TRANSMITTAL

TO: Ms. Juliet Shin
Alameda County Health Care Agency
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, CA 94621

DATE: June 30, 1994
PROJECT #: 7926.12
SUBJECT: Well Installation Report for ARCO Station 5387

FROM:
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cc: **Mr. Joel Coffman**, GSI
Mr. Richard Hiett, Regional Water Quality Control Board
Mr. Chris Winsor, ARCO Products Company
Mr. Michael Whelan, ARCO Products Company

GeoStrategies Inc.

WELL INSTALLATION REPORT
for
ARCO Station 5387
20200 Hesperian Avenue
Hayward, California

792612-18

Report prepared for

ARCO Products Company
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June 23, 1994

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GeoStrategies Inc.

WELL INSTALLATION REPORT
for ARCO Station 5387,
20200 Hesperian Avenue, Hayward, California

1. INTRODUCTION

As requested by ARCO Products Company (ARCO), GeoStrategies Inc. (GSI) installed additional air sparging and vapor extraction wells at ARCO Station 5387 located at 20200 Hesperian Avenue, Hayward, California, and prepared this report including field methods, results and conclusions of the investigation. The wells were installed to further evaluate the lateral extent of hydrocarbons in soil and groundwater at the site and to provide additional air sparging and vapor extraction points for the soil and groundwater remediation system.

The work for this phase of the investigation was conducted in conjunction with construction of the remediation system at the site and included: drilling eight on-site soil borings; collecting soil samples from the borings for description and possible laboratory analyses; constructing one vapor extraction well (AV-4) and seven air sparging wells (AS-3 through AS-9) in the borings; developing wells AS-3 through AS-9; surveying all site wells after installation of the remediation system had been completed; and preparing this report presenting field procedures, results, and conclusions of this investigation. Field work was performed to comply with current State of California Water Resources Control Board (SWRCB) and local agency guidelines. GSI Field Methods and Procedures are presented in Appendix A of this report.

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2. SITE DESCRIPTION AND BACKGROUND

2.1. General

ARCO Station 5387 is an operating service station located at the southeastern corner of the intersection of Hesperian Boulevard and West Sunset Drive in Hayward, California, as shown on Plate 1, Vicinity Map. The site is located in an area of commercial and residential development, and is a relatively flat asphalt- and concrete-covered lot at an elevation of approximately 38 feet above mean sea level. Pertinent site features include four service islands, a station building, and four gasoline underground storage tanks (USTs) located in the southeastern portion of the site. Pertinent site features are shown on Plate 2, Site Plan.

2.2. Regional Geology and Hydrogeology

The site is located within the San Francisco Bay Plain approximately 2.5 miles east of San Francisco Bay and approximately 0.2 miles north of Sulpher Creek. The area is underlain by Holocene-age alluvial deposits consisting of unconsolidated, moderately sorted, fine grained sand, silt, clayey silt, and occasional thin beds of coarse sand (Helley, H.J. and others, 1979).

Based on observation of local and regional topography, the inferred groundwater flow direction appears to be toward the northwest.

3. PREVIOUS ENVIRONMENTAL WORK

3.1. Subsurface Environmental Investigation

In August 1986, Groundwater Technology Inc. (GTI) drilled four soil borings (SB-1 through SB-4) and three groundwater monitoring wells (MW-1 through MW-3) at the site. Concentrations of Total Petroleum

Hydrocarbons as gasoline (TPH-G) in 9-9½ foot below ground surface soil samples collected from borings SB-2, SB-3 and SB-4 were reported as 49, 42 and 20 parts per million (ppm), respectively, and were reported as nondetectable (less than 1 ppm) in soil samples collected from borings SB-1 and MW-1 through MW-3. Results of this investigation were presented in the GTI Site Assessment Investigation Report dated August 21, 1986.

In October and December 1991, GSI installed four groundwater monitoring wells designated A-4 through A-6 on-site and A-7 off-site. TPH-G was detected in the soil sample collected from boring A-4 at a depth of 10 feet at a concentration of 24 ppm. The remainder of the soil samples were reported as nondetectable for TPH-G. Results of this investigation were presented in the GSI Monitoring Well Installation Report dated March 6, 1992.

In August 1992, GSI installed two offsite groundwater monitoring wells A-8 and A-9 and one groundwater recovery well AR-1 at the site. TPH-G was detected in the soil sample from boring AR-1 collected at depths of 10 and 14½ feet at concentrations of 1 ppm and 8.8 ppm, respectively. TPH-G was reported as nondetectable for soil samples collected from offsite borings A-8 and A-9. Results of this investigation were presented in the GSI Continuing Site Assessment/Quarterly Monitoring Report dated December 21, 1992.

One offsite downgradient exploratory soil boring was drilled and completed as groundwater monitoring well A-10 on November 18, 1992. Two soil samples collected at 13 and 16½ feet were selected for chemical analyses. TPH-G was reported as nondetectable for each sample. Results of this investigation are presented in a GSI Quarterly Monitoring/Well Installation Report dated January 29, 1993.

GSI drilled six onsite exploratory soil borings and installed recovery well AR-2, dual vapor extraction/air sparging well AS-1, air sparging well AS-2,

and vapor extraction wells AV-1 through AV-3 in these borings in March 1993. TPH-G was nondetectable or near nondetectable in samples collected at a depth of 10 feet in all borings, and was detected at concentrations ranging from 11 to 32 ppm in samples collected at a depth of 15 feet (capillary fringe zone) from all borings except AV-2 in which TPH-G was nondetectable. Results of this investigation were presented in a GSI Additional Remedial Investigation and Interim Remedial Action Plan dated December 13, 1993. Approval of the interim remediation was received in a letter from Ms. Juliet Shin of Alameda County Health Care Services Agency (ACHCSA) dated December 21, 1993.

Soil boring and well locations are shown on Plate 2. Soil chemical data are summarized in Table 1, Cumulative Soil Analyses Data.

3.2. Aquifer Pumping and Recovery Test

4 hour step-drawdown and 24 hour constant rate aquifer tests were performed utilizing recovery well AR-1 in October 1992. The tests were performed to assess the feasibility of utilizing recovery well AR-1 to achieve hydrologic control of groundwater for extraction of petroleum hydrocarbons from the first encountered water-bearing zone.

Transmissivity values calculated using the Jacob Method ranged between 4,147 and 11,000 gallons per day per foot (gpd/ft), and storativity ranged between 1.09×10^{-4} and 9.92×10^{-2} indicating an aquifer that is unconfined to semi-confined. Transmissivity values for wells MW-1 through MW-3 and A-4 through A-9 estimated using the Theis Method and the Graphical Well Analysis Package (GWAP) software ranged between 3,769 and 9,261 gpd/ft, and storativity values for these wells ranged between 2.13×10^{-4} and 1.35×10^{-1}. Drawdowns measured in observation wells ranged between 0.08 and 0.47 feet below initial water-levels. The maximum extent of influence was observed in well A-7, approximately 80 feet from pumping well AR-1. The cone of depression created by

pumping recovery well AR-1 appeared to equilibrate during the constant rate test, indicating that longer pumping duration may not produce a greater area of influence. Well efficiency was calculated to be approximately 16.5% at a constant rate of 3 gallons per minute. The results of the aquifer pumping and recovery test were presented in GSI Continuing Site Assessment/Quarterly Monitoring Report dated December 21, 1992.

3.3. Quarterly Monitoring and Sampling

Quarterly groundwater monitoring and sampling of site wells began in December 1991. The groundwater samples have been analyzed for TPH-G according to EPA Method 8015 (Modified) and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) according to EPA Method 8020. The cumulative results of groundwater monitoring and sampling are presented in Table 2, Historical Water-Level Data, and Table 3, Historical Water Quality Database (GSI, Quarterly Monitoring Report - Fourth Quarter 1993, dated January 14, 1994). The local groundwater gradient has varied from 0.002 to 0.005 and groundwater flow direction has varied from north to west.

4. WELL INSTALLATION ACTIVITIES

4.1. Drilling

A well construction permit was acquired from the Alameda County Flood Control and Water Conservation District, Zone 7 (ACFCWCD) prior to drilling at the site. A copy of the permit is included in Appendix B. Seven onsite exploratory soil borings (AS-3 through AS-5, AS-7 through AS-9 and AV-4) were drilled on December 7 and 8, 1993. One soil boring (AS-6) was drilled on January 24, 1994. The borings were drilled using a truck-mounted drilling rig and hollow-stem augers. A GSI Geologist observed the drilling, described the soil samples collected from borings

using the Unified Soil Classification System (ASTM D 2488-84) and Munsell Color Chart, and prepared a lithologic log for each boring.

Borings AV-4 and AS-3 through AS-6 were drilled in the vicinity of the service islands, in the central portion of the site; and borings AS-7 through AS-9 were drilled in the vicinity of the existing gasoline storage tanks, in the southeastern portion of the site. These borings were drilled to further evaluate the lateral extent of hydrocarbon contaminated soil beneath the site and to provide air sparging and vapor extraction points for an interim groundwater and soil remediation system.

Borings AS-3 through AS-9 were drilled to total depths of between 34½ to 40½ feet and converted to air sparging wells. Boring AV-4 was drilled to a total depth of 15½ feet and converted to vapor extraction well AV-4. Boring logs and graphic well construction details are presented in Appendix C.

The soil materials encountered during drilling consisted primarily of silty clay to sandy silt, silty sand, and gravel with sand to the total depth explored of 40½ feet below ground surface. A silty clay to sandy silt layer was encountered immediately beneath the ground surface and extended to depths ranging between 15 to 21 feet. A unit consisting of silty sand locally interbedded with gravel with sand was encountered beneath the silty clay to sandy silt layer. Groundwater was encountered in this unit at depths ranging between 15 and 19 feet. A stratum of silty to sandy clay, which may act as a local aquitard was encountered beneath the water bearing zone at depths ranging between 33 and 40.5 feet. Graphic interpretations of soil stratigraphy beneath the site are shown on geologic Cross Sections A-A', B-B' and C-C' (Plates 3 through 5). Locations of the borings and cross-sections are shown on Plate 2.

Drill cuttings generated during drilling were stored onsite, placed on and covered with visqueen. Soil generated during the December drilling was

stockpiled with soil generated during trenching for installation of the interim remediation system piping, sampled and properly disposed after trenching had been completed. Soil generated during drilling of boring A-6 was sampled for disposal purposes on January 24, 1994, after drilling was completed.

4.2. Soil Sampling

Soil samples were collected at five-foot intervals in borings AS-3, AS-5 through AS-9 and AV-4. Two samples were collected in boring AS-4: at depths of 10 and 33 feet. The soil samples were collected using a modified California split-spoon sampler fitted with stainless steel sample tube liners. Soil samples retained for chemical analyses were sealed on both ends with aluminum foil and plastic end caps. Samples were labeled, entered onto a Chain-of-Custody form, and transported in a cooler with ice to the laboratory.

An Organic Vapor Monitor (OVM) photoionization detector (PID) was used to perform head-space analyses on soil for each sample interval, as a reconnaissance-level field test to evaluate the presence of hydrocarbons in the soil. OVM (PID) readings are presented on each boring log in Appendix C.

4.3. Well Construction

Air sparging wells AS-3 through AS-9 were completed in 6-inch diameter (AS-3 and AS-4) or 8-inch diameter (AS-5 through AS-9) boreholes using 2-inch diameter Schedule 40 PVC blank well casing and 0.020-inch wide machine-slotted PVC screen. The screened portion of each air sparging well is limited to two feet at the bottom of the well. The annular space of air sparging wells AS-3 through AS-9 was backfilled with #3 sand. A bentonite seal was placed above the sandpack in each well. A neat cement seal was placed from the top of the bentonite to approximately 1

foot below a ground surface in each well. An underground vault box, set in concrete, was installed over the top of the well. A waterproof locking well cap and lock were placed on the well casing.

Vapor extraction well AV-4 was constructed in an 8-inch diameter borehole using 4-inch diameter Schedule 40 PVC blank casing and 0.1-inch wide machine-slotted PVC screen. Well AV-4 was screened from 5 to 15 feet below ground surface. Washed ⅜-inch pea gravel was placed across the entire screened interval in this well and extends 1 foot above the top of the well screen. A 1-foot-thick bentonite seal was placed above the gravel-pack and hydrated with clean water. A neat cement seal was placed from the top of the bentonite to approximately 1 foot below ground surface. An underground vault box, set in concrete, was placed over the top of the well. A waterproof locking cap was placed on the well casing.

Well completion details are presented with the exploratory boring logs in Appendix C.

4.4. Well Development

Air sparging wells AS-3 through AS-9 were developed by surging and bailing to remove fine-grained sediments and allow better communication between the water-bearing zone and the well. Well development was performed by Gettler-Ryan Inc. (G-R) on January 28, 1994.

4.5. Wellhead Survey

Site wells, except well A-6, were surveyed to a National Geodetic Vertical Datum by Virgil Chavez, a licensed land surveyor, on February 1 and 22, 1994, after installation of the groundwater and soil remediation system had been completed. Well A-6 was not surveyed because it has been

paved over during the construction work associated with remediation system installation. The survey report is included in Appendix D.

5. LABORATORY ANALYSES

5.1. Laboratory Methods

Soil samples collected during this investigation were preserved as required by the applicable analytical method and delivered with Chain-of-Custody Records to Sequoia Analytical (Sequoia), a State-certified environmental laboratory (Hazardous Waste Testing Laboratory #1210) located in Redwood City, California.

Selected soil samples collected from borings AS-3 through AS-9 and AV-4 were analyzed for TPH-G and BTEX using EPA Methods 5030/8015 mod./8020. Soil chemical analytical data for the present and previous investigations are summarized in Table 1.

5.2. Laboratory Results

Laboratory analyses of soil samples collected from borings AS-3, AS-4 and AV-4, located in the northern vicinity of the service islands, reported nondetectable or near nondetectable (not exceeding 3 ppm) concentrations of TPH-G. Laboratory analyses of soil samples collected from boring AS-6, located in the southwestern vicinity of the service islands, reported 2.4 ppm TPH-G in the sample collected at a depth of 10 feet, 56 ppm TPH-G in the sample collected at a depth of 14½ feet (capillary fringe zone), and nondetectable TPH-G concentrations in other samples collected from this boring. Laboratory analyses of soil samples collected from boring AS-5, located in the southeastern vicinity of the service islands, reported detectable concentrations of TPH-G in samples collected at depths of 11½ feet (1.7 ppm) and 36½ feet (110 ppm), and nondetectable concentrations of TPH-G in other samples collected from

this boring, including the sample collected from the capillary fringe zone at a depth of 16½ feet. The analytical results for the 36½-foot sample (aquitard sample) collected from AS-5 appear to be anomalous when compared to other samples collected from the aquitard layer beneath the water bearing zone, which all indicated nondetectable TPH-G and BTEX concentrations. Therefore, it appears that this sample may have been switched in the field or in the laboratory with the 16½-foot sample (capillary fringe sample) collected from the same boring.

The concentrations of hydrocarbons in soil samples collected from boring AS-7, located in the immediate upgradient (eastern) vicinity of UST pit, were nondetectable. Laboratory analyses of soil samples collected from boring AS-8, located between USTs, and from boring AS-9, located in the immediate downgradient (western) vicinity of the UST pit, reported detectable concentrations of TPH-G ranging from 2.8 ppm to 160 ppm for samples collected at depths between 11½ to 16½ feet below ground surface (capillary fringe zone).

Graphic interpretations of TPH-G in soil at depths of 9-13 feet and 14½-16½ feet are shown on Plates 6 and 7, respectively. Soil chemical analytical reports and Chain-of-Custody Forms are presented in Appendix E.

The stockpile samples were composited in the laboratory and analyzed for TPH-G, toxicity characteristic leaching procedure (TCLP) for Total Purgeable Hydrocarbons with BTEX; soluble threshold limit concentration (STLC) lead using EPA Method 239.2; and corrosivity, ignitability and reactivity (RCI). Upon receipt of chemical analyses the stockpiles were removed from the site and transported to an appropriate disposal facility. Where?

6. SUMMARY OF INVESTIGATION

The results of this investigation are presented below:

- Seven exploratory borings were drilled onsite on December 6 and 7, 1993, and completed as air sparging wells AS-3 through AS-5, AS-7 through AS-9, and vapor extraction well AV-4. One exploratory boring was drilled onsite on January 24, 1994, and completed as air sparging well AS-6.

- The lithology of the borings consisted primarily of silty clay to sandy silt, silty sand, and gravel with sand to the total depth explored of 40½ feet below ground surface. Groundwater was encountered at depths ranging between 15 and 19 feet within silty sand locally interbedded with sandy gravel with sand.

- Concentrations of TPH-G in soil samples collected from borings AS-3, AS-4 and AV-4, located in the northern vicinity of the service islands, and from boring AS-7, located in the immediate upgradient (eastern) vicinity of the UST pit, were nondetectable or near nondetectable.

- Concentrations of TPH-G in soil samples collected from boring AS-8, located between the USTs, from boring AS-9, located in the immediate downgradient (western) vicinity of the UST pit, and from boring AS-6, located in the southwestern vicinity of the service islands ranged from 2.4 ppm to 160 ppm in samples collected at depths between 11½ to 16½ feet below ground surface (capillary fringe zone), and were nondetectable in other samples collected from these borings. Laboratory analyses of soil samples collected from boring AS-5, located in the southeastern vicinity of the service islands, reported detectable concentrations of TPH-G in samples collected at depths of 11½ feet (1.7 ppm) and 36½ feet (110

ppm), however, the laboratory results for the 36½-foot sample appear anomalous compared to adjacent borings.

- The lateral extent of hydrocarbon impacted soil at the subject site appears to be delineated to nondetectable TPH-G except southern (crossgradient) and eastern (upgradient) vicinity of the site. The vertical extent of hydrocarbon impacted soil beneath the site appears to be delineated to nondetectable TPH-G at depths between 34½ to 40½ feet below the ground surface.

7. LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental geological and engineering practice in California at the time this investigation was performed. This assessment was conducted solely for the purpose of evaluating environmental conditions of the soil and groundwater with respect to gasoline hydrocarbons at the site and for installation of vapor extraction and air sparging wells to be used in an interim remediation system. No soil engineering or geotechnical references are implied or should be inferred.

8. REFERENCES

GTI, August 21, 1986. Site Assessment Investigation Report for ARCO Station 5387, Hayward, California. #20-8127.

GSI, March 6, 1992. Monitoring Well Installation Report for ARCO Station 5387, Hayward, California. #792602-3.

GSI, December 21, 1992. Continuing Site Assessment/Quarterly Monitoring Report for ARCO Station 5387, Hayward, California. #792605-7.

GSI, January 29, 1993. Quarterly Monitoring/ Well Installation Report for ARCO Station 5387, Hayward, California. #792603-8.

GSI, December 13, 1993. Additional Remedial Investigation and Interim Remedial Action Plan for ARCO Station 5387, Hayward, California. #792608-11.

GSI, January 14, 1994. Quarterly Monitoring Report - Fourth Quarter 1993 for ARCO Station 5387, Hayward, California. #792601-17.

Helley, E.J., and others; 1979. Flatland Deposits - their Geology and Engineering Properties and Their Importance to Comprehensive Planning, Selected Examples from the San Francisco Bay Region, California. U.S. Geological Survey Professional Paper 943, 88p.

