change/100 feet horizontal distance) and a ground water flow direction of south/southeast. The deeper water bearing zone has a flatter gradient of about 0.002, with a northerly flow direction.

- The presence of a subsurface obstruction near the Lucky Store was confirmed. The obstruction was determined to be concrete, and may be an abandoned concrete foundation.

LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental geological practice in California at the time this investigation was performed. This investigation was conducted solely as a tool in evaluating environmental conditions of the soil with respect to gasoline and diesel derived petroleum hydrocarbons at the site and southeast of the site. No soil engineering or geotechnical recommendations are implied or should be inferred. Evaluation of the geologic conditions at the site for the purpose of this investigation is made from a limited number of observation points. Subsurface conditions may vary away from the data points available. Additional work, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of investigation.

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Source: U.S. Geological Survey
7.5-Minute Quadrangle
Oakland East/San Leandro
California
Photorevised 1980

— — — Approximate location of Hayward Fault Zone

N

Approximate Scale

2000 1000 0 2000 4000

feet

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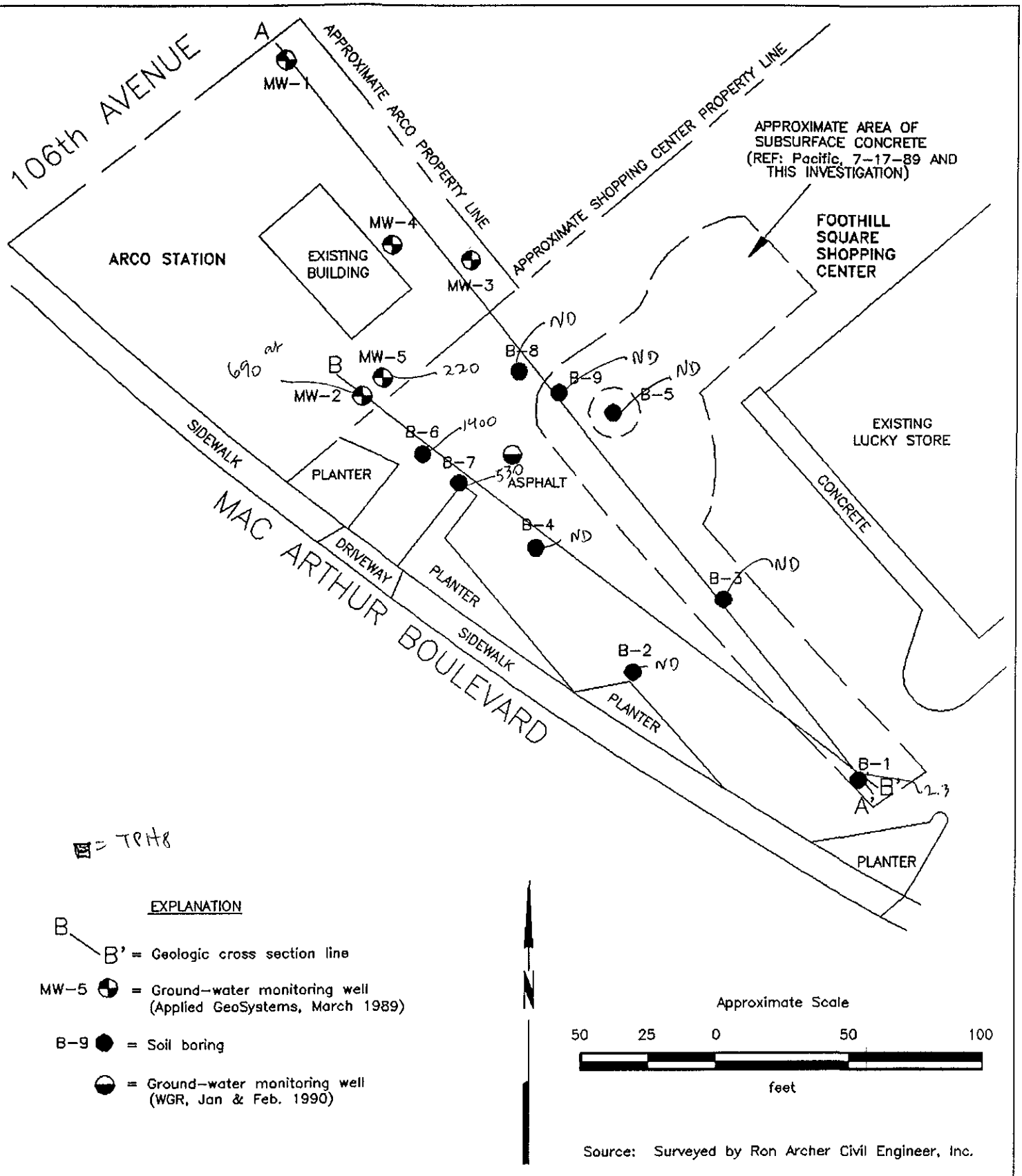
PROJECT 19014-3

SITE VICINITY MAP
ARCO Station No. 276
10600 MacArthur Boulevard
Oakland, California

PLATE
1



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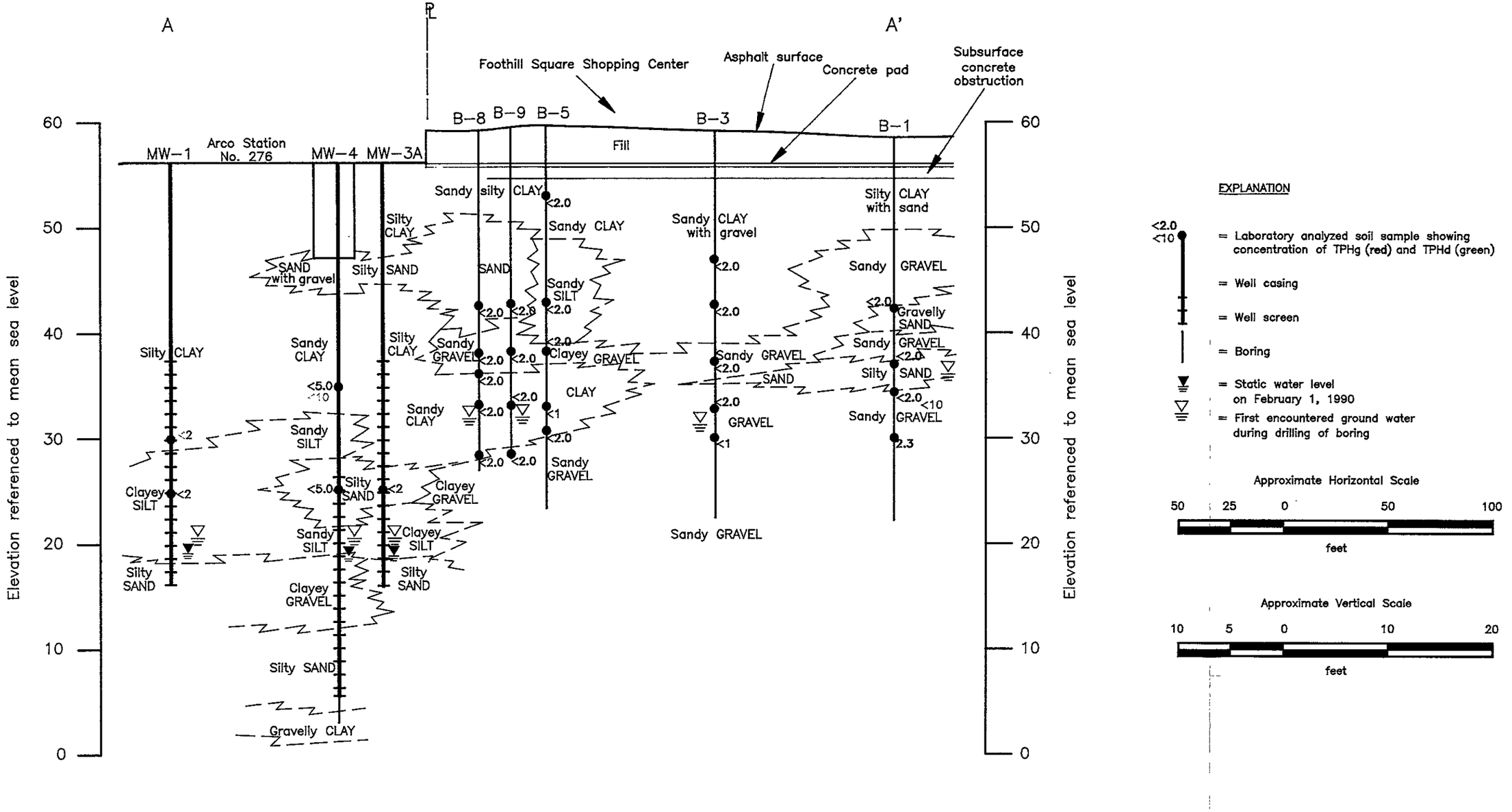
GENERALIZED SITE PLAN
ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 2



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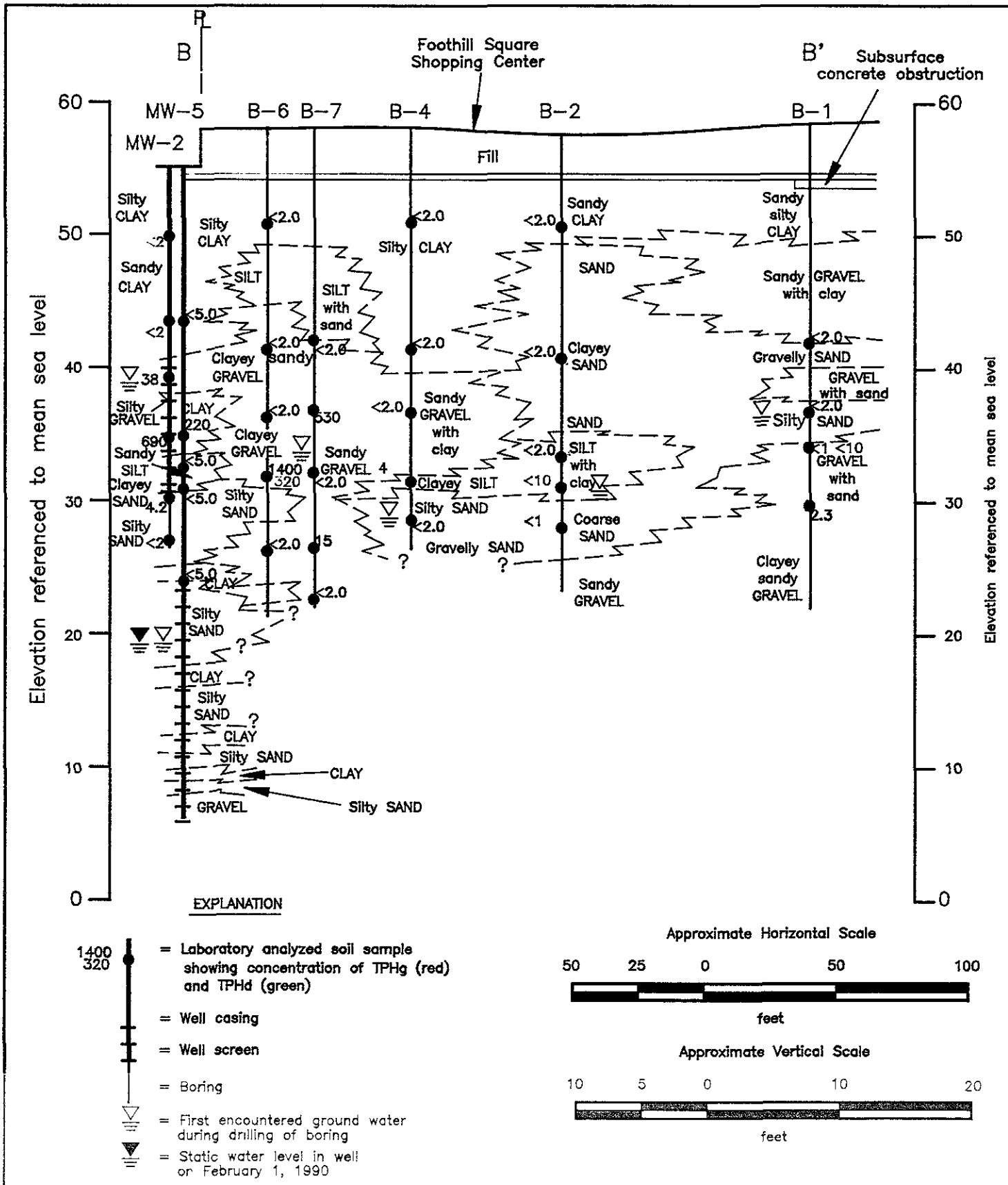
GEOLOGIC CROSS SECTION A - A'
ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 3



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PROJECT 19014-3

GEOLOGIC CROSS SECTION B - B'
ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 4

TABLE 1
ANALYTICAL RESULTS OF SOIL SAMPLES
ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California
Page 1 of 2
(August 1989)

Sample ID	TPHg	TPHd	B	T	E	X
S-16.5-B1	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-21.5-B1	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-24.0-B1	<1	<10	<0.005	<0.005	<0.005	<0.005
S-29.0-B1	2.3	NA	0.27	0.087	0.054	0.15
S-06.5-B2	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-16.5-B2	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-24.0-B2	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-24/26-B2	NA	<10	NA	NA	NA	NA
S-29.0-B2	<1	NA	<0.005	<0.005	<0.005	<0.005
S-11.5-B3	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-16.5-B3	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-21.5-B3	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-26.5-B3	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-29.0-B3	<1	NA	<0.005	<0.005	<0.005	<0.005
S-06.5-B4	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-16.5-B4	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-21.5-B4	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-26.5-B4	4	<10	0.41	0.07	0.08	0.16
S-29.0-B4	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-06.5-B5	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-16.5-B5	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-21.5-B5	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-26.5-B5	<1	NA	0.032	<0.005	<0.005	<0.005
S-29.0-B5	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-06.5-B6	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-16.5-B6	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-21.5-B6	<2.0	NA	0.22	0.14	0.13	0.56
S-26.5-B6	1400	320	<2	19	12	63
S-31.5-B6	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-16.0-B7	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-21.0-B7	530	NA	1.1	5.8	5.8	30
S-26.0-B7	<2.0	NA	0.084	<0.050	<0.050	<0.050
S-31.0-B7	15	NA	0.61	0.57	0.24	0.92
S-36.0-B7	<2.0	NA	<0.050	<0.050	<0.050	<0.050

See notes on page 2 of 2

TABLE 1
ANALYTICAL RESULTS OF SOIL SAMPLES
ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California
Page 2 of 2
(August 1989)

Sample ID	TPHg	TPHd	B	T	E	X
S-16.0-B8	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-21.0-B8	<2.0	NA	0.18	<0.050	0.72	<0.050
S-23.0-B8	<2.0	NA	0.11	<0.050	<0.050	0.075
S-26.0-B8	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-31.0-B8	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-16.0-B9	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-21.0-B9	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-26.0-B9	<2.0	NA	<0.050	<0.050	<0.050	<0.050
S-31.0-B9	<2.0	NA	<0.050	<0.050	<0.050	<0.050

Results are in parts per million (ppm)
TPHg = total petroleum hydrocarbons as gasoline
TPHd = total petroleum hydrocarbons as diesel
B = benzene
T = toluene
E = ethylbenzene
X = total xylenes
NA = not analyzed
< = below the reporting limits of the analysis

Sample designation = S-31.0-B9
- S = Soil sample
- 31.0 = Sample depth in feet
- B9 = Boring number

TABLE 2
COMPOUNDS DETECTED IN SOIL SAMPLES
FOR VOC ANALYSIS
ARCO Service Station 276
10600 MacArthur Boulevard
Oakland, California
(August 1989)

Sample		Compound	Amount Detected
B-4		Benzene	0.220
		Toluene	0.040
		Ethylbenzene	0.043
		Total Xylenes	0.100
	*	unknown	0.070
	*	2,3-dimethylbutane	0.070
	*	unknown	0.060
	*	1-ethyl-2-methylbenzene	0.030
	*	1,3,5-trimethylbenzene	0.040
B-5		Benzene	0.007
B-6		Benzene	5
		Toluene	20
		Ethylbenzene	16
		Total Xylenes	88
	*	unknown	110
	*	unknown	100
	*	methylcyclohexane	30
	*	1-ethyl-2-methylbenzene	40
	*	1,3,5-trimethylbenzene	60

Results are in parts per million (ppm).
"*" denotes Tentatively Identified Compounds (TICs).
All samples obtained at 26-1/2 feet below surface grade.

