Shell Oil Company

EAST BAY MARKETING DISTRICT

P.O. Box 4023
Concord, CA 94524
(415) 676-1414

October 12, 1990

Mr. Gil Wistar
County of Alameda
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

SUBJECT: SHELL SERVICE STATION
999 SAN PABLO AVENUE
ALBANY, CALIFORNIA

Dear Mr. Wistar:

Enclosed is a of copy of the Well Installation Report dated October 10, 1990 which documents the installation of two off-site ground-water monitoring wells at the subject location.

If you should have any questions or comments regarding this project please do not hesitate to call me at (415) 675-6127.

Very truly yours,

Diane M. Lundquist
District Environmental Engineer

cc: Mr. Tom Callaghan, Regional Water Quality Control Board
Mr. John Werfal, Gettler-Ryan Inc.

GeoStrategies Inc.

WELL INSTALLATION REPORT

Shell Service Station
999 San Pablo Avenue
Albany, California

Report No. 7666-4

October 10, 1990

GeoStrategies Inc.
2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545
(415) 352-4800

October 10, 1990

Gettler-Ryan Inc.
2150 West Winton Avenue
Hayward, California 94545

Attn: Mr. John Werfal

Re: WELL INSTALLATION REPORT
Shell Service Station
999 San Pablo Avenue
Albany, California

Gentlemen:

This report summarizes the field activities performed by GeoStrategies Inc. (GSI) and presents the results of ground-water sampling conducted by Gettler-Ryan Inc. (G-R) at the above referenced location (Plate 1). Two exploratory soil borings were drilled and completed as ground-water monitoring wells designated S-6 and S-7, on August 15,, 1990. The monitoring network was sampled on August 28, 1990 (Plate 2). Field work was conducted in accordance with current State of California Water Resources Control Board (SWRCB) guidelines. GSI and G-R Field Methods and Procedures are presented in Appendix A.

The site is located on the northeast corner of San Pablo Avenue and Marin Avenue. An automotive repair shop is north of the site and a service station is located across Marin Avenue. Residential property is adjacent to the site along Marin Avenue. There are three on-site monitoring wells, S-1 through S-3, four off-site wells S-4, S-5, S-6 and S-7, and three corrugated, galvanized, 6-inch-diameter steel wells which appear to be located within the tank backfill area.

SITE BACKGROUND

In January 1990, GSI drilled ten exploratory soil borings (S-A through S-G and S-1, S-2, and S-3) and completed three of these as ground-water monitoring wells (S-1 through S-3). These borings were drilled to characterize soil conditions prior to the replacement of the underground storage tanks (UGSTs). Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) were detected at concentrations ranging from 5.6 to 1900. parts per million (ppm) in soil samples collected from the 5-foot and 10-foot depth interval in the borings. Higher concentrations were detected in samples collected at the 10-foot depth interval.

In April 1990, GSI installed two off-site ground-water monitoring wells (S-4 and S-5) to further delineate hydrocarbon migration. TPH-Gasoline was detected in soil samples collected from well boring S-5 at 25. ppm and 130. ppm in the 12- and 15-foot sample intervals, respectively. Ground-water sampling of the monitoring network was conducted in May 1990. Well S-5 contained 0.64 feet of floating product in measured thickness. TPH-Gasoline concentrations ranged from 2.0 to 11. ppm in Wells S-1, S-2 and S-3 and benzene concentrations ranged from 0.018 to 2.3 ppm. TPH-Gasoline and benzene were not detected in Well S-4.

FIELD PROCEDURES

Two off-site exploratory soil borings (S-6 and S-7) were drilled using a truck-mounted hollow-stem auger drilling rig. The soil borings were drilled to a depth of 19.5 feet below ground surface and completed into monitoring wells. Well S-6 was installed on Marin Avenue in the suspected cross-gradient direction, and Well S-7 was installed on San Pablo Avenue in the suspected down-gradient direction.

Soil samples were collected at approximately five-foot depth intervals using a Modified California split-spoon sampler fitted with precleaned brass tube liners. A GSI geologist supervised the drilling, described soil samples using the Unified Soil Classification System, and Munsell Soil Color Chart, and prepared lithologic logs for each boring. Exploratory boring logs are presented in Appendix B.

A 4-inch long brass tube of soil from each sampled interval was used to perform head-space analysis in the field for the presence of Volatile Organic Compounds (VOCs). Head-space analysis involved transferring soil from the brass liner into a clean glass jar and immediately covering the jar with aluminum foil secured under a ring-type threaded lid. After approximately 20 minutes, the foil was pierced and head-space within the jar was tested for VOCs measured in parts per million (ppm) using an Organic Vapor Monitor (OVM) photoionization detector. These field procedures are performed and recorded as reconnaissance data. Soil sample selection for chemical analysis is based upon site specific geological conditions as they relate to potential contaminant migration pathways and confining layers. Head-space analysis results are presented on each boring log in Appendix B.

Soil samples retained for chemical analyses were collected in clean brass liners, covered on both ends with aluminum foil and sealed with plastic end caps. The samples were labeled, entered onto a Chain-of-Custody form, placed in a cooler with blue ice, and transported to International Technology (IT) Analytical Services, a State-certified environmental laboratory located in San Jose, California. The IT certified analytical report is presented in Appendix C. The chemical analytical soil data are summarized in Table 1.

HYDROGEOLOGY

The subsurface lithology for this site consists of fill sands and clays underlain by a clay unit. This clay unit is underlain by a saturated silty sand, which overlies a silt with sand unit which appears to contain very little water. In well borings S-6 and S-7, Temescal Formation Siltstone was encountered near the bottom of the boring.

The silty sand (SM) unit is interpreted to be the uppermost water-bearing strata (aquifer), with the overlying clay unit and the underlying silt unit acting as confining layers (aquitards) locally. The aquifer appears to be semi-confined to confined, as evidenced by the rise in water levels from first encountered water to stabilized water level. Geologic cross-sections prepared from exploratory boring log data suggest that lateral facies changes occur over the area investigated (Plates 5 and 6). These changes are suspected to affect the occurrence and velocity of ground-water movement.

Monitoring Well Design and Construction

Monitoring wells S-6 and S-7 were installed to a total depth of 15 feet. The wells were constructed using 3-inch-diameter Schedule 40 PVC well casing and 0.020-inch factory slotted well screen. The well screens were placed from the bottom of the borings to approximately four feet above static water level. Lonestar #2/12 graded sand was placed in the annular spaces along the entire screened intervals to approximately one foot above the top of the screens. A one-foot thick bentonite seal followed by a cement grout seal to approximately one foot below grade was placed above the sand packs. Each well was completed at ground surface with a locking cap and lock, secured underneath a traffic-rated Christy box set in concrete. Monitoring well construction details are presented with the boring logs in Appendix B.

Potentiometric Data

Static ground-water levels were measured on August 28, 1990, using an electronic oil-water interface probe. Water levels were measured from the surveyed top of well box and recorded to the nearest ± 0.01 foot (Table 1). Ground-water elevation data, referenced to Mean Sea Level (MSL), were used to prepare a potentiometric contour map (Plate 3). Plate 3 indicates groundwater flows to the southwest. The hydraulic gradient in the uppermost water-bearing zone was calculated to be 0.025.

Floating Product Data

Field measurements for floating product were made in each monitoring well using an electronic oil-water interface probe. Readings were recorded to the nearest ±0.01 foot. Each well was also checked with a clean, clear, acrylic bailer to visually confirm interface probe results and to check for the presence of a product sheen. Floating product was only observed in Well S-5 at 3.51 feet in measured thickness (Table 1). Product sheens were not observed in any of the wells.

CHEMICAL ANALYTICAL DATA

Soil Analytical Data

Soil samples from borings S-6 and S-7 were analyzed for Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) according to EPA Method 8015 (Modified) and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) according to EPA Method 8020.

TPH-Gasoline and BTEX were not detected in the 19.5-foot depth interval sample from Boring S-6. Samples collected from the 6.0 and 9.0 foot depth intervals contained 180. and 770. ppm TPH-Gasoline, respectively. BTEX compounds were also detected in the 6.0 and 9.0 foot soil samples (Table 1). TPH-Gasoline and BTEX were not detected in the two analyzed soil samples from Boring S-7. The analyzed samples were collected from the 9.0 and 19.5 foot depth intervals. The IT - Analytical Services certified analytical report is presented in Appendix C.

Ground-water Analytical Data

Ground-water samples were collected from Wells S-1 through S-7 on August 28, 1990. A ground-water sample was not collected from Well S-5 due to the presence of floating product. Samples were analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020 at IT Analytical Services.

TPH-Gasoline concentrations were detected in Wells S-1 through S-3 and S-6 ranging from 0.80 to 14. ppm (Table 1). Benzene was also detected in these wells at concentrations ranging from 0.0081 to 3.9 ppm. The benzene concentrations in Wells S-1 through S-3, and S-6 exceed the current Regional Water Quality Control Board (RWQCB) Maximum Contaminant Level (MCL). Samples from Wells S-4 and S-7 did not contain detectable levels of TPH-Gasoline or benzene. The IT analytical report notes that the differences between values obtained from sample S-2 and duplicate sample SD-2 may be due to laboratory induced headspace in sample S-2. The values for SD-2 are consistent with historical chemical analytical data for S-2 and were used in the preparation of the TPH-Gasoline and benzene concentration map presented on Plate 4. Historical chemical analytical data are presented in Table 3.

Quality Control

Quality Control (QC) samples for this quarter's ground-water sampling included a trip blank, a field blank, and a duplicate sample. The trip blank was prepared in the IT laboratory using organic-free water to evaluate laboratory handling and analytical procedures. The field blank was prepared in the laboratory and poured in the field using organic-free water to evaluate field sampling procedures. A duplicate sample was collected as a split (second sample) to quantitatively assess laboratory procedures and analytical precision. The IT laboratory chemical analytical reports for this quarter's ground-water sampling are presented in Appendix D. G-R Groundwater Sampling Forms and Chain-of-Custody Forms are included in the Ground-Water Sampling Report presented in Appendix D. G-R Sampling Protocol are presented in Appendix A.

The analysis performed on the trip blank and on the field blank did not detect any measurable concentrations of TPH-Gasoline or BTEX. These results indicate that proper laboratory handling techniques were followed and that no hydrocarbons were introduced into the samples during sampling or transport, or from ambient field conditions.

Precision of QC data can be evaluated by calculating the Relative Percent Difference (RPD) between duplicate samples and the corresponding well samples. The RPD between S-2 and SD-2 could not be calculated due to laboratory-induced headspace in S-2.

The hydrocarbon plume is not sufficiently delineated. Although ND off-site wells have been installed (S-4 and S-7, which are southeast and northwest of the site), additional monitoring wells will be necessary to sufficiently delineate the extent of the hydrocarbon plume.

SUMMARY

A summary of site activities and findings is presented below:

- Two exploratory soil borings, S-6 and S-7, were drilled to a total depth of 19.5 feet and completed as ground-water monitoring wells.