TABLE 1

CUMULATIVE SOIL ANALYSES DATA
ARCO Station 5387
Hayward, California

SAMPLE I.D.	SAMPLE DEPTH (FEET)	TPH-G or [TRPH] (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
August 1986						
MW-1	9-9.5	[<10]	N/A	N/A	N/A	N/A
MW-2	9-9.5	[<10]	N/A	N/A	N/A	N/A
MW-3	11-11.5	[<10]	N/A	N/A	N/A	N/A
SB-1	9-9.5	[<10]	N/A	N/A	N/A	N/A
SB-2	9-9.5	[49]	N/A	N/A	N/A	N/A
SB-3	9-9.5	[42]	N/A	N/A	N/A	N/A
SB-4	9-9.5	[20]	N/A	N/A	N/A	N/A
October 1991						
A-4-10	10	24	0.012	0.042	0.072	0.052
A-4-15	15	<1.0	0.011	<0.0050	0.028	0.0080
A-5-10	10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-5-15	15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-6-10	10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-6-15	15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
December 1991						
A-7-9.5	9.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-7-14.5	14.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
August 1992						
A-8-10.0	10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-9-10.0	10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050

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August 1992 cont.						
A-9-15.0	15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AR-1-10.0	10	1.0	0.16	<0.0050	0.039	<0.0050
AR-1-14.5	14.5	8.8	0.030	<0.0050	0.060	0.070
November 1992						
A-10-13.0	13	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-10-16.5	16.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
March 1993						
A-A-10.0 (AV-1)	10	4.4	0.022	<0.0050	0.033	0.030
A-A-15.0 (AV-1)	15	32	0.12	0.042	0.38	0.22
A-B-10.0 (AV-2)	10	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-B-15.0 (AV-2)	15	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-C-10.0 (AV-3)	10	1.0	0.010	0.0060	0.050	0.0080
A-C-15.0 (AV-3)	15	11	0.027	0.081	0.11	0.52
AS-1-10.0	10	<1.0	<0.0050	<0.0050	<0.0050	0.0070
AS-1-15.0	15	17	0.027	0.012	0.090	0.16
AS-2-10.0	10	1.3	0.042	<0.0050	<0.0050	0.020
AS-2-15.0	15	26	0.085	0.012	0.26	0.22
AR-2-10.0	10	<1.0	0.11	<0.0050	<0.0050	0.022
AR-2-15.0	15	16	0.061	0.015	0.14	0.56
December 1993						
AV-4-6.5	6.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AV-4-11.5	11.5	<1.0	0.048	<0.0050	<0.0050	<0.0050
AV-4-15.5	15.5	2.7	0.030	<0.0050	0.12	0.063

TABLE 1

CUMULATIVE SOIL ANALYSES DATA
ARCO Station 5387
Hayward, California

SAMPLE I.D.	SAMPLE DEPTH (FEET)	TPH-G or [TRPH] (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
December 1993 cont.						
AS-3-6.5	6.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-3-11.5	11.5	<1.0	0.0068	<00050	<0.0050	<0.0050
AS-3-39.5	39.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-4-11.5	11.5	3.0	0.18	0.0062	0.15	0.22
AS-4-34.5	34.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-5-6.5	6.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-5-11.5	11.5	1.7	0.067	<0.0050	0.073	0.049
AS-5-16.5*	16.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-5-36.5*	36.5	110	<0.125	<0.125	1.7	1.4
AS-7-6.5	6.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-7-11.5	11.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-7-16.5	16.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-7-36.5	36.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-8-6.5	6.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-8-11.5	11.5	2.8	0.016	<0.0050	0.048	0.0068
AS-8-16.5	16.5	54	0.093	<0.010	0.84	2.8
AS-8-40.5	40.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
AS-9-6.5	6.5	<1.0	0.011	<0.0050	0.058	0.035
AS-9-11.5	11.5	20	0.032	0.026	0.18	0.69
AS-9-16.5	16.5	160	<0.025	<0.025	1.4	0.53
AS-9-40.5	40.5	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
January 1994						
AS-6-4.5	4.5	<1.0	0.0060	<0.0050	<0.0050	<0.0050
AS-6-10	10	2.4	0.13	0.0060	0.055	<0.0050

TABLE 1

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ARCO Station 5387
Hayward, California

SAMPLE I.D.	SAMPLE DEPTH (FEET)	TPH-G or [TRPH] (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
January 1994 cont.						
AS-6-14.5	14.5	**56**	**0.37**	<0.05	**0.97**	**0.097**
AS-6-34	34	<1.0	<0.0050	<0.0050	<0.0050	<0.0050

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline (analyzed using EPA Method 8015).
TRPH = Total Recoverable Petroleum Hydrocarbons (analyzed using EPA Method 418.1).
PPM = Parts Per Million.
N/A = Not Analyzed.
* = Sample results appear to be anomalous compared to adjacent borings, possibly switched in the field or laboratory.

Sample Identification:

AS-6-34
| └— Depth in feet
└— Well ID

TABLE 2

HISTORICAL WATER-LEVEL DATA
ARCO Station 5387
Hayward, California

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (FT)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
08-Aug-86	MW-1	11.25	38.36	27.11	0.00
24-Dec-91	MW-1	16.12	38.36	22.24	0.00
10-Mar-92	MW-1	13.34	38.36	25.02	0.00
09-Jun-92	MW-1	14.12	38.36	24.24	0.00
14-Sep-92	MW-1	15.34	38.36	23.02	0.00
12-Nov-92	MW-1	15.46	38.36	22.90	0.00
11-Feb-93	MW-1	11.95	38.36	26.41	0.00
14-Apr-93	MW-1	11.65	38.36	26.71	0.00
12-Aug-93	MW-1	12.93	38.36	25.43	0.00
26-Oct-93	MW-1	14.13	38.36	24.23	0.00
16-Feb-94	MW-1	11.86	37.26	25.40	0.00
08-Aug-86	MW-2	11.62	38.58	26.96	0.00
24-Dec-91	MW-2	16.50	38.58	22.08	0.00
10-Mar-92	MW-2	13.50	38.58	25.08	0.00
09-Jun-92	MW-2	14.52	38.58	24.06	0.00
14-Sep-92	MW-2	15.78	38.58	22.80	0.00
12-Nov-92	MW-2	15.98	38.58	22.60	0.00
11-Feb-93	MW-2	12.27	38.58	26.31	0.00
14-Apr-93	MW-2	12.01	38.58	26.57	0.00
12-Aug-93	MW-2	13.81	38.58	24.77	0.00
26-Oct-93	MW-2	14.53	38.58	24.05	0.00
16-Feb-94	MW-2	12.81	37.99	25.18	0.00
08-Aug-86	MW-3	10.61	37.77	27.16	0.00
24-Dec-91	MW-3	15.60	37.77	22.17	0.00
10-Mar-92	MW-3	12.90	37.77	24.87	0.00
09-Jun-92	MW-3	13.60	37.77	24.17	0.00
14-Sep-92	MW-3	14.78	37.77	22.99	0.00
12-Nov-92	MW-3	14.92	37.77	22.85	0.00
11-Feb-93	MW-3	11.65	37.77	26.12	0.00
14-Apr-93	MW-3	11.16	37.77	26.61	0.00
12-Aug-93	MW-3	12.82	37.77	24.95	0.00

TABLE 2

HISTORICAL WATER-LEVEL DATA
ARCO Station 5387
Hayward, California

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (FT)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
26-Oct-93	MW-3	13.60	37.77	24.17	0.00
16-Feb-94	MW-3	11.53	36.80	25.27	0.00
24-Dec-91	A-4	17.60	39.86	22.26	0.00
10-Mar-92	A-4	14.76	39.86	25.10	0.00
09-Jun-92	A-4	15.63	39.86	24.23	0.00
14-Sep-92	A-4	16.83	39.86	23.03	0.00
12-Nov-92	A-4	16.97	39.86	22.89	0.00
11-Feb-93	A-4	13.43	39.86	26.43	0.00
14-Apr-93	A-4	13.06	39.86	26.80	0.00
12-Aug-93	A-4	14.94	39.86	24.92	0.00
26-Oct-93	A-4	15.52	39.86	24.34	0.00
16-Feb-94	A-4	14.02	39.46	25.44	0.00
24-Dec-91	A-5	16.85	38.94	22.09	0.00
10-Mar-92	A-5	13.83	38.94	25.11	0.00
09-Jun-92	A-5	14.91	38.94	24.03	0.00
14-Sep-92	A-5	16.14	38.94	22.80	0.00
12-Nov-92	A-5	16.35	38.94	22.59	0.00
11-Feb-93	A-5	13.21	38.94	25.73	0.00
14-Apr-93	A-5	12.97	38.94	25.97	0.00
12-Aug-93	A-5	14.12	38.94	24.82	0.00
26-Oct-93	A-5	14.72	38.94	24.22	0.00
16-Feb-94	A-5	13.20	38.47	25.27	0.00
24-Dec-91	A-6	16.88	39.07	22.19	0.00
10-Mar-92	A-6	13.73	39.07	25.34	0.00
09-Jun-92	A-6	14.95	39.07	24.12	0.00
14-Sep-92	A-6	16.20	39.07	22.87	0.00
12-Nov-92	A-6	16.35	39.07	22.72	0.00
11-Feb-93	A-6	13.04	39.07	26.03	0.00
14-Apr-93	A-6	12.23	39.07	26.84	0.00
12-Aug-93	A-6	14.18	39.07	24.89	0.00
26-Oct-93	A-6	14.85	39.07	24.22	0.00

TABLE 2

HISTORICAL WATER-LEVEL DATA
ARCO Station 5387
Hayward, California

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (FT)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
16-Feb-94	A-6	Not Sampled			
24-Dec-91	A-7	18.11	39.95	21.84	0.00
10-Mar-92	A-7	15.30	39.95	24.65	0.00
09-Jun-92	A-7	16.12	39.95	23.83	0.00
14-Sep-92	A-7	17.35	39.95	22.60	0.00
12-Nov-92	A-7	17.47	39.95	22.48	0.00
11-Feb-93	A-7	13.80	39.95	26.15	0.00
14-Apr-93	A-7	13.60	39.95	26.35	0.00
12-Aug-93	A-7	15.54	39.95	24.41	0.00
26-Oct-93	A-7	16.28	39.95	23.67	0.00
16-Feb-94	A-7	14.44	39.38	24.94	0.00
14-Sep-92	A-8	14.19	37.23	23.04	0.00
12-Nov-92	A-8	14.35	37.23	22.88	0.00
11-Feb-93	A-8	11.25	37.23	25.98	0.00
14-Apr-93	A-8	12.33	37.23	24.90	0.00
12-Aug-93	A-8	12.41	37.23	24.82	0.00
26-Oct-93	A-8	13.02	37.23	24.21	0.00
16-Feb-94	A-8	11.47	36.76	25.29	0.00
14-Sep-92	A-9	16.12	38.71	22.59	0.00
12-Nov-92	A-9	16.29	38.71	22.42	0.00
11-Feb-93	A-9	12.31	38.71	26.40	0.00
14-Apr-93	A-9	12.01	38.71	26.70	0.00
12-Aug-93	A-9	13.90	38.71	24.81	0.00
26-Oct-93	A-9	14.86	38.71	23.85	0.00
16-Feb-94	A-9	12.99	38.19	25.20	0.00
07-Dec-92	A-10	16.81	38.94	22.13	0.00
11-Feb-93	A-10	13.15	38.94	25.79	0.00
14-Apr-93	A-10	12.93	38.94	26.01	0.00
12-Aug-93	A-10	14.87	38.94	24.07	0.00
26-Oct-93	A-10	15.65	38.94	23.29	0.00
16-Feb-94	A-10	14.16	38.66	24.50	0.00

TABLE 2

HISTORICAL WATER-LEVEL DATA
ARCO Station 5387
Hayward, California

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (FT)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
14-Sep-92	AR-1	15.21	38.11	22.90	0.00
12-Nov-92	AR-1	15.36	38.11	22.75	0.00
11-Feb-93	AR-1	12.81	38.11	25.30	0.00
14-Apr-93	AR-1	11.77	38.11	26.34	0.00
12-Aug-93	AR-1	13.55	38.11	24.56	0.00
26-Oct-93	AR-1	13.98	38.11	24.13	0.00
16-Feb-94	AR-1	12.15	37.46	25.31	0.00
30-Mar-93	AR-2	11.53	38.39	26.86	0.00
14-Apr-93	AR-2	11.87	38.39	26.52	0.00
12-Aug-93	AR-2	13.59	38.39	24.80	0.00
26-Oct-93	AR-2	14.25	38.39	24.14	0.00
16-Feb-94	AR-2	12.76	37.98	25.22	0.00

Notes:
1. Static water elevations referenced to Mean Sea Level (MSL). Site wells except well A-6 were resurveyed on February 1 and 22, 1994.
2. Well elevations and depth-to-water measurements were measured from the top of the well box until October 1993, and from the top of the well casing beginning February 1994.

TABLE 3

HISTORICAL GROUNDWATER QUALITY DATABASE
ARCO Station 5387
Hayward, California

SAMPLE DATE	SAMPLE POINT	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)
08-Aug-86	MW-1	7040	132	8.7	439	230
24-Dec-91	MW-1	2200	190	8.5	6.9	2.6
10-Mar-92	MW-1	2800	270	29	56	39
09-Jun-92	MW-1	2900	960	27	99	63
14-Sep-92	MW-1	2600	450	<5.0	45	21
12-Nov-92	MW-1	1600	310	7.2	22	8.9
11-Feb-93	MW-1	4000	510	47	200	91
14-Apr-93	MW-1	1700	260	20	100	70
12-Aug-93	MW-1	830	60	3.8	39	3.6
26-Oct-93	MW-1	8800	140	<10	41	<10
17-Feb-94	MW-1	1200	130	12	54	58
08-Aug-86	MW-2	1910	20.1	2.8	1.8	---
24-Dec-91	MW-2	23000	1500	1100	480	1400
10-Mar-92	MW-2	210000	44000	3900	1700	5800
09-Jun-92	MW-2	33000	2300	370	780	2600
14-Sep-92	MW-2	16000	3700	100	470	1000
12-Nov-92	MW-2	16000	3800	86	470	910
11-Feb-93	MW-2	27000	3500	720	1600	3800
14-Apr-93	MW-2	27000	3500	220	2200	5100
12-Aug-93	MW-2	16000	1600	27	1300	1200
26-Oct-93	MW-2	12000	1200	<25	510	330
17-Feb-94	MW-2	15000	1800	21	850	540
08-Aug-86	MW-3	7450	510	549	409	1380
24-Dec-91	MW-3	6800	450	10	610	45
10-Mar-92	MW-3	11000	2500	75	400	560
09-Jun-92	MW-3	16000	2000	69	1300	2600
14-Sep-92	MW-3	14000	630	<50	1500	2400
12-Nov-92	MW-3	7400	400	<25	860	330
11-Feb-93	MW-3	8600	580	<20	710	300
14-Apr-93	MW-3	6900	300	8.8	580	99
12-Aug-93	MW-3	3400	56	<5	190	<5

TABLE 3

HISTORICAL GROUNDWATER QUALITY DATABASE
ARCO Station 5387
Hayward, California

SAMPLE DATE	SAMPLE POINT	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)
26-Oct-93	MW-3	2900	42	<10	76	<10
17-Feb-94	MW-3	3100	160	<10	36	8.6
24-Dec-91	A-4	1900	29	1.9	25	29
10-Mar-92	A-4	7400	37	<0.60	11	73
09-Jun-92	A-4	4500	3.2	1.5	37	16
14-Sep-92	A-4	1300	<2.5	2.5	61	6.8
12-Nov-92	A-4	610	7.2	0.98	34	0.97
11-Feb-93	A-4	740	2.4	<0.50	5.0	3.5
14-Apr-93	A-4	380	<0.50	<0.50	10	1.6
12-Aug-93	A-4	1200	0.93	<0.50	0.91	<0.50
26-Oct-93	A-4	160	<0.50	<0.50	1.0	<0.50
17-Feb-94	A-4	**320**	<0.50	<0.50	**28**	**0.9**
24-Dec-91	A-5	1600	35	<0.30	32	52
10-Mar-92	A-5	1000	21	<1.5	43	100
09-Jun-92	A-5	680	1.6	<0.30	14	16
14-Sep-92	A-5	770	34	<2.5	51	65
12-Nov-92	A-5	520	12	0.96	29	36
11-Feb-93	A-5	150	3.0	<0.50	5.1	1.5
14-Apr-93	A-5	190	1.6	<0.50	1.5	0.97
12-Aug-93	A-5	230	5.4	<0.50	5.3	0.94
26-Oct-93	A-5	190	1.7	<0.50	5.5	2.0
17-Feb-94	A-5	**340**	**2.8**	<0.50	**13**	**2.9**
24-Dec-91	A-6	<30	<0.30	<0.30	<0.30	<0.30
10-Mar-92	A-6	<30	<0.30	<0.30	<0.30	<0.30
09-Jun-92	A-6	<30	<0.30	<0.30	<0.30	<0.30
14-Sep-92	A-6	<50	<0.50	<0.50	<0.50	<0.50
12-Nov-92	A-6	<50	<0.50	<0.50	<0.50	<0.50
11-Feb-93	A-6	<50	<0.50	<0.50	<0.50	<0.50
14-Apr-93	A-6	<50	<0.50	<0.50	<0.50	<0.50
12-Aug-93	A-6	<50	<0.50	<0.50	<0.50	<0.50
26-Oct-93	A-6	<50	<0.50	<0.50	<0.50	<0.50

TABLE 3

HISTORICAL GROUNDWATER QUALITY DATABASE
ARCO Station 5387
Hayward, California

SAMPLE DATE	SAMPLE POINT	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)
16-Feb-94	A-6	Not sampled				
24-Dec-91	A-7	10000	88	16	170	610
10-Mar-92	A-7	320	9.3	0.54	8.8	34
09-Jun-92	A-7	340	11	1.1	8.9	26
14-Sep-92	A-7	510	12	<2.0	30	51
12-Nov-92	A-7	760	17	0.83	50	73
11-Feb-93	A-7	260	20	1.0	11	21
14-Apr-93	A-7	1300	89	2.1	48	87
12-Aug-93	A-7	360	9.0	<0.50	13	9.0
26-Oct-93	A-7	99	1.7	<0.50	4.0	3.0
16-Feb-94	A-7	**1300**	**38**	<1	**35**	**25**
14-Sep-92	A-8	<50	<0.50	<0.50	<0.50	<0.50
12-Nov-92	A-8	<50	<0.50	<0.50	<0.50	<0.50
11-Feb-93	A-8	<50	<0.50	<0.50	<0.50	<0.50
14-Apr-93	A-8	<50	<0.50	<0.50	<0.50	<0.50
12-Aug-93	A-8	<50	<0.50	<0.50	<0.50	<0.50
26-Oct-93	A-8	<50	<0.50	<0.50	<0.50	<0.50
16-Feb-94	A-8	<50	<0.50	<0.50	<0.50	<0.50
14-Sep-92	A-9	<50	<0.50	<0.50	<0.50	<0.50
12-Nov-92	A-9	<50	<0.50	<0.50	<0.50	<0.50
11-Feb-93	A-9	<50	<0.50	<0.50	<0.50	<0.50
14-Apr-93	A-9	<50	<0.50	<0.50	<0.50	<0.50
12-Aug-93	A-9	<50	<0.50	<0.50	<0.50	<0.50
26-Oct-93	A-9	<50	<0.50	<0.50	<0.50	<0.50
16-Feb-94	A-9	<50	<0.50	<0.50	<0.50	<0.50
07-Dec-92	A-10	660	30	<2.5	<2.5	<2.5
11-Feb-93	A-10	210	<0.50	0.97	<0.50	<0.50
14-Apr-93	A-10	770	<0.50	3.0	0.76	1.9
12-Aug-93	A-10	390	<0.50	<0.50	<0.50	0.84
26-Oct-93	A-10	290	<0.50	<0.50	<0.50	<0.50
16-Feb-94	A-10	**52**	<0.50	<0.50	<0.50	<0.50