APPENDIX A

FIELD INVESTIGATION PROCEDURES

FIELD INVESTIGATION PROCEDURES

Site Safety Plan

Prior to beginning field work, a Job Site Safety Plan was prepared by AGS. The Site Safety Plan described the safety requirements for the worked to be performed at the site. The Site Safety Plan was applicable to personnel of Applied GeoSystems and its subcontractors. Applied GeoSystems personnel and subcontractors of Applied GeoSystems scheduled to perform the work at the site were briefed on the contents of the Site Safety Plan before work begins. A copy of the Site Safety Plan was available for reference by appropriate parties during the work. A Site Safety Officer was assigned to the project.

Soil Borings

Prior to the drilling of borings, permits were acquired from the appropriate regulatory agency. In addition, Underground Services Alert was notified of our intent to drill, and known underground utility lines and structures were approximately marked.

The borings were drilled by a Mobile B-61 (or equivalent) truck-mounted drill rig equipped with 8- or 10-inch-diameter, hollow-stem augers. The augers were steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination. After drilling the borings, neat-cement grout with bentonite was used to backfill the borings to the ground surface.

Drill Cuttings

Drill cuttings evaluated as having hydrocarbon contamination at levels greater than 100 parts per million (ppm) were separated from those evaluated as having hydrocarbon contamination levels less than 100 ppm. Evaluation was based on measurements made using an OVM. Readings were taken by placing the intake probe of the OVM against the soil in the brass sleeve promptly after opening the sampler. The drill cuttings from the borings were placed on plastic liners at the site, and covered with plastic. Samples were collected for analysis as needed.

Soil Sampling in Borings

Soil samples were collected at 5-foot intervals from the ground surface to the total depth of the borings. The soil samples were collected by advancing the boring to a point

immediately above the sampling depth, and then driving a California-modified, split-spoon sampler containing brass sleeves through the hollow center of the auger into the soil. The sampler and brass sleeves were laboratory-cleaned, steam-cleaned, or washed thoroughly with Alconox and water, prior to each use. The sampler was driven with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each successive 6 inches should be counted and recorded to evaluate the relative consistency of the soil.

The samples selected for laboratory analysis were removed from the sampler and quickly sealed in their brass sleeves with aluminum foil, plastic caps, and aluminized duct tape. The samples were then labeled, promptly placed in iced storage, and delivered to a laboratory certified by the State of California to perform the analyses requested.

One of the samples in brass sleeves not selected for laboratory analysis at each sampling interval was tested in the field using an OVM. This testing is performed by placing the intake probe of the OVM against the soil in the brass sleeve promptly after opening the sampler. The OVM readings are presented in logs of borings included in the project report.

Logging of Borings

An experienced geologist was present to log the soil cuttings and samples using the Unified Soil Classification System. Samples not selected for chemical analysis, and the soil in the sampler shoe, were extruded in the field for inspection. Logs include texture, color, moisture, plasticity, consistency, blow counts, and any other characteristics noted. Logs also include subjective evidence for the presence of hydrocarbons, such as soil staining, obvious product odor, and OVM readings.

APPENDIX B

DRILLING PERMIT

Wi

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE ♦ PLEASANTON, CALIFORNIA 94566 ♦ (415) 484-2600

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT South of Arco Station 226
10600 MacArthur Blvd
Oakland, Calif.

CLIENT
Name Arco Products Co.
Address 2000 Alameda del Prados Phone 415) 571-2434
City San Mateo, CA Zip

APPLICANT
Name Applied GeoSystems
Address 43455 Mission Blvd Phone 415) 651-1906
City Fremont, CA Zip 94539

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	___	General	___
Water Supply	___	Contamination	X
Monitoring	___	Well Destruction	___

soil boring

PROPOSED WATER SUPPLY WELL USE n/a
Domestic ___ Industrial ___ Other ___
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger X
Cable ___ Other ___

DRILLER'S LICENSE NO. 482390

WELL PROJECTS
Drill Hole Diameter ~~10~~ in. Maximum
Casing Diameter ~~6~~ in. Depth ___ ft.
Surface Seal Depth ___ ft. Number ___

GEOTECHNICAL PROJECTS
Number of Borings 9 Maximum
Hole Diameter 2 in. Depth 36 ft.

ESTIMATED STARTING DATE 3/3/89
ESTIMATED COMPLETION DATE 3/6/89

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE Gill Howell Date 3/22/90

FOR OFFICE USE

PERMIT NUMBER * 89148
LOCATION NUMBER

PERMIT CONDITIONS

Circled Permit Requirements Apply

A. GENERAL
(1.) A permit application should be submitted so as arrive at the Zone 7 office five days prior proposed starting date.
2. Submit to Zone 7 within 60 days after completi of permitted work the original Department Water Resources Water Well Drillers Report equivalent for well projects, or drilling lo and location sketch for geotechnical projects.
(3.) Permit is void if project not begun within 9 days of approval date.

B. WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal ar industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth specially approved. Minimum seal depth fc monitoring wells is the maximum depth practicabl or 20 feet.

(C.) GEOTECHNICAL. Backfill bore hole with compacted cut tings or heavy bentonite and upper two feet with com pacted material. In areas of known or suspecte contamination, tremied cement grout shall be used i place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concret placed by tremie.

E. WELL DESTRUCTION. See attached.

* This project was completed before a permit was issued. It will be covered by permit 89148 issued on 16 Mar 89.

Approved Wyman Hong Date 23 Mar 90
Wyman Hong

121989

APPENDIX C

SURVEYED BORING ELEVATIONS

TABLE C-1
SURVEYED BORING ELEVATIONS
ARCO Station 276
10600 MacArthur Blvd.
Oakland, California

Boring Number	Elevation (Ft above MSL)	Description
B-1	58.81	Top of Pavement
B-2	57.69	Top of Pavement
B-3	59.10	Top of Pavement
B-4	58.31	Top of Pavement
B-5	59.94	Top of Pavement
B-6	58.17	Top of Pavement
B-7	58.67	Top of Pavement
B-8	59.23	Top of Pavement
B-9	59.43	Top of Pavement

Reference: Surveyed by Ron Archer Civil Engineer, Inc.,September 7, 1989.

APPENDIX D

LOGS OF BORING

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISION		LTR	DESCRIPTION	MAJOR DIVISION		LTR	DESCRIPTION
COARSE-GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded Gravels or Gravel-Sand mixtures, little or no fines.	FINE-GRAINED SOILS	SILTS AND CLAYS LL<50	ML	Inorganic Silts and very fine sands, rock flour, Silty or Clayey fine Sands, or Clayey Silts with slight plasticity.
		GP	Poorly-graded Gravels or Gravel-Sand mixtures, little or no fines.			CL	Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
		GM	Silty Gravels, Gravel-Sand-Silt mixtures.			OL	Organic Silts and Organic Silt-Clays of low plasticity.
		GC	Clayey Gravel, Gravel-Sand-Clay mixtures.		SILTS AND CLAYS LL>50	MH	Inorganic Silts, micaceous or diatomaceous fine Sandy or Silty Soils, Elastic Silts.
	SAND AND SANDY SOILS	SW	Well-graded Sand or Gravelly Sands, little or no fines.			CH	Inorganic Clays of high plasticity, fat Clays.
		SP	Poorly-graded Sands or Gravelly Sands, little or no fines.			OH	Organic Clays of medium to high plasticity, organic Silts.
		SM	Silty Sands, Sand-Silt mixtures.				
		SC	Clayey Sands, Sand-Clay mixtures.	HIGHLY ORGANIC SOILS		PT	Peat and other highly Organic Soils.


Depth through which sampler is driven


Relatively undisturbed sample


No sample recovered


Static water level observed in well/boring


Initial water level observed in boring

S-10 Sample number


Sand pack


Bentonite


Neat cement


Caved native soil


Blank PVC


Machine-slotted PVC

P.I.D. Photoionization detector

BLOWS REPRESENT THE NUMBER OF BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES TO DRIVE THE SAMPLER THROUGH EACH 6 INCHES OF AN 18-INCH PENETRATION.

DASHED LINES SEPARATING UNITS ON THE LOG REPRESENT APPROXIMATE BOUNDARIES ONLY. ACTUAL BOUNDARIES MAY BE GRADUAL. LOGS REPRESENT SUBSURFACE CONDITIONS AT THE BORING LOCATION AT THE TIME OF DRILLING ONLY.

Applied GeoSystems

PROJECT 19014-3

UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY
ARCO Station 276
10600 MacArthur Boulevard
Oakland, California

PLATE 5

Total depth of boring: 36-1/2 feet Diameter of boring: 8 inches Date drilled: 8-3-89

Casing diameter: N/A Length: N/A Slot size: N/A

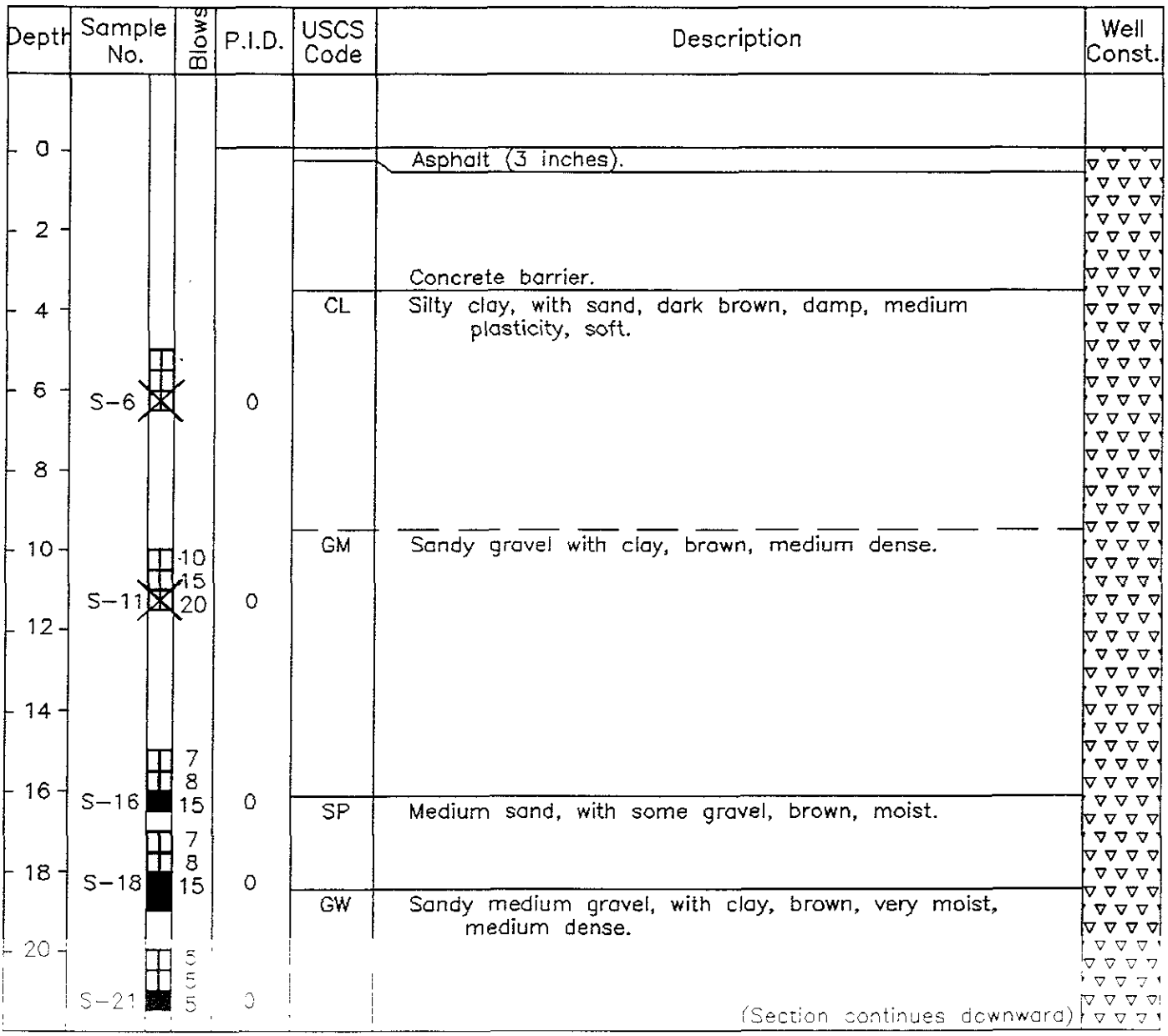
Screen diameter: N/A Length: N/A Material type: N/A

Drilling Company: Kvilhaug Well Drilling Inc. Driller: Rod and Mike

Method Used: Hollow-Stem Auger Field Geologist: Mike Killoran

Signature of Registered Professional: _____

Registration No.: _____ State: CA



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PROJECT 19014-3

LOG OF BORING B - 1

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE

C

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
					Large gravel, with sand and clay, brown, very moist.	
22				SM	Silty sand, brown, moist, loose.	
				SP	Silty gravelly sand, brown, wet, medium dense.	
24	S-23.5		0	GP	Large gravel, with sand, brown, wet, dense.	
		20				
26	S-26	20 18	0			
				GW	Sandy medium gravel, with clay, brown, very moist, dense.	
28		20 20				
	S-28.5	25	0			
30		14 16				
	S-31	25	0			
32						
34						
		20				
36	S-36	50	0			
					Total Depth = 36-1/2 feet. Standing water did not form, perched conditions inferred.	
38						
40						
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT 19011-3

LOG OF BORING B - 1

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 7

Total depth of boring 36-1/2 feet Diameter of boring: 8 inches Date drilled: 8-3-89

Casing diameter: N/A Length: N/A Slot size: N/A

Screen diameter: N/A Length: N/A Material type: N/A

Drilling Company: Kvilhaug Well Drilling Inc. Driller: Rod and Mike

Method Used: Hollow-Stem Auger Field Geologist: Mike Killoran

Signature of Registered Professional:

Registration No.: State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt (3 inches).	
2					Fill.	
4				CL	Clayey with some fine sand, brown, damp, medium plasticity, stiff.	
6	S-6	12 18 34				
8				SP/SM	Medium sand, brown, damp, medium dense.	
10	S-11	7 9 9	0			
12						
14						
16	S-16	5 5 8	0		Clayey sand.	
18						
20						
	S-21	5 7 10	0			

(Section continues downward)

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PROJECT 1901.4-3

LOG OF BORING B - 2

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 8

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
				SP	Sand, brown, damp, medium dense.	
22				ML	Silt, with some clay, brown, moist, low plasticity, rootlets.	
24	S-23.5			SP	Coarse gravelly sand, brown, wet, dense.	
		5				
26	S-26	7 15	0			
		10				
28		25				
	S-28.5	27	0			
30		20				
	S-31	30 20				
32				GP	Sandy medium gravel, brown, wet, dense.	
		20				
34	S-34	30 20				
36	S-36				Total Depth = 36-1/2 feet. Standing water did not form, perched conditions inferred.	
38						
40						
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT 1901.4-3

LOG OF BORING B - 2
ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE
3

Total depth of boring 36-1/2 feet Diameter of boring: 8 inches Date drilled: 8-3-89

