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REPORT
LIMITED SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

AUG 1988

AGS Job No. 18008-3

Report prepared for

Beacon Oil Company
525 West Third Street
Hanford California 93230

by
Applied GeoSystems

Gary D. Barker
Project Geologist

Gillian S. Holmes
G.E. 2023

August 25, 1988

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August 25, 1988
AGS 18008-3

Mr. Steve Epperson
Beacon Oil Company
525 West Third Street
Hanford, California 93230

Subject: Executive Summary of Report No. 18008-3, Limited Subsurface Environmental Investigation, at Beacon Station No. 546, 29705 Mission Boulevard, Hayward, California.

Mr. Epperson:

This report summarizes the results of previous work performed at the above-referenced site in conjunction with tank removal operations and presents the results of additional work performed by Applied GeoSystems to evaluate hydrocarbon contamination of soil and ground water at the site.

In April 1988, Applied GeoSystems was present at the site for the removal of one- diesel and two gasoline-product underground storage tanks and one waste-oil tank (AGS Report No. 18008-1). Laboratory analyses of soil samples collected from directly beneath the tanks indicated that hydrocarbon contamination was present in the soil beneath the product tanks. Following removal of the product tanks, the soil in the tank pit was excavated to approximately 25 feet below the surface which removed most of the soil with elevated levels of hydrocarbons. Beacon Oil requested that Applied GeoSystems install monitoring wells at the site to evaluate if the hydrocarbon contamination had impacted the ground water.

The current phase of work included drilling three soil borings and constructing ground-water monitoring wells in the borings, developing and sampling water from the wells for laboratory analysis, and evaluating the ground-water gradient.

Monitoring well MW-1 was installed in the inferred downgradient direction from the tank pit area. Monitoring well MW-2 was installed in the inferred crossgradient direction from the product tank pit on the downgradient boundary of the site. Monitoring well MW-3 was installed in the inferred upgradient direction from the tank pit area on the site.

Laboratory analytical results of soil and water samples from the borings and monitoring wells indicate that the extent of hydrocarbon contamination has not been limited to the area of the product tank pit. Only the hydrocarbon constituent benzene was present in concentrations above the "action level" recommended for drinking water in the ground water from monitoring well MW-3. The ground-water samples analyzed from monitoring well MW-2 had levels of hydrocarbon contamination slightly above the recommended action levels for the hydrocarbon constituents benzene and toluene. The ground-water samples analyzed from monitoring well MW-1 showed levels of the hydrocarbon constituents benzene, toluene, ethylbenzene, and total xylene isomers all above the recommended action levels for drinking water.

Evaluation of the ground-water flow was made after the wells were installed. The direction of ground-water flow on July 7, 1988, was calculated to be to the southwest.

In our opinion, the ground water beneath the site has been impacted by hydrocarbon contamination. The source for the hydrocarbon contamination has probably been removed with the product tanks and by excavating the hydrocarbon-contaminated soil present in the product tank pit.

Further work is recommended at the Beacon station to evaluate levels of contaminants and delineate the extent of hydrocarbon contamination in the ground water beneath the site. This work may include the installation of additional wells offsite to the south and east to delineate the extent of hydrocarbon contamination. In addition, after further evaluation of aquifer characteristics, we recommend the installation of a recovery well adjacent to the former tank pit.

We recommend that a copy of this report be submitted to Mr. Hugh Murphy of the Hayward Fire Prevention Bureau, 22300 Foothill Boulevard, Hayward, California 94541 and Ms. Lisa McCann of the California Regional Water Quality Control Board, San Francisco Bay Region, 1111 Jackson Street, Room 6040, Oakland, California 94607.

Sincerely,
Applied GeoSystems

Gary D. Barker
Project Geologist

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REPORT
LIMITED SUBSURFACE ENVIRONMENTAL INVESTIGATION SOIL BORINGS AND MONITORING WELL INSTALLATION at Beacon Station No. 546 525 West Third Street Hanford, California

For Beacon Oil Company

INTRODUCTION

This report summarizes the limited subsurface environmental investigation conducted at Beacon Station No. 546 located at 29705 Mission Boulevard in Hayward, California. The site is located at the intersection of Mission Boulevard and Alquire Road, now known as Industrial Parkway, as shown on the Site Vicinity Map, Plate P-1.

Beacon requested that Applied GeoSystems conduct a subsurface environmental investigation at the site after hydrocarbon contamination was discovered in the soil during recent removal of tanks from the site (AGS Report No. 18008-1, dated August 4, 1988). The tanks were removed after a decision was made by Beacon Oil Company to close the station and sell the property.

This report describes the work elements associated with drilling three soil borings, installing ground-water monitoring wells in the borings, and collecting and analyzing selected soil and water samples from the borings and monitoring wells. This report also contains our interpretations of the data collected and our recommendations for future work.

BACKGROUND

When the site was an operating Beacon service station, three underground fuel-storage tanks were located east of the station building. Two were gasoline-storage tanks (Tank T1 and Tank T2) with capacities of 10,000 and 8,000 gallons, respectively. The third (Tank T3) was an 8,000-gallon diesel-storage tank. A fourth tank (Tank T4), located behind the station building, was a 500-gallon waste-oil tank. Former locations of the steel tanks and other selected site features are shown on the Generalized Site Plan, Plate P-2. The date of tank installation is unknown.

On April 6 and April 8, 1988, Applied GeoSystems observed removal of the tanks at the request of Beacon Oil Company. Inspection of the tanks revealed that they were all moderately rusted. Tanks T1 and T4 had visible through-going holes. The results of the

soil samples collected from directly beneath the areas corresponding to the bottom ends of each tank showed hydrocarbon contamination ranging from relatively low (less than 100 ppm) to medium (less than 1,000 ppm) for the gasoline tanks and nondetectable to high (greater than 1,000 ppm) for the diesel tank (T3). The waste-oil tank sample showed nondetectable levels of hydrocarbon contamination in the soil beneath this tank. Results of these analyses of soil samples collected after the tank removal are presented on Table 1. The tank pit that contained the gasoline and diesel tanks was further excavated to ground-water level (approximately 25 feet below the surface), which probably removed the soil contaminated with elevated levels of hydrocarbons from the tank pit.

The gasoline-contaminated soil was stockpiled at the site and composite soil samples were collected prior to analyzing the soil. The Bay Area Air Quality Management District was notified of the levels of hydrocarbons in the soil to be aerated, and permission was received to spread approximately 100 cubic yards a day for aeration. The soil was evaluated with an organic vapor detector periodically. When the field evaluation showed that hydrocarbon levels were probably below 100 parts per million, composite samples were collected for analysis for total petroleum

TABLE 1
RESULTS OF LABORATORY ANALYSES
OF SOIL SAMPLES COLLECTED DURING
TANK REMOVAL
Beacon Station No. 546
29705 Mission Boulevard
Hayward, California
April 6 and 8, 1988

Sample Identifier	TPH	TEH	TOG	VOC
S-15-T1N	184	NA	NA	NA
S-13-T1S	112	NA	NA	NA
S-15-T2N	46	NA	NA	NA
S-15-T2S	5	NA	NA	NA
S-15-T3E	NA	2,750	NA	NA
S-15-T3W	NA	<5	NA	NA
S-9-WT	NA	<5	<30	<*

Results reported in parts per million (ppm)
TPH = total petroleum hydrocarbons
TEH = total extractable hydrocarbons
TOG = total oil and grease
VOC = volatile organic compounds
< = less than detection limit for method of analysis used
NA = analysis not required
* = less than the respective detection limit for each VOC

Sample description: S-9-T4S

- S: Soil
- 9: Depth below grade (feet)
- T4: Tank number
- S: Side of pit sampled (WT = Waste-oil tank)

hydrocarbons. These sample analyses show that, at present, the gasoline-contaminated soil contains less than 100 parts per million of total petroleum hydrocarbons (TPH) as gasoline and can be disposed at a Class III landfill or used at the site for fill.