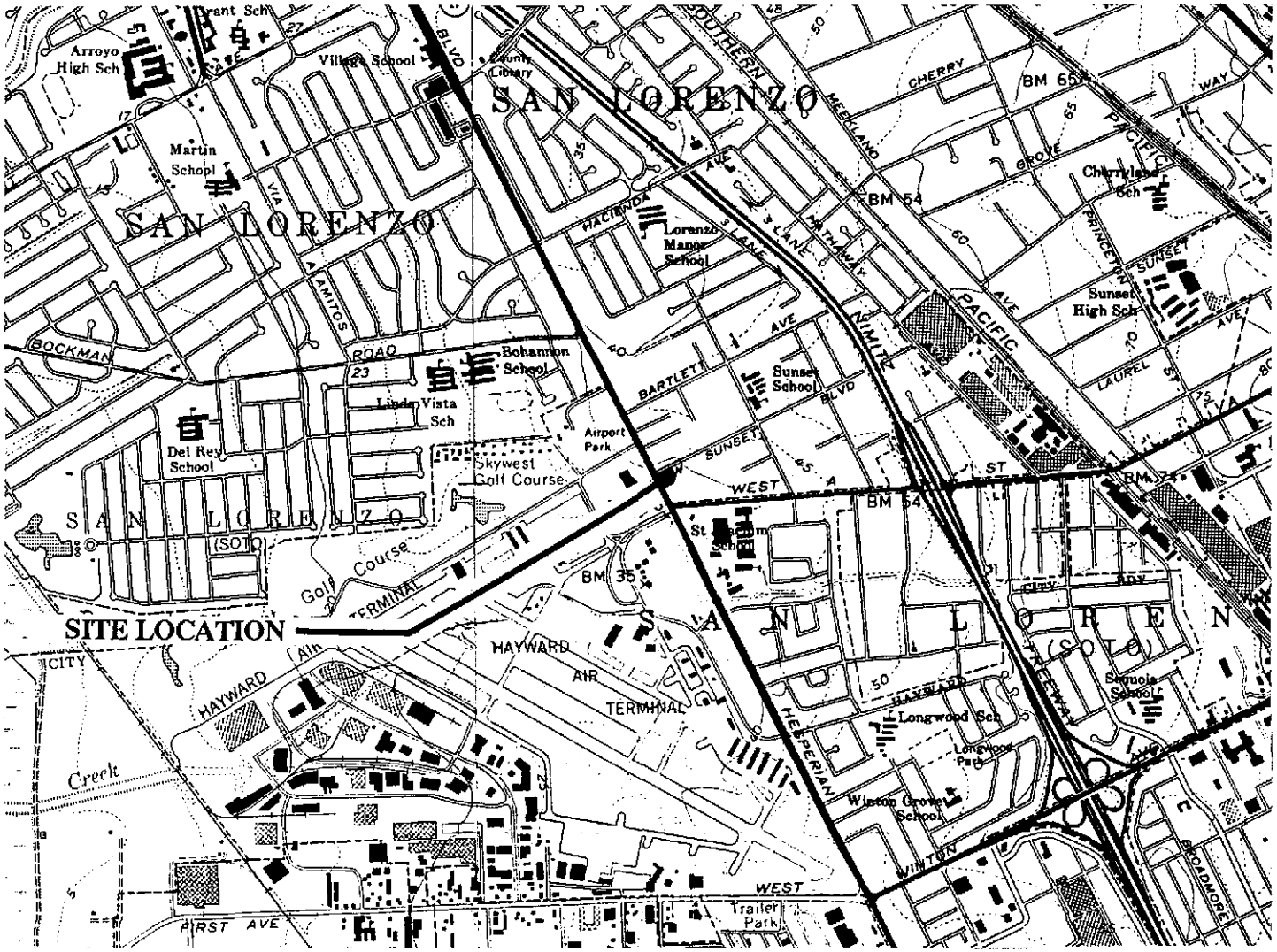
TABLE 3

HISTORICAL GROUNDWATER QUALITY DATABASE
ARCO Station 5387
Hayward, California

SAMPLE DATE	SAMPLE POINT	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)
14-Sep-92	AR-1	820	67	<1.0	8.8	6.7
12-Nov-92	AR-1	140	66	<0.50	4.3	3.7
11-Feb-93	AR-1	360	190	<2.5	8.6	<2.5
14-Apr-93	AR-1	420	240	5.2	30	8.7
12-Aug-93	AR-1	370	150	<2	11	<2
26-Oct-93	AR-1	240	98	<2	11	<2
17-Feb-94	AR-1	4700	1100	<10	140	26
30-Mar-93	AR-2	390	4.1	1.6	<0.50	47
14-Apr-93	AR-2	310	18	<0.50	0.67	36
12-Aug-93	AR-2	130	16	<0.50	1.7	0.57
26-Oct-93	AR-2	110	15	<0.50	1.8	<0.50
17-Feb-94	AR-2	130	2.9	<0.50	15	0.8

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline.
PPB = Parts Per Billion.

Note: All data shown as <x are reported as ND (none detected).



N

0 2000

Scale in Feet

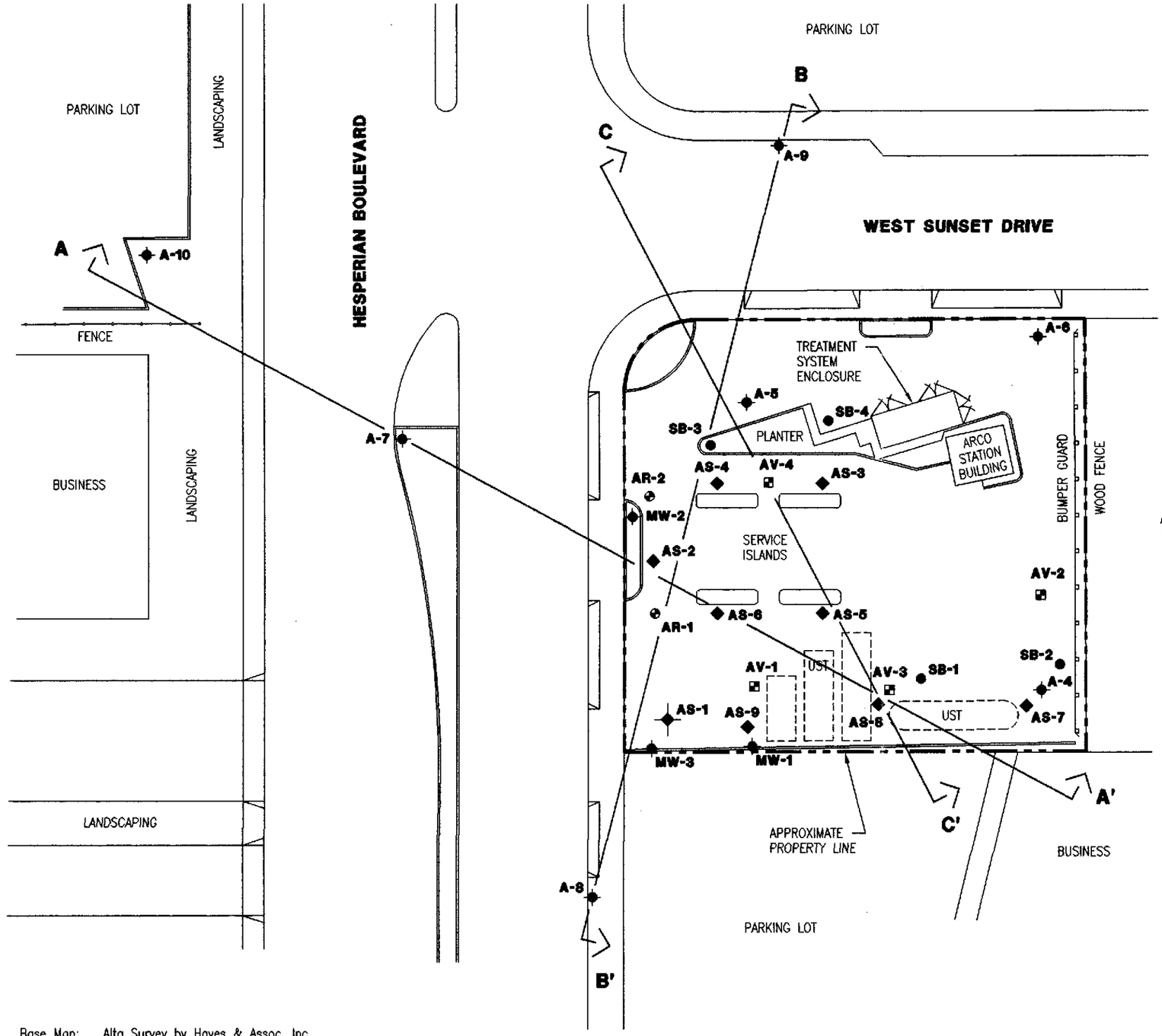
Base Map: USGS Topographic Map

GeoStrategies Inc.

VICINITY MAP
ARCO Service Station #5387
20200 Hesperian Boulevard
Hayward, California

FIGURE 1

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7926		11/91	



EXPLANATION

- Groundwater monitoring well
- Groundwater recovery well
- Vapor extraction well
- Air sparge/vapor extraction well
- Air sparging well
- Soil boring
- Cross section

Base Map: Alta Survey by Hayes & Assoc. Inc. dated 8/13/86 and field observations.

N

0 40

Scale in Feet

FIGURE 2

SITE PLAN
ARCO Service Station #5387
20200 Hesperian Boulevard
Hayward, California

REVISED DATE

DATE 5/94

REVIEWED BY BP

GeoStrategies Inc.

GSI

JOB NUMBER 792612-18

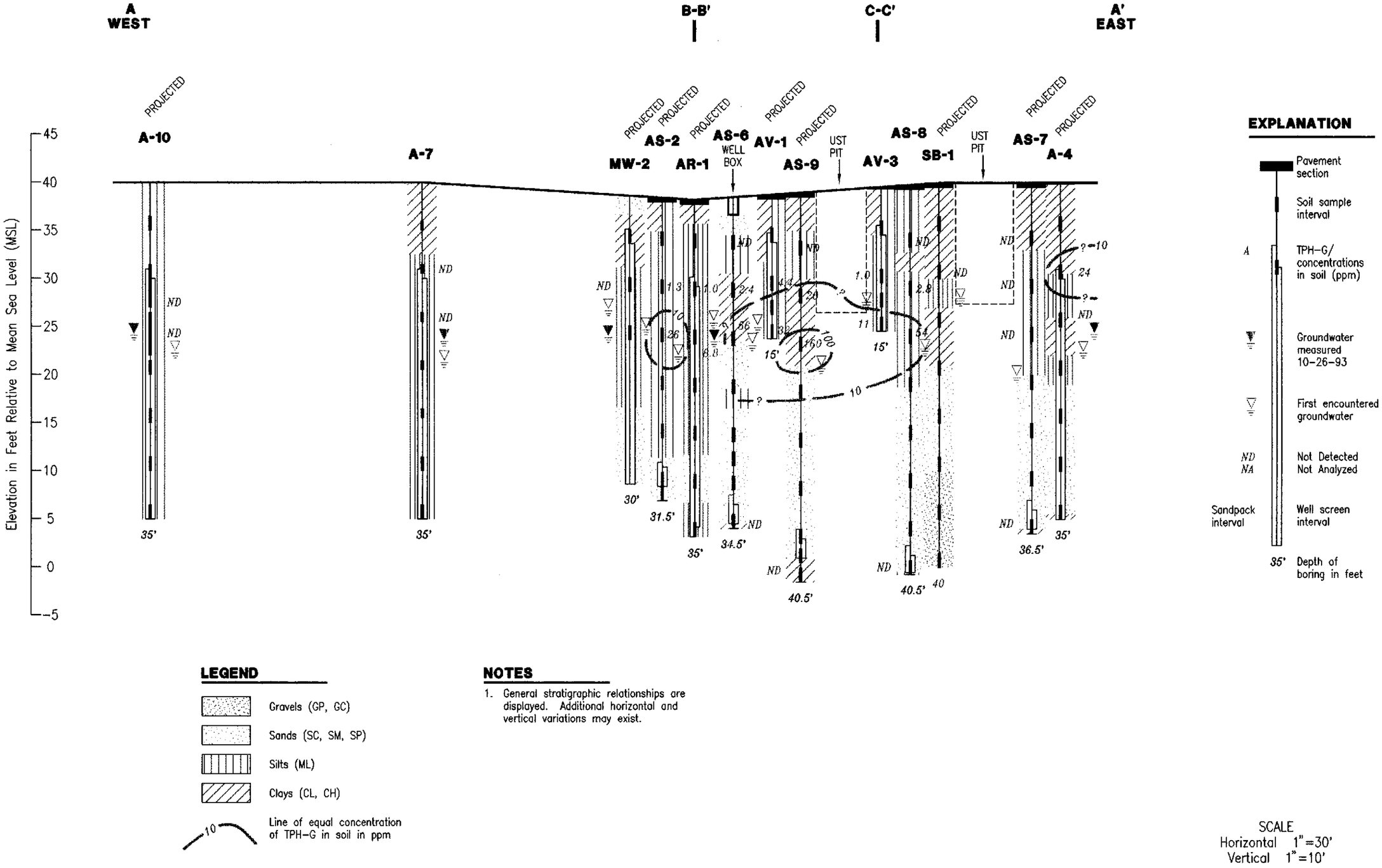


FIGURE 3

CROSS SECTION A-A'
ARCO Service Station #5387
20200 Hesperian Boulevard
Hayward, California

REVISED DATE

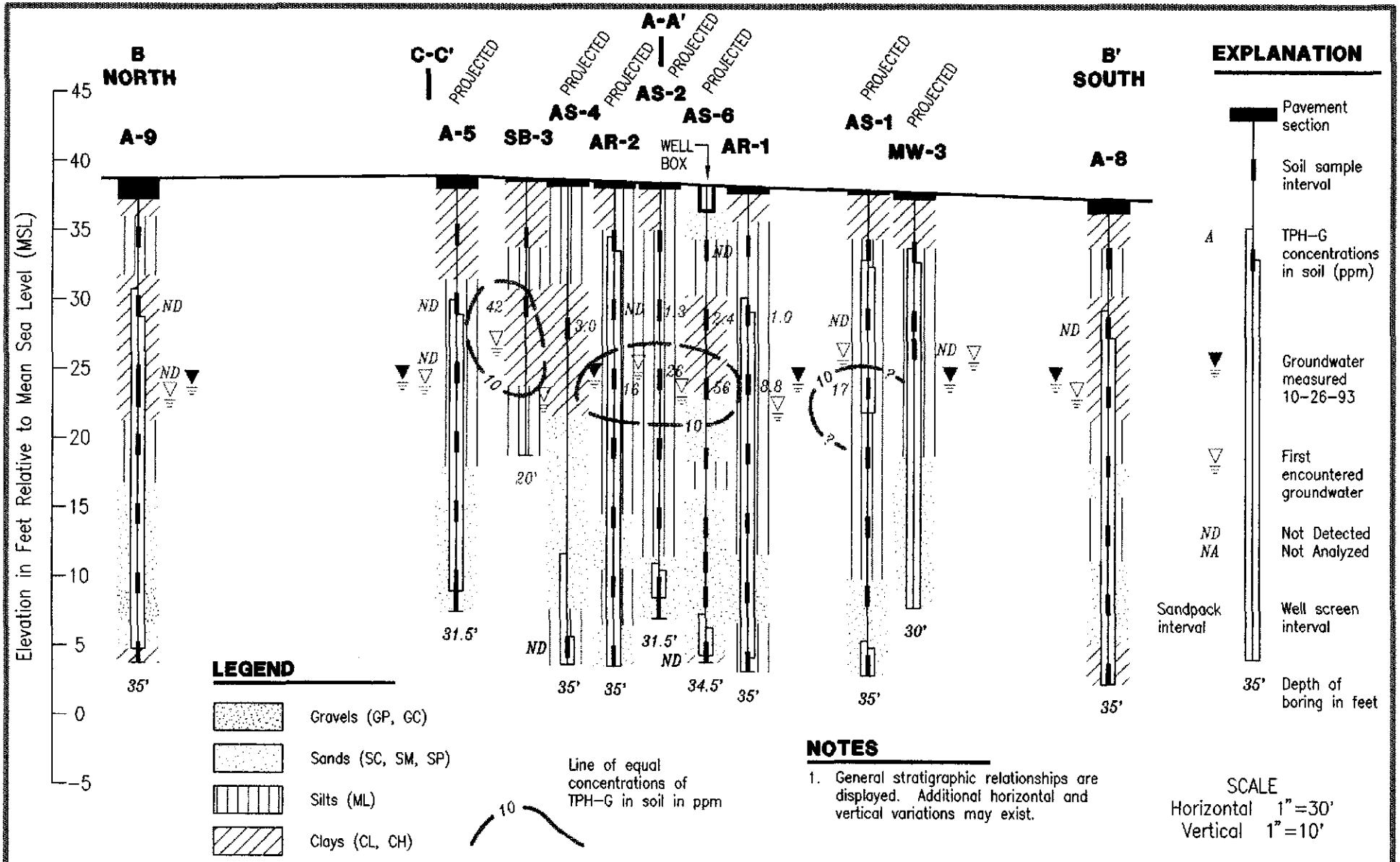
DATE 5/94

REVIEWED BY

JOB NUMBER 792612-18

GeoStrategies Inc.

GSI

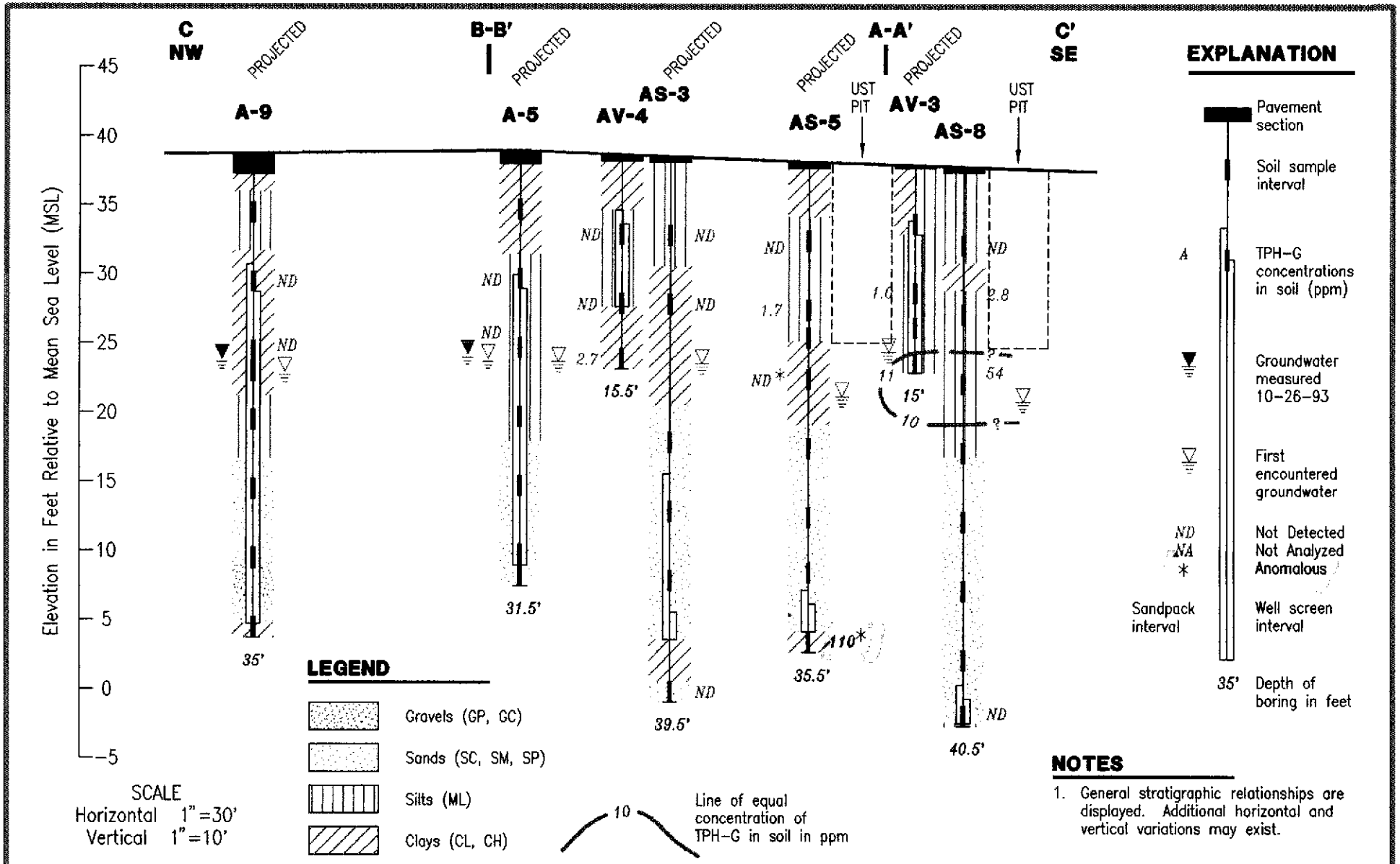


GeoStrategies Inc.