Casing diameter: N/A Length: N/A Slot size: N/A

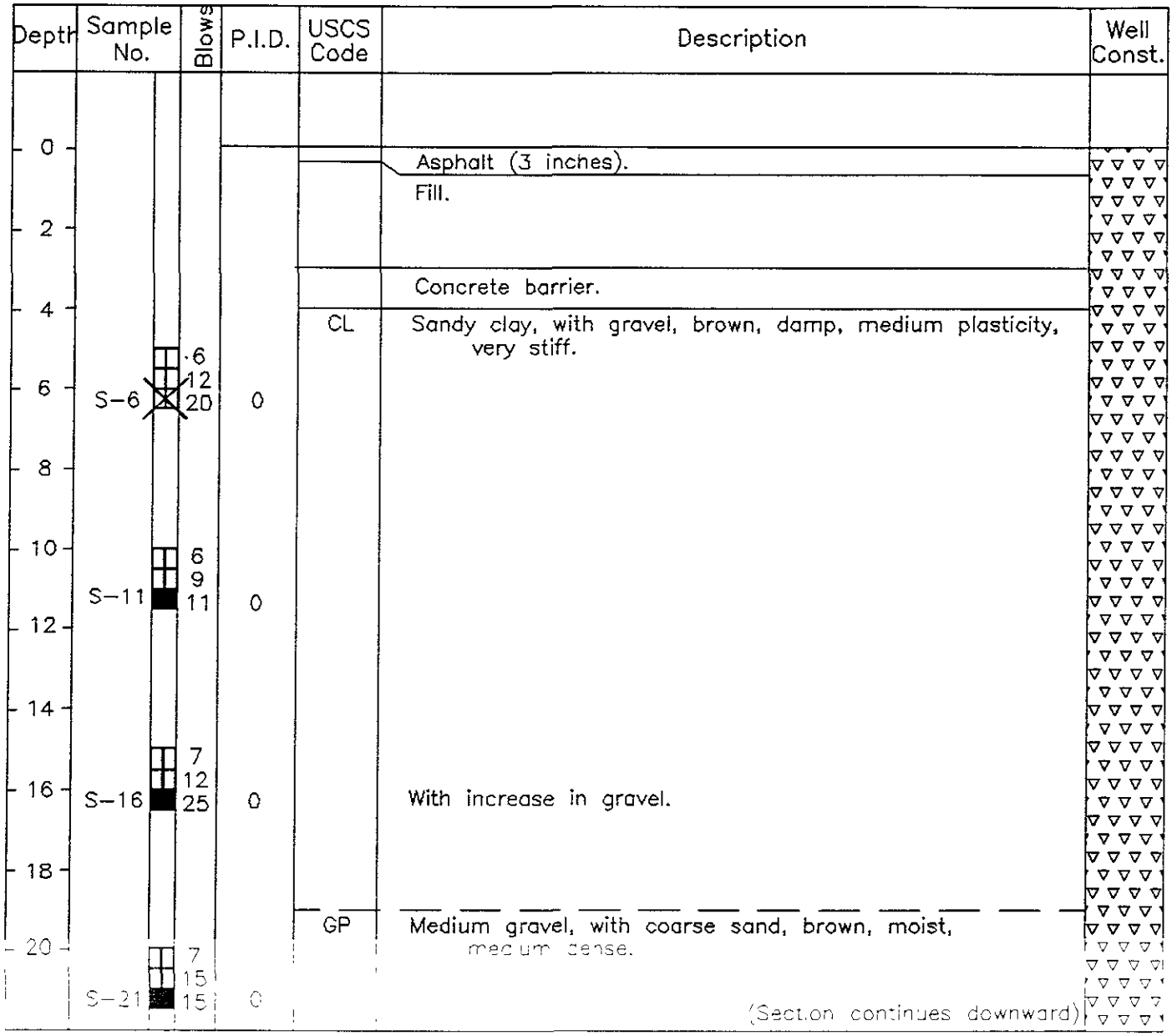
Screen diameter: N/A Length: N/A Material type: N/A

Drilling Company: Kvilhaug Well Drilling Inc. Driller: Rod and Mike

Method Used: Hollow-Stem Auger Field Geologist: Mike Killoran

Signature of Registered Professional: _____

Registration No.: _____ State: CA



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PROJECT 19014-3

LOG OF BORING B - 3

ARCO Station 276

10600 Mac Arthur Boulevard

Oakland, California

PLATE

10

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22		7		GP	Medium gravel, with coarse sand, brown, moist, medium dense.	
		12				
	S-23.5	15		SP	Grades with depth to coarse sand.	
24				GP	Medium gravel with coarse sand, brown, moist, medium dense.	
		18				
26	S-26	10 10				
					▽	
28		7 12				
	S-28.5	18	.7		With sand and trace clay, wet.	
30		15 15				
	S-31	15	1.0			
32		10 20				
	S-33.5	30	0.5			
34						
36	S-36				Total Depth = 36-1/2 feet. Standing water did not form, perched conditions inferred.	
38						
40						
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT 19014-3

LOG OF BORING B - 3
ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE
1-1

Total depth of boring: 31-1/2 feet Diameter of boring: 8 inches Date drilled: 8-4-89

Casing diameter: N/A Length: N/A Slot size: N/A

Screen diameter: N/A Length: N/A Material type: N/A

Drilling Company: Kvilhaug Well Drilling Inc. Driller: Rod and Mike

Method Used: Hollow-Stem Auger Field Geologist: Mike Killoran

Signature of Registered Professional:

Registration No.: State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt (3 inches).	
					Fill.	
2						
4				CH	Silty clay with sand, brown, damp, medium plasticity, stiff.	
6	S-6	4 6 10	0			
8						
10	S-11	4 7 10			Moist, high plasticity, very stiff.	
12						
14						
16	S-16	5 8 12				
18				GM	Medium gravel with sand and clay, gray to brown mootled, moist, high plasticity, very dense.	
20		15				
	S-21	30 35	0		(Section continues downward)	

Applied GeoSystems

PROJECT 19014-3

LOG OF BORING B - 4

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 12

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
				GM	Medium gravel with sand and trace clay, gray–brown mottled, moist, high plasticity, very dense.	
22						
		10				
		20				
24	S–23.5	20	23		With silt sand, brown, dense, noticeable odor.	
		15				
		10				
26	S–26	10	92.7	ML	Clayey silt, brown, moist, medium plasticity, very stiff, noticeable odor.	
		5				
28		10		SM ▽	Silty sand, brown, very moist.	
	S–28.5	18	0	⩧		
30		18				
		15		SP	Gravelly sand, very moist, medium dense.	
	S–31	12	0			
32					Total Depth = 31–1/2 feet. Standing water did not form, perched conditions inferred.	
34						
36						
38						
40						
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT 19014–3

LOG OF BORING B – 4

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE

15

Total depth of boring 36-1/2 feet Diameter of boring: 8 inches Date drilled: 8-4-89

Casing diameter: N/A Length: N/A Slot size: N/A

Screen diameter: N/A Length: N/A Material type: N/A

Drilling Company: Kvilhaug Well Drilling Inc. Driller: Rod and Mike

Method Used: Hollow-Stem Auger Field Geologist: Mike Killoran

Signature of Registered Professional:

Registration No.: State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt (3 inches).	
					Fill.	
2						
4				CL	Silty clay, gray, damp, medium plasticity, very stiff.	
6	S-6	4 8 12	0			
8						
10				CL	Sandy clay, brown, damp, medium plasticity, very stiff.	
	S-11	6 10 10	0	ML	Sandy silt, brown, damp, very stiff.	
12						
14						
16	S-16	5 5 10	0			
18						
20						
	S-21	5 5 10	0		(Section continues cownward)	

Applied GeoSystems

PROJECT 1914-3

LOG OF BORING B - 5

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 14

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
				ML	Sandy silt, brown, damp, very stiff.	
				GC	Clayey medium gravel, gray and brown mottling, moist, medium dense.	
22		4 4		CL	Clay, brown, moist, medium plasticity, stiff.	
24	S-23.5	5	0			
26	S-26	4 5 8	0			
28	S-28.5	3 4 8	0			
30	S-31	7 20 20	0	GC	Medium gravel with coarse sand, brown, moist, dense.	
32	S-33.5	10 20 25	0			
34	S-36	10 21 24	0			
36					Total Depth = 36-1/2 feet.	
38						
40						
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT 1901-3

LOG OF BORING B - 5
ARCO Station 276
10300 Mac Arthur Boulevard
Oakland, California

PLATE 15

Total depth of boring: 36-1/2 feet Diameter of boring: 8 inches Date drilled: 8-4-89

Casing diameter: N/A Length: N/A Slot size: N/A

Screen diameter: N/A Length: N/A Material type: N/A

Drilling Company: Kvilhaug Well Drilling Inc. Driller: Rod and Mike

Method Used: Hollow-Stem Auger Field Geologist: Mike Killoran

Signature of Registered Professional: _____

Registration No.: _____ State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt (3 inches).	
					Fill.	
2						
4						
		10		CL	Silty clay, dark gray, damp, medium plasticity, very stiff.	
6	S-6	15 20	0			
8						
				ML	Fine silt with trace clay, brown, damp, very stiff.	
10		10				
	S-11	15 15	0			
12						
14				GM	Clayey sandy gravel, damp, loose.	
		15				
16	S-16	25 25	0			
18						
20		10				
	S-21	10 18	211			

(Section continues downward)

Applied GeoSystems

PROJECT 1901 4-3

LOG OF BORING B - 6

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 16

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				GM	Clayey sandy gravel, damp, loose.	
24	S-23.5					
26	S-26	10 20 18	148	GC	Clayey gravel, brown, very moist, dense, obvious odor.	
28	S-28.5		36.8	SP	Medium sand, brown, very moist, loose, obvious odor.	
30	S-31	15 20 20	6.8	GW	Medium gravel with coarse sand and clay, brown, very moist, dense, noticeable odor.	
32						
34	S-33.5	10 8 8	5.0	CL	Clay with some silt, brown, very moist, medium plasticity, stiff.	
36	S-36	7 12 12	0.7	SP	Coarse sand with gravel, brown, very moist, medium dense, noticeable odor.	
38					Total Depth = 36-1/2 feet.	
40						
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT 1901.1-3

LOG OF BORING B - 6
ARCO Station 276
10800 Mac Arthur Boulevard
Oakland, California

PLATE

Total depth of boring 36-1/2 feet Diameter of boring: 8 inches Date drilled: 8-16-89

Casing diameter: N/A Length: N/A Slot size: N/A

Screen diameter: N/A Length: N/A Material type: N/A

Drilling Company: Kvilhaug Well Drilling Inc. Driller: Rod and Mike

Method Used: Hollow-Stem Auger Field Geologist: Steve Johnston

Signature of Registered Professional: _____

Registration No.: _____ State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt.	
					Fill.	
2						
4		3 4				
6	S-6	8	0	CL	Clay, black, damp, medium plasticity, stiff.	
8						
10		5 7		ML	Silt with some sand, clay and gravel, dark brown, damp, medium plasticity, very stiff.	
	S-11	10	0			
12						
14						
		5 5				
16	S-16	25	1.7	GM	Clayey sandy medium gravel, damp, dense.	
18		10 15				
	S-18.5	15	41.3			
20		12 15				
	S-21	15	1652			

(Section continues downward)

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PROJECT 19014-3

LOG OF BORING B - 7

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 18

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
				GM	Clayey sandy medium gravel, damp, dense.	
22		15				
		12				
24	S-23.5	17	103			
		3				
26		4				
	S-26	5	110			
		7				
28		5				
	S-28.5	7	12		Less clay, wet.	
30						
	S-31		167		Clay rich inclusions, some small black soft inclusions.	
32		15				
		18				
34	S-33.5	22	76			
		10				
36		18				
	S-36	15	17		Wet.	
					Total Depth = 36-1/2 feet. Standing water did not form, perched conditions inferred.	
38						
40						
42						
44						
46						
48						
50						

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PROJECT 19014-3

LOG OF BORING B - 7
ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 19

Total depth of boring 31-1/2 feet Diameter of boring: 8 inches Date drilled: 8-16-89

Casing diameter: N/A Length: N/A Slot size: N/A

Screen diameter: N/A Length: N/A Material type: N/A

Drilling Company: Kvilhaug Well Drilling Inc. Driller: Rod and Mike

Method Used: Hollow-Stem Auger Field Geologist: Steve Johnston

Signature of Registered Professional:

Registration No.: State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt.	
				CL	Sandy clay, red-brown, damp, medium plasticity, soft, (fill).	
4				CL	Clay, dark brown, damp, low plasticity, very stiff, noticeable odor, rootlets.	
6	S-6	7 8 15	0			
8				SP	Medium sand, brown, damp, loose.	
10	S-11	5 5 5	3.2			
14						
16	S-16	3 4 7	1.0			
18	S-18.5	5 10 13	0.1		With trace of gravel.	
20				GW	Medium gravel with coarse sand and some clay, brown, wet, medium dense	
	S-21	4 7 10	27		(Section continues downward)	

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PROJECT 19014-3

LOG OF BORING B - 8

ARCO Station 276

10600 Mac Arthur Boulevard

Oakland, California

PLATE 20

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
				GW	Medium gravel and coarse sand and some clay, brown, wet, medium dense.	
22		7				
		7	192			
24	S-23	12	42	CL	Clay with some sand and trace gravel, very mosit, medium plasticity, stiff.	
		4				
26		5				
	S-26	10	3.0			
28		3				
		5				
	S-28.5	8	1.0		Wet.	
30		5				
		10			Medium gravel with sand and clay, brown, wet, medium dense.	
	S-31	18	1.3	GC		
32					Total Depth = 31-1/2 feet. Standing water did not form, perched conditions inferred.	
34						
36						
38						
40						
42						
44						
46						
48						
50						

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PROJECT 19014-3

LOG OF BORING B - 8

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE
2

Total depth of boring: 31-1/2 feet Diameter of boring: 8 inches Date drilled: 8-16-89

Casing diameter: N/A Length: N/A Slot size: N/A

Screen diameter: N/A Length: N/A Material type: N/A

Drilling Company: Kvilhaug Well Drilling Inc. Driller: Rod and Mike

Method Used: Hollow-Stem Auger Field Geologist: Steve Johnston

Signature of Registered Professional: _____

Registration No.: _____ State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0						
					Asphalt.	
					Fill.	
2						
4					Concrete barrier.	
		4		CL	Clay with some silt and sand, dark brown, damp, medium plasticity, very stiff.	
6	S-6	6 13	0			
8						
				SP	Medium sand, brown, damp, medium dense.	
10		6				
	S-11	7 10				
12						
14						
		6				
16	S-16	6 11			With trace gravel.	
		5				
18		4			With some coarse sand and some clay.	
	S-18.5	4		GC	Small gravel with sand and trace clay, very moist, loose	
20		3				
		6				
	S-21	10	75			

(Section continues downward)

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PROJECT 19014-3

LOG OF BORING B - 9

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 22

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				GC	Small gravel with sand and trace clay, very moist, loose.	
		10				
		10				
24	S-23.5	10	0.7	CL	Sandy clay, trace gravel, brown, very moist, medium plasticity, very stiff.	
		4				
26		4				
	S-26	5	0	▽		
28		3				
		5				
	S-28.5	7	0		Grades sandier, wet.	
30		10				
		15				
	S-31	20	0	GC	Medium gravel with sand and clay, brown, wet, dense.	
32					Total Depth = 31-1/2 feet. Standing water did not form, perched conditions inferred.	
34						
36						
38						
40						
42						
44						
46						
48						
50						

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PROJECT 1904-3

LOG OF BORING B - 9

ARCO Station 276
10600 Mac Arthur Boulevard
Oakland, California

PLATE 23

APPENDIX E

LABORATORY ANALYTICAL REPORTS AND CHAIN OF CUSTODY RECORDS

CHAIN OF CUSTODY RECORD

Applied GeoSystems

43255 Mission Blvd Suite B Fremont, CA 94539 (415)651-1906

SAMPLER (signature): [signature]

Phone: (415) 651-1906

LABORATORY: Applied Geo Systems

TURNAROUND TIME: 2 week

Project Leader: Bill Howell

Phone No.: 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
[signature]	Bill Howell	8/4/89	17:00
Bill Howell			
	Received for laboratory by: [signature]	8-11-89	0800