BOREHOLE DRILLING

A geologist from Applied GeoSystems observed borehole drilling and monitoring well construction on June 30 and July 1, 1988. Borings B-3 and B-4 were drilled with a CME-75 drill rig operated by Bayland Drilling of Foster City, California. Steam-cleaned, 8-inch-diameter, continuous-flight, hollow-stem augers were used to drill borings B-1, B-2, and B-3 to depths of approximately 40 feet below the ground surface. All three borings were reamed with 12-inch-diameter, continuous-flight, hollow-stem augers for installing 4-inch-diameter well casing. During drilling, ground water was encountered at a depth of approximately 26 feet below the ground surface in each of the borings.

SOIL SAMPLING AND CLASSIFICATION

Twenty-four soil samples were collected and described from borings B-1, B-2, and B-3. These samples, labeled as indicated on the boring logs, were collected during drilling at approximately 5-foot intervals beginning about 5 feet below the ground surface to the total depth of the borings. Soil samples were collected by advancing the boring to a point immediately above the sampling depth and then driving a standard split-spoon

sampler (2-inch inside-diameter) into the soil through the hollow center of the auger. The sampler was driven 18 inches with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows necessary to drive the sampler each 6-inch increment was counted and recorded to evaluate the relative consistency of soil materials.

The soil samples were described in accordance with the Unified Soil Classification System, which is summarized on Plate P-3. Descriptions of the earth materials encountered in the borings are presented on the Logs of Borings, Plates P-4 through P-9. The soil encountered beneath the site consists primarily of silty and sandy to gravelly clay from the surface to approximately 10 feet below grade. The sand and gravel content of the clay increases to approximately 30 feet deep, and the soil becomes more clayey again from 30 feet to total depth.

An Organic Vapor Meter (OVM) photoionization detector was used during sampling to measure the organic vapor concentrations in the soil samples. Readings were obtained by placing the rubber cup that skirts the intake probe flush with the soil in the brass sleeve immediately after opening the sampler. The measurements, which are presented on the boring logs, indicate the relative

organic vapor concentrations in soil but cannot be used to assess the concentrations of hydrocarbon contaminants in the soil directly. The field geologist subjectively analyzed the samples for hydrocarbon contamination as they were collected. Any visual evidence of hydrocarbon contamination was noted on the boring logs.

The soil samples were removed from the sampler and immediately sealed in their brass sleeves with aluminum foil, plastic caps, and airtight tape. The samples were then labeled and placed in iced storage for transport to the laboratory. The field geologist initiated a Chain of Custody Record, and selected samples were delivered to Applied GeoSystems' state-certified laboratory in Fremont, California, for analytical testing. The soil samples collected from the deepest unsaturated sample interval were selected for laboratory analysis to evaluate potential hydrocarbon contamination near the saturated zone. The completed Chain of Custody Record for the tested samples is included the Appendix to this report. The soil cuttings from the boreholes were left at the site for proper disposal by Beacon Oil Company personnel at a later date.

CONSTRUCTION OF GROUND-WATER MONITORING WELLS

Three ground-water monitoring wells (MW-1, MW-2, and MW-3) were constructed at the site in soil borings B-1, B-2, and B-3. A well construction permit was obtained from the Alameda County Flood Control and Water Conservation District. A copy of this permit is included in the Appendix to this report.

Based on the topography of the area, the ground-water flow direction was inferred to be toward the south. Wells MW-1 and MW-2 were constructed in the inferred downgradient direction from the product-tank pit. Well MW-3 was constructed in the inferred upgradient direction from the tank pit on the site. The approximate locations of these wells are shown on the Generalized Site Plan. These wells were situated to evaluate the ground-water gradient and levels of hydrocarbon contamination at these locations.

All the wells were completed with 4-inch-inside-diameter, Schedule 40 polyvinyl chloride (PVC) casing. The well casing was set to approximately 40 feet in each well. The casing consists of machine-slotted PVC with 0.020-inch-wide slots set from the total depth of each well to approximately 20 feet below grade.

Unslotted PVC casing was set from the top of the screened casing to a few inches below the ground surface. All casing joints are flush-threaded; and no glues, chemical cements, or solvents were used in well construction. The top of each casing is covered with a watertight locking cap, and the bottom has a threaded end plug.

The annular space of each well was backfilled with No. 3 size sand from the total depth of the boring to approximately 2 feet above the top of the screened casing. A bentonite plug, approximately 1 foot thick, was placed above the sand as a seal against cement entering the sand pack; and the remaining annulus was backfilled with a slurry of neat cement, sand, water, and 5 percent bentonite to a few inches below the top of the casing. Graphic representations of well construction are shown on the right margins of the boring logs.

A aluminum utility box with a PVC apron was set in concrete flush with the surrounding ground surface. Each utility box has a watertight seal to protect the ground-water well against surface-water infiltration and requires a specially designed wrench to open. This design discourages vandalism and reduces the possibility of accidental disturbance of the well.

WELL DEVELOPMENT AND GROUND-WATER SAMPLING

A geologist returned to the site on July 7, 1988, to develop the wells and collect water samples for analysis. Before developing, the depth to water was measured in each well by using a Solinst electric water-level indicator. A water sample was collected for subjective analysis by gently lowering approximately half the length of a clean Teflon bailer past the air/water interface. Each sample was retrieved and inspected for floating product and product sheen. No subjective evidence of floating product or product sheen was detected in the samples from wells MW-1, MW-2, and MW-3.

The monitoring wells were developed by air-surging and pumped to remove suspended sediment. The wells were purged by pumping approximately three to five well volumes of water. The wells were subjectively analyzed again following purging and after water in the wells recovered to static levels. No subjective evidence of hydrocarbon contamination was observed after pumping. The water samples were collected for laboratory analyses using a Teflon bailer. Prior to each use, the bailer was thoroughly cleaned with Alconox (a commercial soap) and water. The bailer was lowered approximately 2 feet past the air/water interface to

collect samples representative of the formation water.

The ground-water samples were transferred to laboratory-cleaned, 1-liter bottles and 40-milliliter, volatile organic analysis sample vials. Hydrochloric acid was added as a preservative. The vials were then immediately sealed with Teflon-lined caps, labeled, and placed in iced storage for transport to Applied GeoSystems' laboratory for testing. The Chain of Custody Record for the water samples is included in the Appendix to this report.

ANALYTICAL RESULTS OF SOIL AND WATER SAMPLES

Three soil samples (S-25-MW1, S-25-MW2, and S-25-MW3) were analyzed for total petroleum hydrocarbons (TPH) as gasoline using modified Environmental Protection Agency (EPA) Method 8015 and for the hydrocarbon constituents benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) using EPA Method 8020. Soil sample S-25-MW1 was also analyzed for total extractable hydrocarbons (TEH) as diesel by modified EPA Method 8015 for high boiling point hydrocarbons. The results of the chemical analyses of the soil samples are presented in Table 2 and on the laboratory Analysis Reports in the Appendix to this report.