CROSS SECTION B-B'
ARCO Service Station #5387
20200 Hesperian Boulevard
Hayward, California

FIGURE 4

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792612-18		5/94	

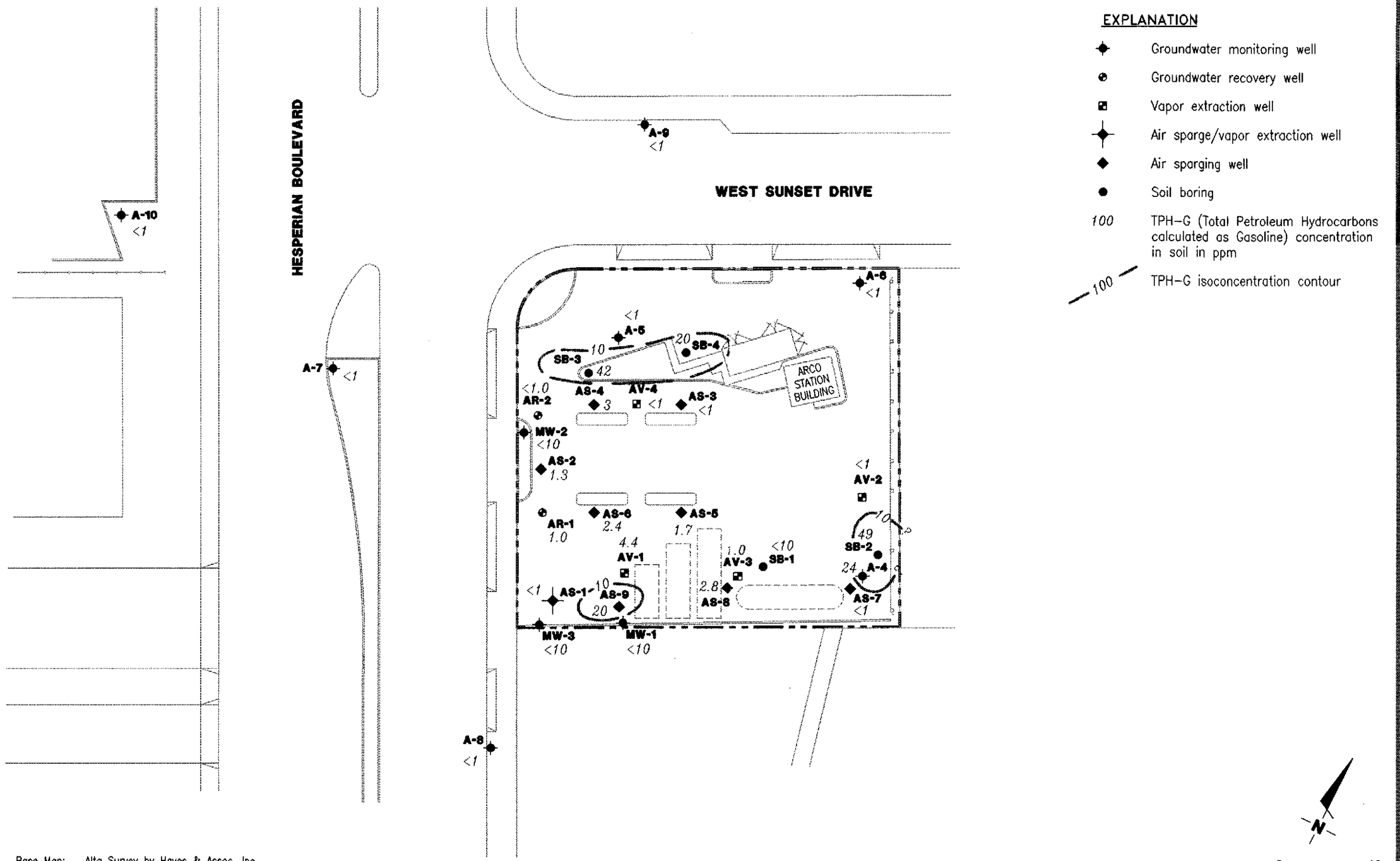


GeoStrategies Inc.

CROSS SECTION C-C'
ARCO Service Station #5387
20200 Hesperian Boulevard
Hayward, Calofornia

FIGURE
5

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792612-18	BS	5/94	



Base Map: Alta Survey by Hayes & Assoc. Inc. dated 8/13/86 and field observations.

EXPLANATION

- Groundwater monitoring well
- Groundwater recovery well
- Vapor extraction well
- Air sparge/vapor extraction well
- Air sparging well
- Soil boring
- 100 — TPH-G (Total Petroleum Hydrocarbons calculated as Gasoline) concentration in soil in ppm
- 100 — TPH-G isoconcentration contour

FIGURE 6

TPH-G ISOCONCENTRATION MAP (IN [redacted] 13 FEET)
ARCO Service Station #5387
20200 Hesperian Boulevard
Hayward, California

REVISED DATE

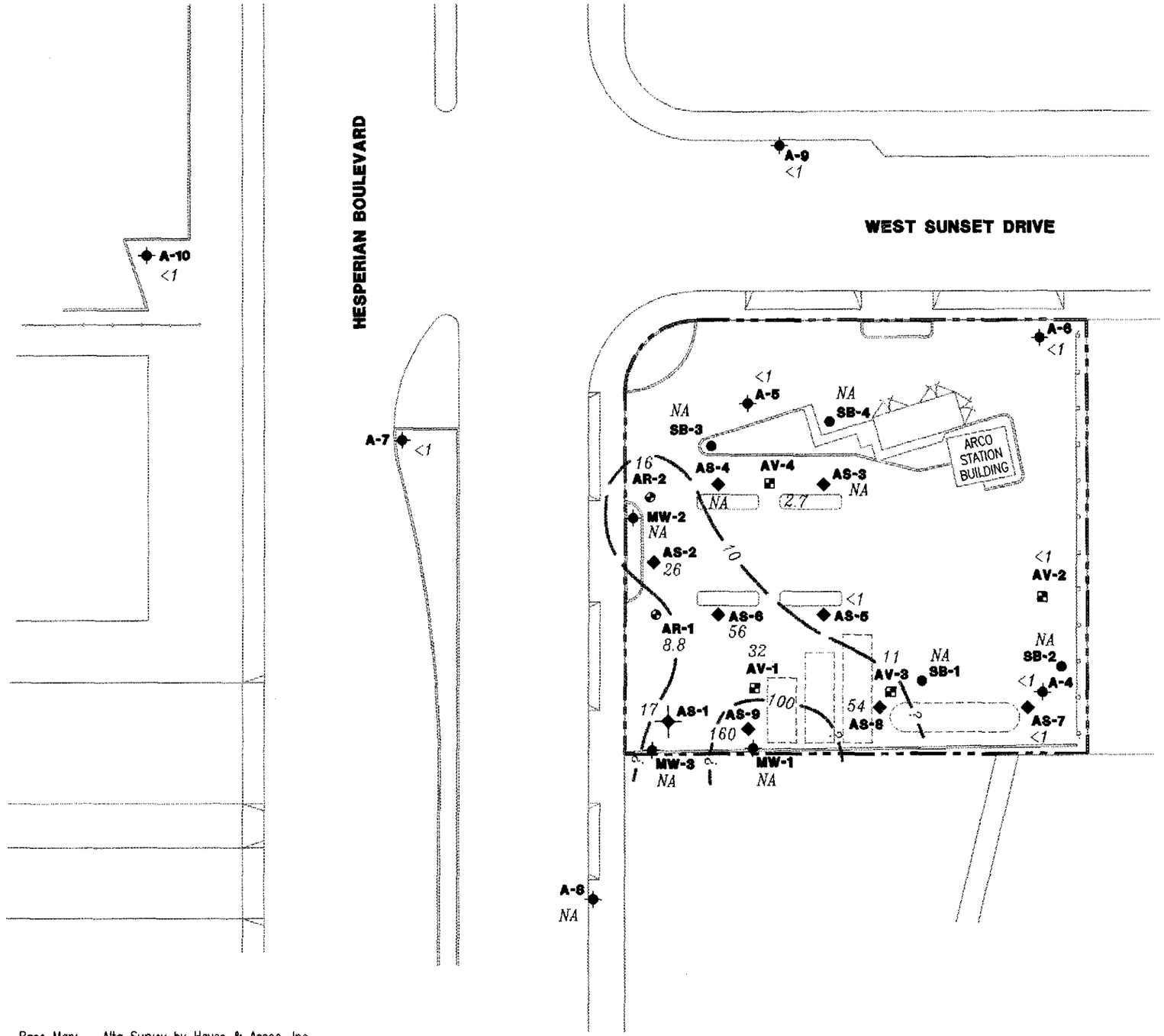
DATE 5/94

REVIEWED BY

JOB NUMBER 792612-18

GeoStrategies Inc.

GSI



Base Map: Alta Survey by Hayes & Assoc. Inc. dated 8/13/86 and field observations.

EXPLANATION

- Groundwater monitoring well
- Groundwater recovery well
- Vapor extraction well
- Air sparge/vapor extraction well
- Air sparging well
- Soil boring
- 100 — TPH-G (Total Petroleum Hydrocarbons calculated as Gasoline) concentration in soil in ppm
- 100 — TPH-G isoconcentration contour
- NA — Not Analyzed

0 40
Scale in Feet

FIGURE 7

TPH-G ISOCONCENTRATION MAP (IN SOIL 14.5 TO 16.5)
ARCO Service Station #5387
20200 Hesperian Boulevard
Hayward, California

GeoStrategies Inc.

JOB NUMBER 792612-18
REVIEWED BY
DATE 5/94
REVISED DATE

FIELD METHODS AND PROCEDURES

EXPLORATION DRILLING

Mobilization

Prior to any drilling activities, GeoStrategies Inc. (GSI) will verify that necessary drilling permits have been secured.

Utility locations will be located and drilling will be conducted so as not to disrupt activities at a project site. GSI will obtain and review available public data on subsurface geology and if warranted, the location of wells within a half-mile of the project site will be identified. Drillers will be notified in advance so that drilling equipment can be inspected prior to performing work.

Drilling

The subsurface investigations are typically performed to assess the lateral and vertical extent of petroleum hydrocarbons present in soils and groundwater. Drilling methods will be selected to optimize field data requirements as well as be compatible with known or suspected subsurface geologic conditions.

Monitoring wells are installed using a truck-mounted hollow-stem auger drill rig or mud-rotary drill rig. Typically, the hollow-stem rig is used for wells up to 100 feet, if subsurface conditions are favorable. Wells greater than 100-feet deep are typically drilled using mud-rotary techniques. When mud rotary drilling is used, an electric log will be performed for additional lithological information. Also during mud rotary drilling, precautions will be taken to prevent mud from circulating contaminants by using a conductor casing to seal off contaminated zones. Samples will be collected for lithologic logging by continuous chip, and where needed by drive sample or core as specified by the supervising geologist.

Soil Sampling

Shallow soil borings will be drilled using a truck-mounted hollow-stem auger drilling rig, unless site conditions favor a different drilling method. Drilling and sampling methods will be consistent with ASTM Method D-1452-80. The auger size will be a minimum 6-inch nominal outside-diameter (O.D). No drilling fluids will be used during this drilling method. The augers and other tools used in the bore hole will be steam cleaned before use and between borings to minimize the possibilities of cross-contamination between borings.

Soil samples are typically collected at 5-foot intervals as a minimum from ground surface to total depth of boring. Additional soil samples will be collected based on significant lithologic changes and/or potential chemical content. Soil samples from each sampling interval will be lithologically described by a GSI geologist (Figure 1). Soil colors will be described using the Munsell Color Chart. Rock units will be logged using appropriate lithologic terms, and colors described by the G.S.A. Rock Color Chart.

Head-space analyses will be performed to check for the evidence of volatile organic compounds. Head-space analyses will be performed using an organic vapor analyzer; either an OVA, HNU, or OVM. Organic vapor concentrations will be recorded on the GSI field log of boring (Figure 1). The selection of soil samples for chemical analysis are typically based on the following criteria:

1) Soil discoloration
2) Soil odors
3) Visual confirmation of chemical in soil
4) Depth with respect to underground tanks (or existing grade)
5) Depth with respect to ground water
6) OVA reading

Soil samples (full brass liners) selected for chemical analysis are immediately covered with aluminum foil and the liner ends are capped to prevent volatilization. The samples are labeled and entered onto a Chain-of-Custody form, and placed in a cooler on blue ice for transport to a State-certified analytical laboratory.

Soil cuttings are stockpiled on-site. Soils are sampled and analyzed for site-specific chemical parameters. Disposition of soils is dependent of chemical analytical results of the samples.

Soil Sampling - cont.

Soil borings not converted to monitoring wells will be backfilled (sealed) to ground surface using either a neat cement or cement-bentonite grout mixture. Backfilling will be tremied by continuously pumping grout from the bottom to the top of the boring where depth exceeds 20' or as required by local permit requirements.

All field and office work, including exploratory boring logs, are prepared under the direction of a registered geologist.

Monitoring Well Installation

Monitoring well casing and screen will be constructed of Schedule 40, flush-joint threaded polyvinylchloride (PVC). The well screen will be factory mill-slotted unless additional open area is required (eg. conversion to an extraction well in a low-yield aquifer). The screen length will be placed adjacent to the aquifer material to a minimum of 2-feet above encountered water. No screen shall be placed in a borehole that potentially creates hydraulic interconnection of two or more aquifer units. Screen slot size and well sand pack will be compatible with encountered aquifer materials, as confirmed by sieve analysis.

Monitoring wells will be completed below grade (Figure 2) unless special conditions exist that require above-grade completion design. In the event a monitoring well is required in an aquifer unit beneath an existing aquifer, the upper aquifer will be sealed off by installing a steel conductor casing with an annular neat cement or cement-bentonite grout seal. This seal will be continuously tremie pumped from the bottom of the annulus to ground surface.

The monitoring well sand pack will be placed adjacent to the entire screened interval and will extend a recommended minimum distance of 2-feet above the top of the screen. No sand pack will be placed that interconnects two or more aquifer units. A minimum 2-foot bentonite pellet or bentonite slurry seal will be placed above the sand pack. Sand pack, bentonite, and cement seal levels will be confirmed by sounding the annulus with a calibrated weighted tape. The remaining annular space above the bentonite seal will be grouted with a bentonite-cement mixture and will be tremie-pumped from the bottom of the annular space to the ground surface. The bentonite content of the grout will not exceed 5 percent by weight. A field log of boring and a field well completion form will be prepared by GSI for each well installed.

Decontamination of drilling equipment before drilling and between wells will consist of steam cleaning, and/or Alconox wash.

Well Development

All newly installed wells will be properly developed within 48 hours of completion. No well will be developed until the well seal has set a minimum of 12 hours. Development procedures will include one or more of the methods described below:

Bailing

Bailing will be used to remove suspended sediments and drilling fluids from the well, where applicable. The bailer will be raised and lowered through the column of water in the well so as to create a gentle surging action in the screened interval. This technique may be used in conjunction with other techniques, such as pumping, and may be used alone if the well is of low yield.

Pumping

Pumping will be used in conjunction with bailing or surging. The pump will be operated in such a manner as to gently surge the entire screened interval of the well. This may involve operating the pump with a packer type mechanism attached and slowly raising and lowering the pump, or by cycling the pump off and on to allow water to move in and out of the screened interval. Care will be used not to overpump a well.

Surging

Surging will be performed on wells that are screened in known or suspected high yield formations and/or on larger diameter (recovery) wells. A surge block will be raised and lowered through the entire screened interval, forcing water in and out of the well screen and sand pack. Pumping or air lifting will be used in conjunction with this method of development to remove any sediment brought into the well during surging.

Air Lifting

Air lifting will be used to remove sediment from wells as an alternative to pumping under certain conditions. When appropriate, a surge block designed for use with air lifting will be used to agitate the entire screened interval and water will be lifted out of the well using forced air. When air lifting is performed, the air source will be either nitrogen or filtered air and the procedure will be performed gently to prevent any damage to the well screen or casing and to insure that discharged water is contained.

Well Development - cont.

All well developing equipment will be thoroughly decontaminated prior to development using a steam cleaner and/or Alconox detergent wash and clean water rinse. During development procedures, field parameters (temperature, specific conductance and pH) will be monitored and recorded on well development forms (Figure 3). Equilibration requirements consist of a minimum of three readings with the following accuracy standards:

pH	± 0.1 pH units
Specific Conductance	± 10% of full scale reading
Temperature	± 0.5 degrees Celsius

The wells will be developed until water is visibly clear and free of sediment, and well purging parameters stabilized. A minimum of 8 to 10 well volumes will be purged from each well, if feasible. If well purging parameters have not stabilized before 10 casing volumes have been removed, well development will continue until purging parameters have stabilized and formation water is being drawn into the well. The adequacy of well development will be judged by the field technician performing the well development and based on known formation conditions.

Well Surveying

Monitoring wells will be surveyed to obtain top of box elevations to the nearest ±0.01 foot. Water level measurements will be recorded to the nearest ±0.01 foot and referenced to Mean Sea Level (MSL). If additional wells are required, then existing and newly installed wells are surveyed relative to MSL.

GROUND-WATER SAMPLING AND ANALYSIS

Quality Assurance/Quality Control Objectives

The sampling and analysis procedures employed by Gettler-Ryan Inc. (G-R) for ground-water sampling and monitoring follow specific Quality Assurance/Quality Control (QA/QC) guidelines. Quality Assurance objectives have been established by G-R to develop and implement procedures for obtaining and evaluating water quality and field data in an accurate, precise, and complete manner so that sampling procedures and field measurements provide information that is comparable and representative of actual field conditions. Quality Control (QC) is maintained by G-R by using specific field protocols and requiring the analytical laboratory to perform internal and external QC checks. It is the goal of G-R to provide data that are accurate, precise, complete, comparable, and representative. The definitions for accuracy, precision, completeness, comparability, and representativeness are as follows:

- Accuracy - the degree of agreement of a measurement with an accepted referenced or true value.

- Precision - a measure of agreement among individual measurements under similar conditions. Usually expressed in terms of the standard deviation.

- Completeness - the amount of valid data obtained from a measurement system compared to the amount that was expected to meet the project data goals.

- Comparability - expresses the confidence with which one data set can be compared to another.

- Representativeness - a sample or group of samples that reflects the characteristics of the media at the sampling point. It also includes how well the sampling point represents the actual parameter variations which are under study.

As part of the G-R QA/QC program, applicable federal, state, and local reference guidance documents are followed. The procedures outlined in these regulations, manuals, handbooks, guidance documents, and journals are incorporated into the G-R sampling procedures to assure that; (1) ground-water samples are properly collected, (2) ground-water samples are identified, preserved, and transported in a manner such that they are representative of field conditions, and (3) chemical analysis of samples are accurate and reproducible.

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April 20, 1990

Guidance and Reference Documents Used to Collect Groundwater Samples

These documents are used to verify G-R sampling procedures and are consistent with current regulatory guidance. If site specific work and sampling plans are required, those plans will be developed from these documents, and newly received applicable documents.

U.S.E.P.A. - 330/9-51-002	NEIC Manual for Groundwater/Subsurface Investigation at Hazardous Waste Sites
U.S.E.P.A. - 530/SW611	Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities (August, 1977)
U.S.E.P.A. - 600/4-79-020	Methods for Chemical Analysis of Water and Wastes (1983)
U.S.E.P.A. - 600/4-82-029	Handbook for Sampling and Sample Preservation of Water and Wastewater (1982)
U.S.E.P.A. - 600/4-82-057	Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (July, 1982)
U.S.E.P.A. - SW-846#, 3rd Edition	Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (November, 1986)
40 CFR 136.3e,Table II (Code of Federal Regulations)	Required Containers, Preservation Techniques, and Holding Times
Resources Conservation and Recover Act (OSWER 9950.1)	Groundwater Monitoring Technical Enforcement Guidance Document (September, 1986)
California Regional Water Quality Control Board (Central Valley Region)	A Compilation of Water Quality Goals (September, 1988); Updates (October, 1988)
California Regional Water Quality Control Board (North Coast, San Francisco Bay, and Central Valley)	Regional Board Staff Recommendations for Initial Evaluations and Investigation of Underground Tanks: Tri-Regional Recommendations (June, 1988)

Guidance and Reference Documents Used to Collect Groundwater Samples (cont.)