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-16.5-B1	19014-3	8/3/89	TPH gas w/ BTEX	frozen
S-21.5-B1				
S-29-B1				
S-6.5-B2	19014-3	8/3/89	TPH gas w/ BTEX	frozen
S-24-B2 (composite)	19014-3	8/3/89	TPH diesel (composite)	frozen
S-26-B2				
S-11.5-B3	19014-3	8/3/89	TPH gas w/ BTEX	frozen
S-6.5-B4	19014-3	8/4/89	TPH gas w/ BTEX	
S-6.5-B5	19014-3	8/4/89	TPH gas w/ BTEX	frozen
S-16.5-B5				
S-29-B5				
S-6.5-B6	19014-3	8/4/89	TPH gas w/ BTEX	frozen

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S01
Project #: 19014-3
Sample #: S-16.5-B1
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-15-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-15-89	
Toluene	ND		0.050		08-15-89	
Ethylbenzene	ND		0.050		08-15-89	
Total Xylenes	ND		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S02
Project #: 19014-3
Sample #: S-21.5-B1
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-15-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-15-89	
Toluene	ND		0.050		08-15-89	
Ethylbenzene	ND		0.050		08-15-89	
Total Xylenes	ND		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S03
Project #: 19014-3
Sample #: S-29-B1
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	2.3		2.0		08-15-89	
TEH as Diesel						NR
Benzene	0.27		0.050		08-15-89	
Toluene	0.087		0.050		08-15-89	
Ethylbenzene	0.054		0.050		08-15-89	
Total Xylenes	0.15		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

APPLIED GEOSYSTEMS IS CERTIFIED BY THE STATE OF CALIFORNIA DEPARTMENT OF HEALTH SERVICES AS A HAZARDOUS WASTE TESTING LABORATORY

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S04
Project #: 19014-3
Sample #: S-6.5-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-15-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-15-89	
Toluene	ND		0.050		08-15-89	
Ethylbenzene	ND		0.050		08-15-89	
Total Xylenes	ND		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S11
Project #: 19014-3
Sample #: S-(24,26.5)-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline						NR
TEH as Diesel	ND		10		08-17-89	
Benzene						NR
Toluene						NR
Ethylbenzene						NR
Total Xylenes						NR

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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08-18-89
Date Reported

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Report Prepared for:
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43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S05
Project #: 19014-3
Sample #: S-11.5-B3
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-15-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-15-89	
Toluene	ND		0.050		08-15-89	
Ethylbenzene	ND		0.050		08-15-89	
Total Xylenes	ND		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S06
Project #: 19014-3
Sample #: S-6.5-B4
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-15-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-15-89	
Toluene	ND		0.050		08-15-89	
Ethylbenzene	ND		0.050		08-15-89	
Total Xylenes	ND		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S07
Project #: 19014-3
Sample #: S-6.5-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-15-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-15-89	
Toluene	ND		0.050		08-15-89	
Ethylbenzene	ND		0.050		08-15-89	
Total Xylenes	ND		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S08
Project #: 19014-3
Sample #: S-16.5-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-15-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-15-89	
Toluene	ND		0.050		08-15-89	
Ethylbenzene	ND		0.050		08-15-89	
Total Xylenes	ND		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S09
Project #: 19014-3
Sample #: S-29-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-15-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-15-89	
Toluene	ND		0.050		08-15-89	
Ethylbenzene	ND		0.050		08-15-89	
Total Xylenes	ND		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90826S10
Project #: 19014-3
Sample #: S-6.5-B6
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-15-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-15-89	
Toluene	ND		0.050		08-15-89	
Ethylbenzene	ND		0.050		08-15-89	
Total Xylenes	ND		0.050		08-15-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-17-89
Date Reported

CHAIN OF CUSTODY RECORD

Applied GeoSystems

43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): [signature]

Phone: (415) 651-1906

LABORATORY: Anametrix

TURNAROUND TIME: 2 week with 48 hr. as noted

Project Leader: Bill Howell

Phone No. 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
[signature] Bill Howell	Bill Howell	8/4/89	17:00
	Received for laboratory by: Sylvia Morrow	8/10/89	11:30

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-24-B1	19014-3	8/3/89	TPH gas w/ BTEX and ~~8240~~ 8240 + TPH diesel (2-week)	frozen
S-29-B2	19014-3	8/3/89	* { TPH gas w/ BTEX (48 hour) and 8240 (2-week)	frozen
S-29-B3	19014-3	8/3/89	* { TPH gas w/ BTEX (48 hour) and 8240 (2 week)	frozen
S-26.5-B4	19014-3	8/4/89	* { TPH gas w/ BTEX (48 hour) + TPH diesel, 8240, and 8080 (2 week)	frozen
S-26.5-B5	19014-3	8/4/89	* TPH gas w/ BTEX (48 hour) and 8240 (2-week)	frozen
S-26.5-B6	19014-3	8/4/89	* TPH gas w/ BTEX (48 hour) and 8240 (2 week) and TPH diesel (2 week)	frozen

ANAMETRIX INC
Environmental & Analytical Chemistry
1961 Concourse Drive, Suite E, San Jose, CA 95131
(408) 432-8192 • Fax (408) 432-8198

REPORT

Bill Howell
Applied GeoSystems
43255 Mission Boulevard
Suite B
Fremont, CA 94539

August 24, 1989
Anametrix W.O.#: 8908088
Date Received : 08/10/89
Project Number : 19014-3

Dear Mr. Howell:

Your samples have been received for analysis. The REPORT SUMMARY lists your sample identifications and the analytical methods you requested. The following sections are included in this report: RESULTS, EXTRA COMPOUNDS and QUALITY ASSURANCE.

NOTE: 1) Amounts reported are net values, i.e. corrected for method blank contamination.
2) The following footnotes are applicable to Methods 624/8240:

*	A Method 624 priority pollutant compound (Federal Register, 10/26/84)
**	A compound on the U.S. EPA CLP Hazardous Substance List (HSL)
#	An additional compound analyzed for by Anametrix, Inc.
ND:	Not detected at or above the practical quantitation limit for the method.

If there is any more that we can do, please give us a call. Thank you for using ANAMETRIX, INC.

Sincerely,

ANAMETRIX, INC.

Burt Sutherland

Burt Sutherland
Laboratory Director

BWS/dmt

REPORT SUMMARY
ANAMETRIX, INC. (408) 432-8192

Client : Applied GeoSystems
Address : 43255 Mission Boulevard
Suite B
City : Fremont, CA 94539
Attn. : Bill Howell

Anametrix W.O.#: 8908088
Date Received : 08/10/89
Purchase Order#: N/A
Project No. : 19014-3
Date Released : 08/23/89

Anametrix I.D.	Sample I.D.	Matrix	Date Sampled	Method	Date Extract	Date Analyzed	Inst I.D.
RESULTS							
8908088-01	S-24-B1	SOIL	08/03/89	8240		08/17/89	F3
8908088-02	S-29-B2	SOIL	08/03/89	8240		08/17/89	F3
8908088-03	S-29-B3	SOIL	08/03/89	8240		08/17/89	F3
8908088-04	S-26.5-B4	SOIL	08/04/89	8240		08/17/89	F3
8908088-05	S-26.5-B5	SOIL	08/04/89	8240		08/17/89	F3
8908088-06	S-26.5-B6	SOIL	08/04/89	8240		08/17/89	F3
TENTATIVELY INDENTIFIED COMPOUNDS (Extra)							
8908088-04	S-26.5-B4	SOIL	08/04/89	XTRAS		08/17/89	F3
8908088-06	S-26.5-B6	SOIL	08/04/89	XTRAS		08/17/89	F3
QUALITY ASSURANCE (QA)							
3CB0817V00	METHOD BLANK	SOIL	N/A	8240		08/17/89	F3
8908088-01	S-24-B1	SOIL	08/03/89	SPIKE		08/17/89	F3

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 624/8240

ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-3 S-24-B1	Anametrix I.D.	: 8908088-01
Matrix	: SOIL	Analyst	: WH
Date sampled	: 08/03/89	Supervisor	: PG
Date analyzed	: 08/17/89	Date released	: 08/23/89
Dilut. factor	: NONE	Instrument ID	: F3

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
74-87-3	* Chloromethane	10	ND
75-01-4	* Vinyl Chloride	10	ND
74-83-9	* Bromomethane	10	ND
75-00-3	* Chloroethane	10	ND
75-69-4	* Trichlorofluoromethane	5	ND
75-35-4	* 1,1-Dichloroethene	5	ND
76-13-1	# Trichlorotrifluoroethane	5	ND
67-64-1	**Acetone	20	ND
75-15-0	**Carbondisulfide	5	ND
75-09-2	* Methylene Chloride	5	ND
156-60-5	* Trans-1,2-Dichloroethene	5	ND
75-34-3	* 1,1-Dichloroethane	5	ND
78-93-3	**2-Butanone	20	ND
156-59-2	* Cis-1,2-Dichloroethene	5	ND
67-66-3	* Chloroform	5	ND
71-55-6	* 1,1,1-Trichloroethane	5	ND
56-23-5	* Carbon Tetrachloride	5	ND
71-43-2	* Benzene	5	ND
107-06-2	* 1,2-Dichloroethane	5	ND
79-01-6	* Trichloroethene	5	ND
78-87-5	* 1,2-Dichloropropane	5	ND
75-27-4	* Bromodichloromethane	5	ND
110-75-8	* 2-Chloroethylvinylether	5	ND
108-05-4	**Vinyl Acetate	10	ND
10061-02-6	* Trans-1,3-Dichloropropene	5	ND
108-10-1	**4-Methyl-2-Pentanone	10	ND
108-88-3	* Toluene	5	ND
10061-01-5	* cis-1,3-Dichloropropene	5	ND
79-00-5	* 1,1,2-Trichloroethane	5	ND
127-18-4	* Tetrachloroethene	5	ND
591-78-6	**2-Hexanone	10	ND
124-48-1	* Dibromochloromethane	5	ND
108-90-7	* Chlorobenzene	5	ND
100-41-4	* Ethylbenzene	5	ND
1330-20-7	**Total Xylenes	5	ND
100-42-5	**Styrene	5	ND
75-25-2	* Bromoform	5	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	5	ND
541-73-1	* 1,3-Dichlorobenzene	5	ND
106-46-7	* 1,4-Dichlorobenzene	5	ND
95-50-1	* 1,2-Dichlorobenzene	5	ND

CAS #	Surrogate Compounds	Limits	% Recovery
17060-07-0	1,2-Dichloroethane-d4	75-130%	101%
2037-26-5	Toluene-d8	74-121%	97%
460-00-4	p-Bromofluorobenzene	70-124%	90%

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 624/8240
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 19014-3 S-29-B2
Matrix : SOIL
Date sampled : 08/03/89
Date analyzed: 08/17/89
Dilut. factor: NONE

Anametrix I.D. : 8908088-02
Analyst : UH
Supervisor : PG
Date released : 08/23/89
Instrument ID : F3

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
74-87-3	* Chloromethane	10	ND
75-01-4	* Vinyl Chloride	10	ND
74-83-9	* Bromomethane	10	ND
75-00-3	* Chloroethane	10	ND
75-69-4	* Trichlorofluoromethane	5	ND
75-35-4	* 1,1-Dichloroethene	5	ND
76-13-1	# Trichlorotrifluoroethane	5	ND
67-64-1	**Acetone	20	ND
75-15-0	**Carbondisulfide	5	ND
75-09-2	* Methylene Chloride	5	ND
156-60-5	* Trans-1,2-Dichloroethene	5	ND
75-34-3	* 1,1-Dichloroethane	5	ND
78-93-3	**2-Butanone	20	ND
156-59-2	* Cis-1,2-Dichloroethene	5	ND
67-66-3	* Chloroform	5	ND
71-55-6	* 1,1,1-Trichloroethane	5	ND
56-23-5	* Carbon Tetrachloride	5	ND
71-43-2	* Benzene	5	ND
107-06-2	* 1,2-Dichloroethane	5	ND
79-01-6	* Trichloroethene	5	ND
78-87-5	* 1,2-Dichloropropane	5	ND
75-27-4	* Bromodichloromethane	5	ND
110-75-8	* 2-Chloroethylvinylether	5	ND
108-05-4	**Vinyl Acetate	10	ND
10061-02-6	* Trans-1,3-Dichloropropene	5	ND
108-10-1	**4-Methyl-2-Pentanone	10	ND
108-88-3	* Toluene	5	ND
10061-01-5	* cis-1,3-Dichloropropene	5	ND
79-00-5	* 1,1,2-Trichloroethane	5	ND
127-18-4	* Tetrachloroethene	5	ND
591-78-6	**2-Hexanone	10	ND
124-48-1	* Dibromochloromethane	5	ND
108-90-7	* Chlorobenzene	5	ND
100-41-4	* Ethylbenzene	5	ND
1330-20-7	**Total Xylenes	5	ND
100-42-5	**Styrene	5	ND
75-25-2	* Bromoform	5	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	5	ND
541-73-1	* 1,3-Dichlorobenzene	5	ND
106-46-7	* 1,4-Dichlorobenzene	5	ND
95-50-1	* 1,2-Dichlorobenzene	5	ND

CAS #	Surrogate Compounds	Limits	% Recovery
17060-07-0	1,2-Dichloroethane-d4	75-130%	102%
2037-26-5	Toluene-d8	74-121%	98%
460-00-4	p-Bromofluorobenzene	70-124%	97%

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 624/8240
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 19014-3 S-29-B3
Matrix : SOIL
Date sampled : 08/03/89
Date analyzed: 08/17/89
Dilut. factor: NONE

Anametrix I.D. : 8908088-03
Analyst : UH
Supervisor : PG
Date released : 08/23/89
Instrument ID : F3

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
74-87-3	* Chloromethane	10	ND
75-01-4	* Vinyl Chloride	10	ND
74-83-9	* Bromomethane	10	ND
75-00-3	* Chloroethane	10	ND
75-69-4	* Trichlorofluoromethane	5	ND
75-35-4	* 1,1-Dichloroethene	5	ND
76-13-1	# Trichlorotrifluoroethane	5	ND
67-64-1	**Acetone	20	ND
75-15-0	**Carbondisulfide	5	ND
75-09-2	* Methylene Chloride	5	ND
156-60-5	* Trans-1,2-Dichloroethene	5	ND
75-34-3	* 1,1-Dichloroethane	5	ND
78-93-3	**2-Butanone	20	ND
156-59-2	* Cis-1,2-Dichloroethene	5	ND
67-66-3	* Chloroform	5	ND
71-55-6	* 1,1,1-Trichloroethane	5	ND
56-23-5	* Carbon Tetrachloride	5	ND
71-43-2	* Benzene	5	ND
107-06-2	* 1,2-Dichloroethane	5	ND
79-01-6	* Trichloroethene	5	ND
78-87-5	* 1,2-Dichloropropane	5	ND
75-27-4	* Bromodichloromethane	5	ND
110-75-8	* 2-Chloroethylvinylether	5	ND
108-05-4	**Vinyl Acetate	10	ND
10061-02-6	* Trans-1,3-Dichloropropene	5	ND
108-10-1	**4-Methyl-2-Pentanone	10	ND
108-88-3	* Toluene	5	ND
10061-01-5	* cis-1,3-Dichloropropene	5	ND
79-00-5	* 1,1,2-Trichloroethane	5	ND
127-18-4	* Tetrachloroethene	5	ND
591-78-6	**2-Hexanone	10	ND
124-48-1	* Dibromochloromethane	5	ND
108-90-7	* Chlorobenzene	5	ND
100-41-4	* Ethylbenzene	5	ND
1330-20-7	**Total Xylenes	5	ND
100-42-5	**Styrene	5	ND
75-25-2	* Bromoform	5	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	5	ND
541-73-1	* 1,3-Dichlorobenzene	5	ND
106-46-7	* 1,4-Dichlorobenzene	5	ND
95-50-1	* 1,2-Dichlorobenzene	5	ND