Three ground-water samples (W-25-MW1, W-23-MW2, and W-27-MW3) were analyzed for TPH as gasoline and BTEX by modified EPA Method 8015 and EPA Method 602, respectively. In addition, water sample W-25-MW1 was analyzed for TEH as diesel. Results of the chemical analyses are presented in Table 2 and on the laboratory Analysis Reports in the Appendix to this report.

TABLE 2
RESULTS OF CHEMICAL ANALYSES OF
SOIL AND WATER SAMPLES
Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

Sample Number	TEH	TPH	Benzene	Ethyl-benzene	Toluene	Total Xylenes
Soil						
S-25-MW1	255	59	13.4	10.3	58.1	63.2
S-25-MW2	NA	28	0.30	0.62	0.99	2.85
S-25-MW3	NA	<2	0.28	0.10	0.09	<0.05
Water						
W-25-MW1	5.4	17.4	4.07	0.33	2.99	3.59
W-23-MW2	NA	7.16	1.266	0.230	2.117	1.563
W-27-MW3	NA	2.81	0.094	0.028	0.006	0.029

Results in milligrams/liter (mg/L) = parts per million (ppm)
< = Result below detection limit for selected analysis method
TPH: Total petroleum hydrocarbons
TEH: Total extractable hydrocarbons
NA: Not analyzed
Sample designation: S-25-MW1
- S-25-MW1 — borehole or well number
- S-25-MW1 — depth of sample in feet
- S-25-MW1 — sample matrix (S = soil; W = water)

EVALUATION OF GROUND-WATER FLOW DIRECTION

A Wild NA-24 Auto Level was used to measure the differences in elevation between the top of the casing of each of the monitoring wells. Measurements were recorded to the nearest 0.01-foot. The static water levels in monitoring wells MW-1, MW-2, and MW-3 were measured to the nearest 0.01-foot using a Solinst electric water-level sounder. The well-head and ground-water elevations were combined to calculate the difference in water-level elevation between each pair of wells with respect to datum set arbitrarily as the top of the highest well casing.

The ground-water elevation differences measured on July 7, 1988, are presented on Table 3. The ground-water gradient calculated from these measurements is approximately 0.003 (0.3 feet vertical per 100 feet horizontal) to the southwest. A graphical interpretation of the ground-water flow across the site at the time of measurement is presented on the Ground-Water Potentiometric Surface Map, Plate P-10.

TABLE 6
GROUND-WATER ELEVATION DIFFERENCES
(Measured on July 7, 1988)
Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

Monitoring Well Number	Top of Casing (C)	Static Water Depth (W)	Calculated Water Level (C + W)
MW-1	2.83	24.45	27.28
MW-2	4.33	23.07	27.40
MW-3	0.00	26.98	26.98

Measurements in feet with respect to an arbitrary datum.
Depth to static water measured in feet below top of casing.

CONCLUSIONS AND RECOMMENDATIONS

The soil sample collected and analyzed from boring B-1 shows relatively low levels of TPH as gasoline (59 ppm) and relatively moderate levels of TPH as diesel (255 ppm) were present in the soil at a depth of approximately 25 feet. Analyses for the hydrocarbon constituents BTEX showed relatively moderate (less than 100 ppm) levels present in the soil sample analyzed from boring B-1. The soil samples analyzed from borings B-2 and B-3 showed nondetectable to relatively low (28 ppm) levels of TPH as gasoline present and indicated very low (less than 1.0 ppm) levels of the hydrocarbon constituents (BTEX) present in the soil at the depth of the sample analyzed.

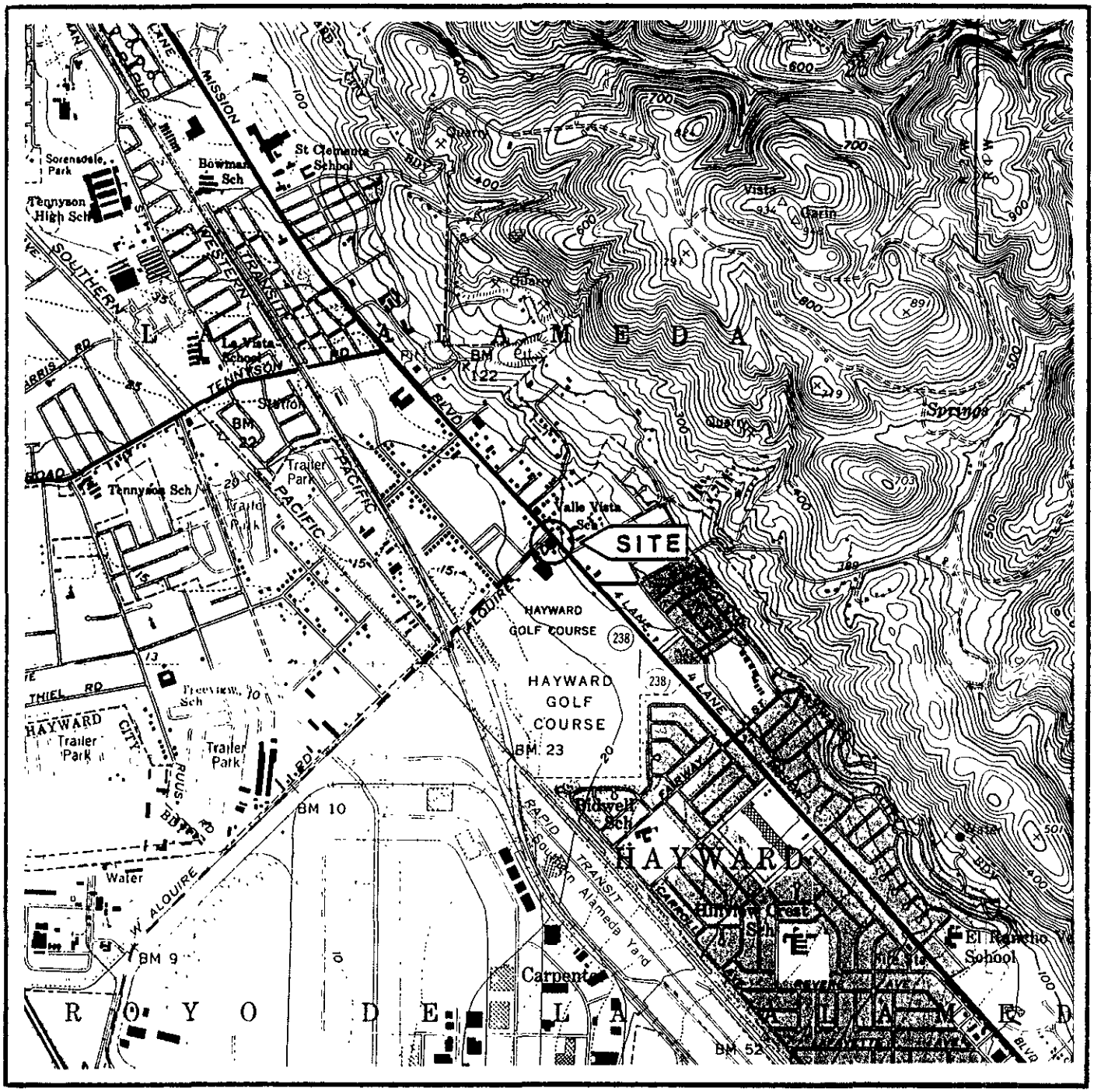
Analysis of the water sample from well MW-3 showed that only benzene is above the maximum concentration ("action level") for drinking water recommended by the California Department of Health Services (DHS). Analysis of the water sample from well MW-2 showed levels of the hydrocarbon constitutes benzene and total xylene isomers above the action levels recommended for drinking water by the DHS. Analysis of the water sample collected from well MW-1 showed levels of the hydrocarbon constituents BTEX above the action levels recommended by the DHS. The DHS recommended action levels are 0.0007 ppm for benzene, 1.0 ppm for toluene, 0.680 ppm for ethylbenzene, and 0.620 ppm for total xylene isomers. In addition, the water sample from well MW-1 showed 17.4 ppm of TPH as gasoline and 5.4 ppm TPH as diesel.