Regional Water Quality Control Board (Central Valley Region)	Memorandum: Disposal, Treatment, and Refuse of Soils Contaminated with Petroleum Fractions (August, 1986)
State of California Department of Health Services	Hazardous Waste Testing Laboratory Certification List (March, 1987)
State of California Water Resources Control Board	Leaking Underground Fuel Tank (LUFT) Field Manual (May, 1988), and LUFT Field Manual Revision (April, 1989)
State of California Water Resources Control Board	Title 23, (Register #85.#33-8-17-85), Subchapter 16: Underground Tank Regulations; Article 3, Sections 2632 and 2634; Article 4, Sections 2645, 2646, 2647, and 2648; Article 7, Sections 2670, 2671, and 2672 (October, 1986: including 1988 Amendments)
Alameda County Water District	Groundwater Protection Program: Guidelines for Groundwater and Soil Investigations at Leaking Underground Fuel Tank Sites (November, 1988)
American Public Health Association	Standard Methods for the Examination of Water and Wastewaters, 16th Edition
Analytical Chemistry (journal)	Principles of Environmental Analysis, Volume 55, Pages 2212-2218 (December, 1983)
Napa County	Napa County Underground Storage Tank Program: Guidelines for Site Investigations; February 1989.
Santa Clara Valley Water District	Guidelines for Preparing or Reviewing Sampling Plans for Soil and Groundwater Investigation of Fuel Contamination Sites (January, 1989)

Guidance and Reference Documents Used to Collect Groundwater Samples (cont.)

Santa Clara Valley Water District	Investigation and Remediation at Fuel Leak sites: Guidelines for Investigation and Technical Report Preparation (March 1989)
Santa Clara Valley Water District	Revised Well Standards for Santa Clara County (July 18, 1989)
American Petroleum Institute	Groundwater Monitoring & Sample Bias; API Publication 4367, Environmental Affairs Department, June 1983
American Petroleum Institute	A Guide to the Assessment and Remediation of Underground Petroleum Releases; API Publication 1628, February 1989
American Petroleum Institute	Literature Summary: Hydrocarbon Solubilities and Attenuations Mechanisms, API Publication 4414, August 1985
Site Specific (as needed)	General and specific regulatory documents as required.

Because ground-water samples collected by G-R are analyzed to the parts per billion (ppb) range for many compounds, extreme care is exercised to prevent contamination of samples. When volatile or semi-volatile organic compounds are included for analysis, G-R sampling crew members will adhere to the following precautions in the field:

1. A clean pair of new, disposable gloves are worn for each well being sampled.

2. When possible, samples are collected from known or suspected wells that are least contaminated (i.e. background) followed by wells in increasing order of contamination.

3. Ambient conditions are continually monitored to maintain sample integrity.

When known or potential organic compounds are being sampled for, the following additional precautions are taken:

1. All sample bottles and equipment are kept away from fuels and solvents. When possible, gasoline (used in generators) is stored away from bailers, sample bottles, purging pumps, etc.

2. Bailers are made of Teflon or Stainless Steel. Other materials such as plastic may contaminate samples with phthalate esters which interfere with many Gas Chromatography (GC) analyses.

3. Volatile organic ground-water samples are collected so that air passage through the sample does not occur or is minimal (to prevent volatiles from being stripped from the samples): sample bottles are filled by slowly running the sample down the side of the bottle until there is a positive convex meniscus over the neck of the bottle; the Teflon side of the septum (in cap) is positioned against the meniscus, and the cap screwed on tightly; the sample is inverted and the bottle lightly tapped. The absence of an air bubble indicates a successful seal; if a bubble is evident, the cap is removed, more sample is added, and the bottle is resealed.

4. Extra Teflon seals are brought into the field in case seals are difficult to handle and/or are dropped. Dropped seals are considered contaminated and are not used. When replacing seals or if seals become flipped, care is taken to assure that the Teflon seal faces down.

Sample analysis methods, containers, preservatives and holding times are shown on Table 1.

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Laboratory and field handling procedures of samples are monitored by including QC samples for analysis with every submitted sample lot from a project site. QC samples may include any combination of the following:

A. Trip Blank: Used for purgeable organic compounds only; QC samples are collected in 40 milliliter (ml) sample vials filled in the analytical laboratory with organic-free water. Trip blanks are sent to the project site, and travel with project site samples. Trip blanks are not opened, and are returned from a project site with the project site samples for analysis.

B. Field Blank: Prepared in the field using organic-free water. These QC samples accompany project site samples to the laboratory and are analyzed for specific chemical parameters unique to the project site where they were prepared.

C. Duplicates: Duplicated samples are collected "second samples" from a selected well and project site. They are collected as either split samples or second-run samples collected from the same well.

D. Equipment Blank: Periodic QC sample collected from field equipment rinsate to verify decontamination procedures.

The number and types of QC samples are determined as follows:

A. Up to 2 wells - Trip Blank Only

B. 2 to 5 Wells - 1 Field Blank and 1 Trip Blank

C. 5 to 10 Wells - 1 Field blank, 1 Trip Blank, and 1 Duplicate

D. More than 10 Wells - 1 Field Blank, 1 Trip Blank, and 1 Duplicate per each 12 wells

E. If sampling extends beyond one day, quality control samples will be collected for each day.

Additional QC is performed through ongoing and random reviews of duplicate samples to evaluate the precision of the field sampling procedures and analytical laboratory. Precision of QC data is accomplished by calculating the Relative Percent Difference (RPD). The RPD is evaluated to assess whether values are within an acceptable range (typically ± 20% of duplicate sample).

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SAMPLE COLLECTION

This section describes the routine procedures followed by G-R while collecting ground-water samples for chemical analysis. These procedures include decontamination, water-level measurements, well purging, physical parameter measurements, sample collection, sample preservation, sample handling, and sample documentation. Critical sampling objectives for G-R are to:

1. Collect ground-water samples that are representative of the sampled matrix and,

2. Maintain sample integrity from the time of sample collection to receipt by the analytical laboratory.

Sample analyses methods, containers, preservation, and holding times are presented in Table 1.

Decontamination Procedures

All physical parameter measuring and sampling equipment are decontaminated prior to sample collection using Alconox or equivalent detergent followed by steam cleaning with deionized water. Any sampling equipment surfaces or parts that might absorb specific contaminants, such as plastic pump valves, impellers, etc., are cleaned in the same manner.

Sample bottles, bottle caps, and septa used for sampling volatile organics are thoroughly cleaned and prepared in the laboratory. Sample bottles, bottle caps, and septa are protected from all potential chemical contact before actual usage at a sample location.

During field sampling, equipment placed in a well are decontaminated before purging or sampling the next well. The equipment are decontaminated by cleaning with Alconox or equivalent detergent followed by steam cleaning with deionized water.

Water-Level Measurements

Prior to purging and sampling a well, the static-water levels are measured in all wells at a project site using an electric sounder and/or calibrated portable oil-water interface probe (Figure 4). Both static water-level and separate-phase product thickness are measured to the nearest ±0.01 foot. The presence of separate-phase product is confirmed using a clean, acrylic or polyvinylchloride (PVC) bailer, measured to the nearest ±0.01 foot with a decimal scale tape.

Water-Level Measurements (continued)

The monofilament line used to lower the bailer is replaced between wells with new line to preclude the possibility of cross-contamination. Field observations (e.g. well integrity, product color, turbidity, water color, odors, etc.) are noted on the G-R Well Sampling Field Data Sheet shown in Figure 4. Before and after each use, the electric sounder, interface probe and bailer are decontaminated by washing with Alconox or equivalent detergent followed by rinsing with deionized water to prevent cross-contamination.

As mentioned previously, water-levels are measured in wells with known or suspected lowest dissolved chemical concentrations to the highest dissolved concentrations.

Well Purging

Before sampling occurs, well casing storage water and interstitial water in the artificial sand pack will be purged using (1) a positive displacement bladder pump constructed of inert, non-wetting, Teflon and stainless steel, (2) a pneumatic-airlift pumping system, (3) a centrifigal pumping system, or (4) a Teflon or Stainless steel bailer (Figure 5). Methods of purging will be assessed based on well size, location, accessibility, and known chemical conditions. Individual well purge volumes are calculated from borehole volumes which take into account the sand packed interval in the well annular space. As a general rule, a minimum of 3 and a maximum of 10 borehole volumes will be purged. Wells which dewater or demonstrate slow recharge periods (i.e. low-yield wells) during purging activities may be sampled after fewer purging cycles. If a low-yield (low recovery) well is to be sampled, sampling will not take place until at least 80 percent of the previously measured water column has been replaced by recharge, or as per local requirements. Physical parameter measurements (temperature, pH, and specific conductance) are closely monitored throughout the well purging process and are used by the G-R sampling crew as indicators for assessing sufficient purging. Purging is continued until all three physical parameters have stabilized. Specific conductance (conductivity) meters are read to the nearest ± 10 umhos/cm, and are calibrated daily. pH meters are read to the nearest ± 0.1 pH units and are calibrated daily. Temperature is read to the nearest 0.1 degree F. Calibration of physical parameter meters will follow manufacturers specifications. Monitoring wells will be purged according to the protocol presented in Figure 5. Collected field data during purging activities will be entered on the G-R Well Sampling Field Data Sheet shown in Figure 4. Copies of the G-R Field Data Sheets will be reviewed by the G-R Sampling Manager for accuracy and completeness.

DOCUMENTATION

Sample Container Labels

Each sample container will be labeled by an adhesive label, noted in permanent ink immediately after the sample is collected. Label information will include:

Sample point designation (i.e. well number or code)

Sampler's identification

Project number

Date and time of collection

Type of preservation used

Well Sampling Data Forms

In the field, the G-R sampling crew will record the following information on the Well Sampling Data Sheet for each sample collected:

Project number

Client

Location

Source (i.e. well number)

Time and date

Well accessibility and integrity

Pertinent well data (e.g. depth, product thickness, static water-level, pH, specific conductance, temperature)

Calculated and actual purge volumes

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Chain-of-Custody

A Chain-of-Custody record (Figure 6) shall be completed and accompany every sample and every shipment of samples to the analytical laboratory in order to establish the documentation necessary to trace sample possession from time of collections. The record will contain the following information:

- Sample or station number or sample identification (ID)
- Signature of collector, sampler, or recorder
- Date and time of collection
- Place of collection
- Sample type
- Signatures of persons involved in chain of possession
- Inclusive dates of possession

Samples shall always be accompanied by a Chain-of-Custody record. When transferring the samples, the individual relinquishing and receiving the samples will sign, date, and note the time on the Chain-of-Custody record. G-R will be responsible for notifying the laboratory coordinator when and how many samples will be sent to the laboratory for analysis, and what types of analyses shall be performed.

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FIELD EXPLORATORY BORING LOG

Field location of boring

Project No. | Date | Boring No.

Client:

Location:

City | Sheet: of

Logged by | Driller

Drilling method

Casing installation data

Hole diameter

Top of box Elevation | Datum:

Water Level:

Time

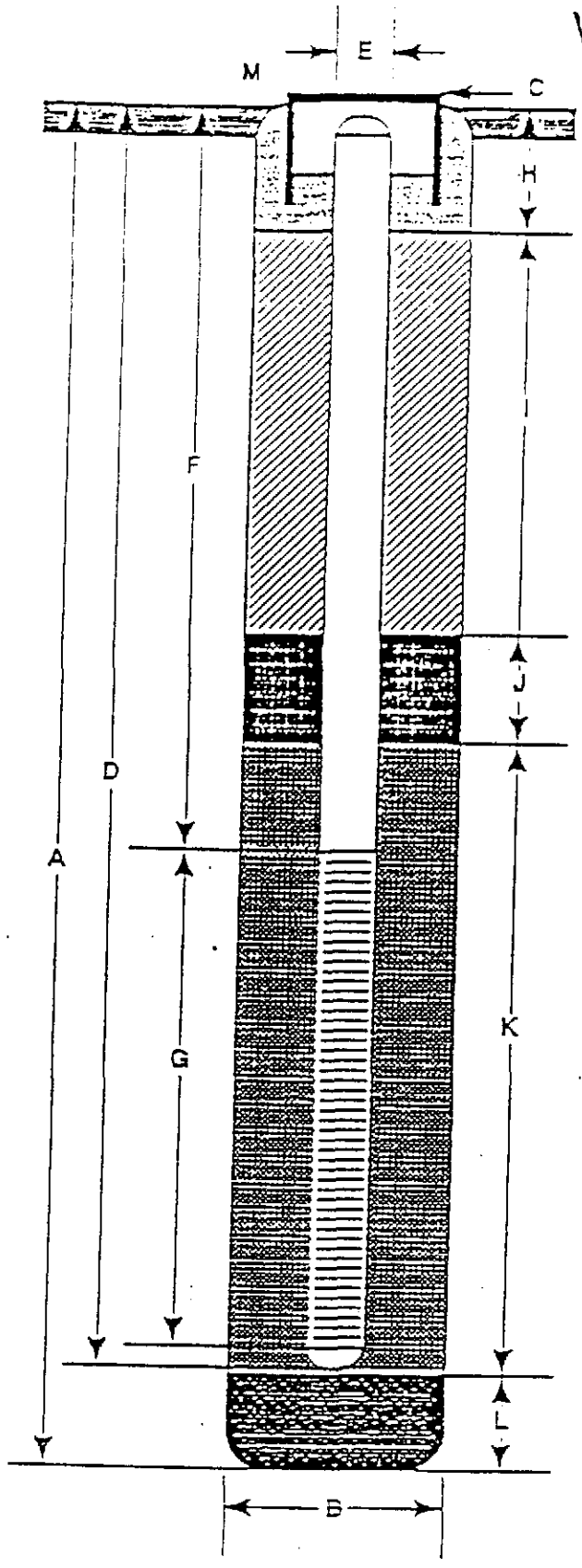
Date

PID (ppm)	Blowcnt. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description

Remarks

WELL CONSTRUCTION DETAIL

FIGURE 2



A Total Depth of Boring _____ ft.

B Diameter of Boring _____ in.
Drilling Method _____

C Top of Box Elevation _____ ft.
☐ Referenced to Mean Sea Level
☐ Referenced to Project Datum

D Casing Length _____ ft.
Material _____

E Casing Diameter _____ in.

F Depth to Top Perforations _____ ft.

G Perforated Length _____ ft.
Perforated Interval from _____ to _____ ft.
Perforation Type _____
Perforation Size _____ in.

H Surface Seal from _____ to _____ ft.
Seal Material _____

I Backfill from _____ to _____ ft.
Backfill Material _____

J Seal from _____ to _____ ft.
Seal Material _____

K Gravel Pack from _____ to _____ ft.
Pack Material _____

L Bottom Seal _____ ft.
Seal Material _____

M _____

Note: Depths measured from initial ground surface

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Well Construction Detail

WELL NO.

JOB NUMBER | REVIEWED BY RG/CEG | DATE | REVISED DATE | REVISED DATE

WELL DEVELOPMENT FORM

FIGURE 3

Page_____ of_____

(to be filled out in office)

Client_____ SS#_____ Job#_____

Name_____ Location_____

Well#_____ Screened Interval_____ Depth_____

Aquifer Material_____ Installation Date _____

Drilling Method_____ Borehole Diameter_____

Comments regarding well installation:_____

(to be filled out in the field) Name_____

Date_____ Development Method_____

Total Depth_____ - Depth to liquid_____ = WaterColumn_____

Product thickness_____

_____ x _____ x _____ x 0.0408 = _____gals
Water Column Diameter (in.) #Vol

Purge Start_____ Stop_____ Rate_____ gpm

Gallons	Time	Clarity	Temp.	pH	Conductivity
0					

Total gallons removed_____ Development stop time_____

Depth to liquid _____at_____(time)

Odor of water_____ Water discharged to_____

Comments_____

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588 VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 20200 Hesperian Boulevard, San Lorenzo, California ARCO Station 5387

CLIENT
Name ARCO Products Co
Address P.O. Box 5811 Voice (415) 571-2434
City San Mateo, CA Zip 94402

APPLICANT
Name GeoStrategies Inc
B Sieminski Fax (510) 551-7888
Address 6747 Sierra Ct, Suite G Voice (510) 551-7444 ext. 288
City _____ Zip _____

TYPE OF PROJECT

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

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other _____
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger Hollow Stem
Cable ___ Other _____

DRILLER'S LICENSE NO. C-57 # 374152

WELL PROJECTS

Drill Hole Diameter	8"	in. (7) 10" (1)	Maximum		
Casing Diameter	2	in. (7) 4" (1)	Depth	40	ft. (7) 15' (1)
Surface Seal Depth	37	ft. (7) 4' (1)	Number	8	

GEOTECHNICAL PROJECTS

Number of Borings	___		Maximum		
Hole Diameter	___	in.	Depth	___	ft.

ESTIMATED STARTING DATE 12/6/93
ESTIMATED COMPLETION DATE 12/7/93

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

APPLICANT'S SIGNATURE Barbara Sieminski Date 11/08/93

FOR OFFICE USE

PERMIT NUMBER 93645
LOCATION NUMBER _____

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. 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 drilling logs and location sketch for geotechnical projects.
3. 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.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

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

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 18 Nov 93
Wyman Hong

91992

MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 15% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 15% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT		PEAT AND OTHER HIGHLY ORGANIC SOILS

LL - Liquid Limit (%)

PI - Plastic Index (%)

PID - Volatile Vapors in ppm

MA - Particle Size Analysis

2.5 YR 6/2 - Soil Color according to Munsell Soil Color Charts (1975 Edition)

5 GY 5/2 - GSA Rock Color Chart

 - No Soil Sample Recovered

 - "Undisturbed" Sample

 - Bulk or Classification Sample

 - First Encountered Ground Water Level

 - Piezometric Ground Water Level

Penetration - Sample drive hammer weight - 140 pounds falling 30 inches. Blows required to drive sampler 1 foot are indicated on the logs

GeoStrategies Inc.

Unified Soil Classification - ASTM D 2488-85
and Key to Test Data

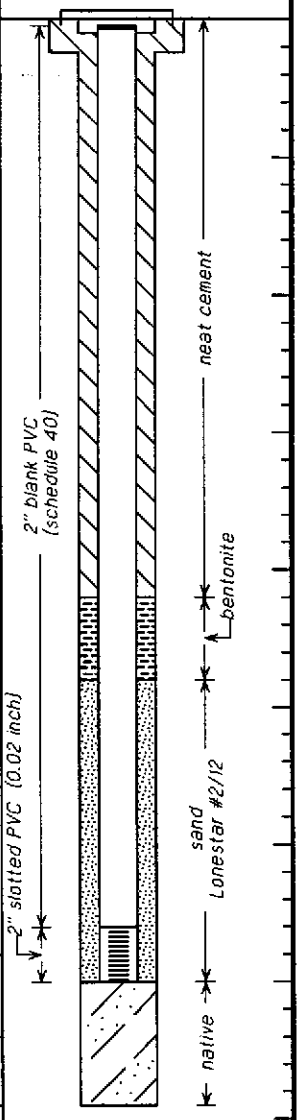
GeoStrategies, Inc.

