GeoStrategies Inc.

WORK PLAN FOR ADDITIONAL SUBSURFACE INVESTIGATION AND EVALUATION OF REMEDIAL ALTERNATIVES

ARCO Station 2169
889 West Grand Avenue
Oakland, California

792711-13

August 17, 1993

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GeoStrategies Inc.

August 17, 1993

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Subject: WORK PLAN FOR ADDITIONAL SUBSURFACE INVESTIGATION AND EVALUATION OF REMEDIAL ALTERNATIVES at ARCO Station 2169, 889 West Grand Avenue, Oakland, California.

INTRODUCTION

At the request of ARCO Products Company (ARCO), GeoStrategies Inc. (GSI) has prepared this work plan to conduct an additional subsurface investigation and evaluation of remedial alternatives at the subject site. This work plan was initiated in response to the results of previous investigations conducted at the site. The purpose of this proposed work is to further investigate the lateral and vertical extents of gasoline hydrocarbons in the subsurface soil and groundwater, and to evaluate the feasibility of air-sparging/vapor extraction as A viable interim remediation alternative for the site.

The work to be performed includes: (1) obtaining drilling permits from the Alameda County Flood Control and Water Conservation District, Zone 7 (ACFCWCD), preparing a site safety plan and scheduling drilling; (2) drilling five onsite soil borings, collecting soil samples from the borings for description and possible laboratory analyses, and i[illegible]r e[illegible]d three a[illegible]h AS-3) in the borings; (3) submitting selected soil samples for laboratory analyses; (4) [illegible]; (5) [illegible]; (6) sa[illegible]; (7) conducting an 8-hour air-sparging/vapor extraction test (AS/VET) using well AS-1 as a sparging well and wells AV-2 and AV-3 as extraction wells; (8) conducting an 8-hour air-AS/VET using well AS-2 as a sparging well and wells AV-4 and AV-5 as extraction w[illegible]; and (9) preparing a report, which presents field proc[illegible], results and conclusions.

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SITE DESCRIPTION AND BACKGROUND

General

ARCO Service Station 2169 is an operating retail gasoline service station and AM/PM minimart located at the southeastern corner of West Grand Avenue and Market Street in Oakland, 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, predominantly asphalt- and concrete-covered lot at an elevation of approximately 15 feet above mean sea level. Currently site features include a station building, four double-wall 10,000-gallon fiberglass underground storage tanks (USTs) containing unleaded gasoline and diesel and four service islands. The locations of these features, existing site wells and former USTs are shown on Plate 2, Site Plan.

Regional Geology and Hydrogeology

The site is located at the base of the Berkeley Hills approximately ½-mile east of the San Francisco Bay. The site is situated on alluvial-fan deposits of the Temescal Formation comprised of interfingering lenses of clayey gravel, sandy to silty clay, and sand-clay-silt mixtures (Radbruch, D.H., 1957). Local topography suggests groundwater flows to the west toward San Francisco Bay.

Local Subsurface Geology

The lithology encountered at the site during previous investigations consisted of clay, sand, silt, and minor gravel to the total depth explored of 30.5 feet below grade (fbg). A layer of clay is present beneath the site immediately beneath the surface and extends to the depth of approximately 9 to 19 fbg. This clay layer is underlain by a unit consisting of sand and clayey sand with some gravel and gravelly clay. Groundwater was encountered in this unit at

depths ranging from 9.5 to 18.5 fbg. A clayey aquitard was encountered beneath the water-bearing unit at depths of approximately 24.5 to 29.5 fbg except in offsite boring A-5, where the aquitard was not encountered. Graphic interpretations of soil stratigraphy beneath the site are shown on geologic Cross Sections A-A' and B-B' (Plates 3 and 4).

Groundwater flow beneath the site has been evaluated to be generally to the north-northwest at a gradient of 0.005. Plate 5 presents the potentiometric map prepared from water-level data collected on January 28, 1993.

PREVIOUS ENVIRONMENTAL WORK

Limited Site Assessment

On May 14, 1991, GSI drilled five exploratory soil borings (A-A through A-E). Four soil borings were drilled adjacent to the underground storage tank (UST) complex (A-B through A-E) and one soil boring (A-A) was drilled in the proposed new UST complex location. Total Petroleum Hydrocarbons calculated as Gasoline (TPH-G) were detected in the soil samples collected from borings A-A through A-E at concentrations ranging from nondetectable (less than 1 part per million [ppm]) to 1,900 ppm. Total Petroleum Hydrocarbons calculated as Diesel (TPH-D) were detected in soil samples from borings A-A through A-E at concentrations ranging from nondetectable (less than 1 ppm) to 300 ppm. Benzene was detected in soil samples from borings A-A through A-E at concentrations ranging from nondetectable (less than 0.0050 ppm) to 18 ppm. Laboratory analyses results for soil samples from borings are summarized in Table 1, Cumulative Results of Laboratory Analyses of Soil Samples from Borings. The results of this investigation are presented in the GSI Preliminary Tank Replacement Report dated July 1, 1991.

Underground Storage Tank Removal

Between January and April 1992, the underground storage tanks and associated product lines were removed and replaced. The former tank complex was composed of four steel tanks: one 12,000 gallon tank (unleaded), one 8,000 gallon tank (regular), and two 6,000 gallon tanks (diesel and super unleaded). The current tank complex is composed of four double wall fiberglass 10,000 gallon tanks containing unleaded gasoline and diesel products. The locations of the former and present tank complexes are shown on Plate 2. Laboratory analytical results for soil sample collected from the former tank complex at the depth of 12 fbg reported concentrations of TPH-G ranging from 3 ppm to 1200 ppm, and concentrations of TPH-D ranging form nondetectable to 620 ppm. Laboratory analytical results for soil samples collected from product line trenches indicated concentrations of TPH-G ranging from nondetectable to 120 ppm; and concentrations of TPH-D ranging from nondetectable (for samples collected in the vicinity of the northeastern service island) to 450 ppm of TPH-D (for samples collected in the vicinity of the diesel dispenser on the westernmost island). The soil from the product line trench in the vicinity of diesel dispenser was overexcavated and resampled at a depth of 7 feet below ground surface. Results of the second sample reported TPH-D at a concentration of 54 ppm. Laboratory analytical results for soil samples from the former tank pit and product line trenches are summarized in Table 2, Results of Laboratory Analyses of Soil Samples from Former Tank Pit and Product Line Trenches. An Underground Storage Tank Removal and Soil Sampling Report documenting the tank removal and soil sampling analytical results was issued by ROUX Associates (ROUX) on July 14, 1992.