- Analyses identified TPH-Gasoline and BTEX in soil samples collected from the 6.0-foot (180. ppm) and 9.0-foot (770. ppm) depth interval in Boring S-6. Hydrocarbons were not detected in soil samples collected from Boring S-7.

- Encountered lithology in Borings S-6 and S-7 included a silty sand aquifer underlain by a sandy silt which may act as a basal confining layer (aquitard).

- Ground-water samples collected from Wells S-1 through S-3, and S-6 contained detectable levels of TPH-Gasoline and benzene. Benzene concentrations in Wells S-1 through S-3, and S-6 exceed the current RWQCB MCL. Ground-water samples from Wells S-4 and S-7 were reported as ND. Well S-5 contained 3.51 feet of floating product and was not sampled.

- Water-level data indicate groundwater flows to the southwest with an approximate hydraulic gradient of 0.025. Floating product (measurable thickness or product sheen) has not been observed in Wells S-2, S-3, and S-6, which are located between the Shell UGSTs and downgradient Well S-5. At this time, available data suggest that the Shell facilities may not be the source of floating product observed in Well S-5. The present distribution of hydrocarbons beneath the site appears to support this conclusion. The site adjacent to Well S-5 is listed with the RWQCB as having a documented fuel release, and may be the source of the floating product identified in Well S-5. Additional hydrogeologic and geologic information will be required to assess potential migration pathways and the source of the floating product.

- The hydrocarbon plume has not been sufficiently delineated. ND wells are to the southeast and northwest (Wells S-4 and S-7). Additional monitoring wells are necessary to delineate the extent of the dissolved plume.

PLANNED SITE ACTIVITIES

The following activities will be conducted at this site:

- Ground-water samples will be collected from site monitoring wells on a quarterly schedule. The samples will be analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020. Water-level and floating product data will be collected on a weekly schedule.

- RWQCB files will be reviewed to evaluate potential off-site sources of the floating product observed in Well S-5.

If you have any questions, please call.

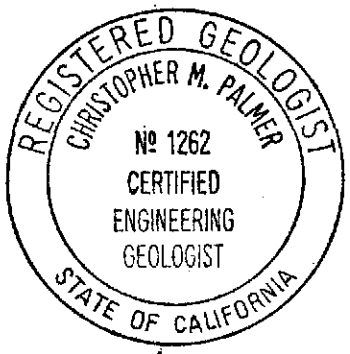
GeoStrategies Inc. by,

Ellen C. Fostersmith

Ellen C. Fostersmith
Geologist

Jeffrey L. Peterson

Jeffrey L. Peterson
Senior Hydrogeologist
R.E.A. 1021



Christopher M. Palmer

Christopher M. Palmer
C.E.G. 1262, R.E.A. 285

ECF/JLP/kjj

Plate 1. Vicinity Map
Plate 2. Site Plan
Plate 3. Potentiometric Map
Plate 4. TPH-G/Benzene Concentration Map
Plate 5. A-A' Cross-Section
Plate 6. B-B' Cross-Section

Appendix A. Field Methods and Procedures
Appendix B. Boring Logs and Well Construction Details
Appendix C. Soil Analytical Report
Appendix D. G-R Groundwater Sampling Report

REFERENCES

GeoStrategies Inc., 1990; Well Installation and Soil Boring Report: Report No. 7666-2, dated March 23, 1990.

GeoStrategies Inc., 1990; Well Installation Report: Report No. 7666-3, dated June 28, 1990.

TABLES

TABLE 1

SOIL ANALYSIS DATA

SAMPLE NO	SAMPLE DATE	ANALYSIS DATE	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
S-6-6	15-Aug-90	23-Aug-90	180.	0.2	0.4	0.5	1.5
S-6-9	15-Aug-90	23-Aug-90	770.	2.2	2.8	6.8	5.1
S-6-19.5	15-Aug-90	22-Aug-90	<1.	<0.005	<0.005	<0.005	<0.005
S-7-9	15-Aug-90	22-Aug-90	<1.	<0.005	<0.005	<0.005	<0.005
S-7-19.5	15-Aug-90	22-Aug-90	<1.	<0.005	<0.005	<0.005	<0.005

TPH = Total Petroleum Hydrocarbons calculated as Gasoline

Note: 1. All data shown as <x are reported as ND (none detected).

TABLE 2

GROUND-WATER ANALYSIS DATA

WELL NO	SAMPLE DATE	ANALYSIS DATE	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)	WELL ELEV (FT)	STATIC WATER ELEV (FT)	PRODUCT THICKNESS (FT)	DEPTH TO WATER (FT)
S-1	28-Aug-90	11-Sep-90	0.80	0.0081	0.001	0.075	0.054	42.73	34.40	----	8.33
S-2	28-Aug-90	11-Sep-90	4.4	1.7	0.035	0.16	0.17	40.73	32.29	----	8.44
S-3	28-Aug-90	11-Sep-90	0.66	0.0087	0.001	0.026	0.007	41.46	33.85	----	7.61
S-4	28-Aug-90	06-Sep-90	<0.005	<0.0005	0.0006	<0.0005	0.0010	41.10	33.01	----	8.09
S-5	28-Aug-90	----	----	----	----	----	----	39.99	29.54	3.51	13.26
S-6	28-Aug-90	11-Sep-90	5.7	0.58	0.023	0.032	0.058	40.12	30.90	----	9.22
S-7	28-Aug-90	04-Sep-90	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	40.10	29.09	----	11.01
SD-2	28-Aug-90	11-Sep-90	14.	3.9	0.13	1.0	1.1	----	----	----	----

CURRENT REGIONAL WATER QUALITY CONTROL BOARD MAXIMUM CONTAMINANT LEVELS
Benzene 0.001 ppm Xylenes 1.750 ppm Ethylbenzene 0.68 ppm

CURRENT DHS ACTION LEVELS
Toluene 0.100 ppm

TPH = Total Petroleum Hydrocarbons as Gasoline
PPM = Parts Per Million
ND = None Detected
SD = Duplicate Sample
SF = Field Blank
TB = Trip Blank

Note: 1. For chemical parameter detection limits, refer to I.T. Laboratory reports
2. Water level elevations referenced to mean sea level (MSL).
3. DHS Action Levels and MCLs are subject to change pending State review.

TABLE 2

GROUND-WATER ANALYSIS DATA

WELL NO	SAMPLE DATE	ANALYSIS DATE	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)	WELL ELEV (FT)	STATIC WATER ELEV (FT)	PRODUCT THICKNESS (FT)	DEPTH TO WATER (FT)
SF-3	28-Aug-90	06-Sep-90	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	----	----	----	----
TB	----	06-Sep-90	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	----	----	----	----

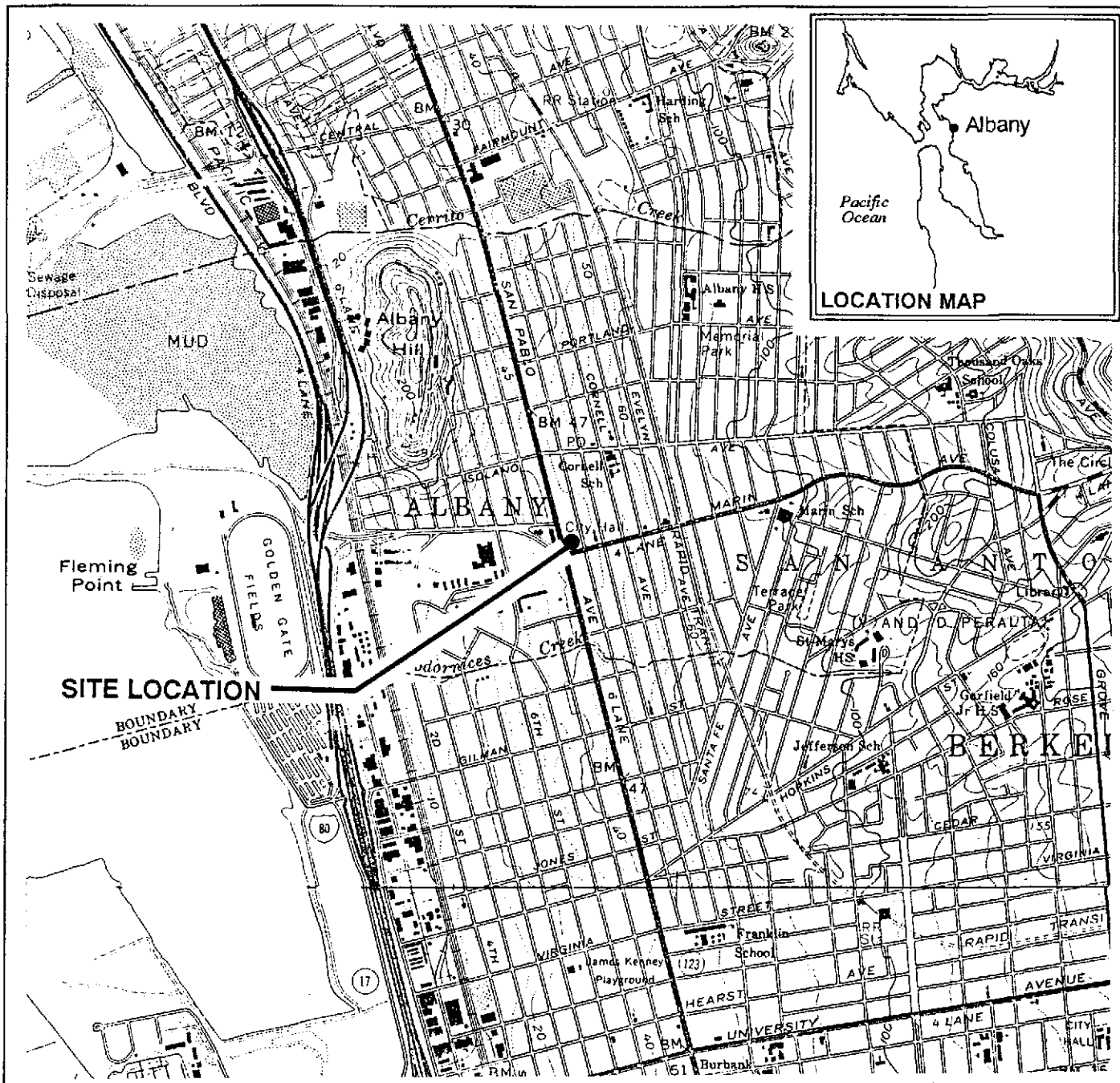
TABLE 3

ANALYTICAL LOG

SAMPLE DATE	SAMPLE POINT	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	E.B. (PPM)	XYLENES (PPM)
05-Feb-90	S-1	3.1	0.056	0.037	0.11	0.097
01-May-90	S-1	4.2	0.023	<0.0025	0.116	0.32
28-Aug-90	S-1	0.80	0.0081	0.001	0.075	0.054
05-Feb-90	S-2	8.7	1.6	0.058	0.16	1.0
01-May-90	S-2	11.	2.3	0.082	0.409	0.77
28-Aug-90	S-2	4.4	1.7	0.035	0.16	0.17
05-Feb-90	S-3	5.7	0.045	0.004	0.12	0.50
01-May-90	S-3	2.0	0.018	<0.0025	0.024	0.008
28-Aug-90	S-3	0.66	0.0087	0.001	0.026	0.007
01-May-90	S-4	<0.05	<0.0005	<0.0005	<0.0005	<0.001
28-Aug-90	S-4	<0.05	<0.0005	0.0006	<0.0005	0.0010
28-Aug-90	S-6	5.7	0.58	0.023	0.032	0.058
28-Aug-90	S-7	<0.05	<0.0005	<0.0005	<0.0005	<0.0005