CAS #	Surrogate Compounds	Limits	% Recovery
17060-07-0	1,2-Dichloroethane-d4	75-130%	102%
2037-26-5	Toluene-d8	74-121%	98%
460-00-4	p-Bromofluorobenzene	70-124%	89%

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 624/8240
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 19014-3 S-26.5-B4
Matrix : SOIL
Date sampled : 08/04/89
Date analyzed: 08/17/89
Dilut. factor: NONE

Anametrix I.D. : 8908088-04
Analyst : UH
Supervisor : PG
Date released : 08/23/89
Instrument ID : F3

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
74-87-3	* Chloromethane	10	ND
75-01-4	* Vinyl Chloride	10	ND
74-83-9	* Bromomethane	10	ND
75-00-3	* Chloroethane	10	ND
75-69-4	* Trichlorofluoromethane	5	ND
75-35-4	* 1,1-Dichloroethene	5	ND
76-13-1	# Trichlorotrifluoroethane	5	ND
67-64-1	**Acetone	20	ND
75-15-0	**Carbondisulfide	5	ND
75-09-2	* Methylene Chloride	5	ND
156-60-5	* Trans-1,2-Dichloroethene	5	ND
75-34-3	* 1,1-Dichloroethane	5	ND
78-93-3	**2-Butanone	20	ND
156-59-2	* Cis-1,2-Dichloroethene	5	ND
67-66-3	* Chloroform	5	ND
71-55-6	* 1,1,1-Trichloroethane	5	ND
56-23-5	* Carbon Tetrachloride	5	ND
71-43-2	* Benzene	5	220
107-06-2	* 1,2-Dichloroethane	5	ND
79-01-6	* Trichloroethene	5	ND
78-87-5	* 1,2-Dichloropropane	5	ND
75-27-4	* Bromodichloromethane	5	ND
110-75-8	* 2-Chloroethylvinylether	5	ND
108-05-4	**Vinyl Acetate	10	ND
10061-02-6	* Trans-1,3-Dichloropropene	5	ND
108-10-1	**4-Methyl-2-Pentanone	10	ND
108-88-3	* Toluene	5	40
10061-01-5	* cis-1,3-Dichloropropene	5	ND
79-00-5	* 1,1,2-Trichloroethane	5	ND
127-18-4	* Tetrachloroethene	5	ND
591-78-6	**2-Hexanone	10	ND
124-48-1	* Dibromochloromethane	5	ND
108-90-7	* Chlorobenzene	5	ND
100-41-4	* Ethylbenzene	5	43
1330-20-7	**Total Xylenes	5	100
100-42-5	**Styrene	5	ND
75-25-2	* Bromoform	5	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	5	ND
541-73-1	* 1,3-Dichlorobenzene	5	ND
106-46-7	* 1,4-Dichlorobenzene	5	ND
95-50-1	* 1,2-Dichlorobenzene	5	ND

CAS #	Surrogate Compounds	Limits	% Recovery
17060-07-0	1,2-Dichloroethane-d4	75-130%	100%
2037-26-5	Toluene-d8	74-121%	99%
460-00-4	p-Bromofluorobenzene	70-124%	92%

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 624/8240

ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-3 S-26.5-B5	Anametrix I.D.	: 8908088-05
Matrix	: SOIL	Analyst	: [illegible]
Date sampled	: 08/04/89	Supervisor	: PG
Date analyzed	: 08/17/89	Date released	: 08/23/89
Dilut. factor	: NONE	Instrument ID	: F3

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
74-87-3	* Chloromethane	10	ND
75-01-4	* Vinyl Chloride	10	ND
74-83-9	* Bromomethane	10	ND
75-00-3	* Chloroethane	10	ND
75-69-4	* Trichlorofluoromethane	5	ND
75-35-4	* 1,1-Dichloroethene	5	ND
76-13-1	# Trichlorotrifluoroethane	5	ND
67-64-1	**Acetone	20	ND
75-15-0	**Carbondisulfide	5	ND
75-09-2	* Methylene Chloride	5	ND
156-60-5	* Trans-1,2-Dichloroethene	5	ND
75-34-3	* 1,1-Dichloroethane	5	ND
78-93-3	**2-Butanone	20	ND
156-59-2	* Cis-1,2-Dichloroethene	5	ND
67-66-3	* Chloroform	5	ND
71-55-6	* 1,1,1-Trichloroethane	5	ND
56-23-5	* Carbon Tetrachloride	5	ND
71-43-2	* Benzene	5	7
107-06-2	* 1,2-Dichloroethane	5	ND
79-01-6	* Trichloroethene	5	ND
78-87-5	* 1,2-Dichloropropane	5	ND
75-27-4	* Bromodichloromethane	5	ND
110-75-8	* 2-Chloroethylvinylether	5	ND
108-05-4	**Vinyl Acetate	10	ND
10061-02-6	* Trans-1,3-Dichloropropene	5	ND
108-10-1	**4-Methyl-2-Pentanone	10	ND
108-88-3	* Toluene	5	ND
10061-01-5	* cis-1,3-Dichloropropene	5	ND
79-00-5	* 1,1,2-Trichloroethane	5	ND
127-18-4	* Tetrachloroethene	5	ND
591-78-6	**2-Hexanone	10	ND
124-48-1	* Dibromochloromethane	5	ND
108-90-7	* Chlorobenzene	5	ND
100-41-4	* Ethylbenzene	5	ND
1330-20-7	**Total Xylenes	5	ND
100-42-5	**Styrene	5	ND
75-25-2	* Bromoform	5	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	5	ND
541-73-1	* 1,3-Dichlorobenzene	5	ND
106-46-7	* 1,4-Dichlorobenzene	5	ND
95-50-1	* 1,2-Dichlorobenzene	5	ND

CAS #	Surrogate Compounds	Limits	% Recovery
17060-07-0	1,2-Dichloroethane-d4	75-130%	102%
2037-26-5	Toluene-d8	74-121%	98%
460-00-4	p-Bromofluorobenzene	70-124%	92%

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 624/8240
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 19014-3 S-26.5-B6
Matrix : SOIL
Date sampled : 08/04/89
Date analyzed: 08/17/89
Dilut. factor: 1000

Anametrix I.D. : 8908088-06
Analyst : JM
Supervisor : PG
Date released : 08/23/89
Instrument ID : F3

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
74-87-3	* Chloromethane	10000	ND
75-01-4	* Vinyl Chloride	10000	ND
74-83-9	* Bromomethane	10000	ND
75-00-3	* Chloroethane	10000	ND
75-69-4	* Trichlorofluoromethane	5000	ND
75-35-4	* 1,1-Dichloroethene	5000	ND
76-13-1	# Trichlorotrifluoroethane	5000	ND
67-64-1	**Acetone	20000	ND
75-15-0	**Carbondisulfide	5000	ND
75-09-2	* Methylene Chloride	5000	ND
156-60-5	* Trans-1,2-Dichloroethene	5000	ND
75-34-3	* 1,1-Dichloroethane	5000	ND
78-93-3	**2-Butanone	20000	ND
156-59-2	* Cis-1,2-Dichloroethene	5000	ND
67-66-3	* Chloroform	5000	ND
71-55-6	* 1,1,1-Trichloroethane	5000	ND
56-23-5	* Carbon Tetrachloride	5000	ND
71-43-2	* Benzene	5000	5000
107-06-2	* 1,2-Dichloroethane	5000	ND
79-01-6	* Trichloroethene	5000	ND
78-87-5	* 1,2-Dichloropropane	5000	ND
75-27-4	* Bromodichloromethane	5000	ND
110-75-8	* 2-Chloroethylvinylether	5000	ND
108-05-4	**Vinyl Acetate	10000	ND
10061-02-6	* Trans-1,3-Dichloropropene	5000	ND
108-10-1	**4-Methyl-2-Pentanone	10000	ND
108-88-3	* Toluene	5000	20000
10061-01-5	* cis-1,3-Dichloropropene	5000	ND
79-00-5	* 1,1,2-Trichloroethane	5000	ND
127-18-4	* Tetrachloroethene	5000	ND
591-78-6	**2-Hexanone	10000	ND
124-48-1	* Dibromochloromethane	5000	ND
108-90-7	* Chlorobenzene	5000	ND
100-41-4	* Ethylbenzene	5000	16000
1330-20-7	**Total Xylenes	5000	88000
100-42-5	**Styrene	5000	ND
75-25-2	* Bromoform	5000	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	5000	ND
541-73-1	* 1,3-Dichlorobenzene	5000	ND
106-46-7	* 1,4-Dichlorobenzene	5000	ND
95-50-1	* 1,2-Dichlorobenzene	5000	ND

CAS #	Surrogate Compounds	Limits	% Recovery
17060-07-0	1,2-Dichloroethane-d4	75-130%	96%
2037-26-5	Toluene-d8	74-121%	101%
460-00-4	p-Bromofluorobenzene	70-124%	94%

ORGANICS ANALYSIS DATA SHEET - 624/8240 TENTATIVELY IDENTIFIED COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 19014-3 S-26.5-B4
Matrix : SOIL
Date Sampled : 08/04/89
Analyzed VOA : 08/17/89
Dilution VOA : NONE

Anametrix I.D. : 8908088-04
Analyst : ARL
Supervisor : PG
Date Released : 08/23/89

	CAS #	Scan#	Volatile Fraction Compound Name	Det. Limit ppb	Amt. Found ppb
1		132	unknown	5	70
2	79-29-8	189	2,3-dimethylbutane	5	70
3		281	unknown	5	60
4	611-14-3	979	1-ethyl-2-methylbenzene	5	30
5	108-67-8	1039	1,3,5-trimethylbenzene	5	40

Tentatively identified compounds are significant chromatographic peaks (TICs) other than priority pollutants. TIC spectra are compared with entries in the National Bureau of Standards mass spectral library. Identification is made by following US EPA guidelines and acceptance criteria. TICs are quantitated by using the area of the nearest internal standard and assuming a response factor of one (1). Values calculated are ESTIMATES ONLY.

ORGANICS ANALYSIS DATA SHEET - 624/8240 TENTATIVELY IDENTIFIED COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 19014-3 S-26.5-B6
Matrix : SOIL
Date Sampled : 08/04/89
Analyzed VOA : 08/17/89
Dilution VOA : NONE

Anametrix I.D. : 8908088-06
Analyst : ARL
Supervisor : PG
Date Released : 08/23/89

	CAS #	Scan#	Volatile Fraction Compound Name	Det. Limit ppb	Amt. Found ppb
1		187	unknown	5000	110000
2		347	unknown	5000	100000
3	108-87-8	471	methylcyclohexane	5000	30000
4	611-14-3	978	1-ethyl-2-methylbenzene	5000	40000
5	108-67-8	1039	1,3,5-trimethylbenzene	5000	60000

Tentatively identified compounds are significant chromatographic peaks (TICs) other than priority pollutants. TIC spectra are compared with entries in the National Bureau of Standards mass spectral library. Identification is made by following US EPA guidelines and acceptance criteria. TICs are quantitated by using the area of the nearest internal standard and assuming a response factor of one (1). Values calculated are ESTIMATES ONLY.

ORGANIC ANALYSIS DATA SHEET - EPA METHOD 624/8240

ANAMETRIX, INC. (408) 432-8192

Sample I.D. : METHOD BLANK
Matrix : SOIL
Date sampled : N/A
Date analyzed: 08/17/89
Dilut. factor: NONE

Anametrix I.D. : 3CB0817V00
Analyst : WA
Supervisor : PG
Date released : 08/23/89
Instrument ID : F3

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
74-87-3	* Chloromethane	10	ND
75-01-4	* Vinyl Chloride	10	ND
74-83-9	* Bromomethane	10	ND
75-00-3	* Chloroethane	10	ND
75-69-4	* Trichlorofluoromethane	5	ND
75-35-4	* 1,1-Dichloroethene	5	ND
76-13-1	# Trichlorotrifluoroethane	5	ND
67-64-1	**Acetone	20	ND
75-15-0	**Carbondisulfide	5	ND
75-09-2	* Methylene Chloride	5	ND
156-60-5	* Trans-1,2-Dichloroethene	5	ND
75-34-3	* 1,1-Dichloroethane	5	ND
78-93-3	**2-Butanone	20	ND
156-59-2	* Cis-1,2-Dichloroethene	5	ND
67-66-3	* Chloroform	5	ND
71-55-6	* 1,1,1-Trichloroethane	5	ND
56-23-5	* Carbon Tetrachloride	5	ND
71-43-2	* Benzene	5	ND
107-06-2	* 1,2-Dichloroethane	5	ND
79-01-6	* Trichloroethene	5	ND
78-87-5	* 1,2-Dichloropropane	5	ND
75-27-4	* Bromodichloromethane	5	ND
110-75-8	* 2-Chloroethylvinylether	5	ND
108-05-4	**Vinyl Acetate	10	ND
10061-02-6	* Trans-1,3-Dichloropropene	5	ND
108-10-1	**4-Methyl-2-Pentanone	10	ND
108-88-3	* Toluene	5	ND
10061-01-5	* cis-1,3-Dichloropropene	5	ND
79-00-5	* 1,1,2-Trichloroethane	5	ND
127-18-4	* Tetrachloroethene	5	ND
591-78-6	**2-Hexanone	10	ND
124-48-1	* Dibromochloromethane	5	ND
108-90-7	* Chlorobenzene	5	ND
100-41-4	* Ethylbenzene	5	ND
1330-20-7	**Total Xylenes	5	ND
100-42-5	**Styrene	5	ND
75-25-2	* Bromoform	5	ND
79-34-5	* 1,1,2,2-Tetrachloroethane	5	ND
541-73-1	* 1,3-Dichlorobenzene	5	ND
106-46-7	* 1,4-Dichlorobenzene	5	ND
95-50-1	* 1,2-Dichlorobenzene	5	ND

CAS #	Surrogate Compounds	Limits	% Recovery
17060-07-0	1,2-Dichloroethane-d4	75-130%	102%
2037-26-5	Toluene-d8	74-121%	98%
460-00-4	p-Bromofluorobenzene	70-124%	98%

CLP VOLATILE MATRIX SPIKE REPORT -- EPA METHOD 8240
ANAMETRIX, INC. (408) 629-1132

Sample I.D. : 19014-3 S-24-B1
Matrix : SOIL
Date sampled : 08/03/89
Date analyzed : 08/17/89

Anametrix I.D. : 8908088-01
Analyst : ARL
Supervisor : PG
Date released : 08/23/89
Instrument I.D.: F3

COMPOUND	SPIKE AMT. (UG/KG)	8908088 MS (UG/KG)	%REC MS	8908088 MSD (UG/KG)	%REC MSD	RPD	%REC LIMITS*
1,1-DICHLOROETHENE	50	44	88%	46	92%	4%	37-155%
FREON 113	50	47	94%	47	94%	0%	48-161%
METHYLENE CHLORIDE	50	46	92%	49	98%	6%	46-141%
CHLOROFORM	50	48	96%	47	94%	-2%	68-126%
1,1,1-TRICHLOROETHANE	50	46	92%	44	88%	-4%	57-149%
BENZENE	50	46	92%	47	94%	2%	64-134%
1,2-DICHLOROETHANE	50	43	86%	45	90%	5%	49-128%
TRICHLOROETHENE	50	48	96%	49	98%	2%	60-110%
4-METHYL-2-PENTANONE	50	43	86%	42	84%	-2%	35-147%
TOLUENE	50	46	92%	48	96%	4%	67-134%
TETRACHLOROETHENE	50	45	90%	44	88%	-2%	70-130%
CHLOROBENZENE	50	50	100%	51	102%	2%	70-131%
1,2-DICHLOROBENZENE	50	53	106%	51	102%	-4%	63-130%

* Limits established by Anametrix, Inc.

