Shell Oil Company

EAST BAY MARKETING DISTRICT

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

September 14, 1989

10/5/89
ALAMEDA COUNTY
DEPT. OF ENVIRONMENTAL HEALTH
HAZARDOUS MATERIALS

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

SUBJECT: FORMER SHELL SERVICE STATION
2800 TELEGRAPH AVENUE
OAKLAND, CALIFORNIA 609

Dear Mr. Shahid:

Enclosed is a copy of the report issued by GeoStrategies Inc., dated September 22, 1989, documenting the installation of three groundwater monitoring wells at the subject location.

The report also presents a proposed scope of work to further assess the extent of the dissolved contaminant plume and to initiate remediation of the separate phase product at the site. The work proposed consists of the installation of one groundwater monitoring well and one recovery well.

If you should have any questions or comments regarding this project please do not hesitate to call me at (415) 676-1414 ext. 127.

Very truly yours,

Diane M. Lundquist
Environmental Engineer

DML/jw

enclosure

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

GeoStrategies Inc.

LOP413

MONITORING WELL INSTALLATION REPORT

Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

Report No. 7610-1

September 22, 1989

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

September 22, 1989

Gettler-Ryan Inc.
1992 National Avenue
Hayward, California 94545

Attn: Mr. John Werfal

Re: MONITORING WELL INSTALLATION REPORT
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

Gentlemen:

INTRODUCTION

This report summarizes the ground-water monitoring well installations and soil sampling performed by GeoStrategies Inc. (GSI) at the above referenced location. Three soil borings were drilled off-site on July 17 and 24, 1989, as outlined in the Woodward-Clyde Consultants (WCC) work plan dated March 20, 1989. The borings were converted to ground-water monitoring wells, designated S-8 through S-10 (Plate 1).

FIELD PROCEDURES

Three borings were drilled and monitoring wells were installed using a truck mounted, hollow-stem auger drilling rig according to GSI Field Methods and Procedures (Appendix A). Soil samples were collected at five-foot depth intervals, using a modified California split-spoon sampler fitted with brass tube liners. A GSI geologist supervised the drilling, described soil samples using the attached Unified Soil Classification System and Munsell Soil Color Chart, and prepared lithologic boring logs.

Soil Sampling

One soil sample collected from each subsurface sampling interval was used to perform head space analysis in the field for Volatile Organic Compounds (VOCs). The test procedure involved emptying the contents of the brass tube into a clear glass jar and sealing the jar with aluminum foil, secured with a threaded ring-type lid. After approximately twenty minutes the foil was pierced and the head space was tested for VOCs, measured in parts per million (ppm), utilizing an OVM photoionization detector. The results of these tests are shown on the boring logs (Appendix B).

Soil samples retained for chemical analysis were collected in clean brass liners, covered on both ends with aluminum foil and sealed with plastic end caps. The samples were labeled, entered on a Chain-of-Custody form and transported in a cooler with blue ice to International Technology (IT) Analytical Services, a California State-certified laboratory in San Jose, California.

Monitoring Well Construction

Borings S-8 through S-10 were drilled using an 8-inch-diameter hollow-stem auger to a total depth of 22, 32 and 30.5 feet below grade, respectively. Boring S-9 was subsequently reamed to 30 feet with a 12-inch diameter hollow-stem auger to total depth due to borehole instability. Monitoring wells S-8 through S-10 were constructed using 3-inch-diameter Schedule 40 PVC well casing, and 0.02-inch machine-slotted well screen. Lonestar 2/12 sand was placed in the annular space across the entire screened interval and extended one to two feet above the top of the well screen. A two-foot bentonite seal was placed above the sand pack. A cement grout seal was placed from the top of bentonite seal to ground surface. A traffic-rated Christy box was placed at ground surface and a locking cap was then placed on the well. The well construction details are presented in Appendix B.

HYDROGEOLOGIC CONDITIONS

The lithology beneath the site consists primarily of clays, silts, sands and gravels to the total depth explored of 32 feet. Clays and silts extend from below the encountered fill material to the first water-bearing zone.

The water-bearing zone (shallow aquifer) consists of gravel with interbedded sand and clay. The gravel layer, encountered in recently installed wells S-9 and S-10, appears to thin from east to west based on data collected to date. A clay layer appears below the water-bearing zone and is surmised to represent the basal aquitard of the shallow aquifer zone. A geologic cross-section is presented on Plate 2.

Groundwater was first encountered between 9 and 15 feet below ground surface. Water levels were measured by Gettler-Ryan Inc. (G-R) on August 3, 1989. Potentiometric data indicates the shallow groundwater beneath the site appears to flow to the southwest. Water level data are presented in the G-R Groundwater Sampling Report (Appendix C). Water-level data were used to construct a potentiometric map (Plate 3).

CHEMICAL ANALYTICAL RESULTS

Soil and ground-water samples were analyzed for TPH (calculated as gasoline) according to EPA Method 8015 (Modified); and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) according to EPA Method 8020. All samples were analyzed by IT Analytical Services.

Soil Analytical Results

Soil samples were retained for chemical analysis from Borings S-8 through S-10 at the 10-foot interval, and from Boring S-8 at the 15-foot interval and from Boring S-9 at the 5-foot depth interval. As shown on Table 1, TPH was detected at a concentration of 220 parts per million (ppm) in Well S-9 at 10 feet. Soil samples collected from Boring S-8 and S-10 were ND for all parameters analyzed. Ethylbenzene and Xylenes were also detected in Well S-9 10-foot sample at concentrations of 1.3 and 7 ppm, respectively. The chemical analytical report for soil analysis is presented in the Appendix D.

Groundwater Analytical Results

On August 3, 1989 ground-water samples were collected from the monitoring network by G-R except Well S-3. Floating product was observed in Well S-3 at a measured thickness of 0.03 feet. TPH concentrations ranged from ND to 7.1 ppm and Benzene concentrations ranged form ND to 2.4 ppm. Chemical analytical data from ground-water samples were used to prepare TPH and Benzene isoconcentration maps (Plates 4 and 5). Ground-water analytical results are presented in Table 2 and Appendix C.

SUMMARY OF FINDINGS

Results of this investigation have been summarized below:

- Three ground-water monitoring wells installed on July 17 and 24, 1989.
- The lithology beneath the site appears to consist primarily of clay, silt, sands and gravel. The water-bearing zone (shallow aquifer) consists of gravel with interbedded sand and clay.
- Five soil samples were submitted for chemical analysis, TPH was detected in Well S-9 at 10 feet at a concentration of 220 ppm. Ethylbenzene and Xylenes were also identified in this well at concentrations of 1.3 and 7. ppm, respectively.