In our opinion, the ground water beneath the site has been impacted by hydrocarbon contamination. The source of hydrocarbon contamination was probably from overfilling or failure of one or more of the product tanks and product lines. The product tanks and soil with elevated levels of hydrocarbons have been removed from the ground; thus, the source for the hydrocarbon contamination found in the ground-water wells has probably been removed.

We recommend that additional work be performed at the Beacon station to evaluate the levels and delineate the extent of hydrocarbon contamination in the ground water. This additional work includes the installation of a minimum of three additional monitoring wells offsite, two in the downgradientdirection and one located in the crossgradient direction from the site to delineate the area of hydrocarbon contamination. The proposed locations of these delineation monitoring wells are shown on Plate P-2. An additional well should also be installed adjacent to the former product tank pit and in the approximate downgradient direction. This well should be constructed as a recovery well and should be installed after additional evaluation of aquifer characteristics. In addition, we recommend that Beacon Oil Company forward copies of this report to Ms. Lisa McCann of the California Regional Water Quality Control Board, San Francisco Bay Region, 1111 Jackson Street, Room 6040, Oakland, California 94607 and Mr. Hugh Murphy, Hazardous Materials Division, Hayward Fire Department, 22300 Foothill Boulevard, Room 814, Hayward, California 94541.

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 for the purpose of evaluating environmental conditions of the soil and ground water with respect to hydrocarbon product contamination in the vicinity of the subject property. 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.



Source: U.S. Geological Survey
7.5-Minute Quadrangle
Hayward, California
Newark, California
Photorevised 1980

N

Approximate Scale
2000 1000 0 2000 4000
feet

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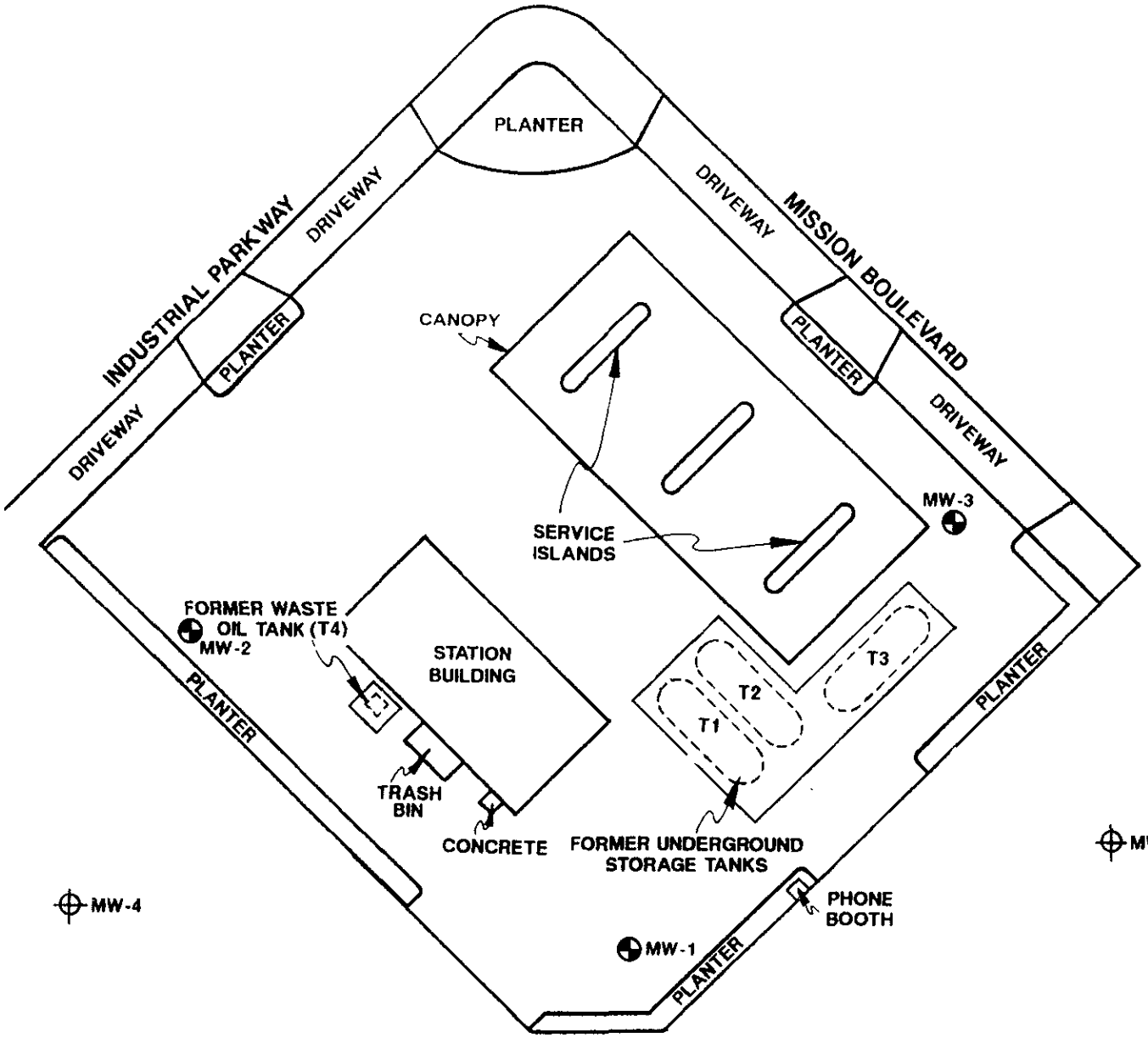
SITE VICINITY MAP
Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

PLATE
P - 1



MW-5

Approximate Scale

30 15 0 30 60

feet

MW-6 = Proposed monitoring well location

MW-3 = Monitoring well location

Source: Measured by tape and compass

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GENERALIZED SITE PLAN
Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

PLATE

P - 2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	DESCRIPTION	MAJOR DIVISIONS		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 mixture, 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-clay mixtures.			OL	Organic silts and organic silt-clays of low plasticity.
		GC	Clayey gravels, 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 sands 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.
		SM	Silty sands, sand-silt mixtures.	HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
		SC	Clayey sands, sand-clay mixtures.				