Subsurface Environmental Investigation

Between March 16 and 25, 1992, GSI installed one recovery well (AR-1) and four groundwater monitoring wells (A-1 through A-4) at the site. TPH-G was

detected in the soil sample collected from boring A-1 at a depth of 10 fbg at a concentration of 2.2 ppm, and was nondetectable in all other samples collected from borings A-1 through A-4. TPH-D was detected in the soil sample collected from boring A-2 at a depth of 4 fbg at a concentration of 14 ppm and was nondetectable in all other samples collected from borings A-1 through A-4. Benzene was identified in samples collected from boring A-1 at depths of 4.5 fbg and 10 fbg at concentrations of 0.024 ppm and 0.13 ppm, respectively, and was nondetectable (less than 0.005 ppm) in all other samples collected from borings A-1 through A-4. Results of this investigation are presented in the GSI Well Installation Report dated June 30, 1992.

On June 8, 1992, GSI installed three vapor extraction wells (AV-1 through AV-3) and one groundwater extraction well (AR-2) at the site. TPH-G was detected in the soil samples collected from boring AV-1 through AV-2 at concentrations ranging from nondetectable to 1,500 ppm. Benzene was reported in soil samples from borings AV-1 through AV-3 at concentrations ranging from 0.037 to 2.4 ppm. TPH-D was reported as nondetectable for all samples submitted for analysis. Well AR-2 was drilled through an existing conductor casing, as a result, no samples were collected above first encountered groundwater. The results of this phase of the investigation are presented in a GSI Continuing Site Assessment/Quarterly Monitoring Report dated November 24, 1992.

On February 4, 1993, GSI installed two offsite groundwater monitoring wells (A-5 and A-6). Selected soil samples were analyzed for TPH-G and BTEX. In addition, soil samples from boring A-5 were also analyzed for Halogenated Volatile Organics (HVO). The soil sample collected from boring A-5 at a depth of 9.5 fbg contained 17 ppm TPH-G and 0.21 ppm benzene. TPH-G and BTEX were reported as nondetectable for the remaining soil samples. HVO concentrations were reported as nondetectable for samples collected from boring A-5. The results from this phase of the investigation are

presented in a GSI Quarterly Monitoring/ Well Installation Report dated April 9, 1993.

Soil chemical analytical data for all of the above borings are summarized in Table 1.

Vapor Extraction Test

An eight-hour vapor extraction test was performed at the site by GSI on June 11, 1992, to evaluate the feasibility of vapor extraction as a soil remediation method.

Based on the results of the vapor extraction test GSI concluded that vapor extraction is a feasible remedial option for the remediation of gasoline hydrocarbons from onsite soils. The results of vapor extraction test are presented in a GSI Continuing Site Assessment/Quarterly Monitoring Report dated November 24, 1992.

Aquifer Pumping and Recovery Test

An aquifer pumping and recovery test was performed at the site on July 15 and 16, 1992, by GSI to evaluate the feasibility of groundwater extraction as a groundwater remediation method.

Based on aquifer test results GSI concluded that a pump and treat system is a [illegible] technically, [illegible] groundwater at the site but may not be feasible based on the associated costs when compared to other technologies. The results of aquifer pumping and recovery test are presented in a GSI Continuing Site Assessment/Quarterly Monitoring Report dated November 24, 1992.

Quarterly Sampling

Quarterly groundwater monitoring and sampling of site wells began in April, 1992. Groundwater samples have been analyzed for TPH-G according to EPA Method 8015 (Modified), BTEX according to EPA Method 8020, and TPH-D using EPA Method 3510. Groundwater monitoring and sampling data are presented in Table 3, Groundwater Monitoring Data.

The groundwater gradient ranged from approximately 0.002 to 0.005 with flow direction fluctuating between west and north. Concentrations of TPH-G and BTEX have remained nondetectable in monitoring well A-2, have decreased to nondetectable levels in wells A-3 and A-4, have decreased in wells A-1 (from 34,000 ppb to 3,700 ppb) and AR-1 (from 17,000 ppb to 15,000 ppb), and have increased in well AR-2 (from 150 ppb to 2,000 ppb) since the quarterly monitoring began.

PROPOSED WORK

GSI proposes project steps 1 through 9 listed below to further investigate the extent of hydrocarbons in the soil and groundwater beneath the site and to evaluate the feasibility of air-sparging in combination with vapor extraction for soil and groundwater remediation.

Step 1 Obtain a well drilling permit from the ACFCWCD, Zone 7; prepare a site specific health and safety plan; and schedule underground locating services, drillers, equipment, and personnel.

Step 2 Drill two onsite soil borings to the depth of approximately 15 fbg using 10-inch diameter hollow-stem augers and three onsite soil borings to the depth of approximately 30 fbg using 8-inch

diameter hollow-stem augers in the locations shown on Plate 2. Install a 2-inch inner-diameter air-sparging well (AS-1) in the boring located in the southern portion of the site. Install two 4-inch inner-diameter vapor-extraction wells (AV-4 and AV-5) and two 2-inch inner-diameter air-sparging wells (AS-2 and AS-3) in the borings drilled in the northern portion of the site, if field observations indicate a presence of hydrocarbons in the soil in these borings. If hydrocarbons are not encountered in borings drilled in the northern portion of the site, these borings will be grouted. Soil samples will be collected continuously for description and possible laboratory analyses in boring AS-2 and every 5 feet and at the changes in soil stratigraphy in the other borings.

The air-sparging wells will be constructed using 2-inch inner-diameter schedule 40, polyvinyl chloride (PVC) blank casing and 0.020-inch wide, machine slotted, schedule 40 PVC screen. The slotted section of the pipes will be limited to the bottom 2 feet in each well. The well annulus will be filled with Lonestar #2/12 sand to approximately one foot above the sparging well screen, and overlain with approximately 1-foot of bentonite. The bentonite will then be hydrated and the annulus will be grouted up to a depth of approximately 1 fbg.

The vapor-extraction wells will be constructed using 4-inch inner-diameter, schedule 40 PVC blank casing and 0.100-inch wide, machine slotted, schedule 40 PVC screen. The well annulus will be filled with ⅜-inch washed pea-gravel to approximately 1-foot above the well screen. Approximately 1-foot of bentonite will be placed over the pea-gravel, hydrated, and the remaining annulus will be grouted to a depth of approximately 1 fbg.