All data shown as <X are reported as ND (none detected)

ILLUSTRATIONS



Base Map: USGS Topographic Map

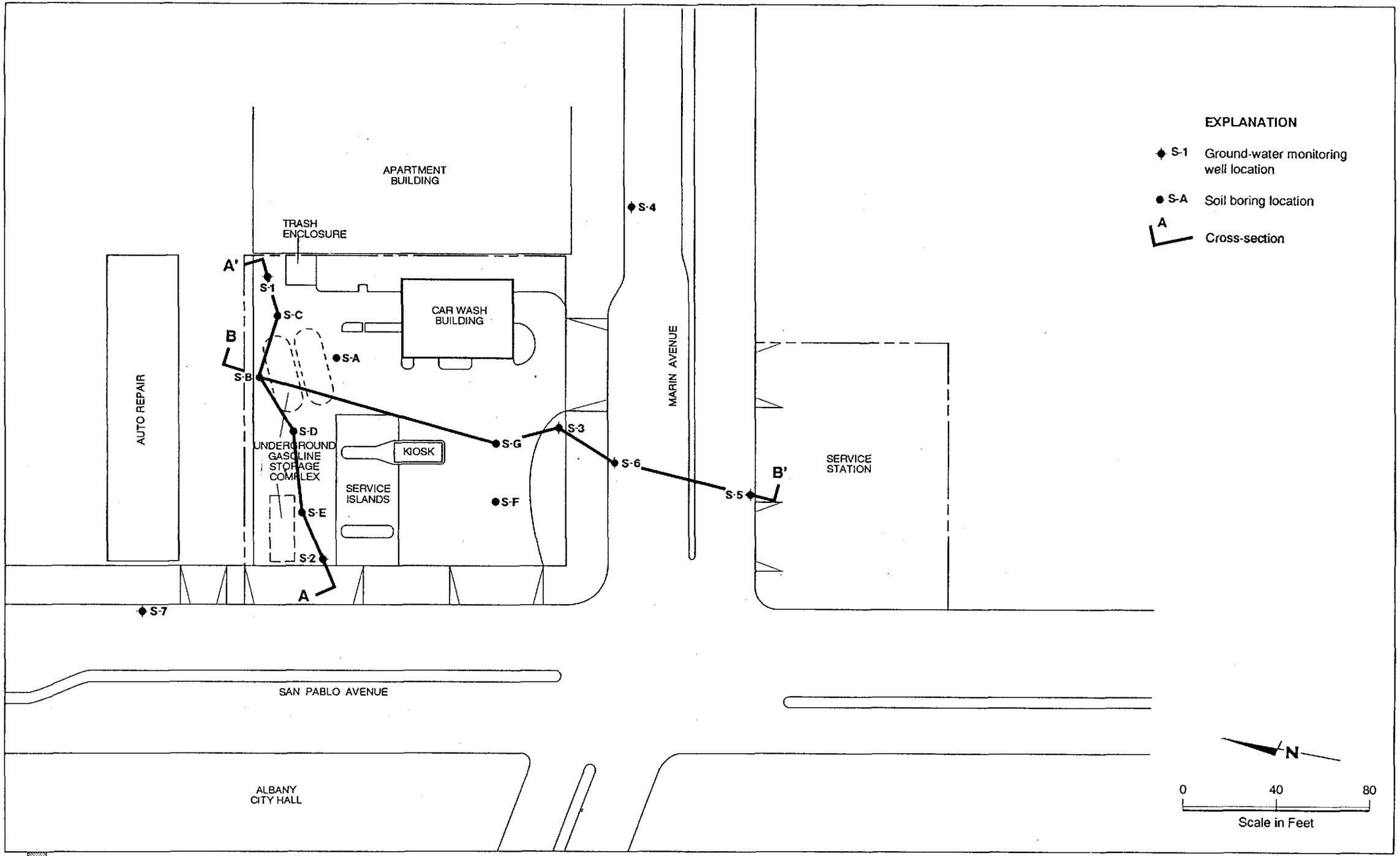
Approximate Scale : 1" = 2000'

GeoStrategies Inc.

Vicinity Map
Shell Service Station
999 San Pablo Avenue
Albany, California

PLATE
1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666		1/90		

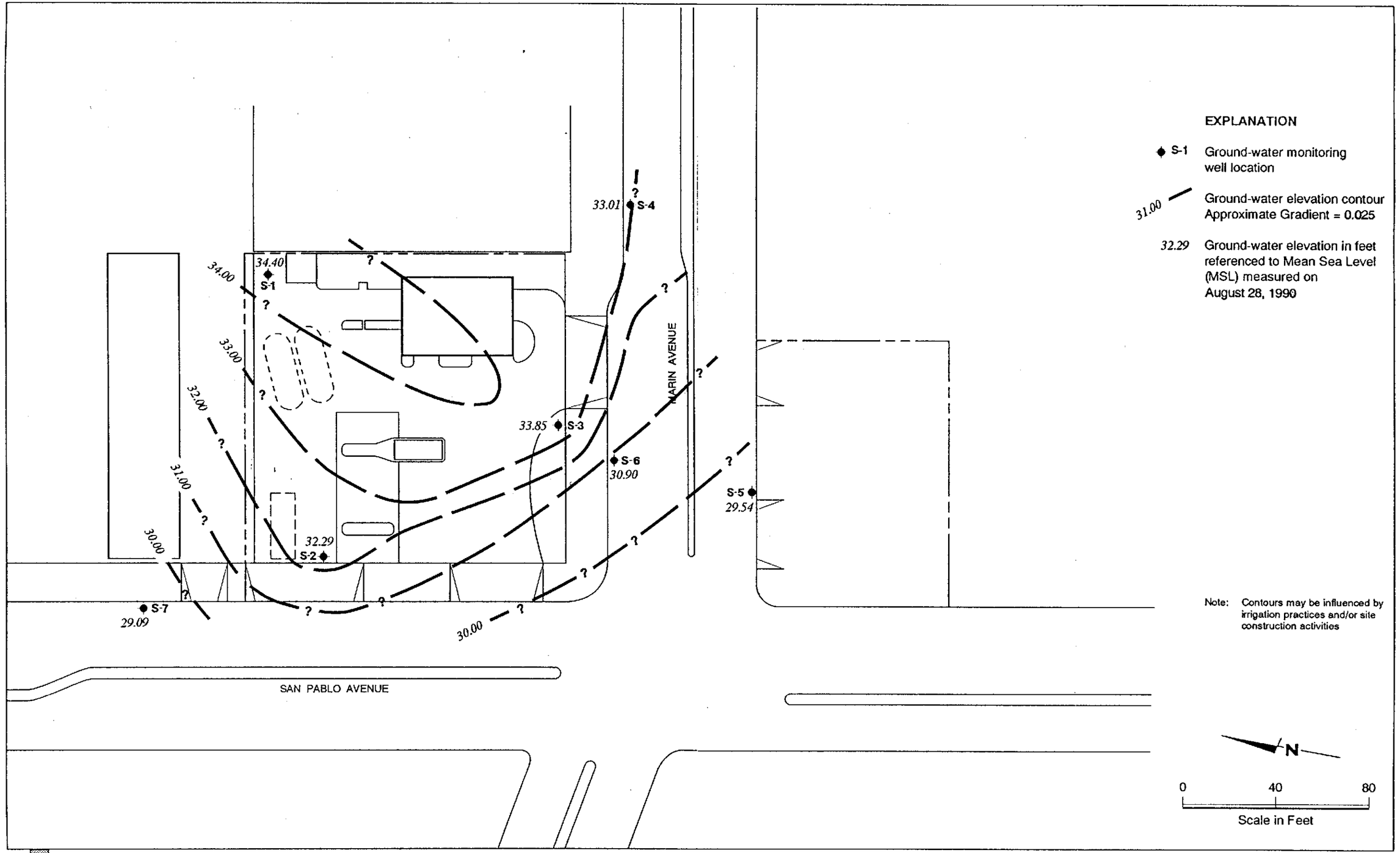


GeoStrategies Inc.

Site Plan
Shell Service Station
999 San Pablo Avenue
Albany, California

PLATE
2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	CMP CEG 1262	9/90	10/90	

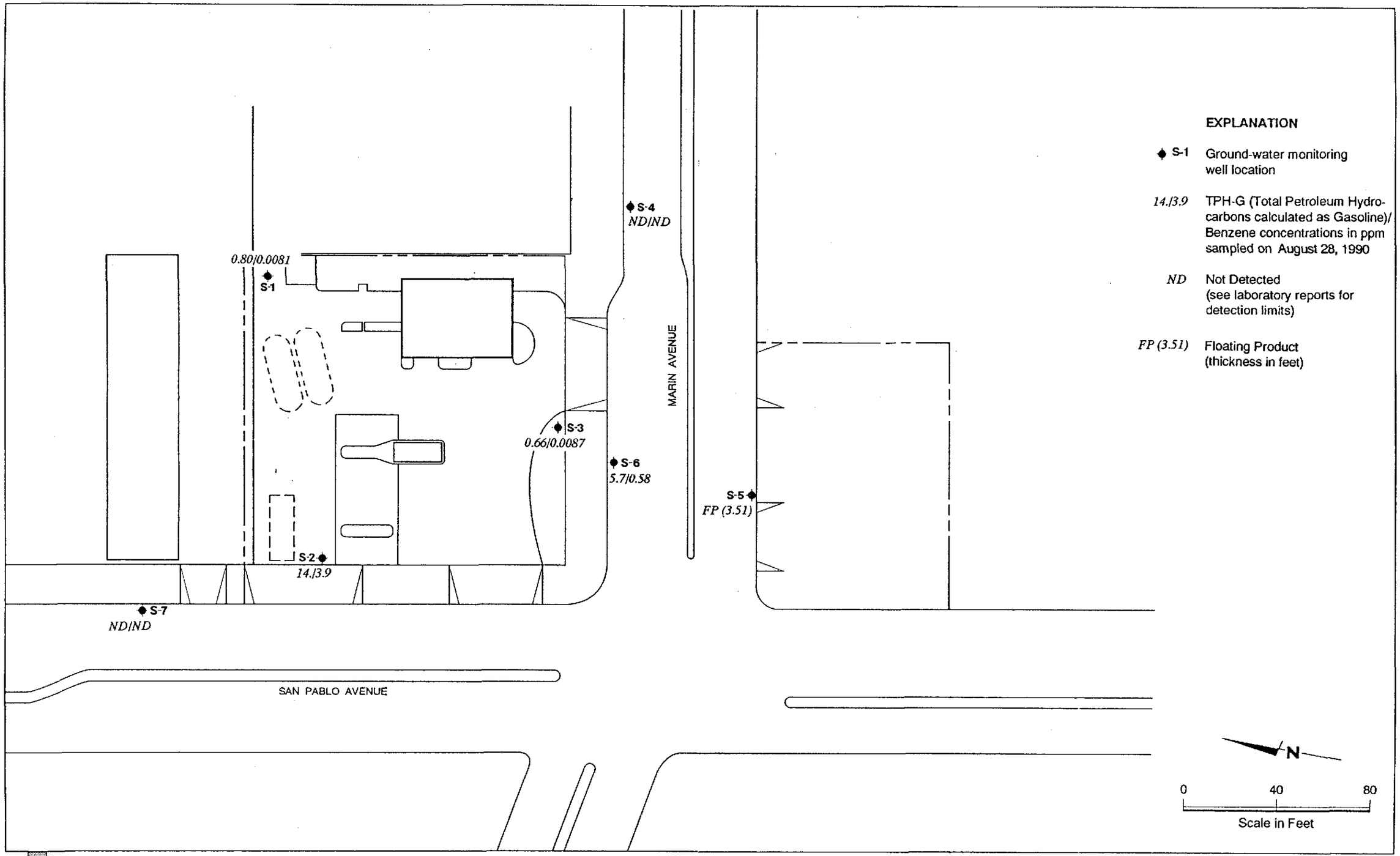


GeoStrategies Inc.