REPORT SUMMARY
ANAMETRIX, INC. (408) 432-8192

Client : Applied GeoSystems
Address : 43255 Mission Boulevard
Suite B
City : Fremont, CA 94539
Attn. : Bill Howell

Anametrix W.O.#: 0908088
Date Received : 08/10/89
Purchase Order#: N/A
Project No. : 19014-3
Date Released : 08/23/89

Anametrix I.D.	Sample I.D.	Matrix	Date Sampled	Method	Date Extract	Date Analyzed	Inst I.D.
RESULTS							
8908088-04	S-26.5-B4	SOIL	08/04/89	8080	08/15/89	08/18/89	HP5
8908088-01	S-24-B1	SOIL	08/03/89	TPH	08/15/89	08/19/89	N/A
8908088-02	S-29-B2	SOIL	08/03/89	TPHg		08/10/89	N/A
8908088-03	S-29-B3	SOIL	08/03/89	TPHg		08/11/89	N/A
8908088-04	S-26.5-B4	SOIL	08/04/89	TPH	08/15/89	08/19/89	N/A
8908088-05	S-26.5-B5	SOIL	08/04/89	TPHg		08/10/89	N/A
8908088-06	S-26.5-B6	SOIL	08/04/89	TPH	08/15/89	08/19/89	N/A
QUALITY ASSURANCE (QA)							
PSBL081589	METHOD BLANK	SOIL	N/A	8080	08/15/89	08/18/89	HP5

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 608/8080
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-3 S-26.5-B4	Anametrix I.D.	: 8908088-04
Matrix	: SOIL	Analyst	:
Date sampled	: 08/04/89	Supervisor	:
Date ext.	: 08/15/89	Date released	: 08/23/89
Date analyzed	: 08/18/89	Weight ext.	: 30 g
Dilution	: NONE	Instrument ID	: HP5

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
319-84-6	alpha-BHC	8	ND
319-85-7	beta-BHC	8	ND
58-89-9	gamma-BHC (Lindane)	8	ND
319-86-8	delta-BHC	8	ND
76-44-8	Heptachlor	8	ND
309-00-2	Aldrin	8	ND
1024-57-3	Heptachlor epoxide	8	ND
959-98-8	Endosulfan I	8	ND
72-55-9	p,p'-DDE	16	ND
60-57-1	Dieldrin	16	ND
72-20-8	Endrin	16	ND
72-54-8	p,p'-DDD	16	ND
33212-65-9	Endosulfan II	16	ND
50-29-3	p,p'-DDT	16	ND
7421-93-4	Endrin aldehyde	16	ND
1031-07-8	Endosulfan sulfate	16	ND
72-43-5	p,p'-Methoxychlor	80	ND
53494-70-5	Endrin ketone	16	ND
12789-03-6	Technical chlordane	80	ND
8001-35-2	Toxaphene	160	ND
1104-28-2	Aroclor 1221	80	ND
11141-16-5	Aroclor 1232	80	ND
53469-21-9	Aroclor 1242	80	ND
12672-29-6	Aroclor 1248	80	ND
11097-69-1	Aroclor 1254	160	ND
11096-82-5	Aroclor 1260	160	ND
12674-11-2	Aroclor 1016	80	ND
	Dibutylchlorendate	20-150%	68%

ND : Not detected at or above the practical quantitation limit for the method.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-3 S-24-B1	Anametrix I.D.	: 8908088-01
Matrix	: SOIL	Analyst	: OL
Date sampled	: 08/03/89	Supervisor	: TC
Date anl.TPHg	: 08/16/89	Date released	: 08/23/89
Date ext.TPHd	: 08/15/89	Date ext. TOG	: N/A
Date anl.TPHd	: 08/19/89	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	5	ND
108-88-3	Toluene	5	ND
100-41-4	Ethylbenzene	5	ND
1330-20-7	Total Xylenes	5	ND
	TPH as Gasoline	1000	ND
	TPH as Diesel	10000	ND

ND - Not detected at or above the practical quantitation limit for the method.

TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.

TPHd - Total Petroleum Hydrocarbons as diesel is determined by GCFID following either EPA Method 3510 or 3550.

BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-3 S-29-B2	Anametrix I.D.	: 8908088-02
Matrix	: SOIL	Analyst	: ON
Date sampled	: 08/03/89	Supervisor	: TC
Date anl.TPHg	: 08/10/89	Date released	: 08/23/89
Date ext.TPHd	: N/A	Date ext. TOG	: N/A
Date anl.TPHd	: N/A	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	5	ND
108-88-3	Toluene	5	ND
100-41-4	Ethylbenzene	5	ND
1330-20-7	Total Xylenes	5	ND
	TPH as Gasoline	1000	ND

ND - Not detected at or above the practical quantitation limit for the method.

TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.

BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-3 S-29-B3	Anametrix I.D.	: 8908088-03
Matrix	: SOIL	Analyst	: ON
Date sampled	: 08/03/89	Supervisor	: TC
Date anl.TPHg	: 08/11/89	Date released	: 08/23/89
Date ext.TPHd	: N/A	Date ext. TOG	: N/A
Date anl.TPHd	: N/A	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	5	ND
108-88-3	Toluene	5	ND
100-41-4	Ethylbenzene	5	ND
1330-20-7	Total Xylenes	5	ND
	TPH as Gasoline	1000	ND

ND - Not detected at or above the practical quantitation limit for the method.

TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.

BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-3 S-26.5-B4	Anametrix I.D.	: 8908088-04
Matrix	: SOIL	Analyst	: ON
Date sampled	: 08/04/89	Supervisor	: TC
Date anl.TPHg	: 08/11/89	Date released	: 08/23/89
Date ext.TPHd	: 08/15/89	Date ext. TOG	: N/A
Date anl.TPHd	: 08/19/89	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	50	410
108-88-3	Toluene	50	70
100-41-4	Ethylbenzene	50	80
1330-20-7	Total Xylenes	50	160
	TPH as Gasoline	1000	4000
	TPH as Diesel	10000	ND

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
TPHd - Total Petroleum Hydrocarbons as diesel is determined by GCFID following either EPA Method 3510 or 3550.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-3 S-26.5-B5	Anametrix I.D.	: 8908088-05
Matrix	: SOIL	Analyst	: ON
Date sampled	: 08/04/89	Supervisor	: TC
Date anl.TPHg	: 08/10/89	Date released	: 08/23/89
Date ext.TPHd	: N/A	Date ext. TOG	: N/A
Date anl.TPHd	: N/A	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	5	32
108-88-3	Toluene	5	ND
100-41-4	Ethylbenzene	5	ND
1330-20-7	Total Xylenes	5	ND
	TPH as Gasoline	1000	ND

ND - Not detected at or above the practical quantitation limit for the method.

TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.

BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 19014-3 S-26.5-B6	Anametrix I.D.	: 8908088-06
Matrix	: SOIL	Analyst	: ON
Date sampled	: 08/04/89	Supervisor	: TC
Date anl.TPHg	: 08/11/89	Date released	: 08/23/89
Date ext.TPHd	: 08/15/89	Date ext. TOG	: N/A
Date anl.TPHd	: 08/19/89	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	2000	ND
108-88-3	Toluene	2000	19000
100-41-4	Ethylbenzene	2000	12000
1330-20-7	Total Xylenes	2000	63000
	TPH as Gasoline	40000	1400000
	TPH as Diesel	10000	320000

ND - Not detected at or above the practical quantitation limit for the method.

TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.

TPHd - Total Petroleum Hydrocarbons as diesel is determined by GCFID following either EPA Method 3510 or 3550.

BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 608/8080
ANAMETRIX, INC. (408) 432-8192

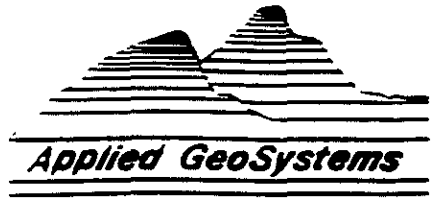
Sample I.D. : METHOD BLANK
Matrix : SOIL
Date sampled : N/A
Date ext. : 08/15/89
Date analyzed: 08/18/89
Dilution : NONE

Anametrix I.D. : PSBL081589
Analyst :
Supervisor :
Date released : 08/23/89
Weight ext. : 30 g
Instrument ID : HP5

CAS #	Compound Name	Reporting Limit (ug/Kg)	Amount Found (ug/Kg)
319-84-6	alpha-BHC	8	ND
319-85-7	beta-BHC	8	ND
58-89-9	gamma-BHC (Lindane)	8	ND
319-86-8	delta-BHC	8	ND
76-44-8	Heptachlor	8	ND
309-00-2	Aldrin	8	ND
1024-57-3	Heptachlor epoxide	8	ND
959-98-8	Endosulfan I	8	ND
72-55-9	p,p'-DDE	16	ND
60-57-1	Dieldrin	16	ND
72-20-8	Endrin	16	ND
72-54-8	p,p'-DDD	16	ND
33212-65-9	Endosulfan II	16	ND
50-29-3	p,p'-DDT	16	ND
7421-93-4	Endrin aldehyde	16	ND
1031-07-8	Endosulfan sulfate	16	ND
72-43-5	p,p'-Methoxychlor	80	ND
53494-70-5	Endrin ketone	16	ND
12789-03-6	Technical chlordane	80	ND
8001-35-2	Toxaphene	160	ND
1104-28-2	Aroclor 1221	80	ND
11141-16-5	Aroclor 1232	80	ND
53469-21-9	Aroclor 1242	80	ND
12672-29-6	Aroclor 1248	80	ND
11097-69-1	Aroclor 1254	160	ND
11096-82-5	Aroclor 1260	160	ND
12674-11-2	Aroclor 1016	80	ND
	Dibutylchlorendate	20-150%	75%

ND : Not detected at or above the practical quantitation limit for the method.

CHAIN OF CUSTODY RECORD



Applied GeoSystems

43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): [signature]

Phone: (415) 651-1906

LABORATORY: Applied Geosystems

TURNAROUND TIME: 48 hour

Project Leader: Bill Howell

Phone No. 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
[signature]	Bill Howell	8/4/89	12:00
Bill Howell			
	Received for laboratory by: [signature]	8-11-89	0800

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
~~S-16.5-B2~~				
S-16.5-B2	90' 14-3	8/3/89	TPH gas w/ BTEX	frozen
S-24-B2	"	"		
~~B~~				
S-16.5-B3	90' 14-3	8/3/89	TPH gas w/ BTEX	frozen
S-21.5-B3	"	"		
S-26.5-B3	"	"		
S-16.5-B4	90' 14-3	8/3/89	TPH gas w/ BTEX	frozen
S-21.5-B4	"	"		
S-29-B4	"	"		
S-21.5-B5	90' W-3	8/4/89	TPH gas w/ BTEX	frozen
S-16.5-B6	90' W-3	8/4/89	TPH gas w/ BTEX	frozen
S-21.5-B6	"	"		
S-31.5-B6	"	"		

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S01
Project #: 19014-3
Sample #: S-16.5-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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08-15-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S02
Project #: 19014-3
Sample #: S-24-B2
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
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Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S03
Project #: 19014-3
Sample #: S-16.5-B3
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S04
Project #: 19014-3
Sample #: S-21.5-B3
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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Report Prepared for:
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Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S05
Project #: 19014-3
Sample #: S-26.5-B3
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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Report Prepared for:
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Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S06
Project #: 19014-3
Sample #: S-16.5-B4
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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Report Prepared for:
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Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S07
Project #: 19014-3
Sample #: S-21.5-B4
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
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Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S08
Project #: 19014-3
Sample #: S-29-B4
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S09
Project #: 19014-3
Sample #: S-21.5-B5
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S10
Project #: 19014-3
Sample #: S-16.5-B6
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-15-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S11
Project #: 19014-3
Sample #: S-21.5-B6
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	0.22		0.050		08-11-89	
Toluene	0.14		0.050		08-11-89	
Ethylbenzene	0.13		0.050		08-11-89	
Total Xylenes	0.56		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-15-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S12
Project #: 19014-3
Sample #: S-31.5-B6
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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Date Reported

CHAIN OF CUSTODY RECORD

Applied GeoSystems
43255 Mission Blvd. Suite B Fremont, CA 94539 (415) 651-1

SAMPLER (signature):

Phone: 415-651-1906

LABORATORY: Applied Geo Systems

TURNAROUND TIME: 2-week

Project Leader: Bill Howell

Phone No. 651-1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Ti
Bill Howell	Bill Howell	8/13/89	16:
	Received for laboratory by: Laura Kirk	8/22/89	10:

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt
S-16-B7	1	1	1	
S-21-B7	3	8/16/89	BTEX	
S-26-B7	14		TPH gas w/	Frozen
S-31-B7	19			
S-36-B7	✓	✓	✓	✓
S-16-B8	1	1	1	
S-21-B8	3	8/16/89	BTEX	
S-23-B8	14		TPH gas w/	Frozen
S-26-B8	19			
S-31-B8	✓	✓	✓	✓
S-16-B9	1	1	1	
S-21-B9	3	8/16/89	BTEX	
S-26-B9	14		TPH gas w/	Frozen
S-31-B9	19			
	✓	✓	✓	✓

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S01
Project #: 19014-3
Sample #: S-16-B7
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-29-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-29-89	
Toluene	ND		0.050		08-29-89	
Ethylbenzene	ND		0.050		08-29-89	
Total Xylenes	ND		0.050		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

09-05-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S02
Project #: 19014-3
Sample #: S-21-B7
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	530		2.0		08-29-89	
TEH as Diesel						NR
Benzene	1.1		1.0		08-29-89	
Toluene	5.8		1.0		08-29-89	
Ethylbenzene	5.8		1.0		08-29-89	
Total Xylenes	30		1.0		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

09-05-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S03
Project #: 19014-3
Sample #: S-26-B7
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-29-89	
TEH as Diesel						NR
Benzene	0.084		0.050		08-29-89	
Toluene	ND		0.050		08-29-89	
Ethylbenzene	ND		0.050		08-29-89	
Total Xylenes	ND		0.050		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S04
Project #: 19014-3
Sample #: S-31-B7
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	15		2.0		08-29-89	
TEH as Diesel						NR
Benzene	0.61		0.050		08-29-89	
Toluene	0.57		0.050		08-29-89	
Ethylbenzene	0.24		0.050		08-29-89	
Total Xylenes	0.92		0.050		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S05
Project #: 19014-3
Sample #: S-36-B7
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-29-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-29-89	
Toluene	ND		0.050		08-29-89	
Ethylbenzene	ND		0.050		08-29-89	
Total Xylenes	ND		0.050		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
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Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S06
Project #: 19014-3
Sample #: S-16-B8
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-29-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-29-89	
Toluene	ND		0.050		08-29-89	
Ethylbenzene	ND		0.050		08-29-89	
Total Xylenes	ND		0.050		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
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Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S07
Project #: 19014-3
Sample #: S-21-B8
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-29-89	
TEH as Diesel						NR
Benzene	0.18		0.050		08-29-89	
Toluene	ND		0.050		08-29-89	
Ethylbenzene	0.72		0.050		08-29-89	
Total Xylenes	ND		0.050		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

09-05-89
Date Reported

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ANALYSIS REPORT

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S08
Project #: 19014-3
Sample #: S-23-B8
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-29-89	
TEH as Diesel						NR
Benzene	0.11		0.050		08-29-89	
Toluene	ND		0.050		08-29-89	
Ethylbenzene	ND		0.050		08-29-89	
Total Xylenes	0.075		0.050		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

09-05-89
Date Reported

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S09
Project #: 19014-3
Sample #: S-26-B8
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-29-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-29-89	
Toluene	ND		0.050		08-29-89	
Ethylbenzene	ND		0.050		08-29-89	
Total Xylenes	ND		0.050		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S10
Project #: 19014-3
Sample #: S-31-B8
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-29-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-29-89	
Toluene	ND		0.050		08-29-89	
Ethylbenzene	ND		0.050		08-29-89	
Total Xylenes	ND		0.050		08-29-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S11
Project #: 19014-3
Sample #: S-16-B9
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-30-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-30-89	
Toluene	ND		0.050		08-30-89	
Ethylbenzene	ND		0.050		08-30-89	
Total Xylenes	ND		0.050		08-30-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

09-05-89
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Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S12
Project #: 19014-3
Sample #: S-21-B9
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-30-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-30-89	
Toluene	ND		0.050		08-30-89	
Ethylbenzene	ND		0.050		08-30-89	
Total Xylenes	ND		0.050		08-30-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

09-05-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • COSTA MESA • SACRAMENTO • HOUSTON

ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S13
Project #: 19014-3
Sample #: S-26-B9
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-30-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-30-89	
Toluene	ND		0.050		08-30-89	
Ethylbenzene	ND		0.050		08-30-89	
Total Xylenes	ND		0.050		08-30-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

09-05-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-11-89
Laboratory Number: 90825S06
Project #: 19014-3
Sample #: S-16.5-B4
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-11-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-11-89	
Toluene	ND		0.050		08-11-89	
Ethylbenzene	ND		0.050		08-11-89	
Total Xylenes	ND		0.050		08-11-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

08-15-89
Date Reported

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Boulevard
Fremont, CA 94539
Attention: William K. Howell

Date Received: 08-22-89
Laboratory Number: 90859S14
Project #: 19014-3
Sample #: S-31-B9
Matrix: Soil

Parameter	Result (mg/kg)	Result (mg/L)	Detection Limit (mg/kg)	Detection Limit (mg/L)	Date Analyzed	Notes
TVH as Gasoline						NR
TPH as Gasoline	ND		2.0		08-30-89	
TEH as Diesel						NR
Benzene	ND		0.050		08-30-89	
Toluene	ND		0.050		08-30-89	
Ethylbenzene	ND		0.050		08-30-89	
Total Xylenes	ND		0.050		08-30-89	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not required.