Depth through which sampler is driven


Relatively undisturbed sample


Missed sample


Ground water level observed in boring

S-10 Sample number

OVM Organic vapor meter


Sand pack


Bentonite annular seal

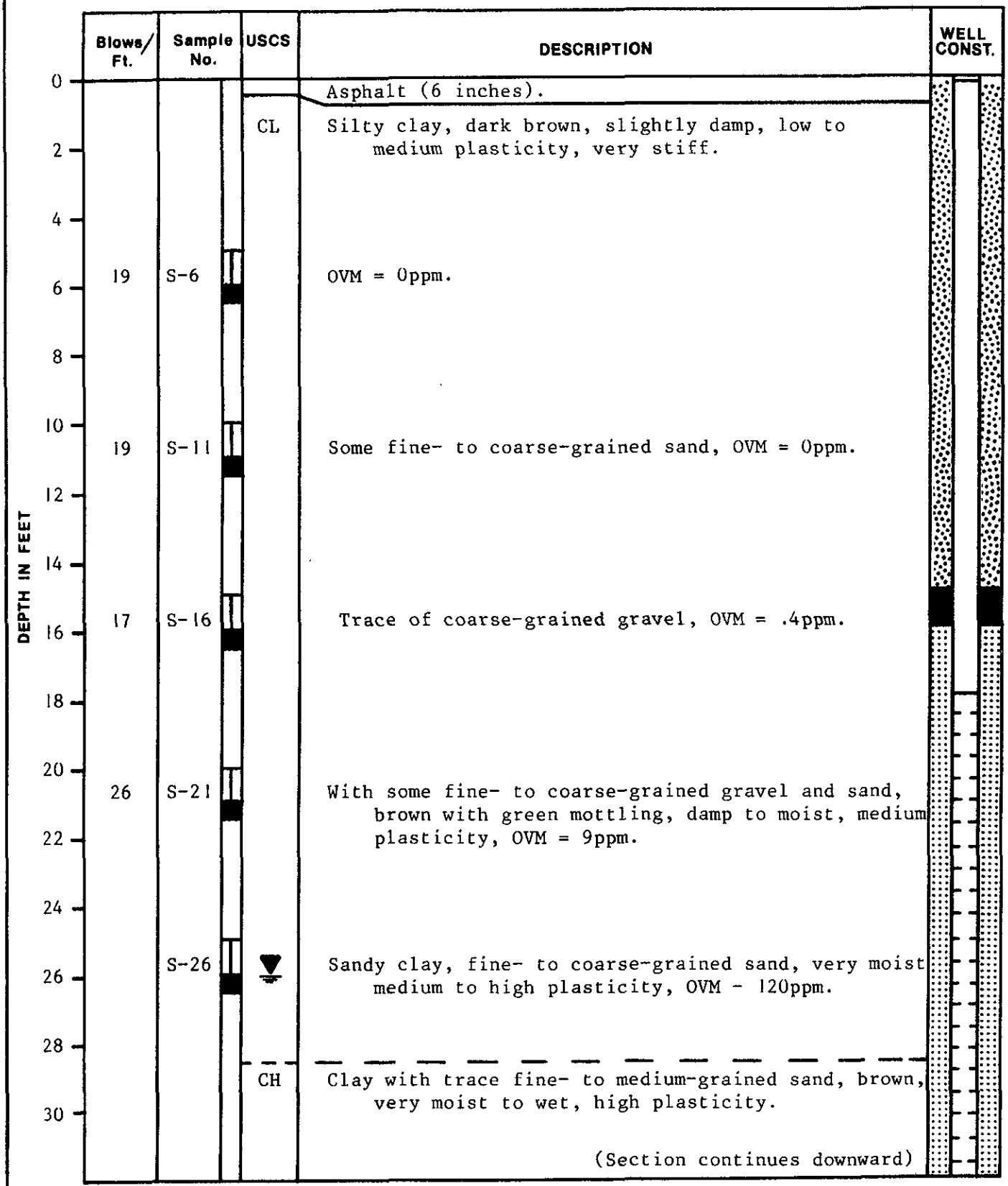

Neat cement annular seal


Blank PVC


Machine-slotted PVC

BLOW/FT. REPRESENTS THE NUMBER OF BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES TO DRIVE THE SAMPLER THROUGH THE LAST 12 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.



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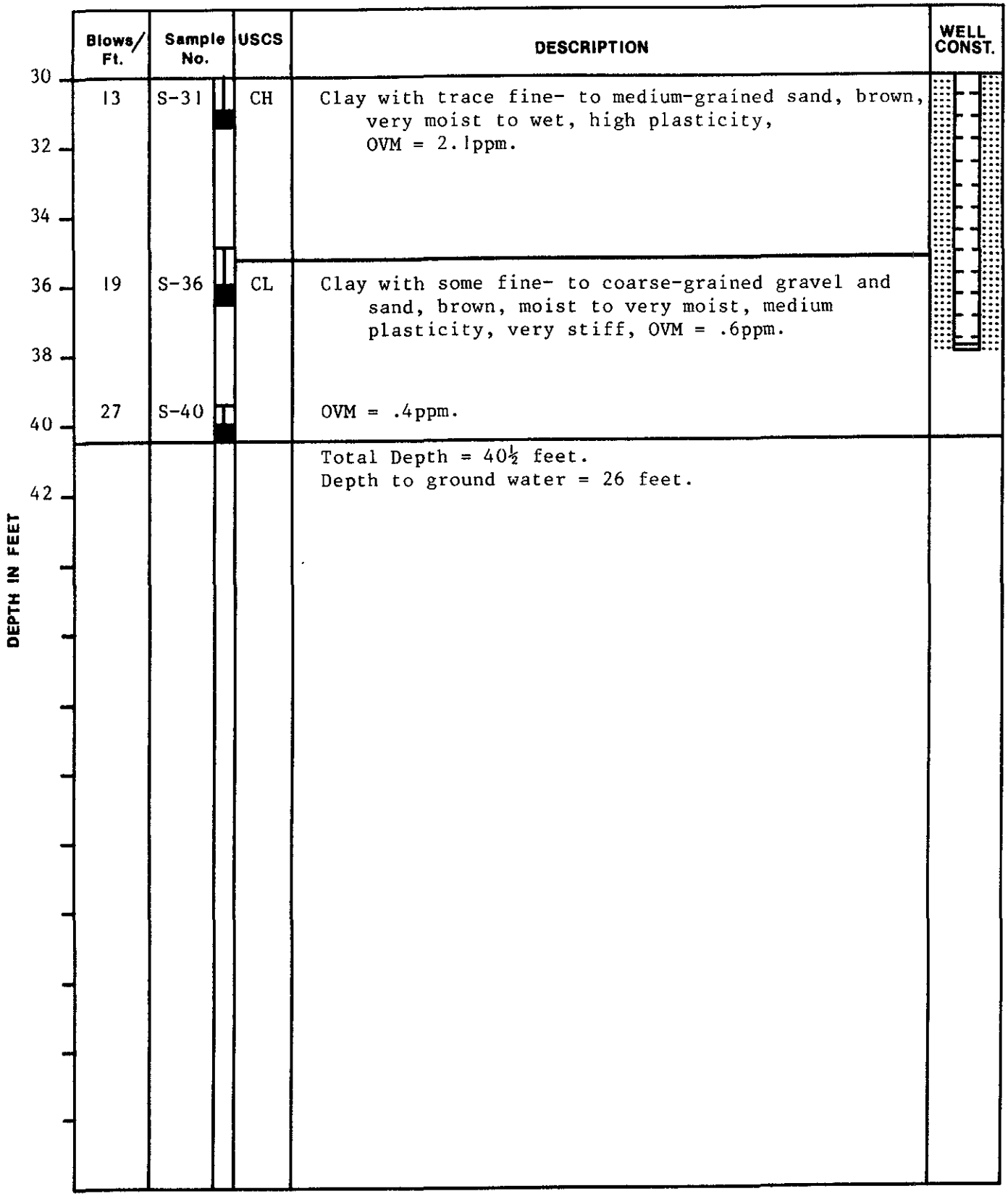
LOG OF BORING B-1/MW-1

Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

PLATE
P - 4



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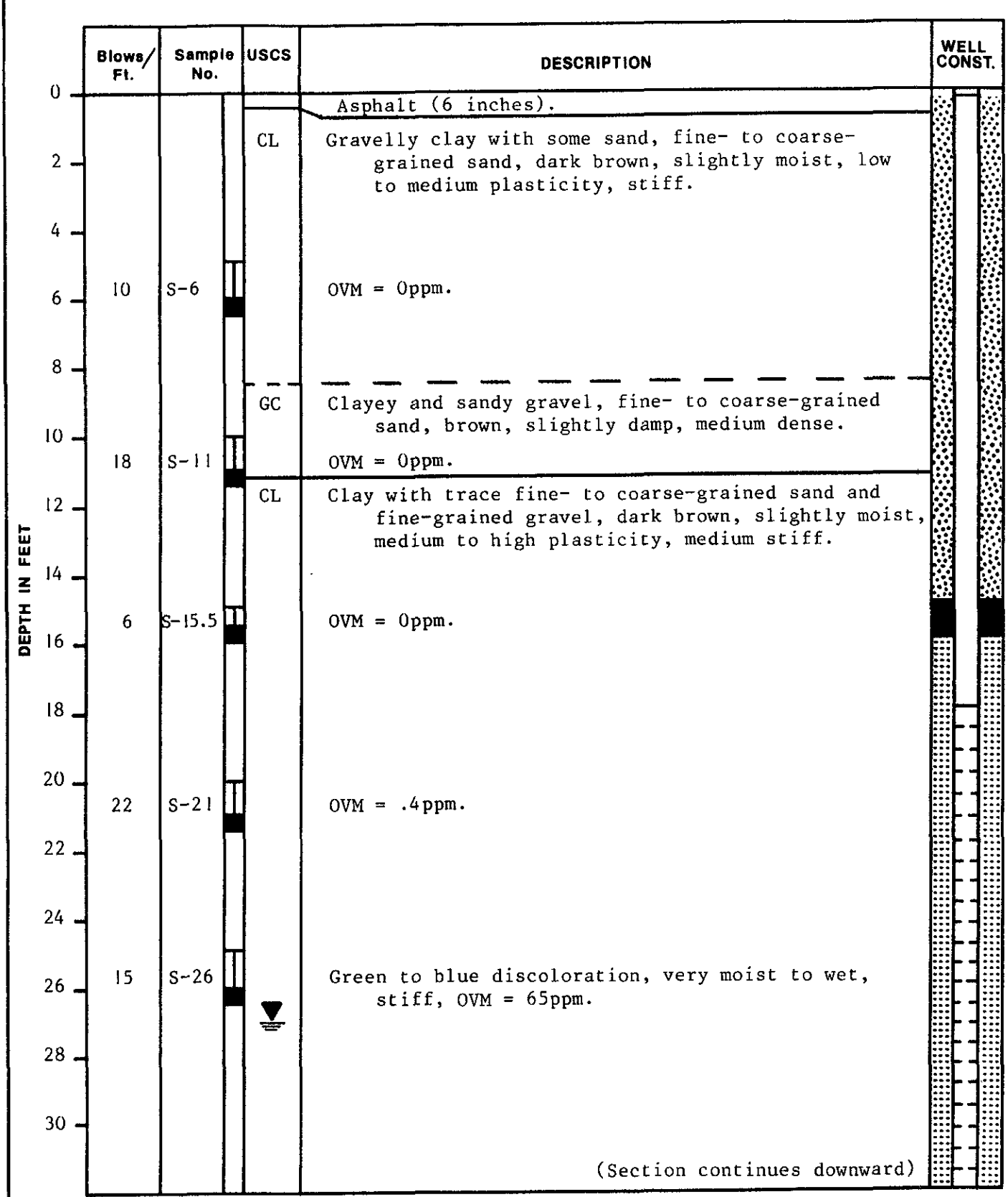
LOG OF BORING B-1/MW-1

Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

PLATE
P - 5



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LOG OF BORING B-2/MW-2

Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

PLATE
P - 6

DEPTH IN FEET	Blows/ Ft.	Sample No.	USCS	DESCRIPTION	WELL CONST.
30	19	S-31	CL	Clay with trace fine- to coarse-grained sand and fine-grained gravel, green to blue discoloration, very moist to wet, medium to high plasticity, stiff, OVM = 0ppm.	
32					
34					
36	26	S-36	CH	Clay with some fine- to coarse-grained sand, and gravel, brown, moist to very moist, medium plasticity, very stiff, OVM = 0ppm.	
38			CH	Clay with trace fine- to coarse-grained sand, and trace fine-grained gravel, brown, moist to very moist, high plasticity.	
40	41	S-40			
42				Total Depth = 40½ feet. Boring terminated due to sufficient depth below ground water. Depth to ground water = 27 feet.	