TABLE 1

SOIL CHEMICAL DATA

WELL NO.	SAMPLE DATE	ANALYSIS DATE	TPH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
S-8-10	26-Jul-89	28-Jul-89	ND	ND	ND	ND	ND
S-8-15	26-Jul-89	28-Jul-89	ND	ND	ND	ND	ND
S-9-5	17-Jul-89	24-Jul-89	ND	ND	ND	ND	ND
S-9-10	17-Jul-89	24-Jul-89	220.	ND	ND	1.3	7.
S-10-10	26-Jul-89	28-Jul-89	ND	ND	ND	ND	ND

TPH = Total Petroleum Hydrocarbons Calculated as Gasoline
PPM = Parts Per Million
ND = None Detected

Project No. 7610-2

TABLE 2

GROUND-WATER CHEMICAL 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	03-Aug-89	10-Aug-89	ND	ND	ND	ND	ND	29.31	19.43	----	9.88
S-2	03-Aug-89	10-Aug-89	0.43	0.073	0.001	0.014	0.007	27.91	18.16	----	9.75
S-3	03-Aug-89	----	----	----	----	----	----	27.56	18.38	0.03	9.30
S-4	03-Aug-89	10-Aug-89	ND	ND	ND	ND	ND	28.08	17.13	----	10.95
S-5	03-Aug-89	10-Aug-89	ND	ND	ND	ND	ND	27.42	16.95	----	10.47
S-6	03-Aug-89	10-Aug-89	7.1	2.4	ND	0.07	ND	26.59	17.19	----	9.40
S-7	03-Aug-89	15-Aug-89	5	0.66	0.38	0.23	0.71	27.33	16.29	----	11.04
S-8	03-Aug-89	10-Aug-89	ND	ND	ND	ND	ND	25.97	15.75	----	10.22
S-9	03-Aug-89	10-Aug-89	1.6	0.052	0.42	0.052	0.25	25.86	15.44	----	10.42
S-10	03-Aug-89	10-Aug-89	ND	ND	ND	ND	ND	26.95	18.70	----	8.25
SD-1	03-Aug-89	10-Aug-89	ND	ND	ND	ND	ND	----	----	----	----

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

CURRENT DEPARTMENT OF HEALTH SERVICES ACTION LEVELS
Benzene 0.0007 ppm Xylenes 0.620 ppm
Toluene 0.10 ppm Ethylbenzene 0.68 ppm

Note: 1. For chemical parameter detection limits, refer to I.T. laboratory reports in Appendix B
2. Water level elevations referenced to project site datum
3. Well S-3 had free product and was not sampled

Project No. 7610-2

TABLE 2

GROUND-WATER CHEMICAL 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-4	03-Aug-89	10-Aug-89	ND	ND	ND	ND	ND	----	----	----	----
TB	03-Aug-89	10-Aug-89	ND	ND	ND	ND	ND	----	----	----	----

- The ground-water monitoring network was sampled by G-R on August 3, 1989. Separate-phase product was observed in Well S-3. Ground-water samples from the remaining wells were submitted for chemical analysis. TPH (calculated as gas) concentrations ranged from ND to 7.1 ppm (Well S-6). Benzene concentrations ranged from ND to 2.4 ppm (Well S-6).

- Ground-water levels measured on August 3, 1989, ranged from 8.25 to 11.04 feet below grade. Potentiometric data indicates southward groundwater movement beneath the site in the shallow aquifer zone.

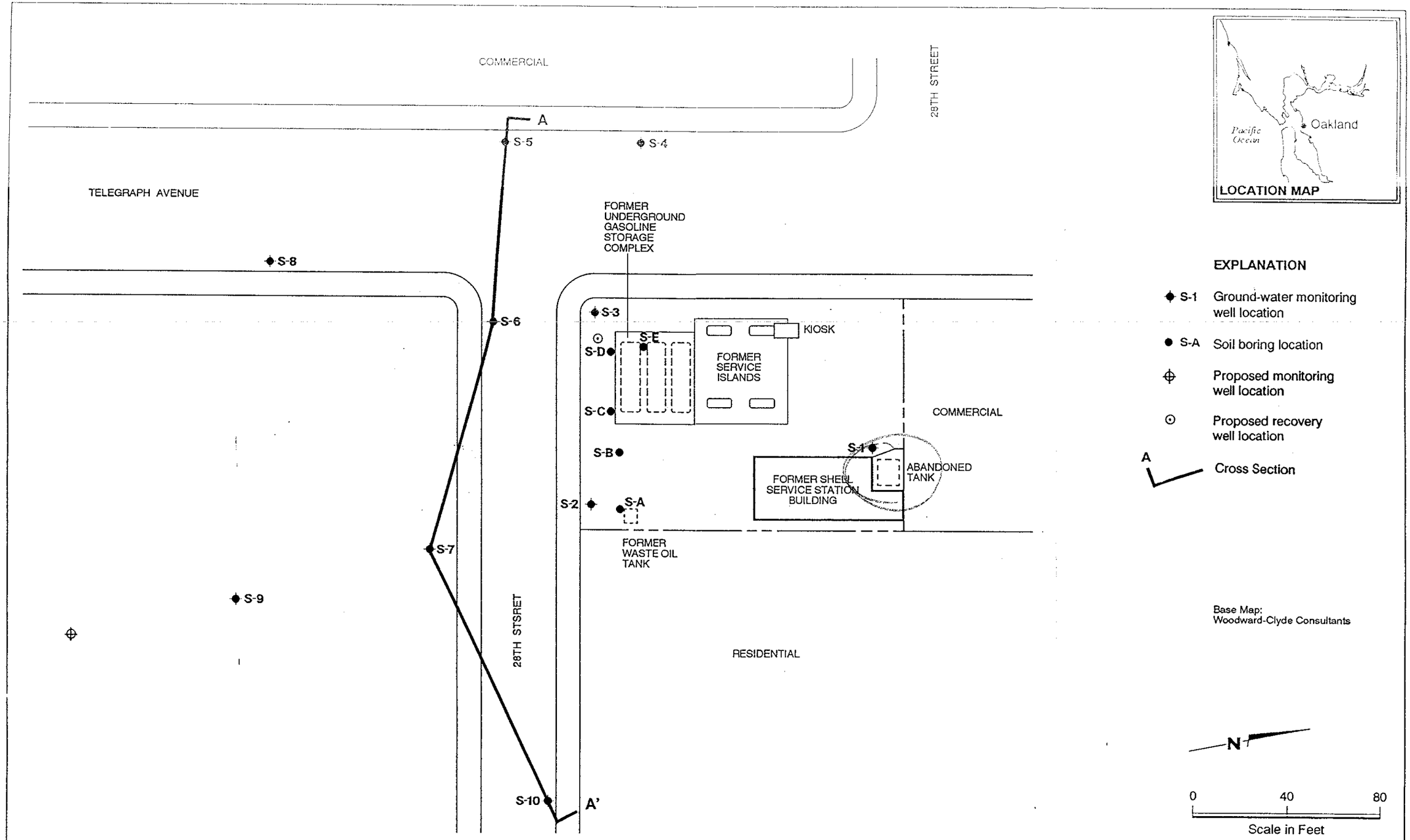
PROPOSED SCOPE OF WORK

Soil and Groundwater analytical results for this investigation indicate that the present ground-water network is not adequate to define the petroleum hydrocarbon plume. A none detected boundary has not been defined downgradient of the site. TPH (calculated as gasoline) and Benzene were detected in Well S-9 at concentrations of 1.6 and 0.032 ppm respectively.