Log of Boring AS-3

PROJECT: *ARCO Station 5387*	LOCATION: *20200 Hesperian Blvd, Hayward, Ca.*
GSI PROJECT NO.: *7926.12*	SURFACE ELEVATION: *38.92ft. MSL*
DATE STARTED: *12/6/93*	WL (ft. bgs): *17.5* DATE: *12/6/93* TIME: *09:45*
DATE FINISHED: *12/6/93*	WL (ft. bgs): *15* DATE: *12/6/93* TIME:
DRILLING METHOD: *6 in. Hollow Stem Auger*	TOTAL DEPTH: *39.5 Feet*
DRILLING COMPANY: *Bayland / Green Drilling*	GEOLOGIST: *TW*

DEPTH feet	PID (ppm)	BLOWS/FT. *	SAMPLE NUMBER	SOIL CLASS	GEOLOGIC DESCRIPTION
				PV	PAVEMENT SECTION – 6" concrete
				ML	CLAYEY SILT (ML) – very dark brown (10YR 2/2), medium stiff, damp, 60% silt, 40% clay, low plasticity.
5	0	33	AS-3-6.5		Color change to dark yellowish brown (10YR 3/6), becoming hard at 5 ft
				CL	SILTY CLAY (CL) – greenish gray (5BG 5/1) with light mottling yellowish brown (10YR 5/6), stiff, moist, 80% clay, 20% silt.
10	4.3	14	AS-3-11.5		
15	NM	12			Color change to olive gray (5Y 4/2), increase sand to 25% at 15 ft.
				SM	SILTY SAND (SM) – brown (10YR 4/3), medium dense, saturated, 60% sand, 25% silt, 15% clay, low plasticity.
20	0	15	AS-3-21.5		
25	0	35	AS-3-26.5		Color change to dark gray (5Y 4/1) at 25 ft.
				GW	GRAVEL WITH SAND AND SILT (GW) – yellowish brown (10YR 5/6), dense, saturated, 60% gravel, 30% fine- to coarse-grained sand, 10% fines.
30	1.4	44	AS-3-31.5		
35	NM	35		CL	SANDY CLAY (CL) – yellowish brown (10YR 5/6), hard, moist, 60% clay, 40% fine-grained sand.
				SC	CLAYEY SAND (SC) – dark grayish brown (10YR 4/2), medium dense, saturated.
40	0	25	AS-3-39.5		
					BOTTOM OF BORING AT 39.5 FEET. 12/6/93
45					(* = converted to equivalent standard penetration blows/ft.)
					NM = Not Measured

WELL DIAGRAM



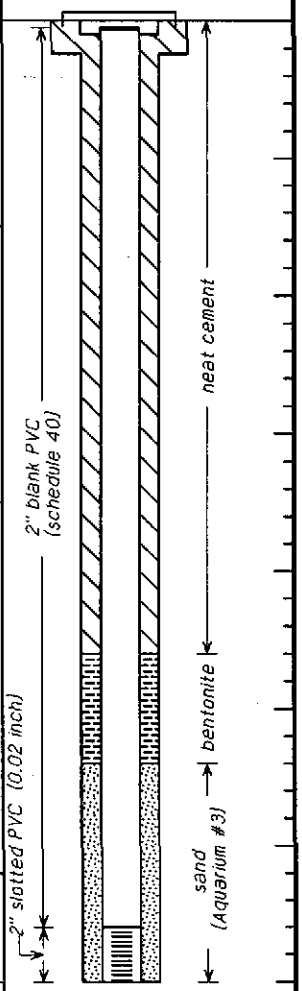
GeoStrategies, Inc.

Log of Boring AS-4

PROJECT: *ARCO Station 5387*	LOCATION: *20200 Hesperian Blvd, Hayward, Ca.*
GSI PROJECT NO. : *7926.12*	SURFACE ELEVATION: *38.50ft. MSL*
DATE STARTED: *12/7/93*	WL (ft. bgs): *17.5* DATE: *12/7/94* TIME:
DATE FINISHED: *12/7/93*	WL (ft. bgs): *16* DATE: *12/7/94* TIME:
DRILLING METHOD: *6 in. Hollow Stem Auger*	TOTAL DEPTH: *35.5 Feet*
DRILLING COMPANY: *Bayland / Green Drilling*	GEOLOGIST: *TW*

DEPTH feet	PID (ppm)	BLOWS/FT. *	SAMPLE NUMBER	SOIL CLASS	GEOLOGIC DESCRIPTION
0				PV	PAVEMENT SECTION – 6" concrete
				ML	CLAYEY SILT (ML) – very dark brown (10YR 2/2), medium stiff, damp, 60% silt, 40% clay, low plasticity.
10	21	14	AS-4-11.5	CL	SILTY CLAY (CL) – dark greenish gray (5GY 4/1), stiff, moist, 80% clay ,20% silt, medium plasticity.
20				SM	SILTY SAND (SM) – brown (7.5YR 5/4), medium dense, saturated, 65% sand, 35% silt.
30					Increasing coarse-grained sand and fine gravel at 28 feet.
35	0	25	AS-4-34.5	ML	SANDY SILT (ML) – brown (10YR 4/3), very stiff, very moist , 60% silt, 40% fine-grained sand.
					BOTTOM OF BORING AT 35 FEET. 12/7/93

(* = converted to equivalent standard penetration blows/ft.)



GeoStrategies, Inc.

Log of Boring AS-5

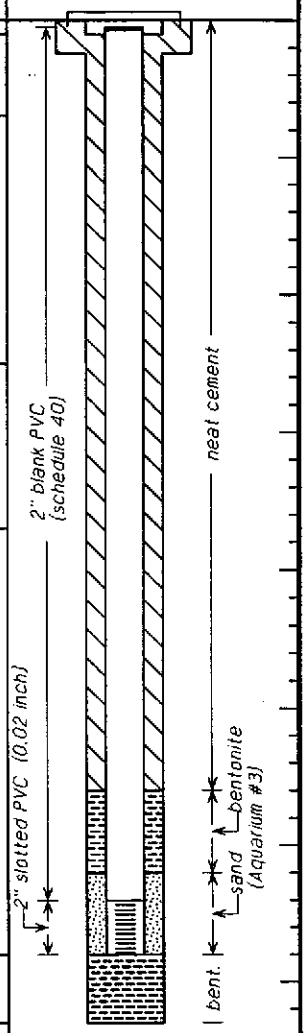
PROJECT: *ARCO Station 5387*	LOCATION: *20200 Hesperian Blvd, Hayward, CA.*
GSI PROJECT NO. : *7926.12*	SURFACE ELEVATION: *38.76ft. MSL*
DATE STARTED: *9/7/93*	WL (ft. bgs): *17* DATE: *12/7/93* TIME:
DATE FINISHED: *9/7/93*	WL (ft. bgs): *17* DATE: *12/7/93* TIME:
DRILLING METHOD: *8 in. Hollow Stem Auger*	TOTAL DEPTH: *36.5 Feet*
DRILLING COMPANY: *Exploration Geoservices*	GEOLOGIST: *RDC*

DEPTH feet	PID (ppm)	BLOWS/FT. *	SAMPLE NUMBER	SOIL CLASS	GEOLOGIC DESCRIPTION
				PV	PAVEMENT SECTION - 6" concrete
				CL	SILTY CLAY (CL) - very dark gray (10YR 3/1), medium stiff, damp, 55% clay, 45% silt, low plasticity.
5	NM	NM	AS-5-6.5	ML	CLAYEY SILT (ML) - very dark gray (10YR 3/1), medium stiff, damp, 60% silt, 40% clay, low plasticity. Color change to olive (5Y 4/3) at 7.0 feet.
10	NM	NM	AS-5-11.5		
15	NM	NM	AS-5-16.5	CL	SILTY CLAY (CL) - dark greenish gray (5BG 4/1), medium stiff, very moist, 65% clay, 35% silt, low plasticity. Saturated at 17.0 feet.
20	NM	NM	AS-5-21.5	SM	SILTY SAND (SM) - brown (7.5YR 5/4), medium dense, saturated, 60% fine to medium-grained sand, 40% silt.
25	NM	NM	AS-5-26.5		
30	NM	NM	AS-5-31.5		
35	NM	NM	AS-5-36.5	CL	SILTY CLAY (CL) - dark grayish brown (10YR 4/2), medium stiff, moist, 55% clay, 45% silt, low plasticity.
40					BOTTOM OF BORING AT 36.5 FEET. 12/7/93
45					

(* = converted to equivalent standard penetration blows/ft.)

NM = Not Measured

WELL DIAGRAM



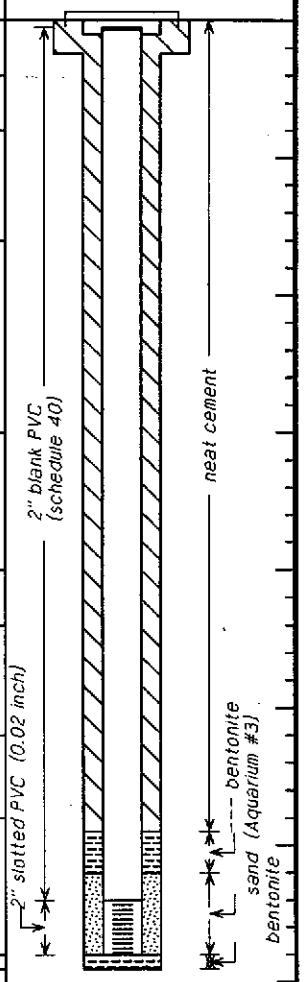
GeoStrategies, Inc.

Log of Boring AS-6

PROJECT: *ARCO Station 5387*	LOCATION: *20200 Hesperian Blvd, Hayward, CA.*
GSI PROJECT NO. : *7926.12*	SURFACE ELEVATION: *38.38ft. MSL*
DATE STARTED: *01/24/94*	WL (ft. bgs): *15* DATE: *01/24/94* TIME:
DATE FINISHED: *01/24/94*	WL (ft. bgs): *15* DATE: *01/24/94* TIME:
DRILLING METHOD: *8 in. Hollow Stem Auger*	TOTAL DEPTH: *34.5 Feet*
DRILLING COMPANY: *Exploration Geoservices*	GEOLOGIST: *BS*

DEPTH feet	PID (ppm)	BLOWS/FT. *	SAMPLE NUMBER	SOIL CLASS	GEOLOGIC DESCRIPTION
				Box	EXISTING WELL BOX.
				SP	SAND (SP) – gray (5Y 5/1), medium dense, very moist, 100% fine– to medium–grained sand; backfill.
5	0	NM	AS–6–4.5	ML	CLAYEY SILT WITH SAND (ML) – dark greenish gray (5G 4/1), stiff, moist, 70% fines, 30% fine–grained sand, low plasticity.
				CL	SILTY CLAY (CL) – dark greenish gray (5BG 4/1), stiff, damp, 85% fines, 15% fine–grained sand, medium plasticity.
10	3	NM	AS–6–10		
	25	NM	AS–6–14		
15				SM	SILTY SAND (SM) – dark greenish gray (5G 4/1), medium dense, saturated, 60% fine– to medium–grained sand, 40% fines.
20	0	NM	AS–6–20	ML	SANDY SILT (ML) – light olive brown (2.5Y 5/6), stiff, moist, 70% fines, 30% fine–grained sand, low plasticity.
				SM	SILTY SAND (SM) – yellowish brown (10YR 5/6) mottled olive (5Y 5/6), dense, saturated, 70% fine–grained sand, 30% fines.
25	0	NM	AS–6–25	SP	SAND (SP) – dark yellowish brown (10YR 4/6), dense, saturated, 95% fine–grained sand, 5% fines.
30				SM	SILTY SAND (SM) – light olive brown (2.5Y 5/4), dense, saturated, 70% fine–grained sand, 30% fines.
	0	NM	AS–6–34		Decreasing sand at 33 feet.
35				CL	SANDY CLAY (CL) – olive brown (2.5Y 4/4), very stiff, damp to moist, 70% fines, 30% sand, low plasticity.
					BOTTOM OF BORING AT 34.5 FEET.
40					12/6/93
					(* = converted to equivalent standard penetration blows/ft.)
45					NM = Not Measured

WELL DIAGRAM

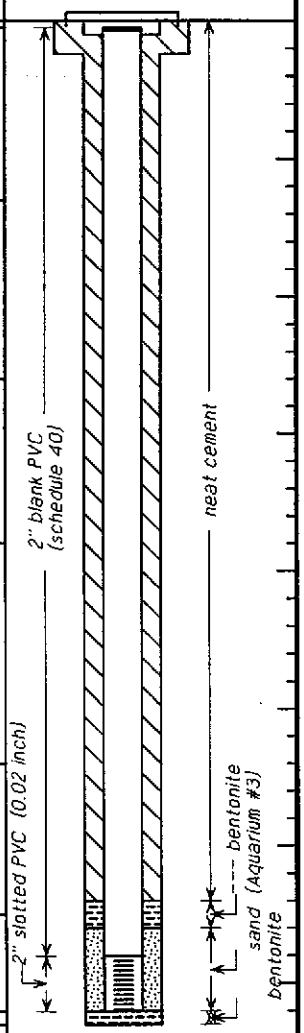


GeoStrategies, Inc.

Log of Boring AS-7

PROJECT: *ARCO Station 5387*	LOCATION: *20200 Hesperian Blvd, Hayward, CA.*
GSI PROJECT NO. : *7926.12*	SURFACE ELEVATION: *39.79ft. MSL*
DATE STARTED: *12/6/93*	WL (ft. bgs): *19* DATE: *12/6/93* TIME:
DATE FINISHED: *12/6/93*	WL (ft. bgs): *19* DATE: *12/6/93* TIME:
DRILLING METHOD: *8 in. Hollow Stem Auger*	TOTAL DEPTH: *36.5 Feet*
DRILLING COMPANY: *Bayland / Green Drilling*	GEOLOGIST: *RDC*

DEPTH feet	PID (ppm)	BLOWS/FT. *	SAMPLE NUMBER	SAMPLE INT.	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						PV	PAVEMENT SECTION – 3" asphalt.
						CL	SILTY CLAY (CL) – very dark brown (10YR 2/2), very stiff, damp, 60% clay, 40% silt, low plasticity.
5	0	20	AS-7-6.5				
						ML	CLAYEY SILT (ML) – dark greenish gray (5GY 4/1), stiff, damp, 55% silt , 45% clay, low plasticity.
10	0	8	AS-7-11.5				
						ML	CLAYEY SILT WITH SAND (ML) – olive gray (5Y 4/2), medium stiff, moist, 50% silt, 30% clay, 20% fine-grained sand, low plasticity.
15	6.9	6	AS-7-16.5				
						SM	SILTY SAND (SM) – dark yellowish brown (10YR 4/6), medium dense, saturated, 60% fine-grained sand, 40% silt.
20	32	12	AS-7-21.5				
25	0	11	AS-7-26.5				
						GM	SILTY GRAVEL WITH SAND (GM) – dark yellowish brown (10YR 4/4), dense, saturated, 50% fine gravel, 20% medium- to coarse-grained sand, 15% fine-grained sand, 15% silt.
30	23	35	AS-7-31.5				
						SM	SILTY SAND (SM) – dark yellowish brown (10YR 4/3), dense, saturated, 40% fine-grained sand, 30% silt, 20% coarse-grained sand, 10% fine gravel.
35	0	8	AS-7-36.5				
						CL	SILTY CLAY WITH SAND (CL) – olive brown (2.5Y 4/4), stiff, moist, 50% clay, 30% silt, 20% fine-grained sand.
40							BOTTOM OF BORING AT 36.5 FEET. 12/6/93
45							(* = converted to equivalent standard penetration blows/ft.)



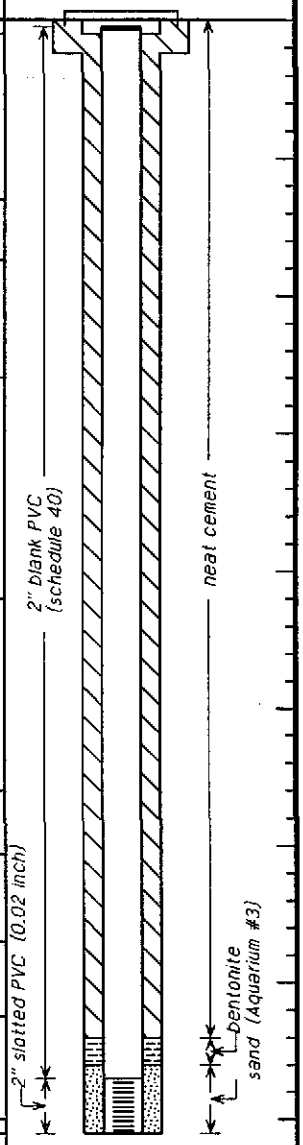
GeoStrategies, Inc.

Log of Boring AS-8

PROJECT: *ARCO Station 5387*	LOCATION: *20200 Hesperian Blvd, Hayward, CA.*
GSI PROJECT NO.: *7926.12*	SURFACE ELEVATION: *39.04ft. MSL*
DATE STARTED: *12/7/93*	WL (ft. bgs): *17* DATE: *12/7/93* TIME:
DATE FINISHED: *12/7/93*	WL (ft. bgs): *17* DATE: *12/7/93* TIME:
DRILLING METHOD: *8 in. Hollow Stem Auger*	TOTAL DEPTH: *40.5 Feet*
DRILLING COMPANY: *Bayland / Green Drilling*	GEOLOGIST: *RDC*

DEPTH feet	PID (ppm)	BLOWS/FT. *	SAMPLE NUMBER	SOIL CLASS	GEOLOGIC DESCRIPTION
				PV	PAVEMENT SECTION – 6" concrete
				ML	SANDY SILT (ML) – black (10YR 2/1), very stiff, damp, 55% silt, 30% fine sand, 15% clay, low plasticity.
5	0	21	AS-8-6.5		
				CL	SILTY CLAY (CL) – dark greenish gray (5GY 4/10), very stiff, moist, 50% clay, 40% silt, 10% fine-grained sand, low plasticity.
10	3	11	AS-8-11.5	ML	SANDY SILT (ML) – black (10YR 2/1), very stiff, moist, 50% silt, 30% fine-grained sand, 20% clay, low plasticity.
				ML	CLAYEY SILT (ML) – black (10YR 2/1), stiff, moist, 50% silt, 45% clay, 5% fine-grained sand; with root holes and roots.
15	0	8	AS-8-16.5		
20	3.7	8	AS-8-21.5	SM	SILTY SAND (SM) – yellowish brown (10YR 3/4) with olive mottling, loose, saturated, 85% fine- to medium-grained sand, 15% silt.
25	115	12	AS-8-26.5		Color change to olive (5Y 4/4), medium dense, increase silt to 30%.
				SW	SAND (SW) – yellowish brown (10YR 3/4), medium dense, saturated, 50% medium- to coarse-grained sand, 45% fine sand, 5% fines.
30	41	25	AS-8-31.5	SM	SILTY SAND (SM) – yellowish brown (10YR 3/4), medium dense, saturated, 85% fine- to medium-grained sand, 15% silt.
				SP	SAND (SP) – dark gray (5Y 3/1), medium dense, saturated, 95% medium- to coarse-grained sand, 5% fines.
35	0	24	AS-8-36.5	SW	SAND WITH GRAVEL (SW) – dark gray (5Y 3/1), medium dense, saturated, 70% fine- to coarse-gained sand, 25% fine gravel, 5% fines.
40	0	16	AS-8-40.5	ML	SANDY SILT (ML) – olive brown (2.5Y 4/4), very stiff, very moist, 50% silt, 45% sand, 5% clay.
45					BOTTOM OF BORING AT 40.5 12/7/93

WELL DIAGRAM



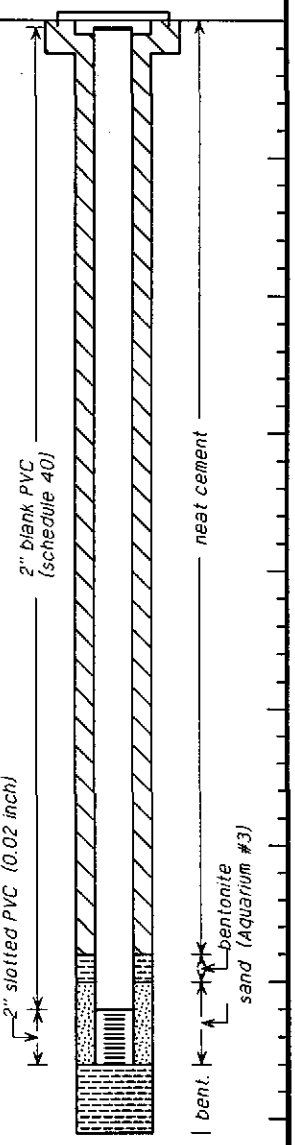
GeoStrategies, Inc.