Potentiometric Map
Shell Service Station
999 San Pablo Avenue
Albany, California

PLATE 3

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	RMP CEG 1262	9/90		

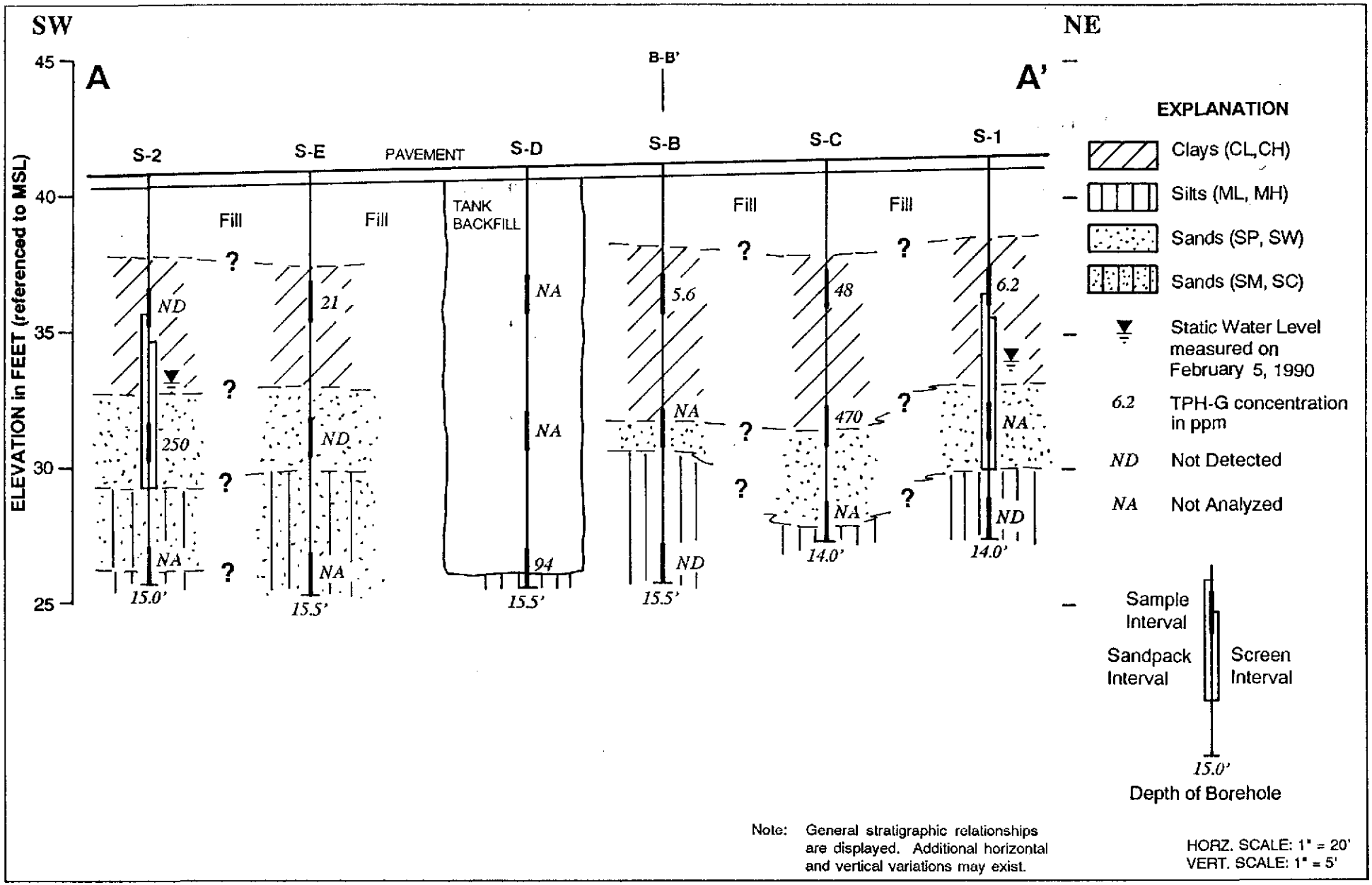


GeoStrategies Inc.

TPH-G/Benzene Concentration Map
Shell Service Station
999 San Pablo Avenue
Albany, California

PLATE
4

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	RG CEG 12/92	9/90		



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

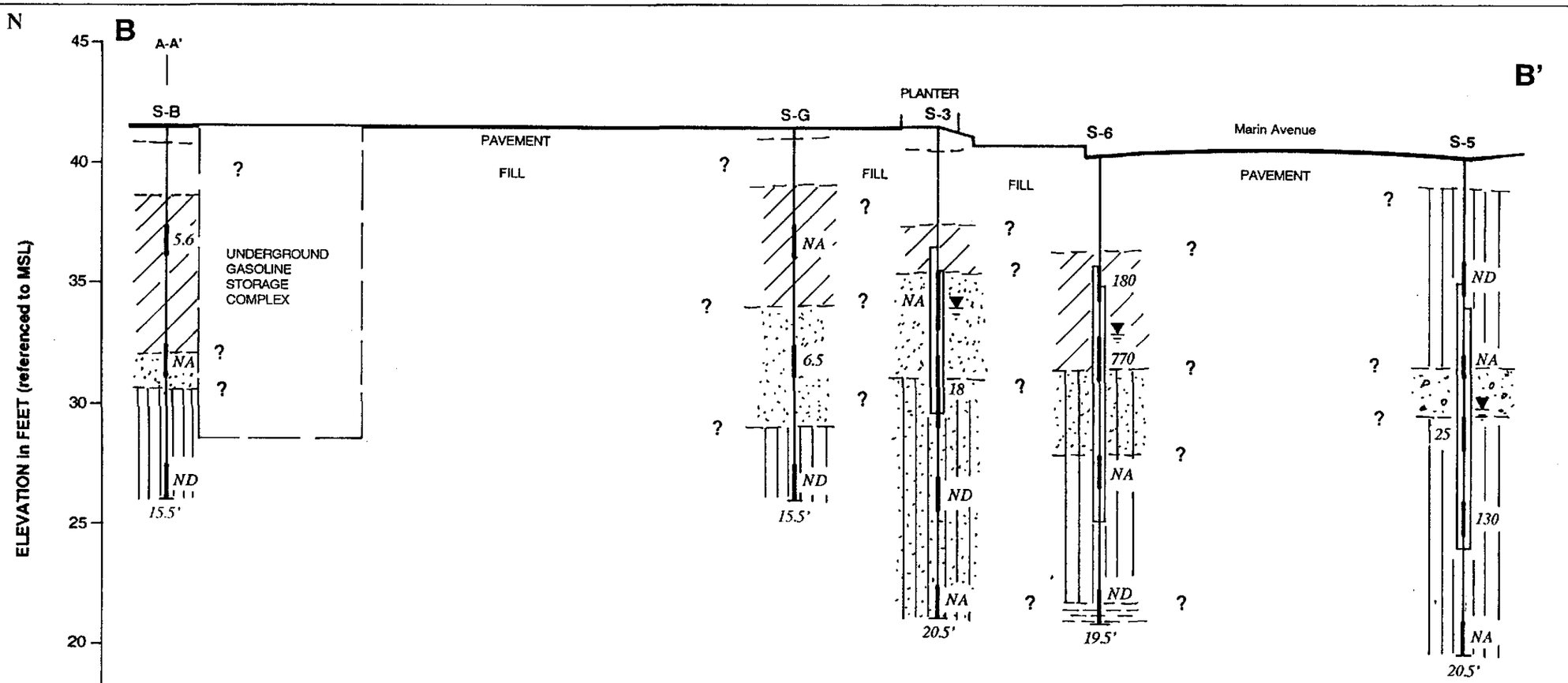
HORZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 5'

GeoStrategies Inc.

Cross-section A-A'
Shell Service Station
999 San Pablo Avenue
Albany, California

PLATE
5

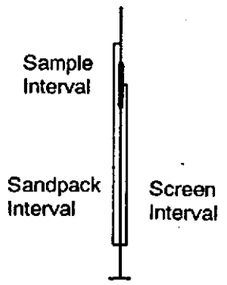
JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	CWP CEG 1262	3/90		



EXPLANATION

- Clays (CL, CH)
- Silts (ML, MH)
- Sands (SP, SW)
- Sands (SM, SC)
- Gravels (GW, GP)
- Siltstone
- Static water level measured on August 28, 1990
- *5.6* TPH-G concentration in ppm
- *ND* Not Detected
- *NA* Not Analyzed

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



HORZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 5'

PLATE 6

Cross-Section B-B'
Shell Service Station
999 San Pablo Avenue
Albany, California

DATE	REVISED DATE	REVISED DATE
6/90		10/90

GeoStrategies Inc.

JOB NUMBER 7666

REVIEWED BY RG/CEG

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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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)

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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)

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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.

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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.

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 $\pm$0.01 foot. The presence of separate-phase product is confirmed using a clean, acrylic or polyvinylchloride (PVC) bailer, measured to the nearest $\pm$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

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.