Step 3 Submit selected soil samples from borings AS-1 through AS-3, AV-4 and AV-5, following Chain of Custody protocol, to a State-certified laboratory and analyze for TPH-G and BTEX using EPA Methods 5030/8015/8020. In addition selected soil samples from boring AS-1 located in the vicinity of the former USTs pit will be analyzed for TPH-D using EPA Method 8015/3550.

Step 4 Develop air-sparging wells (AS-1 through AS-3) by bailing or over-pumping and surge-block techniques.

Step 5 Survey all new wells to a U.S. Coast and Geodetic Survey Datum relative to mean sea level. This work will be performed by a licensed land surveyor.

Step 6 Conduct an 8-hour AS/VET using well AS-1 as a sparging well and wells AV-2 and AV-3 as extraction wells.

Step 7 Conduct an 8-hour AS/VET test using well AS-2 as a sparging well and wells AV-4 and AV-5 as extraction wells.

Data from the AS/VETs will be used to evaluate: (1) the applied air vacuums necessary to maximize soil-gas yield from the vapor extraction wells; (2) soil-gas air flow rates from the extraction wells; (3) optimal air flow rates necessary to perform a combination AS/VET and the air sparge capture zone; (4) radius of influence of each well; (5) initial extracted hydrocarbon concentrations in soil-gas; and (6) to assist in determining the appropriate and most effective remedial technology for use at the site.

Air and groundwater samples will be collected from selected vapor extraction and groundwater monitoring wells during the AS/VETs to evaluate the fluctuation of gasoline hydrocarbon concentrations in the dissolved and vapor phase. Air and groundwater samples collected during the test will be submitted with Chain-of-Custody Records to a State-certified laboratory and analyzed for TPHg and BTEX using EPA Methods 5030/8020/8015.

Step 8 Prepare a report summarizing field and laboratory procedures, findings, and conclusions.

SCHEDULE OF OPERATIONS

A preliminary time schedule to perform the steps described above is shown on Plate 6, Preliminary Time Schedule. This time schedule is an estimate and is subject to change should groundwater elevations increase (limiting the ability to perform vapor extraction), or other circumstances dictate. Time is estimated in weeks after gaining regulatory approval of the Work Plan and any changes which must be incorporated into this Work Plan due to regulatory request. GSI can initiate work at the site within 1 week after receiving authorization to proceed, access and subsurface conditions permitting. **If ARCO has not received regulatory approval of this work plan within 60 days, they will proceed as stated in Title 23, Article 11, Chapter 16, Sections 2722 (b)(5) and 2726 (c).**

PROJECT STAFF

Mr. John F. Vargas, a Registered Geologists in the State of California (R.G. No. 5046), will be in overall charge of hydrogeologic facets. Mr. Joel Coffman, Project Manager, will provide supervision of field and office

operations of the project. GSI and Gettler-Ryan employ a staff of geologists, engineers, and technicians who will assist with the project.

DISTRIBUTION

On behalf of ARCO, GSI has forwarded copies of this report to:

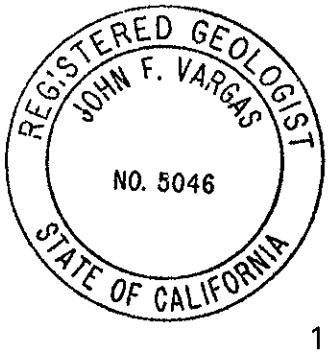
Ms. Susan Hugo
Alameda County Health Care Services Agency
80 Swan Way, Room 200
Oakland, California 94621

Mr. Richard Hiett
Regional Water Quality Control Board
San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, California 94612

If you have any questions or comments, please call us at (510) 352-4800.

Sincerely,
GeoStrategies, Inc.

Barbara Sieminski
Project Geologist



John F. Vargas
Senior Geologist
R.G. 5046

TABLE 1
Cumulative Results of Laboratory Analyses of Soil Samples from Borings
ARCO Station No. 2169, Oakland, California

SAMPLE ID	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)	TPH-D (PPM)
A-A-4.5	14-May-91	22-May-91	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
A-A-9.5	14-May-91	22-May-91	69	1.0	3.8	1.6	7.8	31
A-B-5.5	14-May-91	22-May-91	250	2.1	6.2	4.5	30	31
A-B-10.5	14-May-91	22-May-91	960	16	61	19	110	280
A-C-6.0	14-May-91	22-May-91	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
A-C-11.0	14-May-91	22-May-91	1,900	18	64	44	220	300
A-D-6.0	14-May-91	22-May-91	2.3	0.10	0.019	0.11	0.44	1.6
A-D-9.5	14-May-91	22-May-91	10	0.27	0.021	0.47	1.7	1.6
A-E-6.5	14-May-91	22-May-91	<1.0	0.16	<0.0050	0.0070	<0.0050	<1.0
A-E-10.5	14-May-91	22-May-91	330	3.9	17	6.5	39	130
A-1-4.5	16-Mar-92	01-Apr-92	<1.0	0.024	0.014	0.0090	0.034	<1.0
A-1-10.0	16-Mar-92	01-Apr-92	2.2	0.13	0.051	0.023	0.71	<1.0
A-2-4.0	16-Mar-92	01-Apr-92	<1.0	<0.0050	0.0050	<0.0050	<0.0050	14
A-2-10.0	16-Mar-92	01-Apr-92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
A-3-10.0	17-Mar-92	01-Apr-92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
A-4-10.0	17-Mar-92	01-Apr-92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
AV-1-6.5	08-Jun-92	11-Jun-92	<1.0	0.15	0.019	0.014	0.062	<1.0
AV-1-12	08-Jun-92	11-Jun-92	12	0.81	1.3	0.27	1.5	<1.0
AV-2-6.5	08-Jun-92	11-Jun-92	1.8	0.31	0.15	0.036	0.21	<1.0
AV-2-11.5	08-Jun-92	11-Jun-92	1500	21	84	27	170	<1.0
AV-3-6.5	08-Jun-92	11-Jun-92	<1.0	0.037	<0.0050	0.018	0.028	<1.0
AV-3-11.5	08-Jun-92	11-Jun-92	110	2.4	4.6	1.9	10	<1.0
A-5-6.5	04-Feb-93	08-Feb-93	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	NA
A-5-9.5	04-Feb-93	08-Feb-93	17	0.21	0.076	0.28	0.54	NA
A-6-6.5	04-Feb-93	08-Feb-93	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	NA
A-6-9.0	04-Feb-93	08-Feb-93	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	NA

TPH-G = Total Petroleum Hydrocarbons calculated as gasoline.
TPH-D = Total Petroleum Hydrocarbons calculated as diesel
PPM = Parts Per Million.