Based on our review of available data for the site, we recommend that one additional monitoring well be installed downgradient of Well S-9 (see Plate 1). The proposed well will be drilled to the base of the first water-bearing zone as identified in recently installed Wells S-8 through S-10. Soil samples from the borings will be collected at five-foot intervals and at significant lithologic changes, as a minimum. Soil samples will be used to describe subsurface lithology, perform head-space analyses for volatile organic presence, and for the selection of samples for chemical analysis.

Due to the presence of floating product in Well S-3 we recommend that interim remediation be initiated. A pilot boring will be drilled adjacent to Well S-3 (see Plate 1). Selected soil samples within the first water-bearing zone will be used for grain-size analysis and permeability tests. The results of these tests will be used to design a recovery well adjacent to Well S-3.

ILLUSTRATIONS

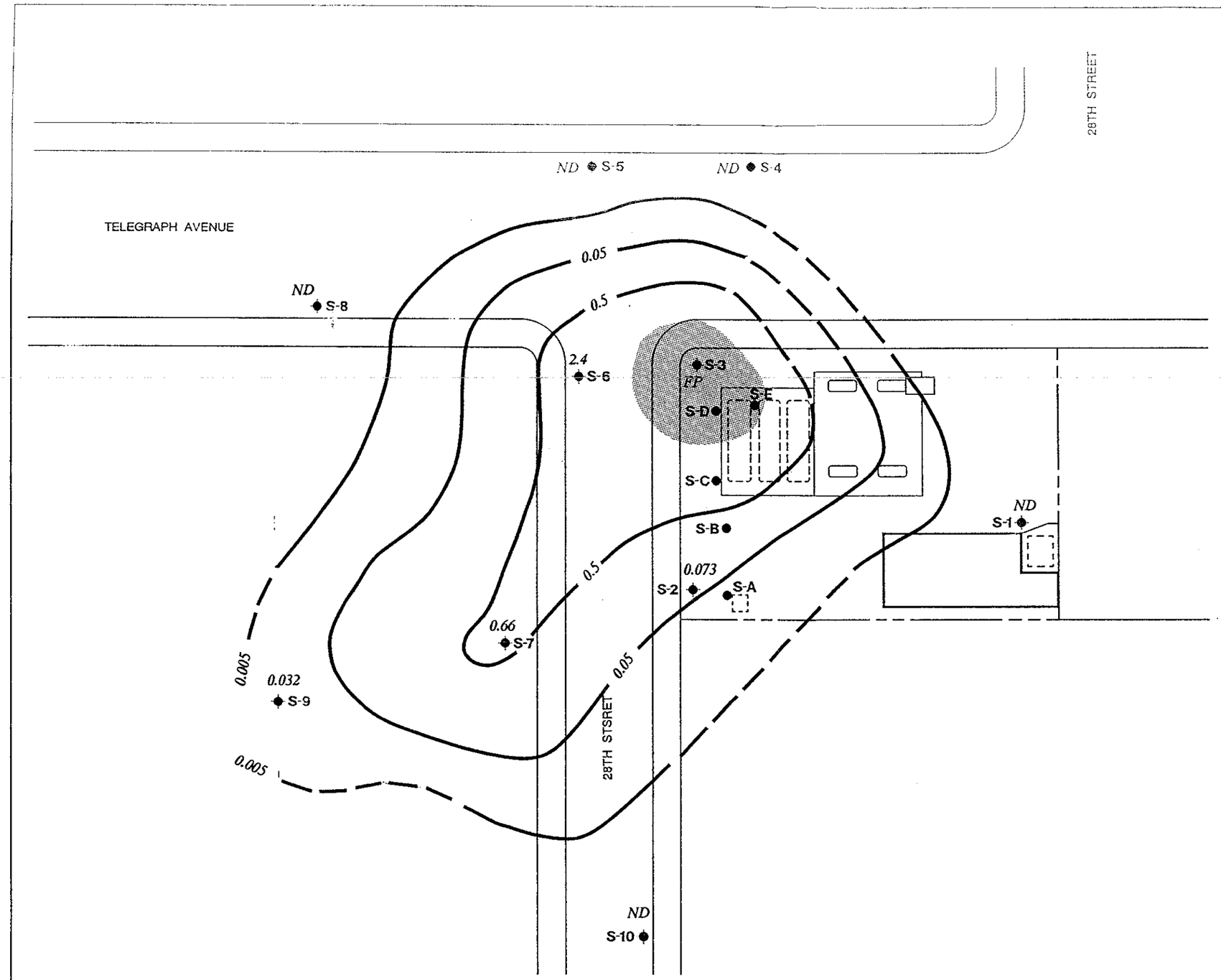


GeoStrategies Inc.

Site Plan
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE
1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610		9/89		



EXPLANATION

- S-1 Ground-water monitoring well location
- S-A Soil boring location
- *0.66* Benzene concentration in ppm sampled August 3, 1989
- *0.05* Benzene isoconcentration contour
- *ND* Not Detected (see laboratory reports for detection limits)
- *FP* Floating Product
- Approx. area of floating product