TABLE 1

SAMPLE ANALYSIS METHODS, CONTAINERS, PRESERVATIONS, AND HOLDING TIMES

Parameter	Analytical Method	Reporting Units	Container	Preservation	Maximum Holding Time
Total Petroleum Hydrocarbons (Gasoline)	EPA 8015 (modified)	mg/l ug/l	40 ml. vial glass, Teflon	cool, 4 C HCl to pH<2	14 days (maximum)
Benzene Toluene Ethylbenzene Xylenes (BTEX	EPA 8020	mg/l ug/l	50 ml. vial glass, Teflon lined septum	cool, 4 C HCl to pH<2	7 days (w/o preservative) 14 days (w preservative)
Oil & Grease	SM 503E	mg/l ug/l	1 l glass, Teflon lined septum	H2SO4 or HCl to pH<2	28 days (maximum)
Total Petroleum Hydrocarbons (Diesel)	EPA 8015 (modified)	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool, 4 C	14 days (maximum)
Halogented Volatile Organics (chlorinated solvents)	8010	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool, 4 C	14 days (maximum)
Non chlorinated solvents	8020	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool, 4 C HCl to pH<2	14 days (maximum)
Volatile Organics	8240	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool, 4 C HCl to pH<2	14 days (maximum)
Semi-Volatile Organics	8270	mg/l ug/l	1 l amber glass, Teflon lined septum	cool, 4 C	7 days extract 40 days (maximum to analyze)
Specific Conductance (Field test)		umhos/cm			
pH (Field test)		pH units			
Temperature (Field test)		Deg F			

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FIELD EXPLORATORY BORING LOG

FIGURE 1

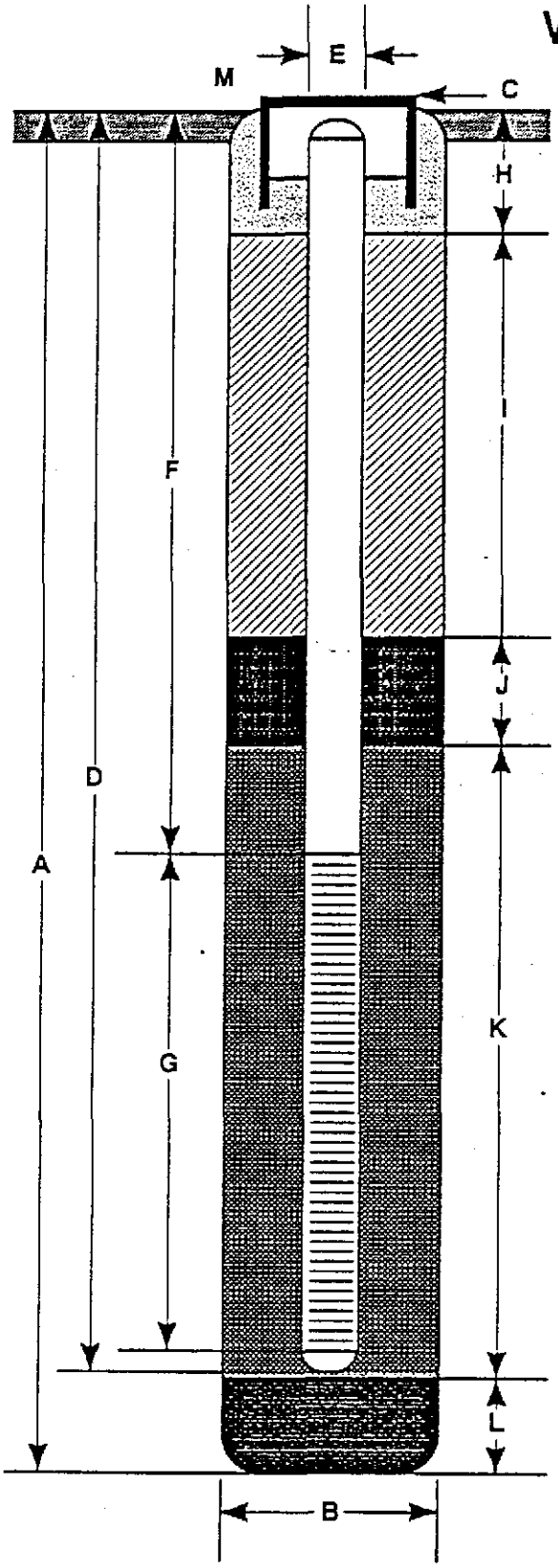
Field location of boring:	Project No.: / Date:	Boring No:
	Client:	
	Location:	
	City:	Sheet
	Logged by: / Driller:	of
Drilling method:	Casing installation data:	
Hole diameter:	Top of Box Elevation: / Datum:	

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Water Level				
								Time				
								Date				
								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_____

_____

_____

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WELL SAMPLING FIELD DATA SHEET

FIGURE 4

COMPANY _____ JOB # _____

LOCATION _____ DATE _____

CITY _____ TIME _____

Well ID. _____ Well Condition _____

Well Diameter _____ in. Hydrocarbon Thickness _____ ft.

Total Depth _____ ft.

Depth to Liquid- _____ ft.

Volume Factor (VF)			
	2" = 0.17	6" = 1.50	12" = 5.80
	3" = 0.38	8" = 2.60	
	4" = 0.66	10" = 4.10	

(# of casing volumes) _____ x _____ x(VF) _____ = (Estimated Purge Volume) _____ gal.

Purging Equipment _____

Sampling Equipment _____

Starting Time _____ Purging Flow Rate _____ gpm.

(Estimated Purge Volume) _____ gal. / (Purging Flow Rate) _____ gpm. = (Anticipated Purging Time) _____ min.

Time	pH	Conductivity	Temperature	Volume

Did well dewater? _____ If yes, time _____ Volume _____

Sampling Time _____ Weather Conditions _____

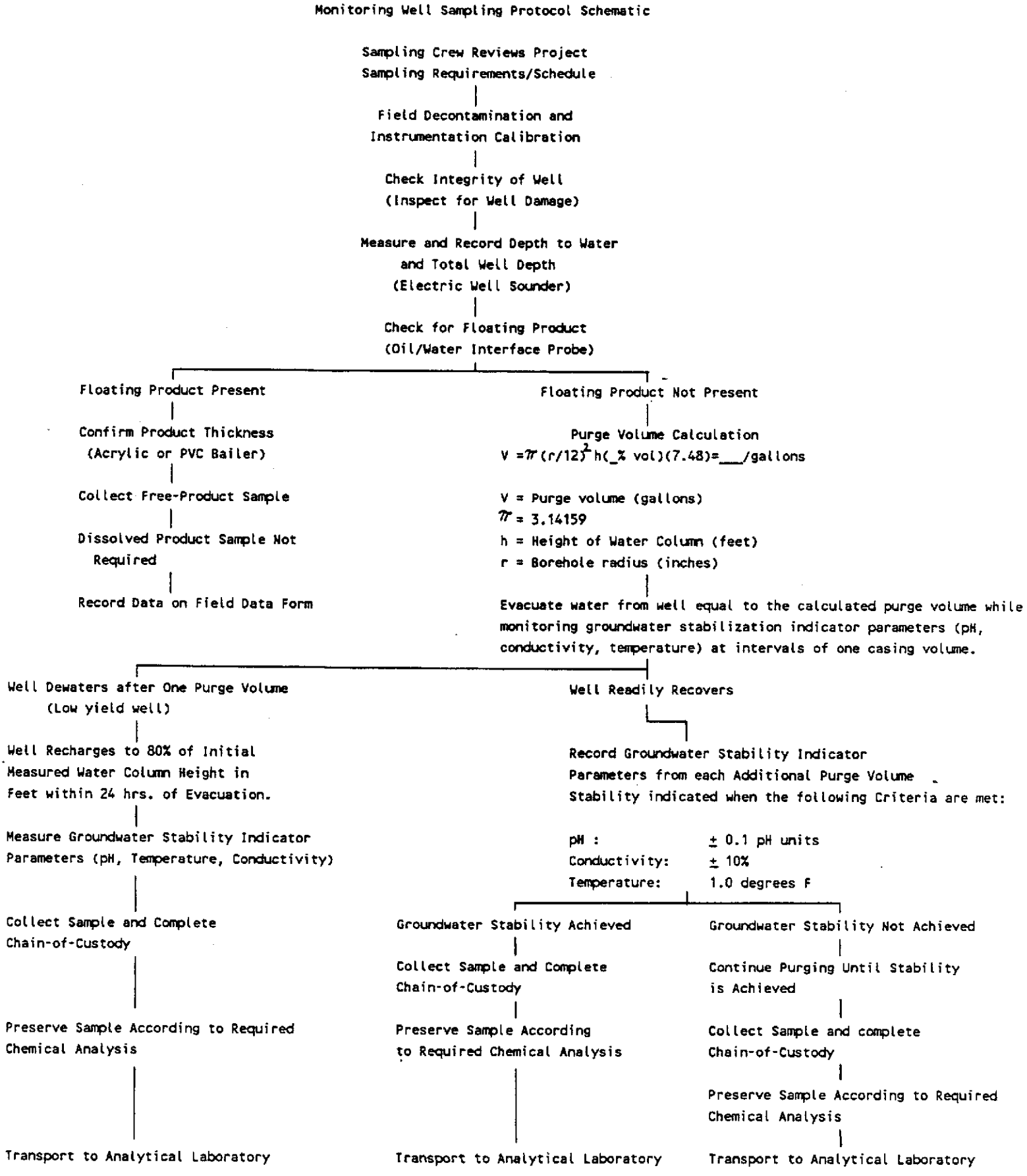
Analysis _____ Bottles Used _____

Chain of Custody Number _____

COMMENTS _____

FOREMAN _____

FIGURE 5


Monitoring Well Sampling Protocol Schematic
Sampling Crew Reviews Project Sampling Requirements/Schedule
Field Decontamination and Instrumentation Calibration
Check Integrity of Well (Inspect for Well Damage)
Measure and Record Depth to Water and Total Well Depth (Electric Well Sounder)
Check for Floating Product (Oil/Water Interface Probe)
Floating Product Present
Confirm Product Thickness (Acrylic or PVC Bailer)
Collect Free-Product Sample
Dissolved Product Sample Not Required
Record Data on Field Data Form
Floating Product Not Present
Purge Volume Calculation
V = π(r/12)² h(_% vol)(7.48)=___/gallons
V = Purge volume (gallons)
π = 3.14159
h = Height of Water Column (feet)
r = Borehole radius (inches)
Evacuate water from well equal to the calculated purge volume while monitoring groundwater stabilization indicator parameters (pH, conductivity, temperature) at intervals of one casing volume.
Well Dewaters after One Purge Volume (Low yield well)
Well Recharges to 80% of Initial Measured Water Column Height in Feet within 24 hrs. of Evacuation.
Measure Groundwater Stability Indicator Parameters (pH, Temperature, Conductivity)
Collect Sample and Complete Chain-of-Custody
Preserve Sample According to Required Chemical Analysis
Transport to Analytical Laboratory
Well Readily Recovers
Record Groundwater Stability Indicator Parameters from each Additional Purge Volume
Stability indicated when the following Criteria are met:
pH : ± 0.1 pH units
Conductivity: ± 10%
Temperature: 1.0 degrees F
Groundwater Stability Achieved
Collect Sample and Complete Chain-of-Custody
Preserve Sample According to Required Chemical Analysis
Transport to Analytical Laboratory
Groundwater Stability Not Achieved
Continue Purging Until Stability is Achieved
Collect Sample and complete Chain-of-Custody
Preserve Sample According to Required Chemical Analysis
Transport to Analytical Laboratory