Log of Boring AS-9

PROJECT: *ARCO Station 5387*	LOCATION: *20200 Hesperian Blvd, Hayward, CA.*
GSI PROJECT NO.: *7926.12*	SURFACE ELEVATION: *38.40ft. MSL*
DATE STARTED: *12/6/93*	WL (ft. bgs): *18* DATE: *12/6/93* TIME:
DATE FINISHED: *12/6/93*	WL (ft. bgs): *17.5* DATE: *12/6/93* TIME:
DRILLING METHOD: *8 in. Hollow Stem Auger*	TOTAL DEPTH: *40.5 Feet*
DRILLING COMPANY: *Bayland / Green Drilling*	GEOLOGIST: *RDC*

DEPTH feet	PID (ppm)	BLOWS/FT. *	SAMPLE NUMBER	SOIL CLASS	GEOLOGIC DESCRIPTION
				PV	PAVEMENT SECTION - 7" baserock, 5" asphalt
				CL	SILTY CLAY (CL) - very dark gray (10YR 3/1), medium stiff, damp, 55% clay, 45% silt, medium plasticity.
				ML	
5	115	18	AS-9-6.5		CLAYEY SILT (ML) - very dark grayish brown (10YR 3/2), very stiff, damp, 50% silt, 40% clay, 10% fine-grained sand, low plasticity.
					Color change to olive (5Y 4/3) at 7.5 feet.
10	510	7	AS-9-11.5	CL	Color change to dark greenish gray (5BG 4/1) at 9 feet.
					SANDY CLAY (CL) - dark greenish gray (5BG 4/1), medium stiff, moist, 50% clay, 30% fine-grained sand, 20% silt, low plasticity.
15	426	8	AS-9-16.5		Becoming very moist at 15 feet.
				SM	SILTY SAND (SM) - brown (7.5 YR 5/4), medium dense, saturated, 80% sand, 20% silt.
20	6.2	10	AS-9-21.5		
25	22.9	22	AS-9-26.5	GM	SILTY GRAVEL WITH SAND (GM) - dark yellowish brown (10YR 4/4), saturatated, 45% fine gravel, 40% fine- to coarse-grained sand, 15% silt.
				SP	
30	19.7	17	AS-9-31.5		SAND (SP) - dark grayish brown (10YR 4/2), medium dense, saturated, 95% medium-grained sand, 5% silt.
35	14.2	7	AS-9-36.5	SM	SILTY SAND (SM) - dark grayish brown (10YR 4/2), loose, saturated, 80% sand, 20% silt.
	0	2	AS-9-38		
40	0	11	AS-9-40.5	CL	SANDY CLAY (CL) - dark grayish brown (10YR 4/2), stiff, moist, 60% clay, 30% fine-grained sand, 10% silt, low plasticity.
45					BOTTOM OF BORING AT 40.5 FEET 12/6/93

WELL DIAGRAM



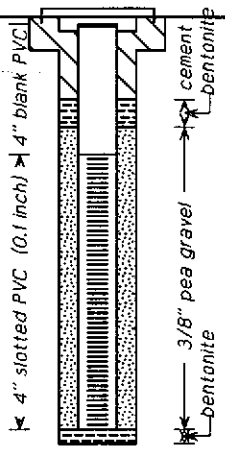
GeoStrategies, Inc.

Log of Boring AV-4

PROJECT: *ARCO Station 5387*	LOCATION: *20200 Hesperian Blvd, Hayward, Ca.*
GSI PROJECT NO.: *7926.12*	SURFACE ELEVATION: *38.62ft. MSL*
DATE STARTED: *12/7/93*	WL (ft. bgs): *15* DATE: *12/7/93* TIME: *09:15*
DATE FINISHED: *12/7/93*	WL (ft. bgs): DATE: TIME:
DRILLING METHOD: *6 in. Hollow Stem Auger*	TOTAL DEPTH: *15 Feet*
DRILLING COMPANY: *Bayland / Green Drilling*	GEOLOGIST: *TW*

DEPTH feet	PID (ppm)	BLOWS/FT. *	SAMPLE NUMBER	SOIL CLASS	GEOLOGIC DESCRIPTION
0				PV	PAVEMENT SECTION – 6" concrete
				CL	SILTY CLAY (CL) – very dark brown (10YR 2/1), medium stiff, damp, 70% clay, 30% silt, medium plasticity.
				ML	CLAYEY SILT (ML) – dark yellowish brown (10YR 4/6), very stiff, damp, 60% silt, 40% clay, medium plasticity.
5	0	30	AV-4-6.5		
10	0	11	AV-4-11.5	CL	SILTY CLAY (CL) – greenish gray (5GY 5/1), stiff, moist, 70% clay, 30% silt, trace fine-grained sand.
15	0	18	AV-4-15.5		▽ Color change to dark greenish gray (5GY 4/1), becoming, very moist, very stiff.
					BOTTOM OF BORING AT 15.5 feet. 12/7/93
20					(* = converted to equivalent standard penetration blows/ft.)
25					
30					
35					
40					
45					

WELL DIAGRAM



Virgil Chavez Land Surveying
1418 Lassen Street
Vallejo, California 94591
707.553.2476

February 23, 1994
Project No. 1104-07

Barbara Sieminski
GeoStrategies, Inc.
6747 Sierra Ct., Suite D
Dublin, Ca. 94568

Subject: Monitoring Well Survey
20200 Hesperian Blvd.
San Lorenzo, Ca.

FEB 28 1994

GeoStrategies Inc.

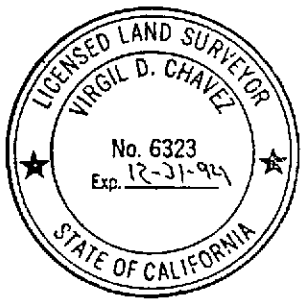
Dear Barbara:

This is to confirm that we have proceeded at your request to survey the ground water monitoring wells located at the above referenced location. The survey was performed on February 1, and February 22, 1994. My findings are shown in the table on page 2, and are based on N.G.V.D. (National Geodetic Vertical Datum). The benchmark used for the survey was a monument disk stamped Hesp. A 1953, located in the centerline intersection of "A" Street and Hesperian Blvd.

Measurements for top of box were taken at approximate north side of top of box. Measurements for top of casing were marked with hashes using a black marker on the top of casing.

Sincerely yours,

Virgil D. Chavez, P.L.S. 6323
Virgil Chavez Land Surveying



Monitoring Well Survey
20200 Hesperian Blvd.
San Lorenzo, Ca.

Monitoring Well No.	Rim Elevation	Top of Casing Elevation
MW- 1	38.33'	37.26'
MW- 2	38.55'	37.99'
MW- 3	37.80'	36.80'
A- 4	39.84'	39.46'
A- 5	38.92'	38.47'
A- 7	39.93'	39.38'
A- 8	37.20'	36.76'
A- 9	38.70'	38.19'
A-10	38.93'	38.66'
AR-1	38.14'	37.46'
AR-2	38.47'	37.98'
AV-1	38.42'	37.01'
AV-2	39.67'	39.07'
AV-3	38.96'	37.56'
AV-4	38.62'	37.16'
AS-1	38.00'	37.05'
AS-2	38.28'	37.51'
AS-3	38.92'	38.19'
AS-4	38.50'	37.66'
AS-5	38.76'	38.00'
AS-6	38.38'	37.97'
AS-7	39.79'	39.04'
AS-8	39.04'	38.24'
AS-9	38.40'	37.55'

Virgil D. Chavez, P.L.S. 6323

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
1900 Bates Avenue, Suite L, Concord, CA 94520, (510) 686-9600, FAX (510) 686-9689
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Gettler Ryan/Geostrategies
6747 Sierra Court, Ste J
Dublin, CA 94568
Attention: Matt Donohue

Project: 5387-93-4B, Arco 5387-San Lorenzo

Enclosed are the results from 24 soil samples received at Sequoia Analytical on December 9,1993. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
3L64201	Soil, AS-3-6.5	12/6/93	EPA 5030/8015 mod./8020
3L64202	Soil, AS-3-11.5	12/6/93	EPA 5030/8015 mod./8020
3L64203	Soil, AS-3-39.5	12/6/93	EPA 5030/8015 mod./8020
3L64204	Soil, AS-4-11.5	12/7/93	EPA 5030/8015 mod./8020
3L64205	Soil, AS-4-34.5	12/7/93	EPA 5030/8015 mod./8020
3L64206	Soil, AV-4-6.5	12/7/93	EPA 5030/8015 mod./8020
3L64207	Soil, AV-4-11.5	12/7/93	EPA 5030/8015 mod./8020
3L64208	Soil, AV-4-15.5	12/7/93	EPA 5030/8015 mod./8020
3L64209	Soil, AS-5-6.5	12/6/93	EPA 5030/8015 mod./8020
3L64210	Soil, AS-5-11.5	12/6/93	EPA 5030/8015 mod./8020
3L64211	Soil, AS-5-16.5	12/6/93	EPA 5030/8015 mod./8020
3L64212	Soil, AS-5-36.5	12/6/93	EPA 5030/8015 mod./8020
3L64213	Soil, AS-7-6.5	12/6/93	EPA 5030/8015 mod./8020
3L64214	Soil, AS-7-11.5	12/6/93	EPA 5030/8015 mod./8020
3L64215	Soil, AS-7-16.5	12/6/93	EPA 5030/8015 mod./8020
3L64216	Soil, AS-7-36.5	12/6/93	EPA 5030/8015 mod./8020
3L64217	Soil, AS-9-6.5	12/6/93	EPA 5030/8015 mod./8020
3L64218	Soil, AS-9-11.5	12/6/93	EPA 5030/8015 mod./8020
3L64219	Soil, AS-9-16.5	12/6/93	EPA 5030/8015 mod./8020
3L64220	Soil, AS-9-40.5	12/6/93	EPA 5030/8015 mod./8020
3L64221	Soil, AS-8-6.5	12/7/93	EPA 5030/8015 mod./8020

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
3L64222	Soil, AS-8-11.5	12/7/93	EPA 5030/8015 mod./8020
3L64223	Soil, AS-8-16.5	12/7/93	EPA 5030/8015 mod./8020
3L64224	Soil, AS-8-40.5	12/7/93	EPA 5030/8015 mod./8020

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Todd Olive
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	5387-93-4B, Arco 5387-San Lorenzo	Sampled:	Dec 6, 1993
6747 Sierra Court, Ste J	Sample Matrix:	Soil	Received:	Dec 9, 1993
Dublin, CA 94568	Analysis Method:	EPA 5030/8015 mod./8020	Amended:	Mar 2, 1994
Attention: Matt Donohue	First Sample #:	3L64201		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 3L64201 AS-3-6.5	Sample I.D. 3L64202 AS-3-11.5	Sample I.D. 3L64203 AS-3-39.5	Sample I.D.	Sample I.D.	Sample I.D.
Purgeable Hydrocarbons	1.0	N.D.	N.D.	N.D.			
Benzene	0.0050	N.D.	0.0068	N.D.			
Toluene	0.0050	N.D.	N.D.	N.D.			
Ethyl Benzene	0.0050	N.D.	N.D.	N.D.			
Total Xylenes	0.0050	N.D.	N.D.	N.D.			
Chromatogram Pattern:		--	Low Gas	--			

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0
Date Analyzed:	12/18/93	12/18/93	12/18/93
Instrument Identification:	GCHP-3	GCHP-3	GCHP-3
Surrogate Recovery, %: (QC Limits = 70-130%)	85	76	85

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Todd Olive
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	5387-93-4B, Arco 5387-San Lorenzo	Sampled:	Dec 7, 1993
6747 Sierra Court, Ste J	Sample Matrix:	Soil	Received:	Dec 9, 1993
Dublin, CA 94568	Analysis Method:	EPA 5030/8015 mod./8020	Amended:	Mar 2, 1994
Attention: Matt Donohue	First Sample #:	3L64204		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 3L64204 AS-4-11.5	Sample I.D. 3L64205 AS-4-34.5	Sample I.D. 3L64206 AV-4-6.5	Sample I.D. 3L64207 AV-4-11.5	Sample I.D. 3L64208 AV-4-15.5	Sample I.D.
Purgeable Hydrocarbons	1.0	3.0	N.D.	N.D.	N.D.	2.7	
Benzene	0.0050	0.18	N.D.	N.D.	0.048	0.030	
Toluene	0.0050	0.0062	N.D.	N.D.	N.D.	N.D.	
Ethyl Benzene	0.0050	0.15	N.D.	N.D.	N.D.	0.12	
Total Xylenes	0.0050	0.22	N.D.	N.D.	N.D.	0.063	
Chromatogram Pattern:		Gas	--	--	Low Gas	Low Gas	

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	1.0	1.0
Date Analyzed:	12/18/93	12/18/93	12/18/93	12/18/93	12/18/93
Instrument Identification:	GCHP-3	GCHP-3	GCHP-3	GCHP-3	GCHP-3
Surrogate Recovery, %: (QC Limits = 70-130%)	87	80	82	81	87

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Todd Olive
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	5387-93-4B, Arco 5387-San Lorenzo	Sampled:	Dec 6, 1993
6747 Sierra Court, Ste J	Sample Matrix:	Soil	Received:	Dec 9, 1993
Dublin, CA 94568	Analysis Method:	EPA 5030/8015 mod./8020	Amended:	Mar 2, 1994
Attention: Matt Donohue	First Sample #:	3L64207		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 3L64209 AS-5-6.5	Sample I.D. 3L64210 AS-5-11.5	Sample I.D. 3L64211 AS-5-16.5	Sample I.D. 3L64212 AS-5-36.5	Sample I.D. 3L64213 AS-7-6.5	Sample I.D. 3L64214 AS-7-11.5
Purgeable Hydrocarbons	1.0	N.D.	1.7	N.D.	110	N.D.	N.D.
Benzene	0.0050	N.D.	0.067	N.D.	N.D.	N.D.	N.D.
Toluene	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Ethyl Benzene	0.0050	N.D.	0.073	N.D.	1.7	N.D.	N.D.
Total Xylenes	0.0050	N.D.	0.049	N.D.	1.4	N.D.	N.D.
Chromatogram Pattern:		--	Low Gas	--	Gas	--	--

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	25	1.0	1.0
Date Analyzed:	12/18/93	12/18/93	12/20/93	12/18/93	12/20/93	12/18/93
Instrument Identification:	GCHP-3	GCHP-3	GCHP-18	GCHP-18	GCHP-18	GCHP-18
Surrogate Recovery, %: (QC Limits = 70-130%)	90	87	93	124	97	75

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Todd Olive
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	5387-93-4B, Arco 5387-San Lorenzo	Sampled:	Dec 6, 1993
6747 Sierra Court, Ste J	Sample Matrix:	Soil	Received:	Dec 9, 1993
Dublin, CA 94568	Analysis Method:	EPA 5030/8015 mod./8020	Amended:	Mar 2, 1994
Attention: Matt Donohue	First Sample #:	3L64213		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 3L64215 AS-7-16.5	Sample I.D. 3L64216 AS-7-36.5	Sample I.D. 3L64217 AS-9-6.5	Sample I.D. 3L64218 AS-9-11.5	Sample I.D. 3L64219 AS-9-16.5	Sample I.D. 3L64220 AS-9-40.5
Purgeable Hydrocarbons	1.0	N.D.	N.D.	N.D.	20	160	N.D.
Benzene	0.0050	N.D.	N.D.	0.011	0.032	N.D.	N.D.
Toluene	0.0050	N.D.	N.D.	N.D.	0.026	N.D.	N.D.
Ethyl Benzene	0.0050	N.D.	N.D.	0.058	0.18	1.4	N.D.
Total Xylenes	0.0050	N.D.	N.D.	0.035	0.69	0.53	N.D.
Chromatogram Pattern:		--	--	Low Gas	Gas	Gas	--

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	1.0	5.0	1.0
Date Analyzed:	12/18/93	12/18/93	12/18/93	12/18/93	12/20/93	12/18/93
Instrument Identification:	GCHP-18	GCHP-18	GCHP-18	GCHP-18	GCHP-9	GCHP-18
Surrogate Recovery, %: (QC Limits = 70-130%)	82	81	80	146 *	180 *	82

* - Coelution Confirmed

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Todd Olive
Project Manager

SEQUOIA ANALYTICAL

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Gettler Ryan/Geostrategies	Client Project ID:	5387-93-4B, Arco 5387-San Lorenzo	Sampled:	Dec 7, 1993
6747 Sierra Court, Ste J	Sample Matrix:	Soil	Received:	Dec 9, 1993
Dublin, CA 94568	Analysis Method:	EPA 5030/8015 mod./8020	Amended:	Mar 2, 1994
Attention: Matt Donohue	First Sample #:	3K64221		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 3L64221 AS-8-6.5	Sample I.D. 3L64222 AS-8-11.5	Sample I.D. 3L64223 AS-8-16.5	Sample I.D. 3L64224 AS-8-40.5	Sample I.D.	Sample I.D.
Purgeable Hydrocarbons	1.0	N.D.	2.8	54	N.D.		
Benzene	0.0050	N.D.	0.016	0.093	N.D.		
Toluene	0.0050	N.D.	N.D.	N.D.	N.D.		
Ethyl Benzene	0.0050	N.D.	0.048	0.84	N.D.		
Total Xylenes	0.0050	N.D.	0.0068	2.8	N.D.		
Chromatogram Pattern:		--	Low Gas	Gas	--		

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	2.0	1.0
Date Analyzed:	12/18/93	12/18/93	12/20/93	12/20/93
Instrument Identification:	GCHP-18	GCHP-18	GCHP-6	GCHP-18
Surrogate Recovery, %: (QC Limits = 70-130%)	81	75	147 *	104

* - Coelution Confirmed

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Todd Olive
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	5387-93-4B, Arco 5387-San Lorenzo
6747 Sierra Court, Ste J	Matrix:	Solid
Dublin, CA 94568		
Attention: Matt Donohue	QC Sample Group:	3L64201 - 24

Amended: Mar 2, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	E.Cunanan	E.Cunanan	E.Cunanan	E.Cunanan
MS/MSD Batch#:	3L67601	3L67601	3L67601	3L67601
Date Prepared:	12/17/93	12/17/93	12/17/93	12/17/93
Date Analyzed:	12/17/93	12/17/93	12/17/93	12/17/93
Instrument I.D.#:	GCHP-18	GCHP-18	GCHP-18	GCHP-18
Conc. Spiked:	0.20 mg/kg	0.20 mg/kg	0.20 mg/kg	0.60 mg/kg
Matrix Spike % Recovery:	74	85	89	89
Matrix Spike Duplicate % Recovery:	77	83	92	92
Relative % Difference:	4.0	2.3	3.3	3.3
LCS Batch#:				
Date Prepared:				
Date Analyzed:				
Instrument I.D.#:				
LCS % Recovery:				
% Recovery Control Limits:	55-145	47-149	45-155	56-140

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Todd Olive
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	5387-93-4B, Arco 5387-San Lorenzo	
6747 Sierra Court, Ste J	Matrix:	Solid	
Dublin, CA 94568			
Attention: Matt Donohue	QC Sample Group:	3L64201 - 24	Amended: Mar 2, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	E.Cunanan	E.Cunanan	E.Cunanan	E.Cunanan
MS/MSD Batch#:	3L67601	3L67601	3L67601	3L67601
Date Prepared:	12/17/93	12/17/93	12/17/93	12/17/93
Date Analyzed:	12/17/93	12/17/93	12/17/93	12/17/93
Instrument I.D.#:	GCHP-18	GCHP-18	GCHP-18	GCHP-18
Conc. Spiked:	0.20 mg/kg	0.20 mg/kg	0.20 mg/kg	0.60 mg/kg
Matrix Spike % Recovery:	78	83	92	91
Matrix Spike Duplicate % Recovery:	75	85	89	89
Relative % Difference:	3.9	3.6	3.3	2.2
LCS Batch#:				
Date Prepared:				
Date Analyzed:				
Instrument I.D.#:				
LCS % Recovery:				
% Recovery Control Limits:	55-145	47-149	45-155	56-140