Base Map:
Woodward-Clyde Consultants

N

0 40 80

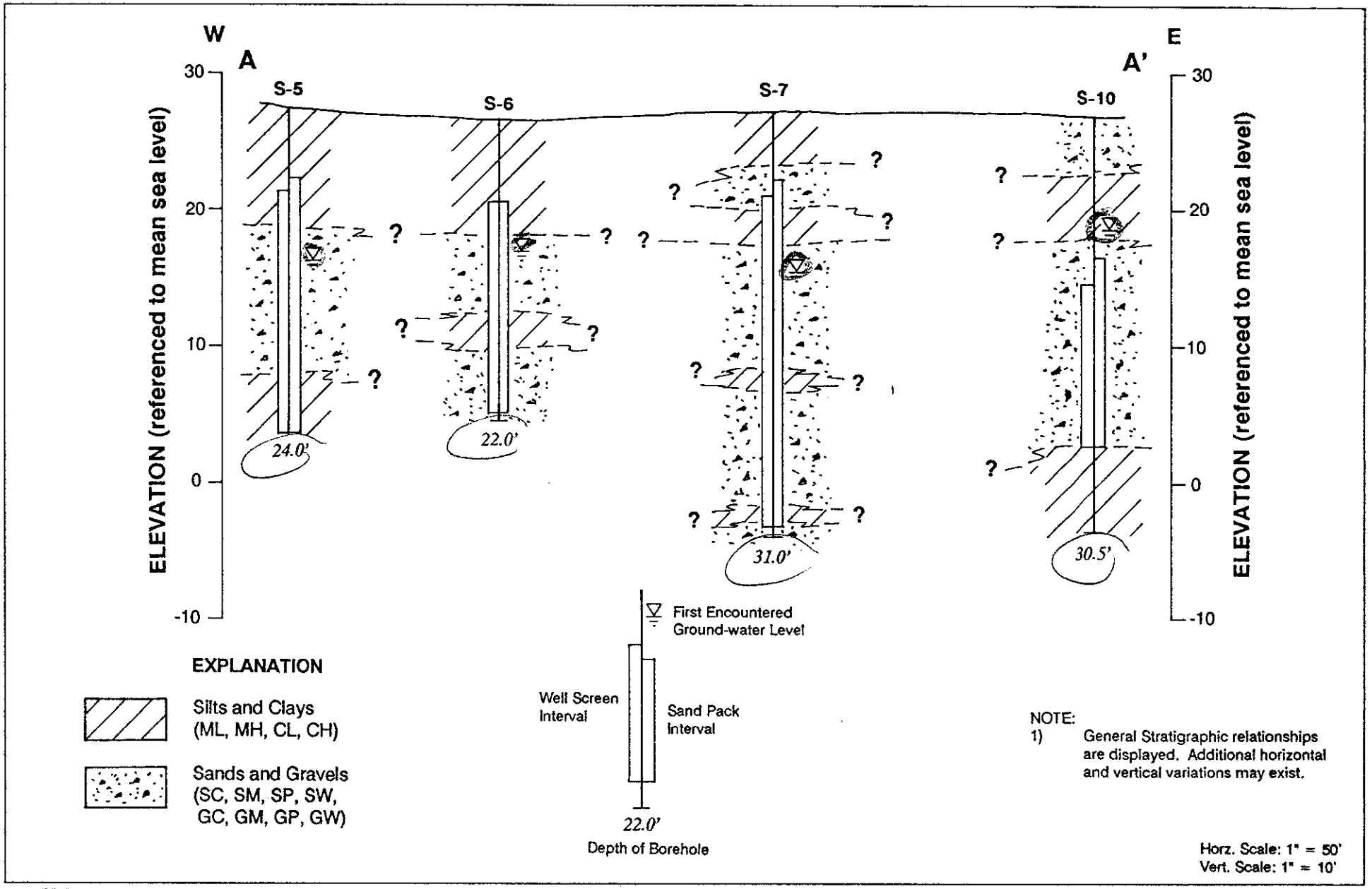
Scale in Feet

GeoStrategies Inc.

Benzene Isoconcentration Map
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE
5

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CMP CEG 1262	9/89		

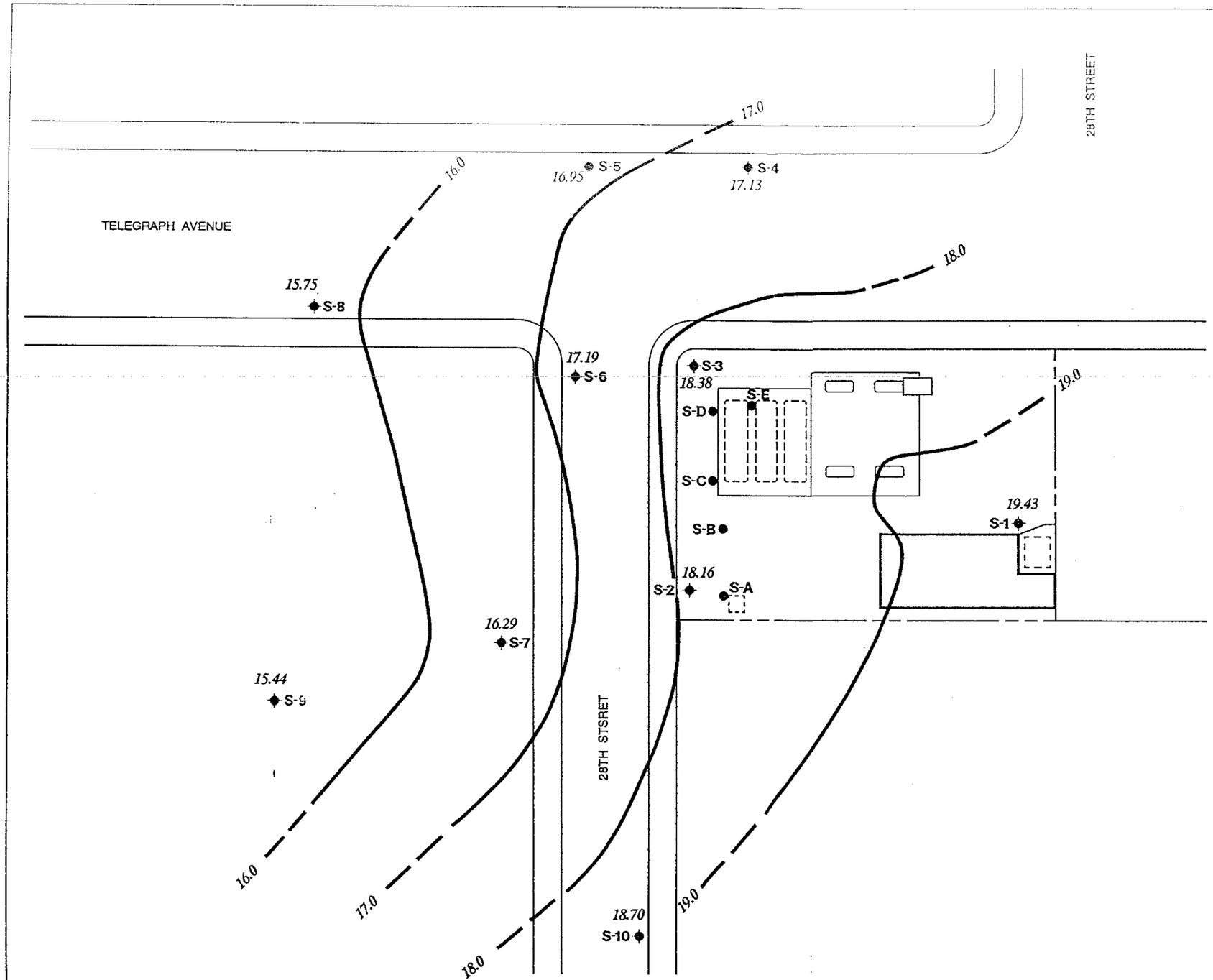


GeoStrategies Inc.