Notes:
1. Data shown as <x indicate concentrations below laboratory detection limits (not detected).
2. The last number of the sample I.D. corresponds to the depth the sample was collected.
3. NA indicates that the compound was not analyzed for.
4. Halogenated volatile organic analysis performed on samples A-5-6.5 and A-5-9.5 were reported as not detected.

TABLE 2
RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES FROM
FORMER TANK PIT AND PRODUCT LINE TRENCHES
ARCO Station 2169
Oakland, California

SAMPLE DATE	SAMPLE NO.	DEPTH (FBG)	TPH-G (PPM)	TPH-D (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
Former Tank Pit								
1-Jan-92	SW-1	12	1200	620	6.8	47	22	140
1-Jan-92	SW-2	12	81	19	0.98	2.9	1.9	9.1
1-Jan-92	SW-3	12	200	7.1	3.0	10	4.6	25
1-Jan-92	SW-4	12	170	3.4	3.2	11	3.9	22
1-Jan-92	SW-5	12	3.0	ND	1.1	0.022	0.21	0.11
1-Jan-92	SW-6	12	100	2.8	0.88	3.9	2.1	15
1-Jan-92	SW-7	12	420	10	4.2	16	8.0	53
1-Jan-92	SW-8	12	180	4.4	2.5	2.7	3.7	23
1-Jan-92	SW-9	12	200	17	2	4.5	4.7	29
Product Line	Trenches							
19-Feb-92	LINE-1	3	120	NA	0.36	0.81	0.56	3.8
19-Feb-92	LINE-2	3	4.7	NA	0.32	0.097	0.088	0.18
19-Feb-92	LINE-3	4	ND	NA	ND	ND	ND	ND
19-Feb-92	LINE-4	3	140	450	2.2	0.28	2.2	5.1
19-Feb-92	LINE-5	3	2.8	6.0	0.19	0.005	0.024	0.088
3-Mar-92	LINE-4A	7	4.6	54	0.054	0.059	0.14	0.64

FBG = Feeet Below Bround
TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline.
TPH-D = Total Petroleum Hydrocarbons calculated as Diesel.
PPM = Parts Per Million.
NA = Not Analyzed.
ND = Not Detected