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Todd Olive
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

ARCO Products Company
Division of Atlantic Richfield Company

Task Order No. 5387-93-4B

Chain of Custody

ARCO Facility no. 5387	City (Facility) San Lorenzo	Project manager (Consultant) JOEL COFFMAN	Laboratory name Sequoia
ARCO engineer Mike Wheelan	Telephone no. (ARCO) (415) 577 2449	Telephone no. (Consultant) (510) 551-8777	Fax no. (Consultant) (510) 551-7888	Contract number 07-073
Consultant name GeoStrategies	Address (Consultant) 6747 Sierra Court Dublin Ca 94568		Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Water	Other	Preservation: Ice	Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH: Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	Hold
AS-36.5			X			X		12-6-93			X		01								
AS-3-11.5			X			X		11			X		02								
AS-3-21.5			X			X		11													X
AS-3-26.5			X			X		11													X
AS-3-31.5			X			X		11													X
AS-3-39.5			X			X		11			X		03								
AS-4-11.5			X			X		12-7-93			X		04								
AS-4-34.5			X			X		11			X		05								
~~AS-65~~			X			X		11													
AV-4-6.5			X			X		11			X		06								
AV-4-11.5			X			X		11			X		07								
AV-4-15.5			X			X		11			X		08								

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number 9312642

Turnaround time

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

Condition of sample:

Temperature received:

Relinquished by sampler	Date 12-9-93	Time 1200	Received by
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory / Date / Time

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPC-3292 (2-91)

ARCO Products Company
Division of Atlantic Richfield Company

Task Order No. 5387-93-4B

Chain of Custody

ARCO Facility no. 5387	City (Facility) San Lorenzo	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Michael Whelan	Telephone no. (ARCO) (415) 571-2449	Telephone no. (Consultant) (916) 551-8777	Fax no. (Consultant) (916) 551-7888
Consultant name GeoStrategies Inc.	Address (Consultant) 6747 Sierra Ct., Suite G, Dublin, CA 94568		Contract number 307-073

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Water	Other	Preservation: Ice	Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ 8aml VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 STLC ☐ TTLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
AS-5 6½		1	X			X		12-6-93			X		09									
AS-5 11½		1	X			X					X		10									
AS-5 16½		1	X			X					X		11									
AS-5 21½		1	X			X															X	
AS-5 26½		1	X			X															X	
AS-5 31½		1	X			X															X	
AS-5 36½		1	X			X					X		12									
AS-7 6½		1	X			X					X		13									
AS-7 11½		1	X			X					X		14									
AS-7 16½		1	X			X					X		15									
AS-7 21½		1	X			X															X	
7 26½		1	X			X															X	
AS-7 31½		1	X			X															X	
AS-7 36½		1	X			X					X		16									
AS-9 6½		1	X			X					X		17									
AS-9 11½		1	X			X		↓			X		18									

Condition of sample:

Relinquished by sampler: Robert D. Coffman — Date 12/9/93 — Time 1230

Relinquished by — Date — Time

Relinquished by — Date — Time

Temperature received:

Received by: Sue Vanderpool

Received by

Received by laboratory — Date — Time

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number 9312642

Turnaround time

- Priority Rush 1 Business Day [ ]
- Rush 2 Business Days [ ]
- Expedited 5 Business Days [ ]
- Standard 10 Business Days [X]

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPC-3292 (2-91)

ARCO Products Company
Division of AtlanticRichfieldCompany

Chain of Custody

Task Order No. 5387-93-YB

ARCO Facility no. 5387	City (Facility) San Leandro	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Michael Whelan	Telephone no. (ARCO) (415) 571-2449	Telephone no. (Consultant) (510) 551-7777	Fax no. (Consultant) (510) 551-7888	Contract number 07-073
Consultant name GeoStrategies Inc.	Address (Consultant) 6747 Sierra Ct, Suite G, Dublin, CA 94568		Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Water	Other	Preservation: Ice	Acid	Sampling date	Sampling time	BTEX 8020/EPA 8020	BTEX/TPH EPA M8020/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 8010/8010	EPA 8240/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	PNA
AS-9 16½		1	X			X		12-6-93			X		19								
AS-9 21½		1	X			X															X
AS-9 26½		1	X			X															X
AS-9 31½		1	X			X															X
AS-9 36½		1	X			X															X
AS-9 38		1	X			X															X
AS-9 40½		1	X			X		↓			X		20								
AS-8 6½		1	X			X		12-7-93			X		21								
AS-8 11½		1	X			X					X		22								
AS-8 16½		1	X			X					X		23								
AS-8 21½		1	X			X															X
AS-8 26½		1	X			X															X
AS-8 31½		1	X			X															X
AS-8 36½		1	X			X															X
AS-8 40½		1	X			X		↓			X		24								

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number 9312642

Turnaround time

Priority Rush 1 Business Day ☐

Rush 2 Business Days ☐

Expedited 5 Business Days ☐

Standard 10 Business Days ☐

Condition of sample:		Temperature received:	
Relinquished by sampler	Date 12-9-93 Time 1200	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date Time

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPC-3292 (2-91)

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies
6747 Sierra Court, Ste J
Dublin, CA 94568
Attention: Matt Donohue

Project: Arco 5387-93-4B

Enclosed are the results from 4 soil samples received at Sequoia Analytical on January 25,1994. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
4AC8701	Soil, AS-6-4.5	1/24/94	EPA 5030/8015 Mod./8020
4AC8702	Soil, AS-6-10	1/24/94	EPA 5030/8015 Mod./8020
4AC8703	Soil, AS-6-14.5	1/24/94	EPA 5030/8015 Mod./8020
4AC8704	Soil, AS-6-34	1/24/94	EPA 5030/8015 Mod /8020

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	Arco 5387-93-4B	Sampled:	Jan 24, 1994
6747 Sierra Court, Ste J	Sample Matrix:	Soil	Received:	Jan 25, 1994
Dublin, CA 94568	Analysis Method:	EPA 5030/8015 Mod./8020	Reported:	Feb 7, 1994
Attention: Matt Donohue	First Sample #:	4AC8701		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 4AC8701 AS-6-4.5	Sample I.D. 4AC8702 AS-6-10	Sample I.D. 4AC8703 AS-6-14.5	Sample I.D. 4AC8704 AS-6-34
Purgeable Hydrocarbons	1.0	N.D.	2.4	56	N.D.
Benzene	0.0050	0.0060	0.13	0.37	N.D.
Toluene	0.0050	N.D.	0.0060	N.D.	N.D.
Ethyl Benzene	0.0050	N.D.	0.055	0.97	N.D.
Total Xylenes	0.0050	N.D.	N.D.	0.097	N.D.
Chromatogram Pattern:		Weathered Gas Discrete Peak	Weathered Gas Discrete Peak	Weathered Gas Discrete Peak	--

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	10	1.0
Date Analyzed:	1/27/94	1/27/94	1/27/94	1/27/94
Instrument Identification:	GCHp-18	GCHP-7	GCHP-18	GCHP-18
Surrogate Recovery, %: (QC Limits = 70-130%)	91	70	90	93

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

N. Herrera

Nokowhat D. Herrera
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	Arco 5387-93-4B
6747 Sierra Court, Ste J	Matrix:	Solid
Dublin, CA 94568		
Attention: Matt Donohue	QC Sample Group: 4AC8701-04	Reported: Feb 7, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	R. Geckler	R. Geckler	R. Geckler	R. Geckler
MS/MSD Batch#:	4AC6701	4AC6701	4AC6701	4AC6701
Date Prepared:	1/27/94	1/27/94	1/27/94	1/27/94
Date Analyzed:	1/27/94	1/27/94	1/27/94	1/27/94
Instrument I.D.#:	0.20	0.20	0.20	0.60
Conc. Spiked:				
Matrix Spike % Recovery:	85	85	85	82
Matrix Spike Duplicate % Recovery:	85	80	80	80
Relative % Difference:	0.0	6.0	6.0	2.5
LCS Batch#:				
Date Prepared:				
Date Analyzed:				
Instrument I.D.#:				
LCS % Recovery:				
% Recovery Control Limits:	55-145	47-149	47-155	56-140

Quality Assurance Statements: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 5387-93-4B

Chain of Custody

ARCO Facility no. 5387	City (Facility) Hayward	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Michael Whelan	Telephone no. (ARCO) (415) 571-2434	Telephone no. (Consultant) (510) 551-8777	Fax no. (Consultant) (510) 551-7888
Consultant name GeoStrategies	Address (Consultant) 6747 Sierra Court, Dublin, CA 94568		Contract number 07-073

Method of shipment: Courier

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH – Gas EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	Special detection Limit/reporting
AS-6-45		1	✓			✓		01/24/94			X					94010C87				-01	
AS-6-10		1	✓			✓		01/24/94			X									-02	
AS-6-145		1	✓			✓		01/24/94			X									-03	
AS-6-34		1	✓			✓		01/24/94			X									-04	

Special QA/QC

Remarks

Lab number

Turnaround time

- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☑

Condition of sample:

Temperature received:

	Date	Time		Date	Time
Relinquished by sampler: Barbara Sieminski	01/25/94	940 AM	Received by: Bill Rime ARCO		
Relinquished by: Bill Rime ARCO	1/25/94	10:10 AM	Received by:		
Relinquished by:			Received by laboratory: [illegible]	1/25/94	10:40

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPC-3292 (2-91)

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies
6747 Sierra Court, Ste J
Dublin, CA 94568
Attention: Joel Coffman

Project: Arco 5387, Hayward

Enclosed are the results from 1 soil sample received at Sequoia Analytical on January 25,1994. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
4AC2401	Soil, SP-A,B,C,D	1/24/94	Lead STLC EPA 5030/8015 Mod. EPA 5030/8015 Mod./8020

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	Arco 5387, Hayward	Sampled:	Jan 24, 1994
6747 Sierra Court, Ste J	Sample Descript:	Soil, SP-A,B,C,D	Received:	Jan 25, 1994
Dublin, CA 94568			Analyzed:	see below
Attention: Joel Coffman	Lab Number:	4AC2401	Reported:	Jan 28, 1994

LABORATORY ANALYSIS

Analyte	Date Analyzed	Detection Limit mg/L	Sample Result mg/L
STLC Lead	1/28/94	0.010	0.070

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	Arco 5387, Hayward	Sampled:	Jan 24, 1994
6747 Sierra Court, Ste J	Sample Matrix:	Soil	Received:	Jan 25, 1994
Dublin, CA 94568	Analysis Method:	EPA 5030/8015 Mod.	Reported:	Jan 28, 1994
Attention: Joel Coffman	First Sample #:	4AC2401		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS

Analyte	Reporting Limit mg/kg	Sample I.D. 4AC2401 SP-A,B,C,D	Sample I.D.	Sample I.D.	Sample I.D.	Sample I.D.	Sample I.D.
Purgeable Hydrocarbons	1.0	42					
Chromatogram Pattern:		Gas & Non-Gas Mix C6-C12					

Quality Control Data

Report Limit Multiplication Factor:	2.0
Date Analyzed:	1/26/94
Instrument Identification:	GCHP-6
Surrogate Recovery: (QC Limits = 70-130%)	110

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Ali Ray for

Nokowhat D. Herrera
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	Arco 5387, Hayward	Sampled:	Jan 24, 1994
6747 Sierra Court, Ste J	Sample Matrix:	TCLP Extraction	Received:	Jan 25, 1994
Dublin, CA 94568	Analysis Method:	EPA 5030/8015 Mod./8020	Reported:	Jan 28, 1994
Attention: Joel Coffman	First Sample #:	4AC2401		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 4AC2401 SP-A,B,C,D	Sample I.D.	Sample I.D.	Sample I.D.	Sample I.D.	Sample I.D.
Purgeable Hydrocarbons	1.0	N.D.					
Benzene	0.0050	N.D.					
Toluene	0.0050	N.D.					
Ethyl Benzene	0.0050	N.D.					
Total Xylenes	0.0050	N.D.					
Chromatogram Pattern:		--					

Quality Control Data

Report Limit Multiplication Factor:	20
Date Analyzed:	1/26/94
Instrument Identification:	GCHP-2
Surrogate Recovery, %: (QC Limits = 70-130%)	96

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	Arco 5387, Hayward
6747 Sierra Court, Ste J	Matrix:	Liquid
Dublin, CA 94568		
Attention: Joel Coffman	QC Sample Group:	4AC2401

Reported: Jan 28, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Lead
Method:	EPA 239.2
Analyst:	J.Martinez
MS/MSD Batch#:	4AD7503
Date Prepared:	1/27/94
Date Analyzed:	1/28/94
Instrument I.D.#:	MV-1
Conc. Spiked:	0.050 mg/L
Matrix Spike % Recovery:	25
Matrix Spike Duplicate % Recovery:	0.0
Relative % Difference:	200

LCS Batch#:	BLK012794
Date Prepared:	1/27/94
Date Analyzed:	1/28/94
Instrument I.D.#:	MV-1
LCS % Recovery:	109
% Recovery Control Limits:	75-125

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	Arco 5387, Hayward
6747 Sierra Court, Ste J	Matrix:	Solid
Dublin, CA 94568		
Attention: Joel Coffman	QC Sample Group: 4AC2401	Reported: Jan 28, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	T.Costello	T.Costello	T.Costello	T.Costello
MS/MSD Batch#:	4AB4303	4AB4303	4AB4303	4AB4303
Date Prepared:	1/26/94	1/26/94	1/26/94	1/26/94
Date Analyzed:	1/26/94	1/26/94	1/26/94	1/26/94
Instrument I.D.#:	GCHP-6	GCHP-6	GCHP-6	GCHP-6
Conc. Spiked:	0.20 mg/kg	0.20 mg/kg	0.20 mg/kg	0.60 mg/kg
Matrix Spike % Recovery:	75	80	80	78
Matrix Spike Duplicate % Recovery:	75	75	80	77
Relative % Difference:	0.0	6.4	0.0	1.3
LCS Batch#:				
Date Prepared:				
Date Analyzed:				
Instrument I.D.#:				
LCS % Recovery:				
% Recovery Control Limits:	55-145	47-149	47-155	56-140

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

Gettler Ryan/Geostrategies	Client Project ID:	Arco 5387, Hayward
6747 Sierra Court, Ste J	Matrix:	Liquid
Dublin, CA 94568		
Attention: Joel Coffman	QC Sample Group: 4AC2401	Reported: Jan 28, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	J.M.	J.M.	J.M.	J.M.
MS/MSD Batch#:	4AC1203	4AC1203	4AC1203	4AC1203
Date Prepared:	N.A.	N.A.	N.A.	N.A.
Date Analyzed:	1/26/94	1/26/94	1/26/94	1/26/94
Instrument I.D.#:	GCHP-2	GCHP-2	GCHP-2	GCHP-2
Conc. Spiked:	10 µg/L	10 µg/L	10 µg/L	30 µg/L
Matrix Spike % Recovery:	100	100	100	100
Matrix Spike Duplicate % Recovery:	120	120	120	117
Relative % Difference:	18	18	18	16
LCS Batch#:				
Date Prepared:				
Date Analyzed:				
Instrument I.D.#:				
LCS % Recovery:				
% Recovery Control Limits:	71-133	72-128	72-130	71-120

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Nokowhat D. Herrera
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 5387-93-413

Chain of Custody

ARCO Facility no. 5387	City (Facility) Hayward	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Michael Whelan	Telephone no. (ARCO) (415) 571-2434	Telephone no. (Consultant) (510) 551-7777	Fax no. (Consultant) (510) 551-7888
Consultant name GeoStrategies	Address (Consultant) 6747 Sierra Court, Suite G, Dublin, CA 94568		Contract number 07-073

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☒ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP BTEX ☒ Semi ☐ Metals ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	STLC Lead	
SP-A		1	✓			✓		01/24/94				X						X			X	(1)
SP-B		1	✓			✓		01/24/94				X						X			X	
SP-C		1	✓			✓		01/24/94				X						X			X	
SP-D		1	✓			✓		01/24/94				X						X			X	

Special detection Limit/reporting

Special QA/QC

Method of shipment: Courier

Remarks: Composite Sample
48 hr turnaround time

Lab number: 9401024

Turnaround time
- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☒
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

Condition of sample:

Temperature received:

Relinquished by sampler: Barbara Sieminski	Date 01/25/94	Time 9 AM	Received by: [illegible] Prime-870
Relinquished by: [illegible] Prime-870	Date 1/25/94	Time 10:40 AM	Received by:
Relinquished by:	Date	Time	Received by laboratory: [illegible] Date 1/25/94 Time 10:40

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

TABLE 1

VAPOR EXTRACTION SYSTEM PERFORMANCE DATA

ARCO Station 5387
Hayward, California

Beginning Date	1-Apr-94	15-Apr-94	30-Apr-94	6-May-94	13-May-94	18-May-94	27-May-94	8-Jun-94
Ending Date	15-Apr-94	30-Apr-94	6-May-94	13-May-94	18-May-94	27-May-94	8-Jun-94	18-Jun-94
Down-time (days)*	9.00	11.04	4.08	4.63	3.63	5.38	8.25	6.04
Total Operation (days)	5.00	3.96	1.92	2.38	1.38	3.63	3.75	3.96
Total Operation (hours)	120	95	46	57	33	87	90	95
Operational Hours to Date	459	554	600	657	690	777	867	962
Benzene Concentrations								
Average Influent (ppmv)	ND	ND	1.6	NS	ND	NS	0.3	NS
Average Effluent (ppmv)	0.02	0.03	0.03	NS	0.10	NS	0.08	NS
TPH-G Concentrations								
Average Influent (ppmv)	180	56	350	NS	330	NS	410	NS
Average Effluent (ppmv)	ND	ND	2.1	NS	3.2	NS	34	NS
Flow Rates								
Average Influent (scfm)	25	25	30	15	17	17	17	18
Average Effluent (scfm)	68	119	43	53	84	39	35	33
Benzene Recovery Data								
Recovery Rate (lbs/hr)	0.000	0.000	0.001	0.001	0.000	0.000	0.000	0.000
Recovery Rate (lbs/day)	0.000	0.000	0.016	0.020	0.000	0.000	0.001	0.001
Destruction Efficiency (%)	- - -	- - -	97.90%	94.55%	- - -	- - -	48.71%	54.37%
Product Recovered (lbs)	0.000	0.000	0.031	0.047	0.000	0.000	0.006	0.006
Product Recovered To Date (lbs)	1.352	1.352	1.382	1.430	1.430	1.430	1.435	1.441
Product Recovered To Date (gal)	0.186	0.186	0.191	0.197	0.197	0.197	0.198	0.199
TPH-G Recovery Data								
Recovery Rate (lbs/hr)	0.05	0.01	0.11	0.05	0.06	0.06	0.07	0.07
Recovery Rate (lbs/day)	1.11	0.34	2.58	1.25	1.38	1.39	1.69	1.79
Destruction Efficiency (%)	96.59%	80.40%	99.16%	97.62%	95.29%	97.62%	82.99%	84.87%
Product Recovered (lbs)	5.53	1.34	4.95	2.98	1.90	5.03	6.33	7.07
Product Recovered To Date (lbs)	111.17	112.51	117.46	120.42	122.32	127.35	133.68	140.76
Product Recovered To Date (gal)	18.53	18.75	19.58	20.07	20.39	21.23	22.28	23.46

*System does not operate on weekends.

ppmv = parts per million by volume

TPH-G = total petroleum hydrocarbons as gasoline

scfm = standard cubic feet per minute

lbs/hr = pounds per operational hour

Notes:

1. Molecular weights used in recovery calculations are 85 for TPH and 78 for benzene.
2. Densities used in recovery calculations are 6.0 lbs/gal for TPH and 7.25 lbs/gal for benzene.
3. Average Influent Flow is total flow from well field, Average Effluent Flow includes total products of combustion.