Cross-Section A-A'
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE
2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CEG 12/62	9/89		



EXPLANATION

- S-1 — Ground-water monitoring well location
- S-A — Soil boring location
- 17.0 — Ground-water elevation contour Approximate Gradient = 0.018
- *17.13* — Ground-water elevation measured on August 3, 1989 in feet referenced to MSL (Mean Sea Level)

Note: Contours may be influenced by irrigation practices and?or site construction activities

Base Map:
Woodward-Clyde Consultants

N

0 40 80

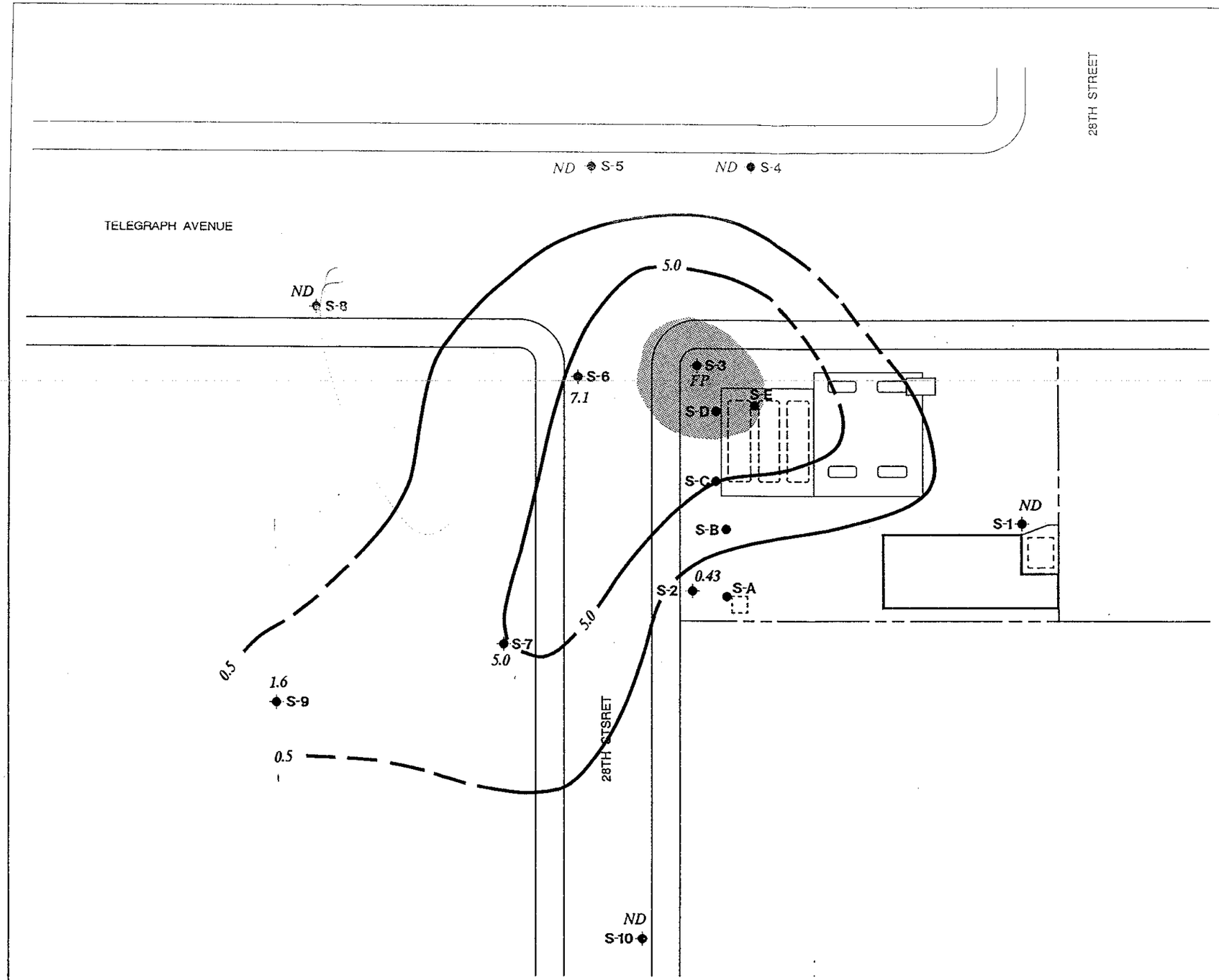
Scale in Feet

GeoStrategies Inc.

Potentiometric Map
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE
3

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	RMP CEG 12/62	9/89		



EXPLANATION

- S-1 — Ground-water monitoring well location
- S-A — Soil boring location
- *7.1* — TPH (Total Petroleum Hydrocarbon) concentration in ppm sampled August 3, 1989
- 0.5 — TPH isoconcentration contour
- *ND* — Not Detected (see laboratory reports for detection limits)
- *FP* — Floating Product
- Approx. area of floating product