TABLE 5
GROUNDWATER MONITORING DATA
ARCO Station 2169
Oakland, California

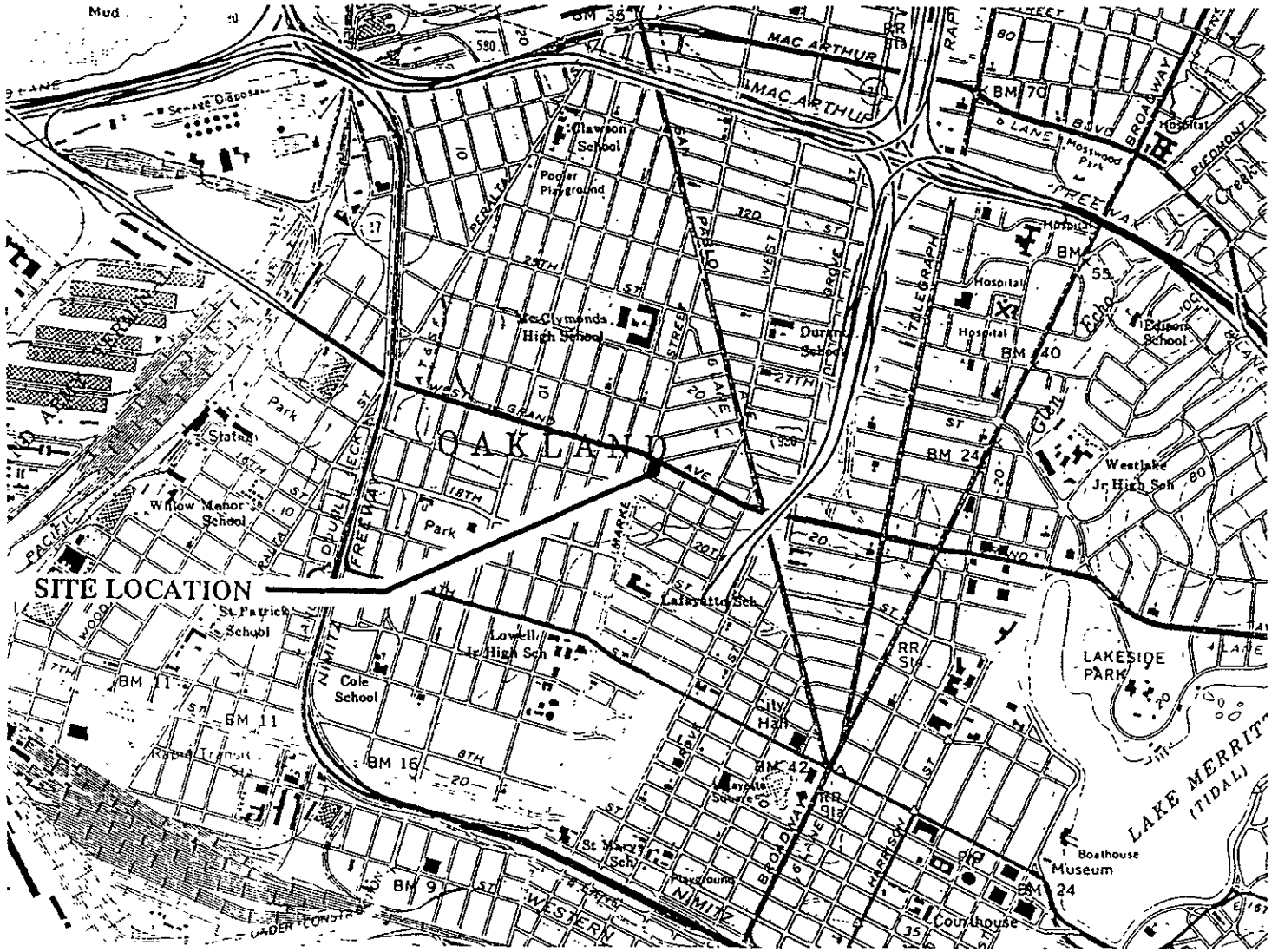
WELL NO	MONITORING DATE	ANALYZED DATE	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	TPH-D (PPB)	WELL ELEV (FT.)	STATIC WATER ELEV (FT.)	PRODUCT THICKNESS (FT.)	DEPTH TO WATER (FT.)
A-1	3-Apr-92	10-Apr-92	34,000	6,200	3,900	410	3100	6,100	14.75	4.40	0.00	10.35
	20-May-92	-----	-----	-----	-----	-----	-----	-----	14.75	3.09	0.00	11.66
	16-Jun-92	-----	-----	-----	-----	-----	-----	-----	14.75	2.80	0.00	11.95
	17-Jul-92	21-Jul-92	5,600	3,000	500	<100	<100	NA	14.75	2.52	0 00	12.23
	7-Aug-92	-----	-----	-----	-----	-----	-----	----	14.75	2.59	0 00	12 16
	22-Sep-92	-----	-----	-----	-----	-----	-----	----	14.75	2.33	0.00	12 42
	13-Oct-92	19-Oct-92	5,600	980	590	85	910	NA	14.75	2.28	0.00	12 47
	23-Nov-92	-----	-----	-----	-----	-----	-----	-----	14.75	2.92	0.00	11 83
	16-Dec-92	-----	-----	-----	-----	-----	-----	-----	14.75	3.72	0 00	11.03
	28-Jan-93	3-Feb-93	3,700	780	360	130	460	620*	14.75	5.67	0 00	9.08
A-2	3-Apr-92	10-Apr-92	<30	<0.30	<0.30	<0.30	<0.30	<50	15.16	4.19	0.00	10.97
	20-May-92	-----	-----	-----	-----	-----	-----	-----	15.16	2.99	0 00	12 17
	16-Jun-92	-----	-----	-----	-----	-----	-----	-----	15.16	2.73	0.00	12 43
	17-Jul-92	21-Jul-92	<50	<0.50	<0.50	<0.50	<0.50	NA	15.16	2.52	0.00	12.64
	7-Aug-92	-----	-----	-----	-----	-----	-----	----	15.16	2.41	0.00	12.75
	22-Sep-92	-----	-----	-----	-----	-----	-----	----	15.16	2.28	0 00	12 88
	13-Oct-92	20-Oct-92	<50	0.57	<0.50	<0.50	<0.50	NA	15.16	2.24	0 00	12.92
	23-Nov-92	-----	-----	-----	-----	-----	-----	-----	15.16	2.98	0.00	12.18
	16-Dec-92	-----	-----	-----	-----	-----	-----	-----	15.16	3.64	0.00	11.52
	28-Jan-93	3-Feb-93	<50	<0.50	<0.50	<0.50	<0.50	NA	15.16	5.43	0.00	9.73
A-3	3-Apr-92	10-Apr-92	200	0.79	0.65	4.4	<0.30	130	16.38	4.68	0.00	11 70
	20-May-92	-----	-----	-----	-----	-----	-----	-----	16.38	3.38	0.00	13.00
	16-Jun-92	-----	-----	-----	-----	-----	-----	-----	16.38	2.92	0.00	13.46
	17-Jul-92	21-Jul-92	<50	<0.50	<0.50	<0.50	<0.50	NA	16.38	2 93	0 00	13.45
	7-Aug-92	-----	-----	-----	-----	-----	-----	----	16.38	4.01	0.00	12.37
	22-Sep-92	-----	-----	-----	-----	-----	-----	----	16.38	2.67	0.00	13.71
	13-Oct-92	19-Oct-92	<50	<0.50	<0.50	<0.50	<0.50	NA	16.38	2.62	0 00	13.76
	23-Nov-92	-----	-----	-----	-----	-----	-----	-----	16.38	2.78	0.00	13.60
	16-Dec-92	-----	-----	-----	-----	-----	-----	-----	16.38	4.07	0.00	12.31
	28-Jan-93	3-Feb-93	<50	<0.50	<0.50	<0.50	<0.50	NA	16.38	6.05	0.00	10.33
A-4	3-Apr-92	10-Apr-92	35	<0.30	<0.30	<0.30	<0.30	85	15.89	5.05	0.00	10 84
	20-May-92	-----	-----	-----	-----	-----	-----	-----	15.89	3.76	0.00	12.13
	16-Jun-92	-----	-----	-----	-----	-----	-----	-----	15.89	3.56	0 00	12.33
	17-Jul-92	21-Jul-92	<50	<0.50	<0.50	<0.50	<0.50	NA	15.89	3.29	0.00	12.60
	7-Aug-92	-----	-----	-----	-----	-----	-----	----	15.89	3.33	0.00	12 56
	22-Sep-92	-----	-----	-----	-----	-----	-----	----	15.89	3.02	0.00	12.87
	13-Oct-92	19-Oct-92	<50	<0.50	<0.50	<0.50	<0.50	N/A	15.89	3.02	0.00	12.87
	23-Nov-92	-----	-----	-----	-----	-----	-----	-----	15.89	3.26	0.00	12.63
	16-Dec-92	-----	-----	-----	-----	-----	-----	-----	15.89	4.55	0.00	11.34
	28-Jan-93	3-Feb-93	<50	<0.50	<0.50	<0.50	<0.50	NA	15.89	6.49	0.00	9.40
A-5	11-Feb-93	17-Feb-93	4900	380	640	140	970	NA	14.14	4.99	0.00	9.15
A-6	11-Feb-93	18-Feb-93	990	1.8	5.1	17	7.2	NA	14.17	4.82	0.00	9.35
AR-1	3-Apr-92	10-Apr-92	17,000	310	1,400	320	3,000	12,000	15.71	4.64	0.00	11.07
	20-May-92	-----	-----	-----	-----	-----	-----	-----	15.71	3.34	0.00	12.37
	16-Jun-92	-----	-----	-----	-----	-----	-----	-----	15.71	3.24	0.00	12.47
	17-Jul-92	21-Jul-92	44,000	9,100	1,800	1,800	10,000	NA	15.71	2.71	0.00	13.00
	7-Aug-92	-----	-----	-----	-----	-----	-----	----	15.71	2.84	0.00	12.87