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Chain of Custody
FIGURE 6

COMPANY _____ JOB NO. _____

JOB LOCATION _____

CITY _____ PHONE NO. _____

AUTHORIZED _____ DATE _____ P.O. NO. _____

SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID

RELINQUISHED BY: _____ RECEIVED BY: _____

RELINQUISHED BY: _____ RECEIVED BY: _____

RELINQUISHED BY: _____ RECEIVED BY LAB: _____

DESIGNATED LABORATORY: _____ DHS #: _____

REMARKS: _____

DATE COMPLETED _____ FOREMAN _____

Field location of boring:	Project No.: 7666	Date: 08/15/90	Boring No:
(See Plate 2)	Client: Shell Oil Company		S-6
	Location: 999 San Pablo Avenue		
	City: Albany, California		Sheet 1
	Logged by: MJJ	Driller: Bayland	of 2
Drilling method: Hollow Stem Auger	Casing installation data:		
Hole diameter: 8-Inches	Top of Box Elevation: 40.12		Datum: MSL

Water Level	9.38'		
Time	14:43		
Date	08/15/90		

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				0				PAVEMENT SECTION
				1				
				2				FILL - Sand (SP) - dark grayish brown (2.5Y 4/2), loose, damp; 85% medium sand; 15% silt; moderate chemical odor.
				3				-
				4				Lumber encountered at 3.5 feet.
	50			5				CLAY (CL) - dark greenish gray (5G 4/1), soft, very moist, medium plasticity; interbedded with medium sand; weak chemical odor.
256	50	S&H	S-6-6					
	50	push		6				
				7				
	300			8				strong chemical odor.
93	300	S&H	S-6-9					
	300	push		9				SILTY SAND (SM) - very dark gray (2.5Y N3/0), saturated, loose; 75% fine sand; 25% silt; trace gravel; strong chemical odor.
				10		▽		
				11				
				12				
	13			13				SANDY SILT (ML) - yellowish brown (10YR 5/5), damp, hard; 60% silt; 35% coarse to fine sand; 5% fine gravel; no chemical odor.
37	16	S&H	S-6-14					
	35			14				
				15				
				16				
				17				
				18				

Remarks:

GeoStrategies Inc.

Log of Boring

BORING NO. S-6

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	CEG 12/62	08/90		

Field location of boring:	Project No.: 7666	Date: 08/15/90	Boring No:
(See Plate 2)	Client: Shell Oil Company		S-6
	Location: 999 San Pablo Avenue		
	City: Albany, California		Sheet 2
	Logged by: MJJ	Driller: Bayland	of 2
	Casing installation data:		
Drilling method: Hollow Stem Auger			
Hole diameter: 8-Inches	Top of Box Elevation:		Datum:

PID (ppm)	Blows/ft or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Water Level / Time / Date	Description
	24								TEMESCAL FORMATION - Siltstone - dark yellowish
0	26	S&H	S-6-	19					orange (10YR 6/6), damp, hard; moderate weathering;
	50		19.5						moderately cemented; angular siltstone clasts in a silt
				20					and sand matrix; no chemical odor.
				21					
				22					Bottom of sample at 19.5 feet.
									Bottom of boring at 19.5 feet.
				23					08/15/90
				24					
				25					
				26					
				27					
				28					
				29					
				30					
				31					
				32					
				33					
				34					
				35					
				36					
				37					
				38					

Remarks:

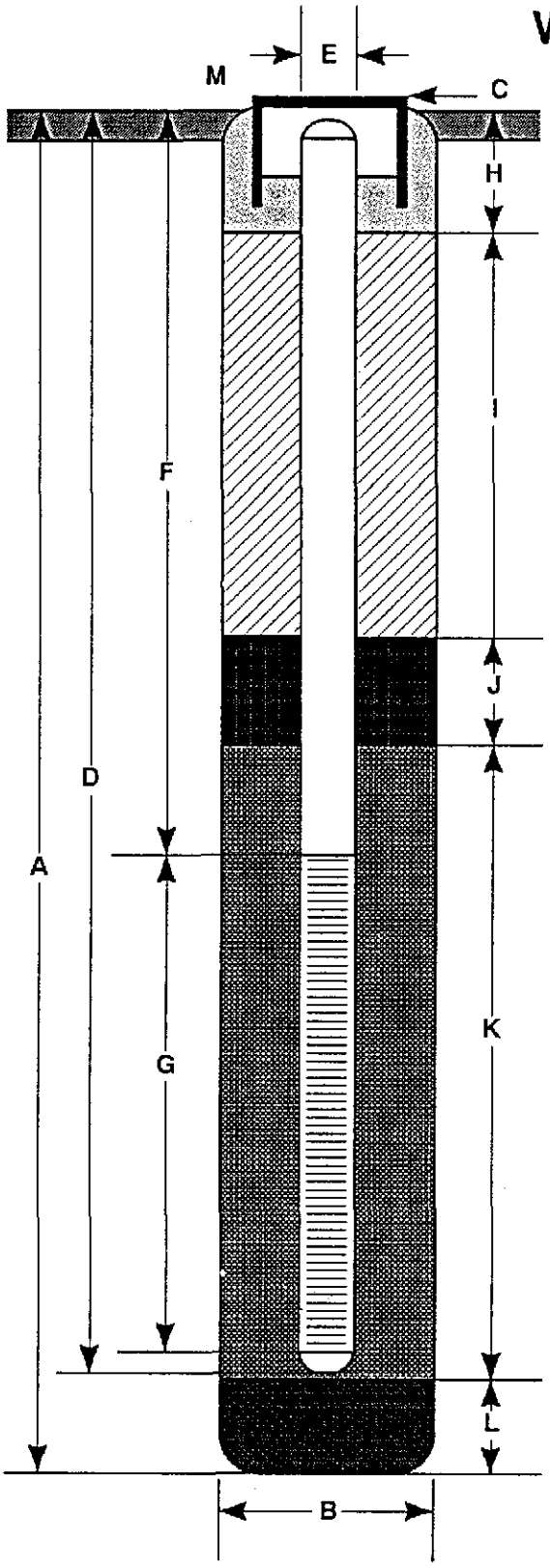
GeoStrategies Inc.

Log of Boring

BORING NO. S-6

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	CEG 12/62	08/90		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring: 19.5 ft.

B Diameter of Boring: 8 in.
Drilling Method: Hollow Stem Auger

C Top of Box Elevation: 40.12 ft.
[X] Referenced to Mean Sea Level
[ ] Referenced to Project Datum

D Casing Length: 15.0 ft.
Material: Schedule 40 PVC

E Casing Diameter: 3 in.

F Depth to Top Perforations: 5.5 ft.

G Perforated Length: 9.5 ft.
Perforated Interval from 5.5 to 15 ft.
Perforation Type: Machine Slot
Perforation Size: 0.020 in.

H Surface Seal from 0.5 to 1.0 ft.
Seal Material: Concrete

I Backfill from 1.0 to 3.5 ft.
Backfill Material: Cement

J Seal from 3.5 to 4.5 ft.
Seal Material: Bentonite

K Gravel Pack from 4.5 to 15 ft.
Pack Material: Lonestar #2/12 Sand

L Bottom Seal: 4.5 ft.
Seal Material: Bentonite

M G-5 Traffic-Rated Christy Box Waterproof Locking Well Cap and Lock.

Note: Depths measured from initial ground surface.

GeoStrategies Inc.

Well Construction Detail

WELL NO. S-6

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	CEG 12/92	08/90		

Field location of boring:	Project No.: 7666	Date: 08/15/90	Boring No:
(See Plate 2)	Client: Shell Oil Company		S-7
	Location: 999 San Pablo Avenue		
	City: Albany, California		Sheet 1
	Logged by: MJJ	Driller: Bayland	of 2
Drilling method: Hollow Stem Auger	Casing installation data:		
Hole diameter: 8-Inches	Top of Box Elevation: 40.10		Datum: MSL

Water Level	13.0'	11.73'							
Time	11:14	14:40							
Date	08/15/90	08/15/90							

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				0				PAVEMENT SECTION
				1				FILL - Sandy Silt (ML) - olive brown (2.5Y 4/4), medium stiff, damp, medium to low plasticity; 50% silt; 30% fine sand; 20% clay; no chemical odor.
				2				
				3				-
				4				COLOR CHANGE to very dark grayish brown (2.5Y 3/2); increasing silt at 3.0 feet.
	500	S&H						
0	500	push	S-7-5	5				SANDY SILT (ML) - light olive brown (2.5 5/4), medium stiff, damp, low plasticity; 50% silt; 35% fine sand; 15% clay; no chemical odor.
	500			6				
				7				SILTY SAND (SM) - light olive brown (2.5Y 5/4), medium dense, moist; 65% fine to medium sand; 30% silt; 5% clay; no chemical odor.
	350			8				
0	450	S&H	S-7-9					
	500	push		9				Moist, medium dense; increasing coarse sand and gravel at 8.75 feet; no chemical odor.
	350							
0	350	S&H	S-7-	10				
	500	push	10.5					SILTY SAND (SM) - dark greenish gray (5GY 5/1), medium dense, moist to saturated; 70% fine sand; 25% silt; 5% clay; no chemical odor.
				11				
				12		▼		Hard drilling at 12.5 feet.
				13		▽		
				14				Hard drilling at 14.0 feet.
				15				
	26							SANDY SILT (ML) - yellowish brown (10YR 5/6), damp, hard; 50% silt; 35% fine to coarse sand; 15% fine gravel; no chemical odor. (weathered bedrock?)
0	33	S&H	S-7-	16				
	50(5")		16.5					
				17				
				18				

Remarks:

GeoStrategies Inc.