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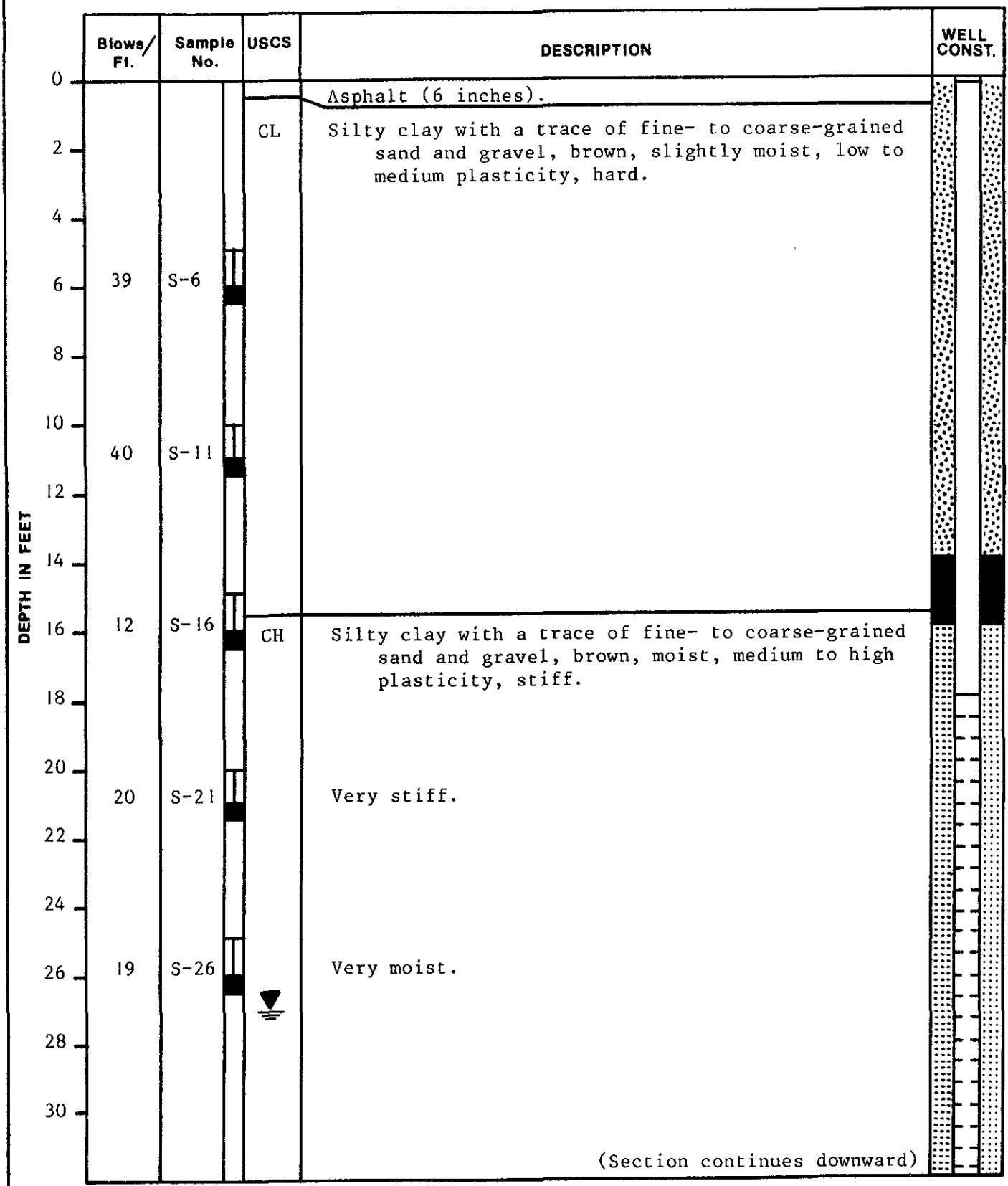
PROJECT NO. 18008-3

LOG OF BORING B-2/MW-2

Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

PLATE
P - 7



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PROJECT NO. 18008-3

LOG OF BORING B-3/MW-3

Beacon Station No. 546

29705 Mission Boulevard

Hayward, California

PLATE

P - 8

DEPTH IN FEET	Blows/ Ft.	Sample No.	USCS	DESCRIPTION	WELL CONST.
30	25	S-31	CH	Silty clay with a trace of fine- to coarse-grained sand and gravel, brown, moist, high plasticity, very stiff.	
32					
34					
36	23	S-36		Some fine-grained gravel, very moist.	
38					
40	21	S-40		Wet.	
42				Total Depth = 40½ feet. Boring terminated due to sufficient depth below ground water. Depth to ground water = 27 feet.	

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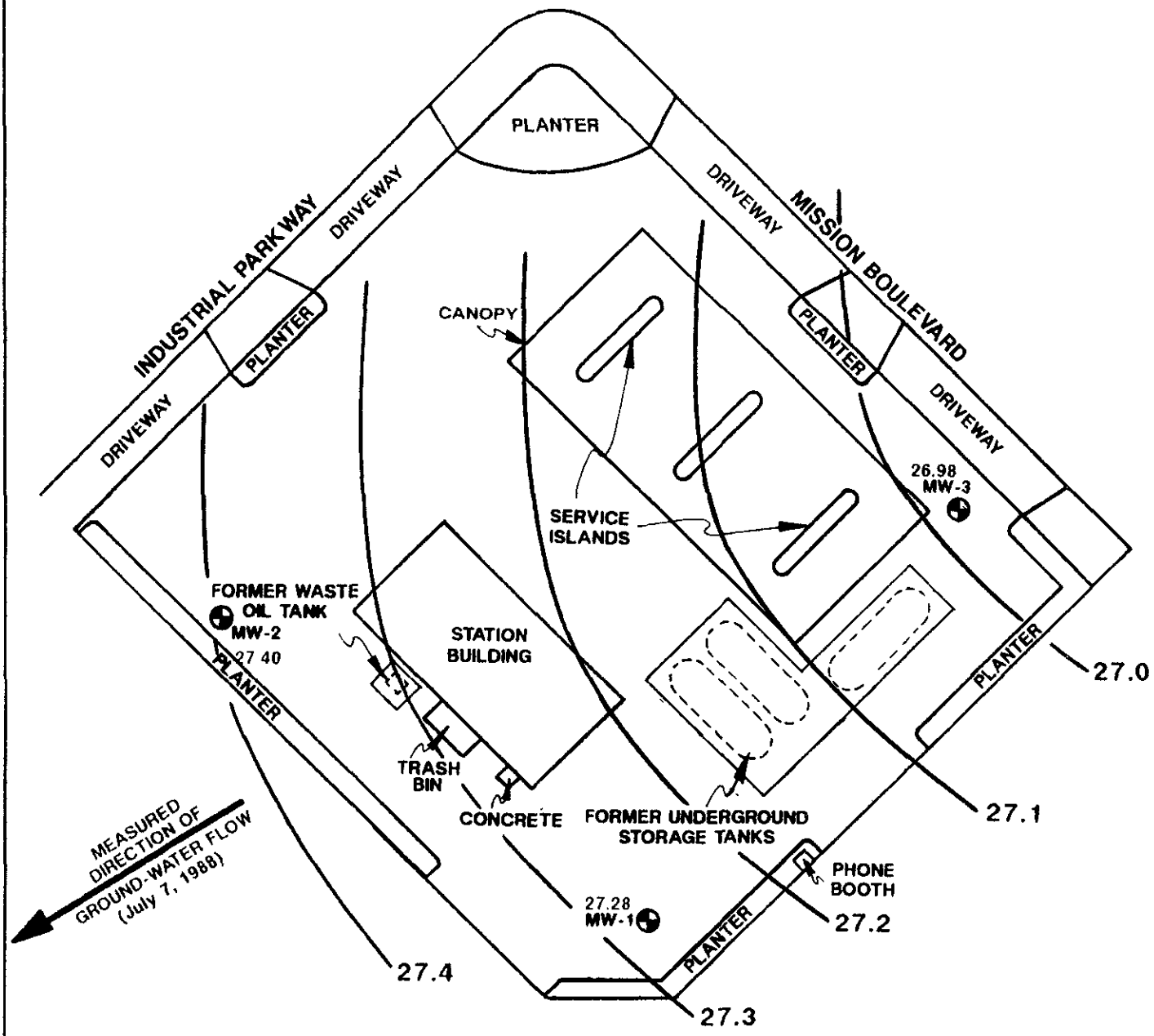
PROJECT NO. 18008-3

LOG OF BORING B-3/MW-3

Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

PLATE
P - 9



27.4 = Line of equal depth to ground water

MW-3 = Monitoring well location

Source: Measured by tape and compass

N

Approximate Scale

30 15 0 30 60

feet

Applied GeoSystems

PROJECT NO. 18008-3

GROUND-WATER POTENTIOMETRIC SURFACE MAP
Beacon Station No. 546
29705 Mission Boulevard
Hayward, California