TABLE 5
GROUNDWATER MONITORING DATA
ARCO Station 2169
Oakland, California

WELL NO	MONITORING DATE	ANALYZED DATE	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	TPH-D (PPB)	WELL ELEV (FT.)	STATIC WATER ELEV (FT.)	PRODUCT THICKNESS (FT.)	DEPTH TO WATER (FT.)
	22-Sep-92	-----	-----	-----	-----	-----	-----	----	15.71	2.72	0.00	12.99
	13-Oct-92	20-Oct-92	32,000	310	730	570	3,100	22,000*	15.71	2.66	0.00	13.05
	23-Nov-92	-----	-----	-----	-----	-----	-----	-----	15.71	2.91	0.00	12.80
	16-Dec-92	-----	-----	-----	-----	-----	-----	-----	15.71	4.22	0 00	11.49
	28-Jan-93	3-Feb-93	15,000	1,200	510	510	2,600	5,300*	15.71	6.25	0.00	9.46
AR-2	17-Jul-92	21-Jul-92	150	6.6	24	6.6	39	NA	15.79	2.65	0.00	13.14
	7-Aug-92	-----	-----	-----	-----	-----	-----	----	15.79	2.54	0.00	13.25
	22-Sep-92	-----	-----	-----	-----	-----	-----	----	15 79	2.21	0.00	13 58
	13-Oct-92	20-Oct-92	<50	2.0	0.86	0.51	3.8	58*	15.79	2.14	0.00	13.65
	23-Nov-92	-----	-----	-----	-----	-----	-----	-----	15.79	---	---	---
	16-Dec-92	-----	-----	-----	-----	-----	-----	-----	15.79	3.63	0 00	12.16
	28-Jan-93	3-Feb-93	2,000	570	13	<10	380	290*	15.79	5.53	0.00	10.26

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

Notes
1 Data shown as <x indicates concentrations are below laboratory detection limits (none detected).
2 Water level elevations referenced to Mean Sea Level (MSL).
3 * = Reported as a non-diesel mix.
4. NA = Compound not analyzed for.
5 Well AR-2 could not be located on November 23, 1993.
6 Halogenated volatile organic analyses performed on samples from Wells A-5 and A-6 collected on February 11, 1993 were reported as none detected.



N

0 2000

Scale in Feet

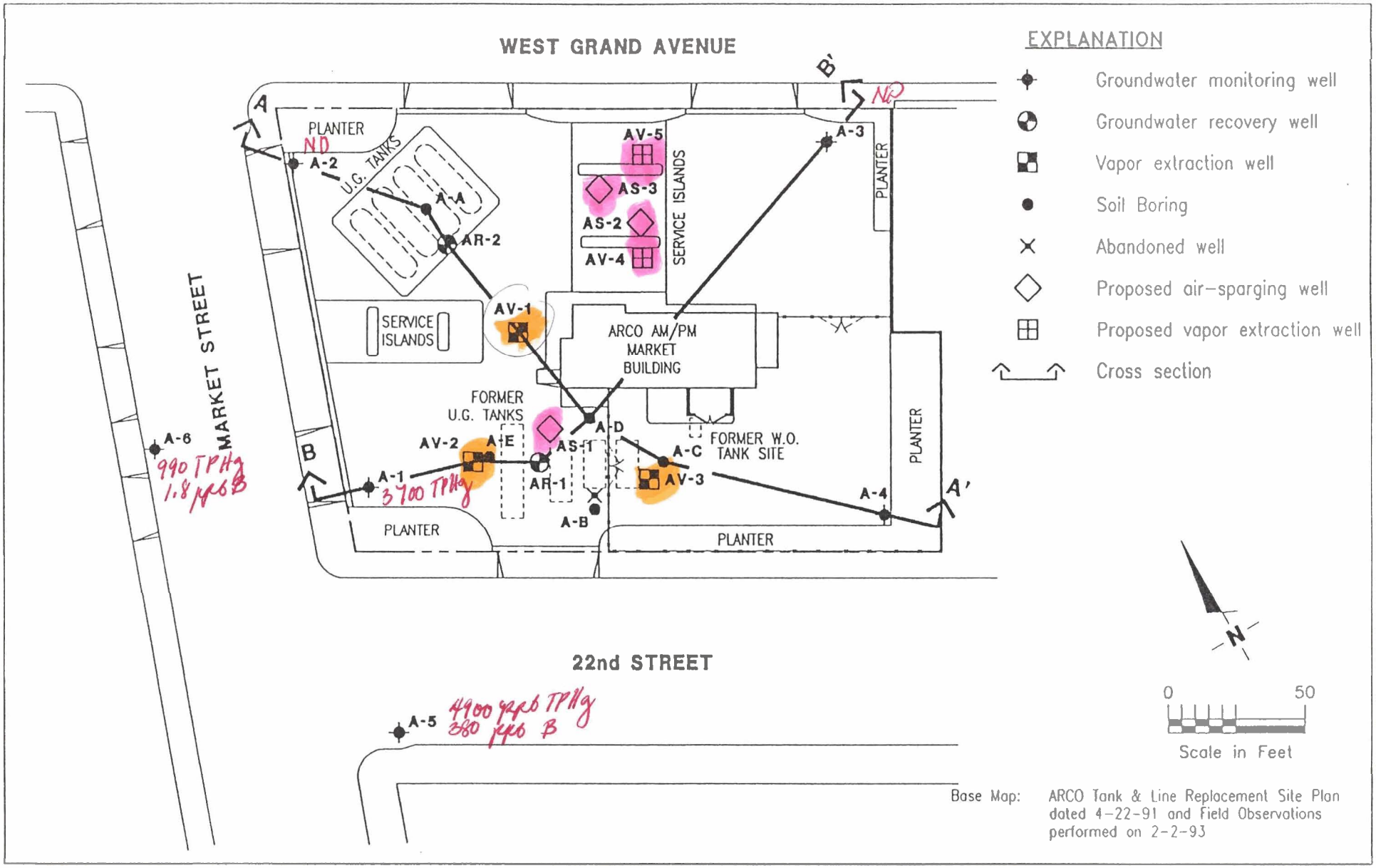
Base Map: USGS Topographic Map

GeoStrategies Inc.