Log of Boring

BORING NO. S-7

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	CMP CEG 1262	08/90		

Field location of boring:	Project No.: 7666	Date: 08/15/90	Boring No:
(See Plate 2)	Client: Shell Oil Company		S-7
	Location: 999 San Pablo Avenue		
	City: Albany, California		Sheet 2
	Logged by: MJJ	Driller: Bayland	of 2
	Casing installation data:		
Drilling method: Hollow Stem Auger			
Hole diameter: 8-Inches	Top of Box Elevation:		Datum:

	Water Level			
	Time			
	Date			

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
	25							TEMESCAL FORMATION - Siltstone - dark yellowish
0	30	S&H	S-7-	19				orange (10YR 6/6), damp, hard; moderate weathering;
	45		19.5					moderately cemented; siltstone clasts within a silt and
				20				sand matrix; no chemical odor.
				21				
				22				Bottom of sample at 19.5 feet.
								Bottom of boring at 19.5 feet.
				23				08/15/90
				24				
				25				
				26				
				27				
				28				
				29				
				30				
				31				
				32				
				33				
				34				
				35				
				36				
				37				
				38				

Remarks:

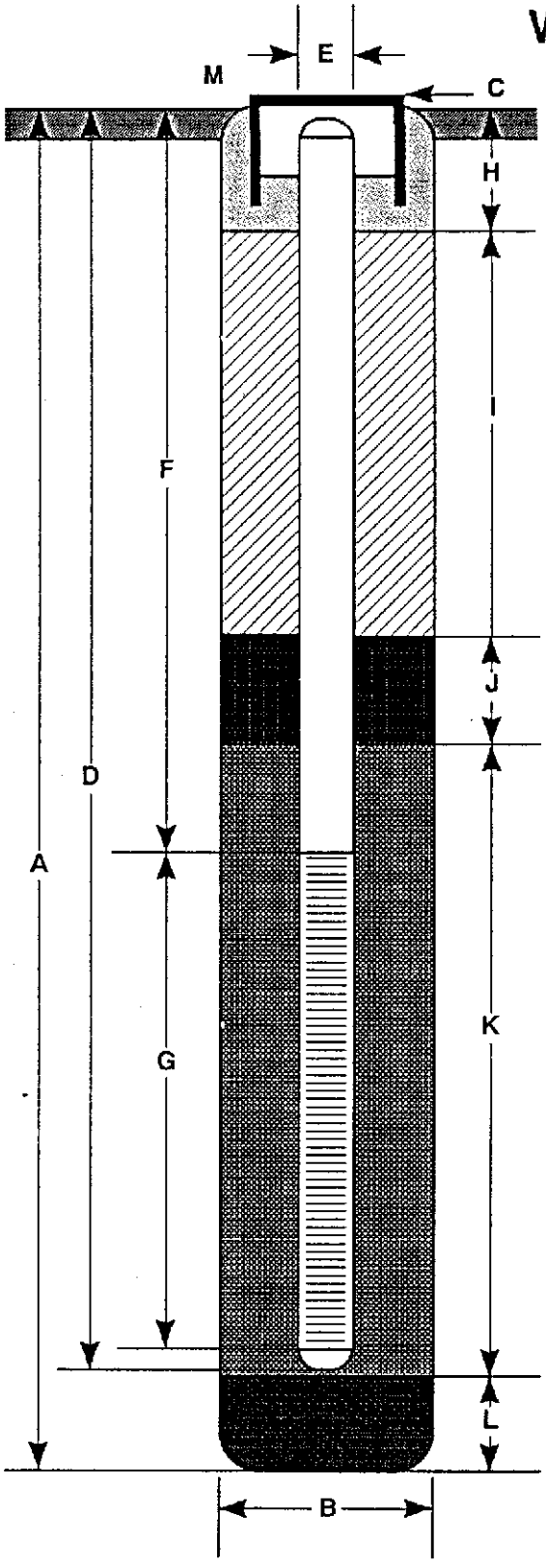
GeoStrategies Inc.

Log of Boring

BORING NO. S-7

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	CEG 1262	08/90		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring: 19.5 ft.

B Diameter of Boring: 8 in.
Drilling Method: Hollow Stem Auger

C Top of Box Elevation: 40.10 ft.
[X] Referenced to Mean Sea Level
[ ] Referenced to Project Datum

D Casing Length: 15.0 ft.
Material: Schedule 40 PVC

E Casing Diameter: 3 in.

F Depth to Top Perforations: 5.5 ft.

G Perforated Length: 9.5 ft.
Perforated Interval from 5.5 to 15 ft.
Perforation Type: Machine Slot
Perforation Size: 0.020 in.

H Surface Seal from 0.5 to 1.0 ft.
Seal Material: Concrete

I Backfill from 1.0 to 3.5 ft.
Backfill Material: Cement

J Seal from 3.5 to 4.5 ft.
Seal Material: Bentonite

K Gravel Pack from 4.5 to 15 ft.
Pack Material: Lonestar #2/12 Sand

L Bottom Seal: 4.5 ft.
Seal Material: Bentonite

M G-5 Traffic-Rated Christy Box Waterproof Locking Well Cap and Lock.

Note: Depths measured from initial ground surface.

GeoStrategies Inc.

Well Construction Detail

WELL NO. S-7

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7666	RMP CEG 12/92	08/90		

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 08/31/90
Client Work ID: GR7666, 999 San Pablo, Albany

Work Order: T0-08-182

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-6-6
SAMPLE DATE: 08/15/90
LAB SAMPLE ID: T008182-01
SAMPLE MATRIX: solid
RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020	08/21/90	08/23/90
Low Boiling Hydrocarbons	Mod.8015	08/21/90	08/23/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	20.	180.
BTEX		
Benzene	0.2	0.2
Toluene	0.2	0.4
Ethylbenzene	0.2	0.5
Xylenes (total)	0.2	1.5

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 08/31/90
Client Work ID: GR7666, 999 San Pablo, Albany

Work Order: TO-08-182

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-6-9
SAMPLE DATE: 08/15/90
LAB SAMPLE ID: TO08182-02
SAMPLE MATRIX: solid
RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020	08/21/90 -	08/23/90
Low Boiling Hydrocarbons	Mod.8015	08/21/90	08/23/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	40.	770.
BTEX		
Benzene	0.4	2.2
Toluene	0.4	2.8
Ethylbenzene	0.4	6.8
Xylenes (total)	0.4	5.1

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 08/31/90
Client Work ID: GR7666, 999 San Pablo, Albany

Work Order: TO-08-182

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-6-19.5
SAMPLE DATE: 08/15/90
LAB SAMPLE ID: T008182-03
SAMPLE MATRIX: solid
RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020	08/21/90	08/22/90
Low Boiling Hydrocarbons	Mod.8015	08/21/90	08/22/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	1.	None
BTEX		
Benzene	0.005	None
Toluene	0.005	None
Ethylbenzene	0.005	None
Xylenes (total)	0.005	None

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 08/31/90
Client Work ID: GR7666, 999 San Pablo, Albany

Work Order: TO-08-182

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-7-19.5
SAMPLE DATE: 08/15/90
LAB SAMPLE ID: TO08182-05
SAMPLE MATRIX: solid
RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020	08/21/90	08/22/90
Low Boiling Hydrocarbons	Mod.8015	08/21/90	08/22/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	1.	None
BTEX		
Benzene	0.005	None
Toluene	0.005	None
Ethylbenzene	0.005	None
Xylenes (total)	0.005	None

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 08/31/90
Client Work ID: GR7666, 999 San Pablo, Albany

Work Order: TO-08-182

TEST CODE TPHVB TEST NAME TPH Gas,BTEX by 8015/8020

The method of analysis for low boiling hydrocarbons is taken from E.P.A. Methods 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatograhy using a flame ionization detector as well as a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline and includes benzene, toluene, ethylbenzene and xylenes.

TP-6F-182

Gettler - Ryan Inc. ENVIRONMENTAL DIVISION — **Chain of Custody**

COMPANY Shell JOB NO. 7666

JOB LOCATION 999 San Pablo Ave

CITY Albany PHONE NO.

AUTHORIZED John Werfal DATE 8-16-90 P.O. NO.

SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID
1A S-6-6	1	Soil	8-15-90	Gas, BTEX	cool
2A S-6-9	1				
3A S-6-19.5	1				
4A S-7-9	1				
5A S-7-19.5	1				

WIC N° 204 0079 0109

AFE 086683

EXP Code 5440

RELINQUISHED BY: Matt Janowich 8-16-90 RECEIVED BY: Guadalupe Sanchez 8-17-90 07:10

RELINQUISHED BY: Guadalupe Sanchez 8-17-90 08:47 RECEIVED BY:

RELINQUISHED BY: RECEIVED BY LAB: Glenn A. Jadlan 8/17/90 0845

DESIGNATED LABORATORY: IT - San Jose DHS #: 137

REMARKS: Normal T-A-T

DATE COMPLETED FOREMAN

gettler — ryan inc.

September 18, 1990

GROUNDWATER SAMPLING REPORT

Referenced Site: Shell Service Station
999 San Pablo Ave/Marin Ave
Albany, California

Sampling Date: August 28, 1990

This report presents the results of the quarterly groundwater sampling and analytical program conducted by Gettler-Ryan Inc. on August 28, 1990 at the referenced location. The site is occupied by an operating service station located on the northeast corner of San Pablo Avenue and Marin Avenue. The service station has underground storage tanks which contain leaded, unleaded and super unleaded gasoline products.

There are currently seven groundwater monitoring wells on or near the site at the locations shown on the attached site map. Recently installed wells S-6 and S-7 were developed August 23, 1990. Prior to sampling, all wells were inspected for total well depth, water levels, and presence of separate phase product using an electronic interface probe. A clean acrylic bailer was used to visually confirm or detect the presence and thickness of separate phase product. Groundwater depths ranged from 7.61 to 13.26 feet below grade. Separate phase product was observed in well S-5.

Well that did not contain separate phase product were purged and sampled. The purge water was contained in drums for proper disposal. Standard sampling procedure calls for a minimum of four case volumes to be purged from each well. Each well was purged while pH, temperature, and conductivity measurements were monitored for stability. Details of the final well purging results are presented on the attached Table of Monitoring Data. In cases where a well dewatered or less than four case volumes were purged, groundwater samples were obtained after the physical parameters had stabilized. Under such circumstances the sample may not represent actual formation water, due to low flow conditions.

Samples were collected, using Teflon bailers, in properly cleaned and laboratory prepared containers. All sampling equipment was thoroughly cleaned after each well was sampled and steam cleaned upon completion of work at the site. The samples were labeled, stored on blue ice, and transported to the laboratory for analysis. A trip and field blank (SF-3), supplied by the laboratory, were included and analyzed to assess quality control. A duplicate sample (SD-2), was submitted without well designation to assess laboratory performance. Analytical results for the blanks are included in the Certified Analytical Report (CAR's). Chain of custody records were established noting sample identification numbers, time, date, and custody signatures.

2150 west winton avenue • hayward, california 94545-1210 • (415) 783-7500

The samples were analyzed at International Technology Corporation - Santa Clara Valley Laboratory, located at 2055 Junction Avenue, San Jose, California. The laboratory is assigned a California DHS-HMTL Certification number of 137. The results are presented as a Certified Analytical Report, a copy of which is attached to this report.