PLATE
P - 10

APPENDIX

RECEIVED
JUN 26 1988
ZONE 7 ASEGWCD

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

1) LOCATION OF PROJECT Beacon Station
29705 Mission Blvd.
Hayward, Calif

2) CLIENT
Name Beacon Oil Company
Address 525 W. 3rd ST Phone
City Hanford, Ca Zip 93230

3) APPLICANT
Name Applied GeoSystems
Address 43255 Mission Phone 415-651-1906
City Fremont Zip 94539

4) DESCRIPTION OF PROJECT
Water Well Construction ✓ Geotechnical ___
Cathodic Protection ___ Well Destruction ___

5) PROPOSED WATER WELL USE
Domestic ___ Industrial ___ Irrigation ___
Municipal ___ Monitoring ✓ Other ___

6) PROPOSED CONSTRUCTION
Drilling Method:
Mud Rotary ___ Air Rotary ___ Auger ✓
Cable ___ Other ___

WELL PROJECTS
Drill Hole Diameter 12 in. Depth(s) 50 ft.
Casing Diameter 4 in. Number
Surface Seal Depth 20 ft. of Wells 3
Driller's License No. 374152

GEOTECHNICAL PROJECTS
Number ___
Diameter ___ in. Maximum Depth ___ ft.

(7) ESTIMATED STARTING DATE 6-30-88
ESTIMATED COMPLETION DATE 7-1-88

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

APPLICANT'S SIGNATURE Gary Barker Date 6-23-88

FOR OFFICE USE

PERMIT NUMBER 88299
LOCATION NUMBER

Approved Craig A. Mayfield Date 27 Jun 88
Craig A. Mayfield

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Notify this office (484-2600) at least one day prior to starting work on permitted work and before placing well seals.
3. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well projects, or bore hole logs and location sketch for geotechnical projects. Permitted work is completed when the last surface seal is placed or the last boring is completed.
4. Permit is void if project not begun within 90 days of approval date.

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

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie, or equivalent.

E. WELL DESTRUCTION. See attached.

91987

CHAIN OF CUSTODY RECORD

Applied GeoSystems

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

SAMPLER (signature): Tim O'Brien

Phone: 415 651-1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 2 week

Project Leader: Gary Baker

Phone No. 415 651 1906

SHIPPING INFORMATION:

Shipper _____

Address _____

Date Shipped _____

Service Used _____

Airbill No. _____ Cooler No. _____

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Tim O'Brien	Gary Baker	7-1-88	1200
Gary Baker	Received for laboratory by:	7-5-88	8:00 AM

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
25-MW1	18008-3	6-30-88	TPH, TEH, BTEX	Iced
25-MW2	18008-3	6-30-88	TPH, BTEX	Iced
25-MW3	18008-3	7-1-88	TPH, BTEX	Iced

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Gary D. Barker

Date Received: 7-05-88
Laboratory Number: 07003S01
Project: 18008-3
Sample: S-25-MW1
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	59		2		07-14-88	
TEH as Diesel	255		5		07-13-88	
Benzene	13.4		0.5		07-14-88	
Toluene	58.1		0.5		07-14-88	
Ethylbenzene	10.3		0.5		07-14-88	
Total Xylenes	63.2		0.5		07-14-88	

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

7-19-88
Date Reported

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Gary D. Barker

Date Received: 7-05-88
Laboratory Number: 07003S02
Project: 18008-3
Sample: S-25-MW2
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	28		2		07-14-88	
TEH as Diesel						NR
Benzene	0.30		0.05		07-14-88	
Toluene	0.99		0.05		07-14-88	
Ethylbenzene	0.62		0.05		07-14-88	
Total Xylenes	2.85		0.05		07-14-88	

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

7-19-88
Date Reported

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Gary D. Barker

Date Received: 7-05-88
Laboratory Number: 07003S03
Project: 18008-3
Sample: S-25-MW3
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		07-14-88	
TEH as Diesel						NR
Benzene	0.28		0.05		07-14-88	
Toluene	0.09		0.05		07-14-88	
Ethylbenzene	0.10		0.05		07-14-88	
Total Xylenes	ND		0.05		07-14-88	

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.

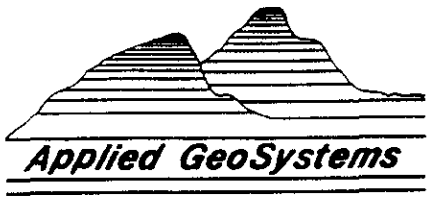
TPH--Total petroleum hydrocarbons (low-to-medium boiling points) are measured by extraction according to EPA Method 5030 followed by analysis by a modified EPA Method 8015 which uses a GC equipped with an FID. Soil extracts and water samples are subjected to purge-and-trap introduction into the GC.

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

7-19-88
Date Reported

CHAIN OF CUSTODY RECORD



Applied GeoSystems

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

SAMPLER (signature): Tim O'Brien

Phone: 415 651 1906

LABORATORY: Applied GeoSystems

TURNAROUND TIME: 2 week

Project Leader: Gary Barker

Phone No. 415 651 1906

SHIPPING INFORMATION:

Shipper

Address

Date Shipped

Service Used

Airbill No. Cooler No.

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
Tim O'Brien	Gary Barker	7-8-88	083
Gary Barker	Received for laboratory by:	7-8-88	1500

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
W-25-MW1	018008-3	7-7-88	TEH, TPH, BTEX	iced
W-23-MW2	018008-3	7-7-88	TPH, BTEX	iced
W-27-MW3	018008-3	7-7-88	TPH, BTEX	iced

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ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Gary D. Barker

Date Received: 7-08-88
Laboratory Number: 07016W01
Project: 18008-3
Sample: W-25-MW1
Matrix: Water

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		17.4		0.2	07-20-88	
TEH as Diesel		5.4		0.5	07-14-88	NR
Benzene		4.07		0.05	07-20-88	
Toluene		2.99		0.05	07-20-88	
Ethylbenzene		0.33		0.05	07-20-88	
Total Xylenes		3.59		0.05	07-20-88	

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

7-25-88
Date Reported

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ANALYSIS REPORT

0212lab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Gary D. Barker

Date Received: 7-08-88
Laboratory Number: 07016W02
Project: 18008-3
Sample: W-23-MW2
Matrix: Water

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		7.16		0.02	07-20-88	
TEH as Diesel						NR
Benzene		1.266		0.005	07-20-88	
Toluene		2.117		0.005	07-20-88	
Ethylbenzene		0.230		0.005	07-20-88	
Total Xylenes		1.563		0.005	07-20-88	

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mg/L = milligrams per liter = ppm.
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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.

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Tia Tran, Laboratory Supervisor

7-25-88
Date Reported

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ANALYSIS REPORT

02121ab.frm

Report Prepared for:
Applied GeoSystems
43255 Mission Blvd.
Fremont, CA 94539
Attention: Gary D. Barker

Date Received: 7-08-88
Laboratory Number: 07016W03
Project: 18008-3
Sample: W-27-MW3
Matrix: Water

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		2.81		0.02	07-20-88	
TEH as Diesel						NR
Benzene		0.094		0.005	07-20-88	
Toluene		0.006		0.005	07-20-88	
Ethylbenzene		0.028		0.005	07-20-88	
Total Xylenes		0.029		0.005	07-20-88	

mg/kg = milligrams per kilogram = parts per million (ppm).
mg/L = milligrams per liter = ppm.
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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.

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Tia Tran, Laboratory Supervisor

7-25-88
Date Reported