VICINITY MAP
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 1

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7927		5/91	

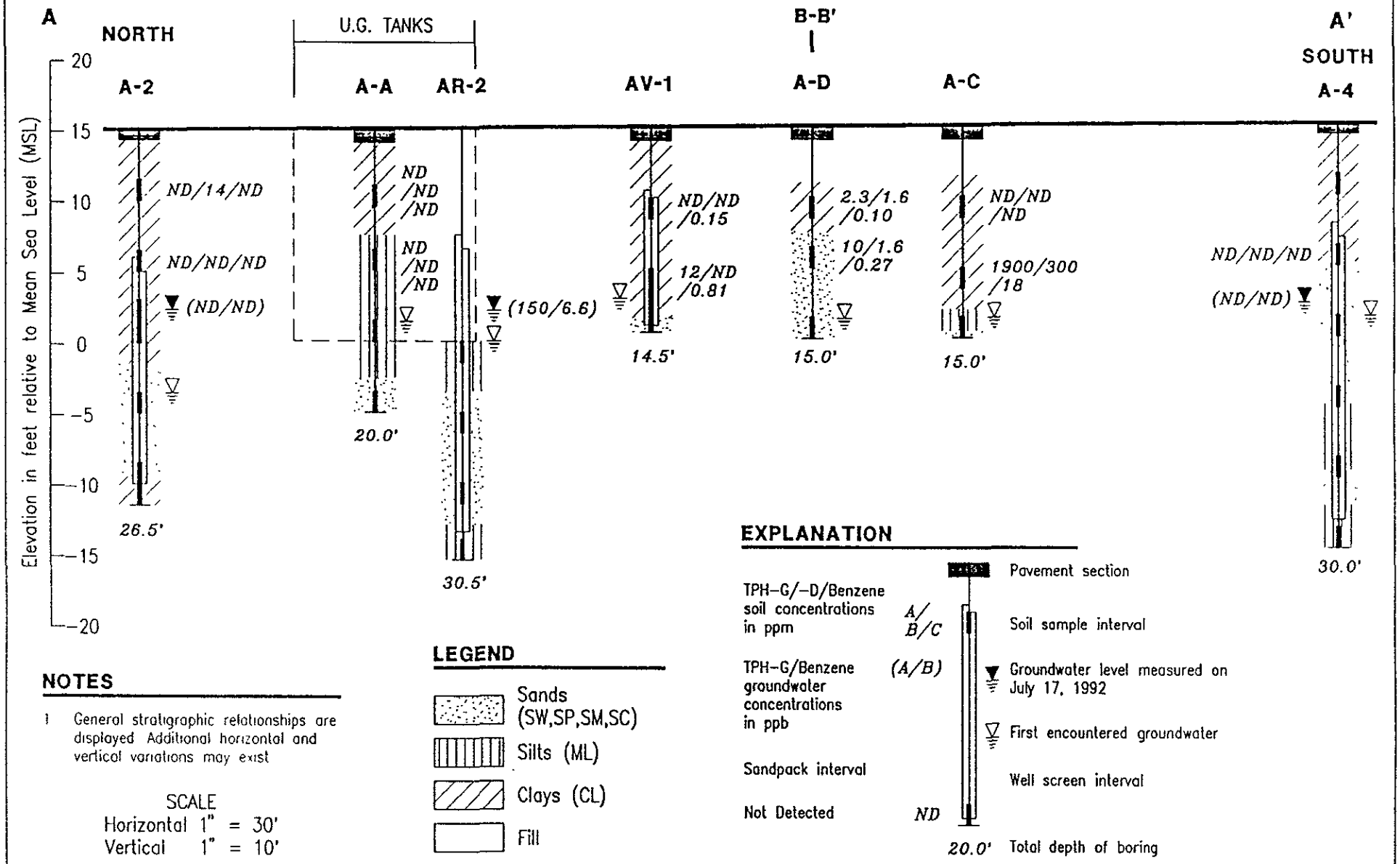


GeoStrategies Inc.

SITE PLAN
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 2

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792711-13		7/93	



NOTES

1 General stratigraphic relationships are displayed. Additional horizontal and vertical variations may exist.

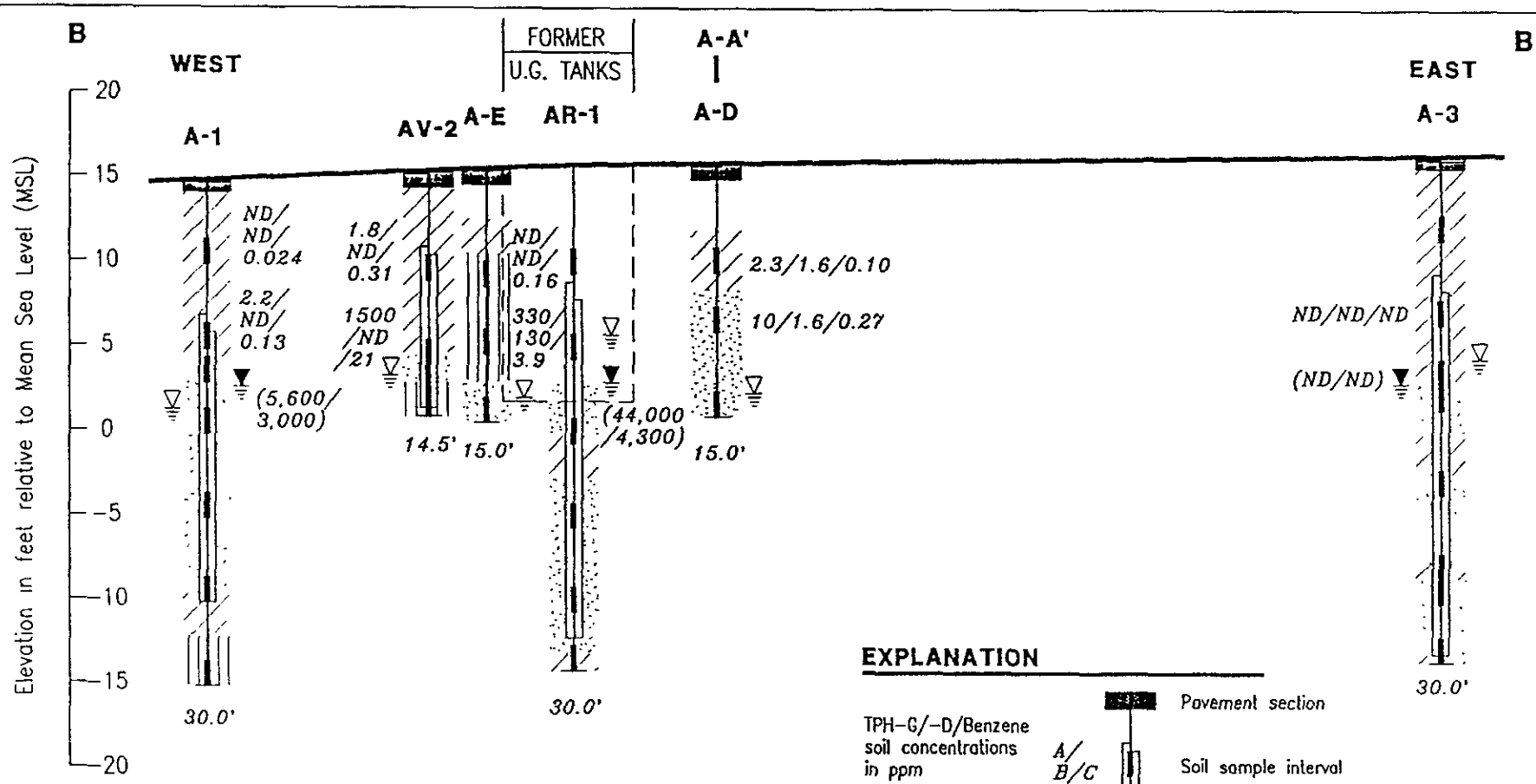
SCALE
Horizontal 1" = 30'
Vertical 1" = 10'

GeoStrategies Inc.