PROCEDURES

TVH/BTEX--Total volatile hydrocarbons (TVH) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction according to EPA Method 5030 followed by analysis by a EPA Method 8020/602 (modified for TVH) which uses a gas chromatograph (GC) equipped with a photo-ionization detector (PID) and a flame-ionization detector (FID) in series. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

TEH--Total extractable hydrocarbons (high boiling points) are measured by extraction according to EPA Method 3550 for soils or EPA Method 3510 for water followed by a modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Tia Tran, Laboratory Supervisor

09-05-89
Date Reported

APPENDIX F

SOIL VAPOR SURVEY

PACIFIC
ENVIRONMENTAL
GROUP INC.

July 17, 1989
Project No. 330-40.02

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

Attn: Mr. Kyle Christie

RE: ARCO Station No. 0276
10600 MacArthur Boulevard at 106th Avenue
Oakland, California

Dear Mr. Christie:

This letter presents the results of a soil gas investigation conducted by Pacific Environmental Group, Inc. (PACIFIC) at ARCO service station No. 0276, located at 10600 MacArthur Boulevard, Oakland, California (see Figure 1). Following is a preliminary report of the procedures and findings of the soil gas survey that was conducted on June 21 and 22, 1989.

The soil vapor probe locations were selected to define the extent of hydrocarbon migration southeast of the ARCO station. A total of sixteen soil gas probes were installed during the investigation and were sampled at two depth intervals: four on-site probes (P-1 to P-4) were set at depth intervals of 14 to 16 feet and 19 to 21 feet; and twelve off-site probes (P-5 to P-16) were set at depth intervals of 17 to 19 feet and 22 to 24 feet below grade. The three-foot difference in sampling depth between the on-site and off-site probes allowed similar elevation intervals to be sampled throughout the area of investigation. (The ARCO station is situated approximately three feet lower in elevation than the adjacent lot.)

The elevation intervals sampled were 39-41 feet mean sea level (MSL) for the shallower sampling interval, and 34-36 feet MSL for the deeper interval. MSL elevations were taken from Cross-Section A-A', prepared by Applied Geosystems in a preliminary report dated May 12, 1989.

The probes were constructed of 1/2-inch diameter steel pipe, with the lower two feet perforated with 3/16-inch holes. The probes were driven into the soil with pneumatic equipment.

ANALYTICAL PROCEDURES

The sample of soil gas was drawn from each probe by means of a diaphragm pump through a stainless steel well head fitting and a Teflon sampling line, into a Beckman Model 400 Total Hydrocarbon Analyzer equipped with a flame-ionization detector and a Houston Instruments chart recorder. This detector uses a hydrogen flame to measure gas vapor. The detector is calibrated relative to propane; therefore, the total hydrocarbon concentration (THC) is reported with a detection limit of 150 parts per million (ppm) as propane (volume basis). The rate through the pump was maintained at 5 to 10 cubic feet per minute.

Once the flame ionization reading stabilized, a sample of soil gas was also taken from the probe head and injected into a Photovac Model 10S55 portable gas chromatograph equipped with an 11 eV photo-ionization detector. An ultraviolet (UV) light source in the detector ionizes the chemical compounds that have an ionization potential less than that of the UV light (11 electron volts). The temperature controlled chromatographic column separates the individual compounds for speciation. Table 1 presents a summary of the analytical results for each probe location and depth. Chromatograms are included in Appendix A.

The gas chromatograph was calibrated with a certified standard mixture of benzene, toluene, ethylbenzene, and xylene isomers (BTEX). The THC measurements obtained by the flame-ionization detector were used to set the sample gain on the detector in the gas chromatograph. The carrier gas rate through the gas chromatograph was 7 cubic centimeters per minute, and the oven temperature was maintained at 40 degrees Celsius.

The lowest sample volume and least sensitive gain were used in locations where hydrocarbon concentrations were high. Compounds that were not quantifiable at these locations are shown as Excessive Hydrocarbon Interference (EHI) in Table 1 and the accompanying figures.

A number of measures have been implemented to prevent cross contamination of samples by residual hydrocarbons in the sampling equipment. In addition, the gas chromatograph is calibrated frequently during the test to ensure accurate results. The quality assurance/quality control information relating to the techniques used to obtain accurate results and prevent cross contamination of samples is presented as Attachment 1.

FINDINGS

- Probe installation in the adjacent parking lot was hampered by a localized resistant layer (possibly buried pavement) located approximately four feet below grade (see Figure 1). At approximately four feet in depth the soil vapor probes within the resistant area met refusal and soil gas samples were not collected.

- At the approximate elevation of 39-41 feet MSL, benzene concentrations ranged from none detected to 100 ppm; and total hydrocarbon concentrations ranged from 5 ppm to 31,900 ppm (see Table 1). Isoconcentration maps for the THC and total BTEX at 39-41 feet MSL were prepared assuming a logarithmic decrease in concentration between sample points (see Figures 2 and 3). The highest THC and benzene concentrations were found within approximately 150 feet southeast of the ARCO station.

- At the elevation of approximately 34-36 feet MSL, benzene concentrations ranged from none detected to 300 ppm, and total hydrocarbon concentrations ranged from 20 ppm to 40,000 ppm (see Table 1). Isoconcentration maps for THC and total BTEX at 34-36 feet MSL were prepared (see Figures 4 and 5). THC and BTEX concentrations generally decrease southeast of the ARCO station for a distance of approximately 200 feet, and increase for sample points beyond approximately 250 feet from the station.

- The chromatograms for probes P-7, P-8 and P-9 indicated an unknown compound which was detected during the soil-gas investigation that does not correspond to gasoline constituents (see Appendix A).

CONCLUSIONS

- Based on the soil gas survey it appears that a hydrocarbon plume is extending from ARCO's southeastern property boundary, near the underground fuel tanks, to the adjacent parking lot to the southeast (see Figures 4 and 5). The western boundary of the plume remains undefined and may extend into MacArthur Boulevard.

- THC and total BTEX concentrations decrease in the area of probes P-7, P-8 and P-10 at both sampling depths, indicating the plume extends approximately 200 feet off-site to the southeast. A second source may exist as indicated by probes P-9 and P-11, located downgradient of the southern edge of the plume, where elevated levels of hydrocarbons were detected (see Figures 4 and 5).

If there are any questions regarding the contents of this letter, please call.

Sincerely,

PACIFIC ENVIRONMENTAL GROUP, INC.

John N. Baldwin
Staff Geologist

Debra Moser
Senior Geologist

enclosures

cc: Richard Gilchrest, Drake Builders
Bill Howell, Applied GeoSystems
Chris Winsor, ARCO Petroleum Products Company

Project No. 330-40.02

TABLE 1
Summary of Soil-Gas results for ARCO Station #0276
Sampled on June 21-22, 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	14-16	EHI	1000	45	190	26	31,900	1300
1	19-21	.8	9.3	40	33	14	20,000	98
2	14-16	EHI	63	9.7	47	16	200	140
2	19-21	3.2	7.3	1.0	4.1	.6	200	16
3	14 16	10	60	7.9	32	5.2	1,000	110
3	19-21	63	9.3	BRL	1.9	BRL	25,000	74
4	14-16	BRL	.8	.4	1.6	.4	200	3.2
4	19 21	.2	.1	.2	1.3	.4	500	2.2
5	17 19	1.3	1.3	BRL	BRL	BRL	300	2.6
5	22-24	130	190	20	17	19	25,300	380
6	17-19	BRL	BRL	BRL	BRL	BRL	80	BRL
6	22-24	130	39	BRL	BRL	BRL	21,500	170
7	17-19	.1	.5	BRL	.2	BRL	10	.8
7	22-24	BRL	BRL	BRL	BRL	BRL	20	BRL
8	17-19	BRL	BRL	BRL	BRL	BRL	45	BRL
8	22-24	BRL	.2	BRL	BRL	BRL	100	.2
9	17-19	BRL	BRL	BRL	BRL	BRL	BRL	BRL
9	22-24	6.7	7.8	15	4.5	BRL	2,100	34
10	17 19	.1	.3	BRL	.1	BRL	160	.5
10	22-24	1.2	.8	BRL	BRL	BRL	800	2.0
11	17-19	BRL	BRL	BRL	BRL	BRL	5	BRL
11	22-24	.1	9.7	.7	2.2	1.5	14,000	14
12	17-19	BRL	.4	BRL	BRL	BRL	10	.4
12	22-24	EHI	300	BRL	BRL	BRL	33,500	300
Reporting Limit:		.1	.1	.1	.1	.1	5	.1

THC: Total Hydrocarbons recorded by Flame Ionization Detector. All other gasoline constituents recorded by gas chromatograph.
EHI: Not quantified due to Excessive Hydrocarbon Interference. (Lowest volume of injection and least sensitive gain set for gas chromatograph).
BRL: Below Reporting Limit.
ppm: parts per million on a volume to volume basis.

Project No. 330-40.02

TABLE 1 (cont.)
Summary of Soil-Gas results for ARCO Station #0276
Sampled on June 21-22, 1989

PROBE #	DEPTH (in feet)	BENZENE (ppm)	TOLUENE (ppm)	E-BENZENE (ppm)	P,M-XYLENE (ppm)	O-XYLENE (ppm)	THC (ppm)	TOTAL BTEX (ppm)
13	17-19	.1	.5	.1	.2	.1	60	1.0
13	22-24	300	190	BRL	25	BRL	24,500	510
14	17-19	.1	.3	.1	.2	.1	50	.8
14	22 24	20	29	1.8	6.3	1.6	5,000	59
15	17-19	100	180	11	7.4	8.7	23,500	300
15	22-24	EHI	2000	79	230	48	40,000	2400
16	17-19	3.1	4.1	.5	.5	BRL	500	8.2
16	22-24	.5	1.2	BRL	.4	.1	500	2.2
Reporting Limit:		.1	.1	.1	.1	.1	5	.1

THC: Total Hydrocarbons recorded by Flame Ionization Detector. All other gasoline constituents recorded by gas chromatograph.
EHI: Not quantified due to Excessive Hydrocarbon Interference. (Lowest volume of injection and least sensitive gain set for gas chromatograph).
BRL: Below Reporting Limit.
ppm: parts per million on a volume to volume basis.

Attachment 1

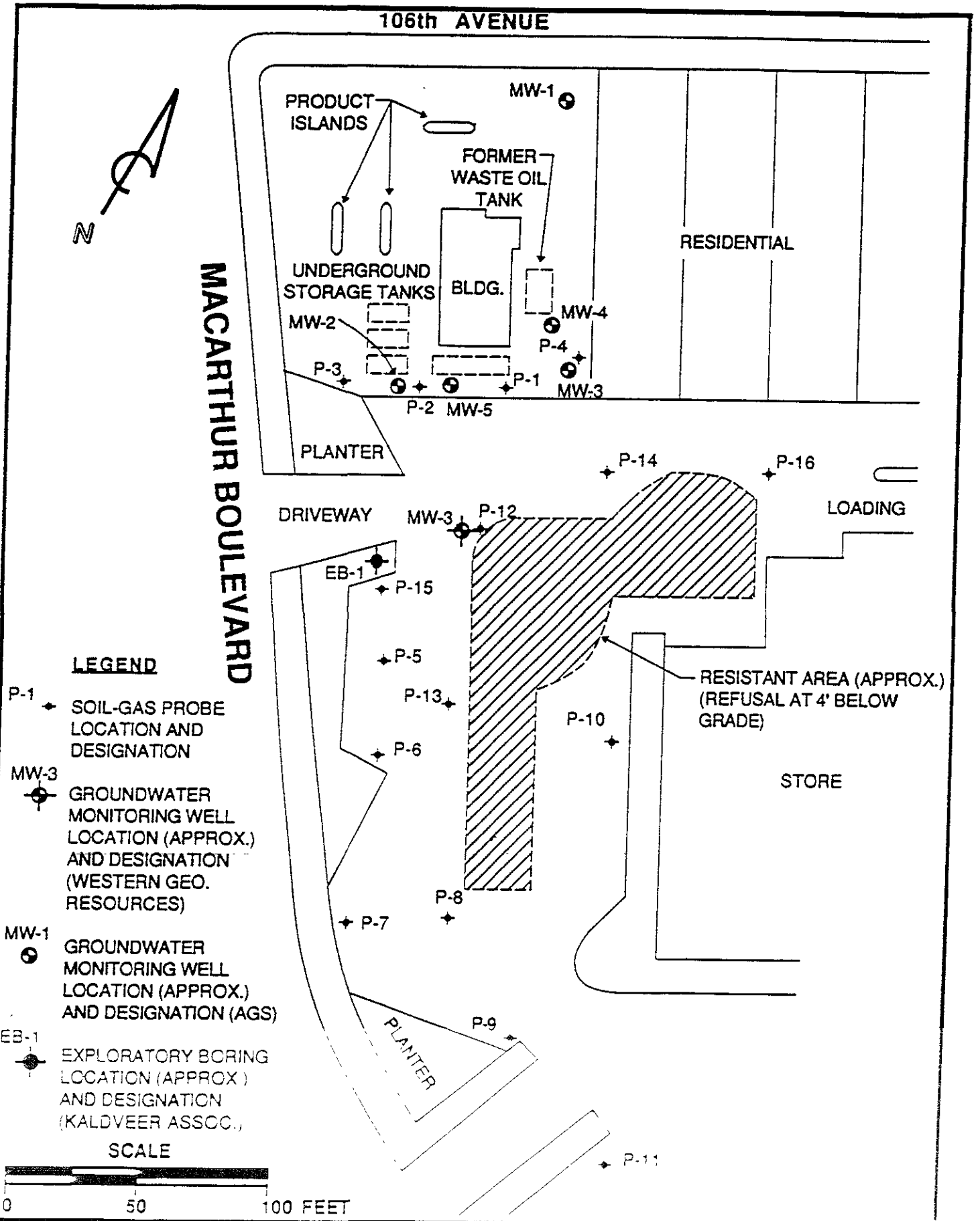
Quality Assurance/Quality Control

PACIFIC's normal quality assurance procedures were followed 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 perforated 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. A different probe is used for each sample. The equipment is steam cleaned prior to each use. An equipment blank, a sample of air 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 FID 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.