Tom Paulson
Sampling Manager

attachments

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

WELL I.D.	S-1	S-2 SD-2	S-3	S-4	S-5
Casing Diameter (inches)	3	3	3	3	3
Total Well Depth (feet)	11.8	12.2	12.2	14.1	----
Depth to Water (feet)	8.33	8.44	7.61	8.09	13.26 **
Free Product (feet)	none	none	none	none	3.51
Reason Not Sampled	----	----	----	----	free product
Calculated 4 Case Vol.(gal.)	5.3	5.6	6.8	9.2	----
Did Well Dewater?	yes	yes	yes	yes	----
Volume Evacuated (gal.)	2.0	2.0	4.5	4.5	----
Purging Device	Bailer	Bailer	Bailer	Bailer	----
Sampling Device	Bailer	Bailer	Bailer	Bailer	----
Time	11:50	10:51	11:37	09:40	----
Temperature (F)*	67.9	70.4	71.2	68.2	----
pH*	7.07	7.06	6.93	7.17	----
Conductivity (umhos/cm)*	731	1035	850	417	----

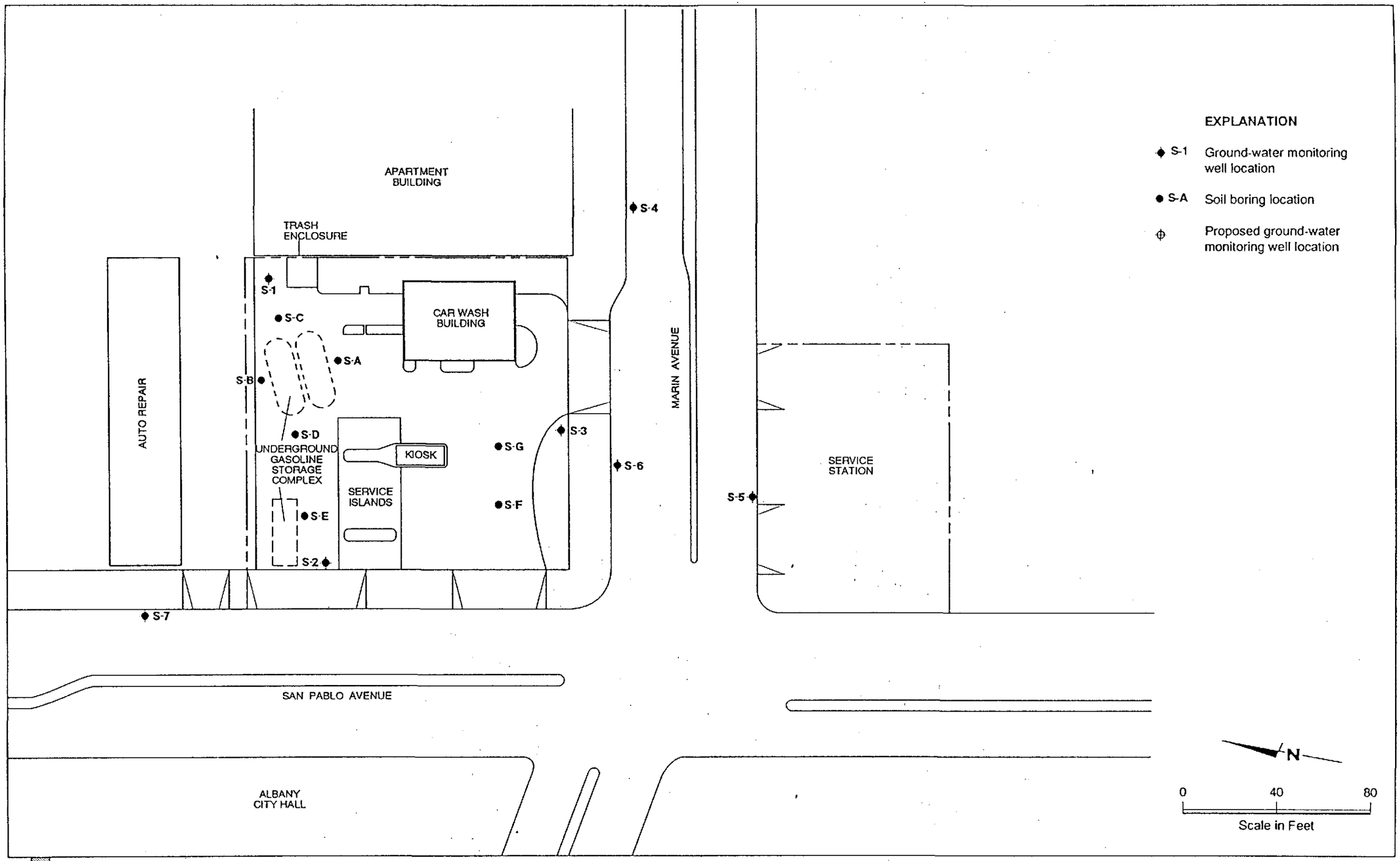
* Indicates Stabilized Value

** Not corrected for the presence of free product

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

WELL I.D.	S-6	S-7
Casing Diameter (inches)	3	3
Total Well Depth (feet)	15.3	15.1
Depth to Water (feet)	9.22	11.01
Free Product (feet)	none	none
Reason Not Sampled	----	----
Calculated 4 Case Vol.(gal.)	9.2	6.0
Did Well Dewater?	yes	yes
Volume Evacuated (gal.)	3.5	2.5
Purging Device	Bailer	Bailer
Sampling Device	Bailer	Bailer
Time	09:47	10:36
Temperature (F)*	69.4	69.3
pH*	7.08	7.05
Conductivity (umhos/cm)*	850	950

* Indicates Stabilized Value



GeoStrategies Inc.

Site Plan
Shell Service Station
999 San Pablo Avenue
Albany, California

PLATE
2

JOB NUMBER
7666

REVIEWED BY RG/CEG

DATE

REVISED DATE

REVISED DATE

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Shell Oil Company
Gettler-Ryan
2150 West Winton
Hayward, CA 94545
Tom Paulson

Date: 09/25/90

Work Order: TO-08-309 P.O. Number: MOH 880-021

This is the Certificate of Analysis for the following samples:

Client Work ID: GR3666, 999 San Pablo, Albany, CORRECTED REPORT
Date Received: 08/28/90
Number of Samples: 9
Sample Type: aqueous

TABLE OF CONTENTS FOR ANALYTICAL RESULTS

Reviewed and Approved:

Suzanne Veaudry
Project Manager

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: TO-08-309

TEST NAME: **Petroleum Hydrocarbons**

SAMPLE ID: **S-1**
SAMPLE DATE: **08/28/90**
LAB SAMPLE ID: **TO08309-01**
SAMPLE MATRIX: **aqueous**
RECEIPT CONDITION: **Cool pH < 2**

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/11/90
Low Boiling Hydrocarbons	Mod.8015		09/11/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.25	0.80
BTEX		
Benzene	0.0025	0.0081
Toluene	0.0025	0.001
Ethylbenzene	0.0025	0.075
Xylenes (total)	0.0025	0.054

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: TO-08-309

TEST NAME: **Petroleum Hydrocarbons**

SAMPLE ID: **S-2**
SAMPLE DATE: **08/28/90**
LAB SAMPLE ID: **TO08309-02**
SAMPLE MATRIX: **aqueous**
RECEIPT CONDITION: **Cool pH < 2**

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/11/90
Low Boiling Hydrocarbons	Mod.8015		09/11/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	4.4
BTEX		
Benzene	0.0005	1.7
Toluene	0.0005	0.035
Ethylbenzene	0.0005	0.16
Xylenes (total)	0.0005	0.17

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: TO-08-309

TEST NAME: **Petroleum Hydrocarbons**

SAMPLE ID: **S-3**
SAMPLE DATE: **08/28/90**
LAB SAMPLE ID: **TO08309-03**
SAMPLE MATRIX: **aqueous**
RECEIPT CONDITION: **Cool pH < 2**

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/11/90
Low Boiling Hydrocarbons	Mod.8015		09/11/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.25	0.66
BTEX		
Benzene	0.0025	0.0087
Toluene	0.0025	0.001
Ethylbenzene	0.0025	0.026
Xylenes (total)	0.0025	0.007

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: TO-08-309

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-4
SAMPLE DATE: 08/28/90
LAB SAMPLE ID: TO08309-04
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/06/90
Low Boiling Hydrocarbons	Mod.8015		09/06/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	0.0006
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	0.0010

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: TO-08-309

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-6
SAMPLE DATE: 08/28/90
LAB SAMPLE ID: T008309-05
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/11/90
Low Boiling Hydrocarbons	Mod.8015		09/11/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.25	5.7
BTEX		
Benzene	0.0025	0.58
Toluene	0.0025	0.023
Ethylbenzene	0.0025	0.032
Xylenes (total)	0.0025	0.058

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: TO-08-309

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: S-7
SAMPLE DATE: 08/28/90
LAB SAMPLE ID: T008309-06
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/04/90
Low Boiling Hydrocarbons	Mod.8015		09/04/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: TO-08-309

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: SD-2
SAMPLE DATE: 08/28/90
LAB SAMPLE ID: T008309-07
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/11/90
Low Boiling Hydrocarbons	Mod.8015		09/11/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	2.5	14.
BTEX		
Benzene	0.025	3.9
Toluene	0.025	0.13
Ethylbenzene	0.025	1.0
Xylenes (total)	0.025	1.1

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: TO-08-309

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: SF-3
SAMPLE DATE: 08/28/90
LAB SAMPLE ID: TO08309-08
SAMPLE MATRIX: aqueous
RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/06/90
Low Boiling Hydrocarbons	Mod.8015		09/06/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: T0-08-309

TEST NAME: **Petroleum Hydrocarbons**

SAMPLE ID: **Trip Blank**
SAMPLE DATE: **not spec**
LAB SAMPLE ID: **T008309-09**
SAMPLE MATRIX: **aqueous**
RECEIPT CONDITION: **Cool pH < 2**

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/06/90
Low Boiling Hydrocarbons	Mod.8015		09/06/90

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company, CORRECTED REPORT
Date: 09/25/90
Client Work ID: GR3666, 999 San Pablo, Albany

Work Order: TO-08-309

TEST CODE TPHVB TEST NAME TPH Gas,BTEX by 8015/8020

The method of analysis for low boiling hydrocarbons is taken from E.P.A. Methods 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatograhy using a flame ionization detector as well as a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline and includes benzene, toluene, ethylbenzene and xylenes.

Results for the sample S-2 and duplicate SD-2 varied for Gas/BTEX, possibly due to headspace present in the sample vial for S-2.

Results reported for samples S-1, S-2 and S-3 are taken from analysis of vials containing headspace. The headspace resulted from re-analysis required due to laboratory instrument problems.

Geffler - Ryan Inc. — ENVIRONMENTAL DIVISION — 10-08-307

Chain of Custody

COMPANY Shell Oil Company — JOB NO.

JOB LOCATION 999 San Pablo Ave / Marin Ave

CITY Albany, CA — PHONE NO. (415) 783-7500

AUTHORIZED Tom Paulson — DATE 8-28-90 — P.O. NO. 3666

SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID
S-1	3	Liquid	8-28-90 / 11:50	THC (gas) BTXE	Cool
S-2			/ 10:51		
S-3			/ 11:37		
S-4			/ 9:40		
S-6			/ 9:47		
S-7			/ 10:36		
SD-2			/ —		
SF-3			/ 11:37		
trip blank	1		8-24-90 / —		

RELINQUISHED BY: Guadalupe Sanchez 8/28/90 13:33 — RECEIVED BY:

RELINQUISHED BY: — RECEIVED BY:

RELINQUISHED BY: — RECEIVED BY LAB: Josephine DeCarli 8/28/90 13:33

DESIGNATED LABORATORY: TT SCV — DHS #: 137

REMARKS: WIC # 204-0079-0109

AFE : 086683

Normal TAT

Exp : 5440

Eng: D. Lundquist

DATE COMPLETED 8-28-90 — FOREMAN Guadalupe Sanchez

ORIGINAL