CROSS SECTION A-A'
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE **3**

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792711-13		7/93	



NOTES

1. General stratigraphic relationships are displayed. Additional horizontal and vertical variations may exist.

SCALE
Horizontal 1" = 30'
Vertical 1" = 10'

LEGEND

- Sands and Gravels (SW,SP,SM,SC,GW)
- Silts (ML)
- Clays (CL)
- Fill

EXPLANATION

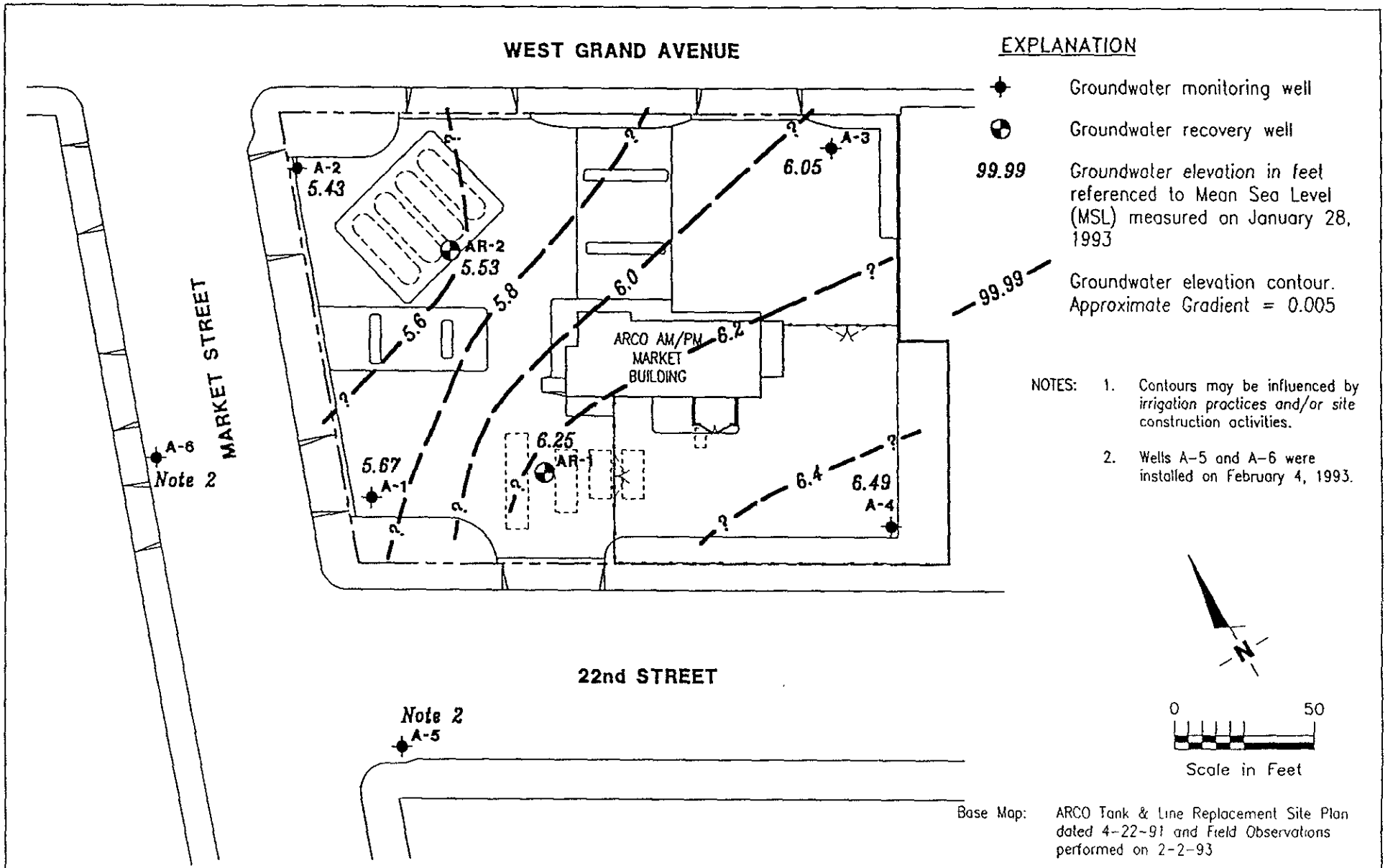
- TPH-G/-D/Benzene soil concentrations in ppm — A/B/C
- TPH-G/Benzene groundwater concentrations in ppb — (A/B)
- Sandpack interval
- Not Detected — ND
- Pavement section
- Soil sample interval
- Groundwater level measured on July 17, 1992
- First encountered groundwater
- Well screen interval
- 20.0' Total depth of boring

GeoStrategies Inc.

CROSS SECTION B-B'
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 4

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792711-13		7/93	



GeoStrategies Inc.

POTENTIOMETRIC MAP (JANUARY 28, 1993)

ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE
5

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792711-13		7/93	

PRELIMINARY TIME SCHEDULE

PROJECT STEPS	ESTIMATED TIME IN WEEKS (AFTER ACQUIRING REGULATORY APPROVAL)																								COMMENTS
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
(1) OBTAIN PERMITS, SCHEDULE DRILLING																									
(2) DRILL AND INSTALL WELLS																									
(3) SUBMIT SOIL SAMPLES FOR ANALYSIS																									
(4) DEVELOP WELLS																									
(5) SURVEY WELLS																									
(6 & 7) CONDUCT 8 HR. AIR-SPARGING/VAPOR EXTRACTION TESTS																									
(8) PREPARE REPORT																									

NOTES: 1. IF ARCO HAS NOT RECEIVED REGULARORY APPROVAL OF THIS WORK PLAN WITHIN 60 DAYS, THEY WILL PROCEED AS STATED IN TITLE 23, ARTICLE 11, CHAPTER 16, SECTIONS 2722 (b)(5) AND 2726 (c).

LEGEND

ESTIMATED SCHEDULE

GeoStrategies Inc.

PRELIMINARY TIME SCHEDULE
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

PLATE 6

JOB NUMBER 792711-13

REVIEWED BY

DATE 7/93

REVISED DATE