APPENDIX A



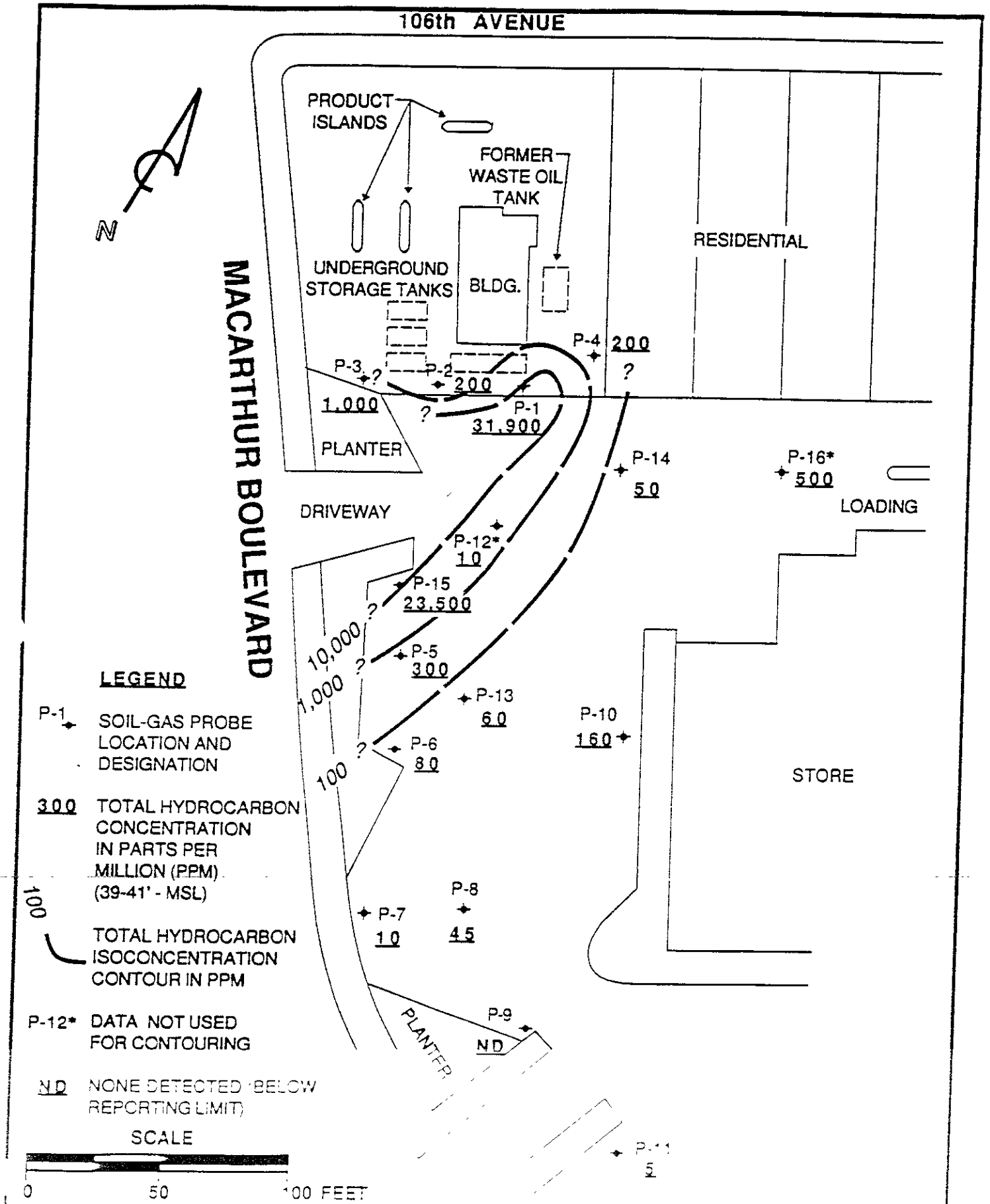
PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO SERVICE STATION #0276
10600 MacArthur Boulevard
Oakland, California

SITE MAP

FIGURE: 1

PROJECT.

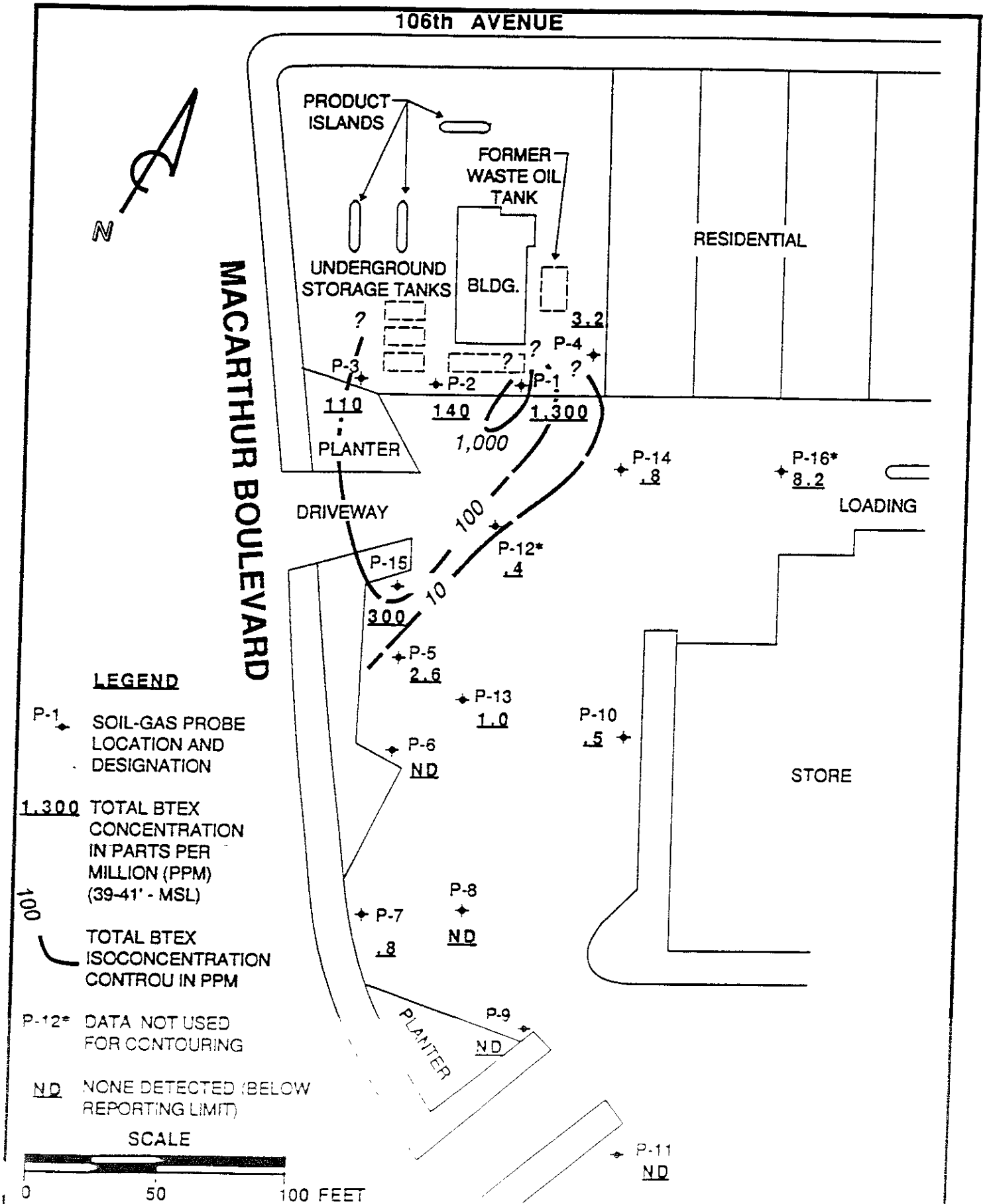


PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO SERVICE STATION #0276
10600 MacArthur Boulevard
Oakland, California

TOTAL HYDROCARBON ISOCONCENTRATION MAP AT 39-41' - MSL

FIGURE 2
PROJECT 330-40.02



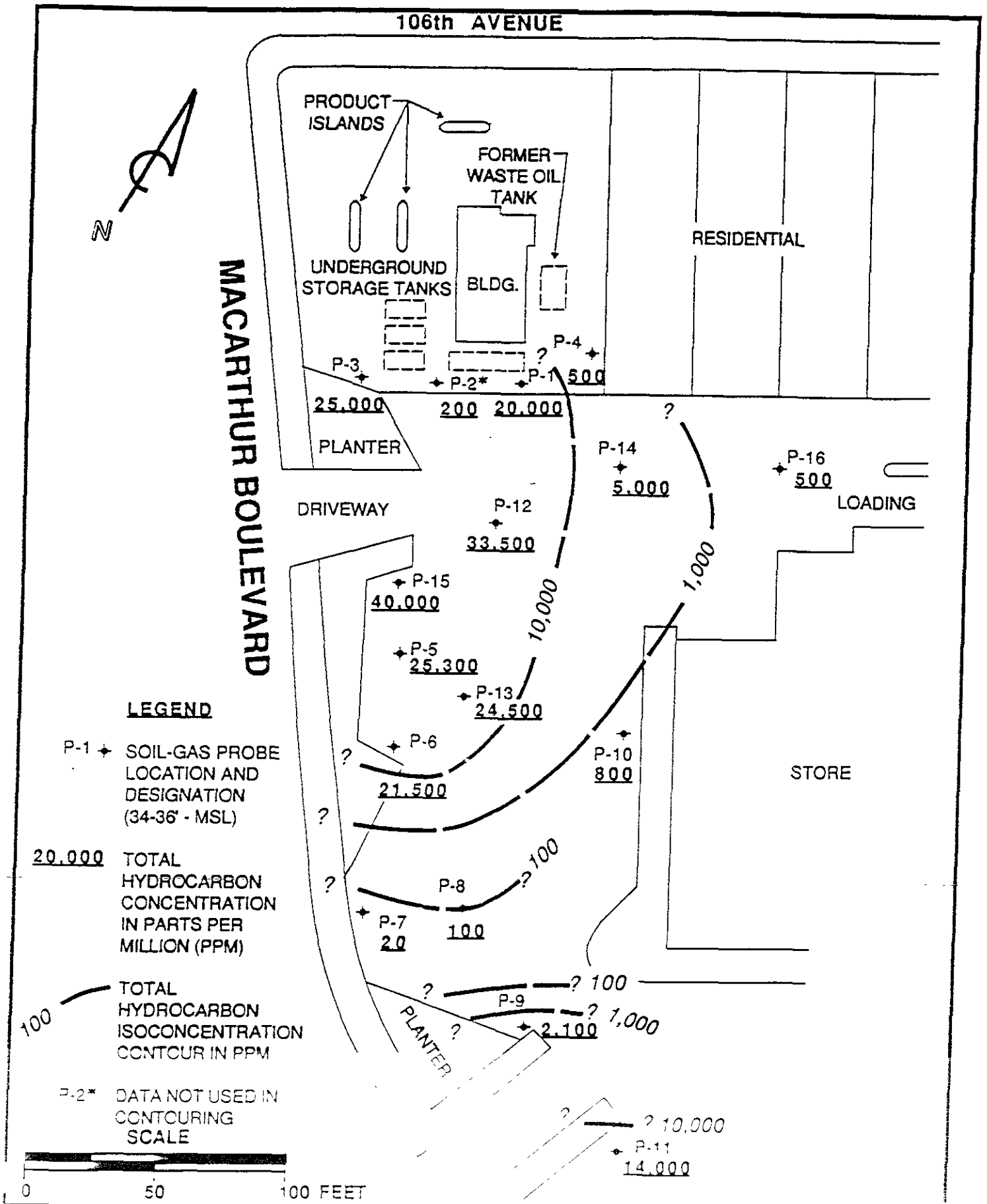
PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO SERVICE STATION #0276
10600 MacArthur Boulevard
Oakland, California

TOTAL BTEX ISOCONCENTRATION MAP

FIGURE: 3

PROJECT.



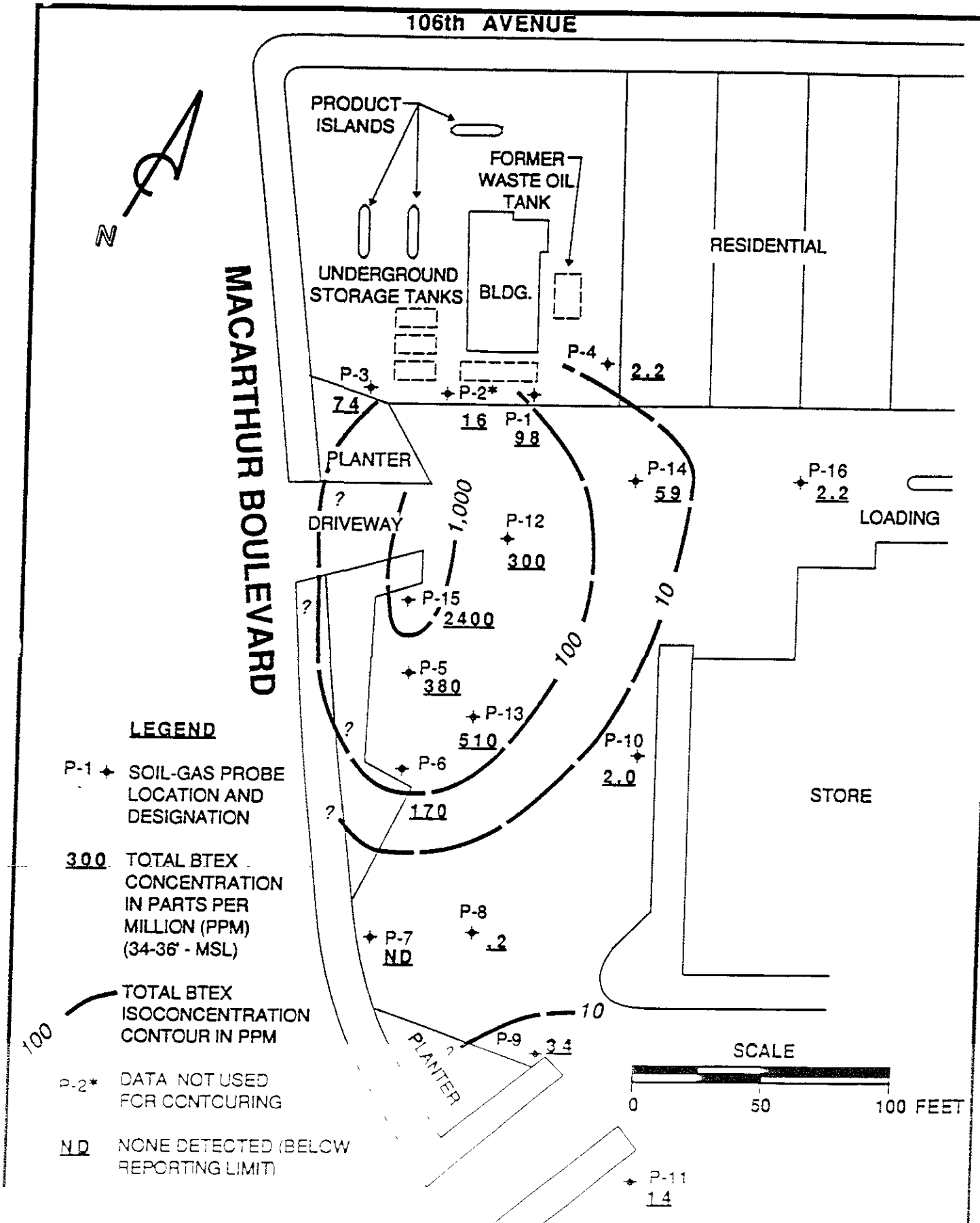
PACIFIC ENVIRONMENTAL GROUP, INC

ARCO SERVICE STATION #0276
10600 MacArthur Boulevard
Oakland, California

TOTAL HYDROCARBON ISOCONCENTRATION MAP AT 34'-36' MSL

FIGURE 4

PROJECT 330-40.02



PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO SERVICE STATION #0276
10600 MacArthur Boulevard
Oakland, California

TOTAL BTEX ISOCONCENTRATION

FIGURE. 5
PROJECT.