Base Map:
Woodward-Clyde Consultants

N

0 40 80

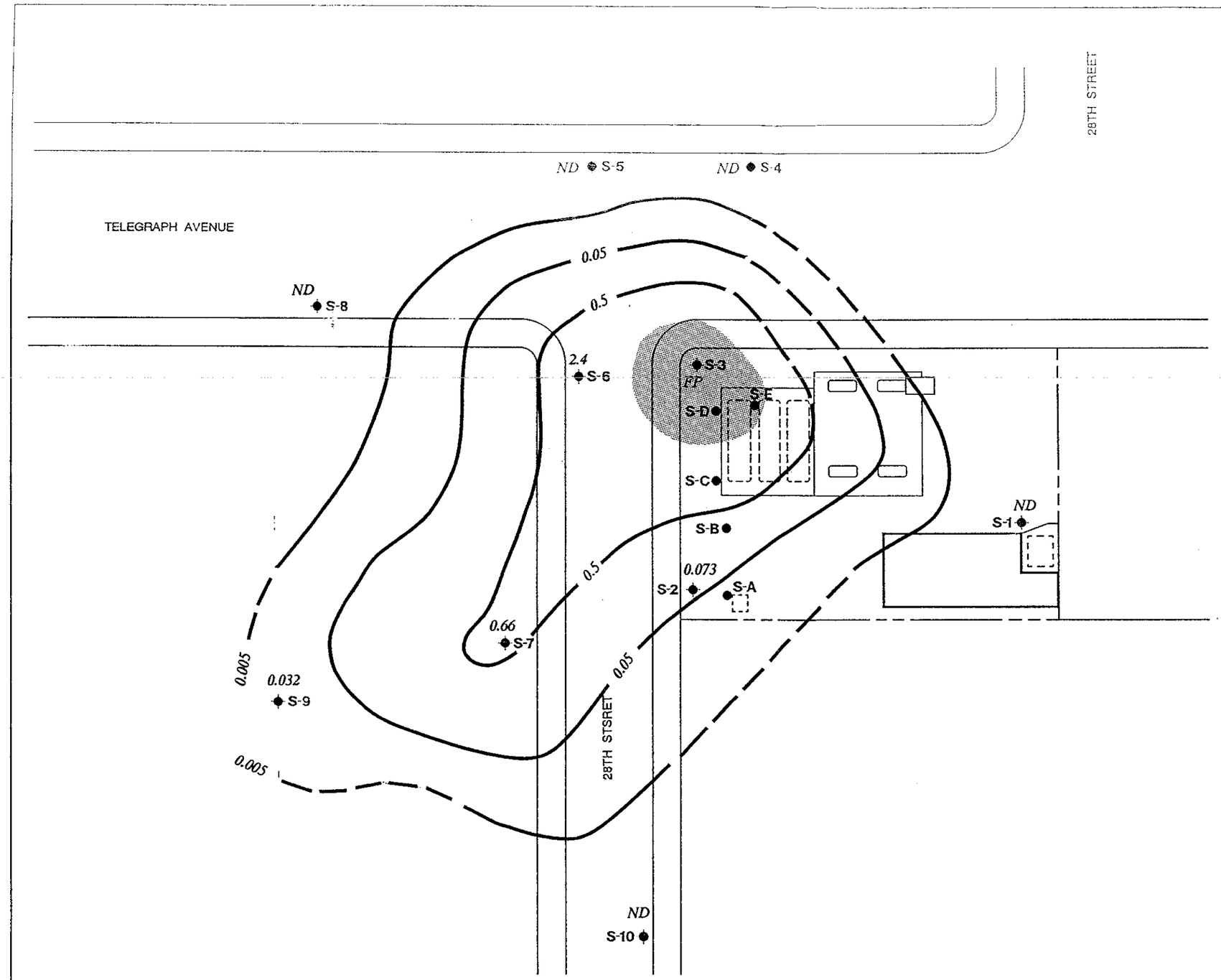
Scale in Feet

GeoStrategies Inc.

TPH Isoconcentration Map
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE
4

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CWP CEG 1262	9/89		



EXPLANATION

- S-1 Ground-water monitoring well location
- S-A Soil boring location
- *0.66* Benzene concentration in ppm sampled August 3, 1989
- *0.05* Benzene isoconcentration contour
- *ND* Not Detected (see laboratory reports for detection limits)
- *FP* Floating Product
- Approx. area of floating product

Base Map:
Woodward-Clyde Consultants

N

0 40 80

Scale in Feet

GeoStrategies Inc.

Benzene Isoconcentration Map
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE
5

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CMP CEG 1262	9/89		

APPENDIX A
FIELD METHODS AND PROCEDURES

FIELD METHODS AND PROCEDURES

EXPLORATION DRILLING

Mobilization

Prior to any drilling activities, 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 ground water. 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 tremied 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

Monitoring wells will be developed using a submersible pump, bladder pump or bailer. All well developing equipment will be decontaminated prior to development using a steam cleaner and/or Alconox detergent wash. Wells will be developed until discharge water is visibly clear and free of sediment. The adequacy of well development will be assessed by the GSI geologist. Indicator parameters (pH, specific conductance, and temperature) will be monitored and recorded during well development. Field instrument calibrations will be performed according to manufacturer's specifications.

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.

Guidance and Reference Documents Used to Collect Groundwater Samples

These documents are used to verify Gettler-Ryan Inc. sampling procedures and consistent with current regulatory guidance. If site specific work and sampling plans are required, those plans will be developed from these 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)

gettler — ryan inc. (415) 783-7500
general and environmental contractors

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, Section 2647 (October, 1986)
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)
Santa Clara Valley Water District	Guidelines for Preparing or Reviewing Sampling Plans for Soil and Groundwater Investigation of Fuel Contamination Sites (January, 1989)
Santa Clara Valley Water District	Investigation and Remediation at Fuel Leak sites: Guidelines for Investigation and Technical Report Preparation (March 1989)
American Petroleum Institute	Groundwater Monitoring & Sample Bias; API Publication 4367, Environmental Affairs Department, June 1983
Site Specific (as needed)	General and specific regulatory documents as required.

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

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

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

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) samples 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.

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 3). Both static water-level and separate-phase product thickness are measured to the nearest ±0.01 foot. The presence of separate-phase product is confirmed using a clean, acrylic or polyvinylchloride (PVC) bailer, measured to the nearest ±0.01 foot with a decimal scale tape.

Water-Level Measurements (continued)

The monofilament line used to lower the bailer is replaced between wells with new line to preclude the possibility of cross-contamination. Field observations (e.g. well integrity, product color, turbidity, water color, odors, etc.) are noted on the G-R Well Sampling Field Data Sheet shown in Figure 3. 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 4). 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 4. Collected field data during purging activities will be entered on the G-R Well Sampling Field Data Sheet shown in Figure 3. 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

geltler — ryan inc. (415) 783-7500
general and environmental contractors

Chain-of-Custody

A Chain-of-Custody record (Figure 5) 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 HC1 to pH<2	14 days (maximum)
Benzene Toluene Ethylbenzene Xylenes (BTEX)	EPA 8020	mg/l ug/l mg/l	50 ml. vial glass, Teflon lined septum 1 l glass, Teflon	cool, 4 C HC1 to pH<2	7 days (w/o preservative) 14 days (w preservative)
Oil & Grease	SM 503E	ug/l	lined septum	H2SO4 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	14 days (maximum)
Semi-Volatile Organics	8270	mg/l ug/l	40 ml. vial glass, Teflon lined septum	cool , 4 C	14 days (maximum)
Specific Conductance (Field test)		umhos/cm			
pH (Field test)		pH units			
Temperature (Field test)		Deg F			

GeoStrategies Inc.

FIELD EXPLORATORY BORING LOG

Field location of boring:

Project No.:	Date:	Boring No:
Client:		
Location:		
City:		Sheet of
Logged by:	Driller:	
Casing installation data:		
Top of Box Elevation:		Datum:

Drilling method:

Hole diameter:

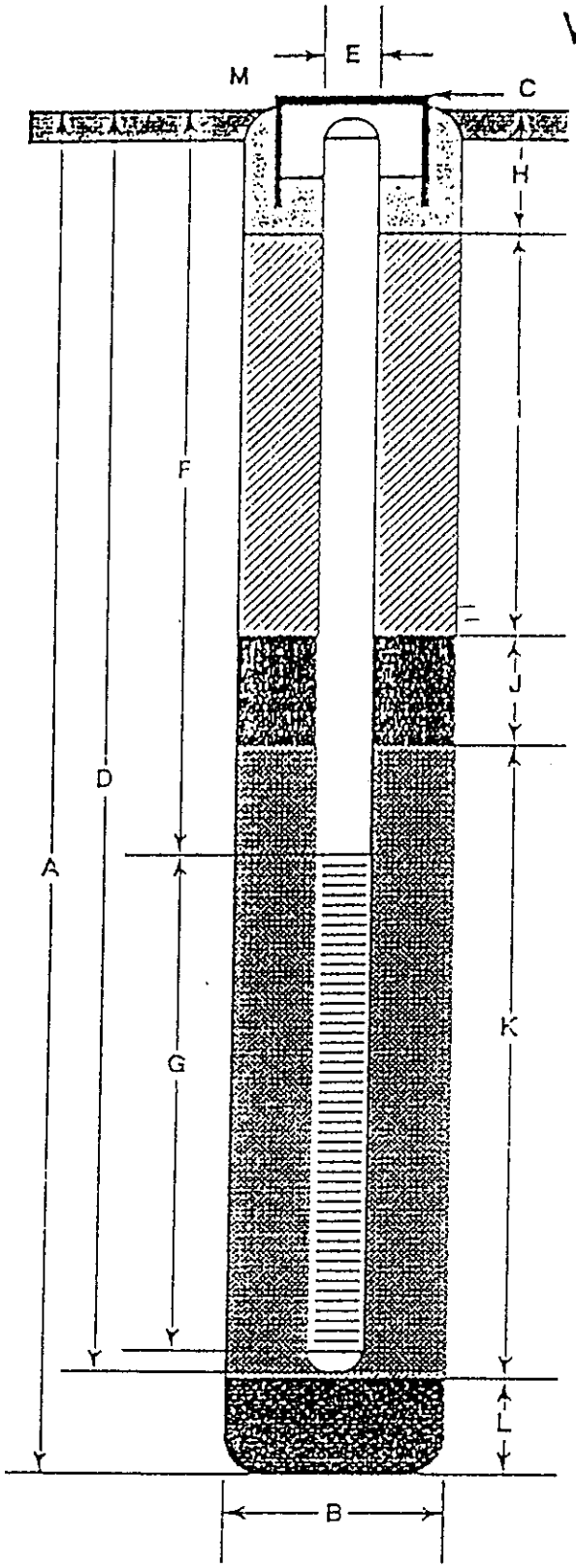
Water Level							
Time							
Date							

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

Remarks:

FIGURE 1

WELL CONSTRUCTION DETAIL



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 _____

Well Construction Detail

GeoStrategies Inc.

WELL NO.

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

FIGURE 2

GETTLER-RYAN INC.
General and Environmental Contractors

WELL SAMPLING FIELD DATA SHEET

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 _____ ASSISTANT _____

FIGURE 3

Monitoring Well Sampling Protocol Schematic

Sampling Crew Reviews Project Sampling Requirments/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

$V = (r/12)^2 h(\_\_\_\ \#\ vol)(7.48) = \_\_\_\_\_$ /gallons

V = Purge volume (gallons)
= 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 Initials Measured Water Column Height in Feet within 24 hrs. of Evacuation.

↓

Measure Groundwater Stability Indicator Parameters (pH, Temp., Conductivity)

↓

Collect Sample and Complete Chain-of-Custody

↓

Preserve Sample According to Required Chemical Analysis

↓

Transport to Anayltical 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%
Temperaure:	1.0 degree 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

FIGURE 4

Gettler - Ryan Inc. ENVIRONMENTAL DIVISION

Chain of Custody

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 _____

FIGURE 5

APPENDIX B
EXPLORATORY BORING LOGS
WELL CONSTRUCTION DETAILS

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

Perm	- Permeability
Consol	- Consolidation
LL	- Liquid Limit (%)
PI	- Plastic Index (%)
G_s	- Specific Gravity
MA	- Particle Size Analysis
2.5 YR 6/2	- Soil Color according to Munsell Soil Color Charts (1975 Edition)
5 GY 5/2	- GSA Rock Color Chart

- No Soil Sample Recoverd
- "Undisturbed" Sample
- Bulk or Classification Sample
- First Encountered Ground Water Level
- Piezometric Ground Water Level

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

PLATE

GeoStrategies Inc.

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

Field location of boring:	Project No.: 7610	Date: 07/24/89	Boring No:
(See Plate 1)	Client: Shell Oil Company		S-8
	Location: 2800 Telegraph Avenue		
	City: Oakland, California		Sheet 1
	Logged by: J. Vargas	Driller: Bayland	of 2
	Casing installation data:		
Drilling method: Hollow-Stem Auger			
Hole diameter: 8-Inches	Top of Box Elevation: 25.97		Datum: Mean Sea-Level

Water Level	10.5'	
Time		
Date	7/24/89	

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
								PAVEMENT SECTION - Asphalt/Concrete/Base Rock
				1				
				2				SILTY CLAY (CL) - very dark grayish brown (2.5Y 3/2), stiff, damp; 70% clay; 20% silt; trace - 10% very fine to fine sand; low plasticity, roots, trace coarse angular sand; no chemical odor.
				3				
				4				
	150	S&H		5				
0	150	push						CLAYEY SAND (SC) - olive (5Y 5/4), loose to medium dense, damp; 60-70% very fine to fine sand; 20-30% clay; 10% silt; trace subrounded coarse sand; no chemical odor.
	150		S-8-5	6				
				7				
				8				
				9				CLAYEY SAND (SC) - olive (5Y 5/4), loose, damp; 70% fine subrounded sand; 10-20% clay; trace fine gravel; slight chemical odor.
	100	S&H		10				
0	100	push	S-8-10	11		▼		
				12				
				13				
				14				
	2	S&H						no chemical odor at 14.0 feet.
0	6			15				
	12		S-8-15			▽		CLAYEY SAND (SC) - olive (5Y 4/3), medium dense, saturated; 70% medium to fine sand; 20% clay; 10% angular gravel; no chemical odor.
				16				
				17				
				18				
				19				

Remarks:

GeoStrategies Inc.

Log of Boring

BORING NO. S-8

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CWP CEG 1262	9/89		

Field location of boring: (See Plate 1)	Project No.: 7610	Date: 07/24/89	Boring No: S-8
	Client: Shell Oil Company		
	Location: 2800 Telegraph Avenue		
	City: Oakland, California		Sheet 2 of 2
	Logged by: J. Vargas	Driller: Bayland	
Drilling method: Hollow-Stem Auger	Casing installation data:		
Hole diameter: 8-Inches	Top of Box Elevation: 25.97		Datum: Mean Sea-Level

Water Level	10.5'	
Time		
Date	7/24/89	

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
	5	S&H						
0	6			20				SANDY CLAY (CL) - light olive brown (2.5Y 5/4), stiff, damp; 70% clay; 30% fine to medium sand; low plasticity, brown/gray mottling black organics, interbeds of thin gravel; no chemical odor.
	7							
	5	SPT		21				
	6							
	4			22				
								Bottom of boring at 19.5 feet.
				23				Bottom of sample at 22.0 feet.
								07/24/89
				24				
				25				
				26				
				27				
				28				
				29				
				30				
				31				
				32				
				33				
				34				
				35				
				36				
				37				

Remarks:

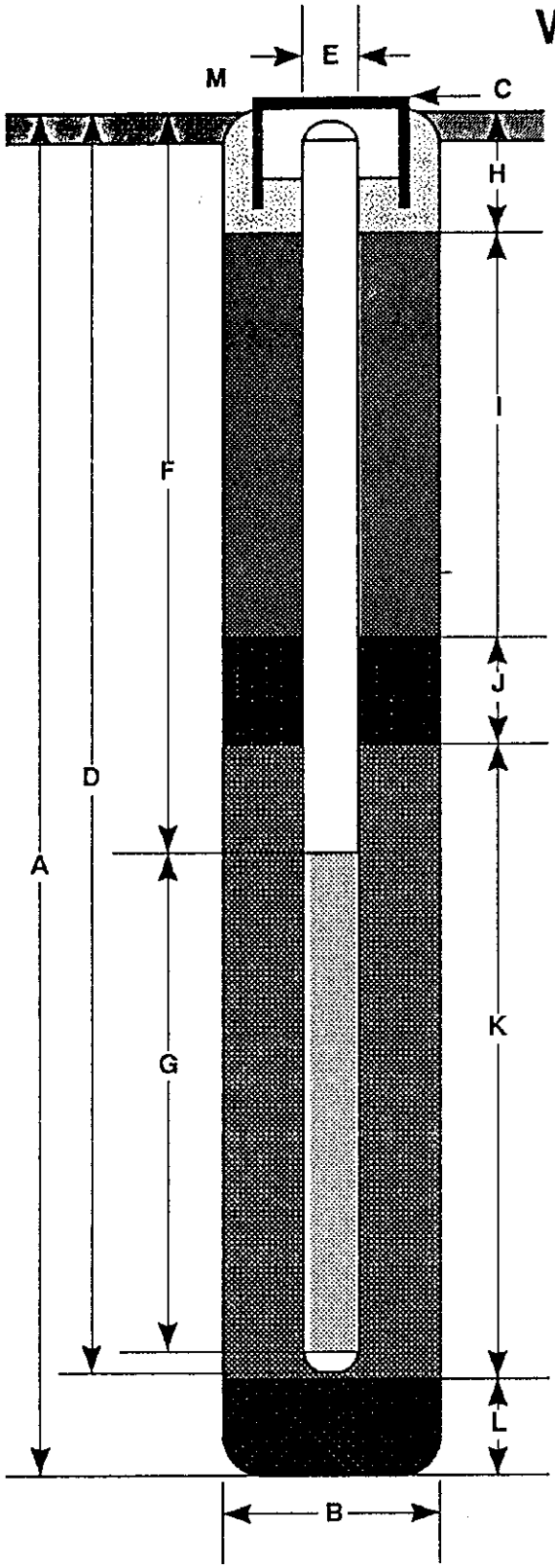
GeoStrategies Inc.

Log of Boring

BORING NO. S-8

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CWP CEG 1262	9/89		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 22 ft.

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

C Top of Box Elevation 25.97 ft.
[X] Referenced to Mean Sea Level
[ ] Referenced to Project Datum

D Casing Length 19.5 ft.
Material Schedule 40 PVC

E Casing Diameter 3 in.

F Depth to Top Perforations 9.5 ft.

G Perforated Length 10 ft.
Perforated Interval from 19.5 to 9.5 ft.
Perforation Type Machine Slot
Perforation Size 0.02 in.

H Surface Seal from 0.5 to 0 ft.
Seal Material Concrete

I Backfill from 5.5 to 0.5 ft.
Backfill Material Concrete

J Seal from 7.5 to 5.5 ft.
Seal Material Bentonite Pellets

K Gravel Pack from 19.5 to 7.5 ft.
Pack Material 2/12 Lonestar Sand

L Bottom Seal 2.5 ft.
Seal Material Natural Clay

M Christy Box with locking well cap and lock

GSI GeoStrategies Inc.

Well Construction Detail

WELL NO. **S-8**

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CMP CEG 1262	9/89		

Field location of boring: (See Plate 1)	Project No.: 7610	Date: 07/17/89	Boring No: S-9
	Client: Shell Oil Company		
	Location: 2800 Telegraph Avenue		
	City: Oakland, California		Sheet 1 of 2
	Logged by: J. Vargas	Driller: Bayland	
	Casing installation data:		
Drilling method: Hollow-Stem Auger			
Hole diameter: 8-Inches - Reamed with 12-Inches	Top of Box Elevation: 25.86		Datum: Mean Sea-Level

	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
								PAVEMENT SECTION - Asphalt, Base Rock
				1				
				2				SILTY CLAY (CL) - black (7.5YR 2/0), stiff, damp; 70% clay; 10-20% silt; 0-10% fine to medium sand; low plasticity, roots, trace coarse angular sand; no chemical odor.
				3				
				4				
	150	S&H		5				
1.5	150	push						color change at 4.5 feet to very dark grayish brown (2.5Y 3/2).
	150		S-9-5	6				
				7				CLAYEY SAND (SC) - very dark grayish brown (2.5Y 3/2), loose, damp; 50-60% medium to coarse angular sand; 40-50% clay; no chemical odor.
				8				
				9				
	150	S&H						CLAYEY SAND (SC) - olive gray (5Y 5/2), medium stiff, damp; 65% very fine to fine subangular sand; 35% clay; roots, green staining, trace fine gravels, gradational contact with above unit; moderate chemical odor.
230	150	push		10				
	150		S-9-10	11				
				12				
				13				SANDY CLAY (CL) - olive gray (5Y 5/2), medium stiff, damp; 50% clay; 40-50% fine sand; 0-10% silt; no chemical odor.
				14		▽		
	14	S&H						
0	18			15				SANDY GRAVEL (GW) - light olive brown (2.5Y 5/4), dense, saturated; 60% fine angular gravel; 30% fine to coarse sand; 10% clay; trace coarse gravel; no chemical odor.
	16		S-9-15	16				
				17				
				18				
				19				

Remarks:

GeoStrategies Inc.

Log of Boring

BORING NO. S-9

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CWP CEG 1262	9/89		

Field location of boring:	Project No.: 7610	Date: 07/17/89	Boring No:
(See Plate 1)	Client: Shell Oil Company		S-9
	Location: 2800 Telegraph Avenue		
	City: Oakland, California		Sheet 2
	Logged by: J. Vargas	Driller: Bayland	of 2
	Casing installation data:		
Drilling method: Hollow-Stem Auger			
Hole diameter: 8-Inches - Reamed with 12-Inches	Top of Box Elevation: 25.86		Datum: Mean Sea-Level

	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
	7	S&H						
0	13			20				
	14		S-9-20					becoming medium dense; no chemical odor.
				21				
				22				
				23				
				24				increasing coarse gravel to 20%; no chemical odor.
	8	S&H						
0	14			25				
	9							
				26				
				27				
				28				
				29				
	4	S&H						GRAVELLY CLAY (CL) - light olive brown (2.5Y 5/4), very
	6			30				stiff, damp; 50% clay; 40% fine gravel; 10% fine sand;
	18							low plasticity; no chemical odor.
	5	SPT		31				
	7							gradational contact at 30.5 feet.
	11			32				
								CLAY with SAND (CL) - light olive brown (2.5Y 5/4), very
				33				stiff, damp; 70% clay; 20% fine sand; 0-10% fine
								subangular gravel; trace medium to coarse sand, brown
				34				mottling; no chemical odor.
				35				Bottom of boring at 30.0 feet.
								Bottom of sample at 32.0 feet.
				36				07/17/89
				37				

Remarks:

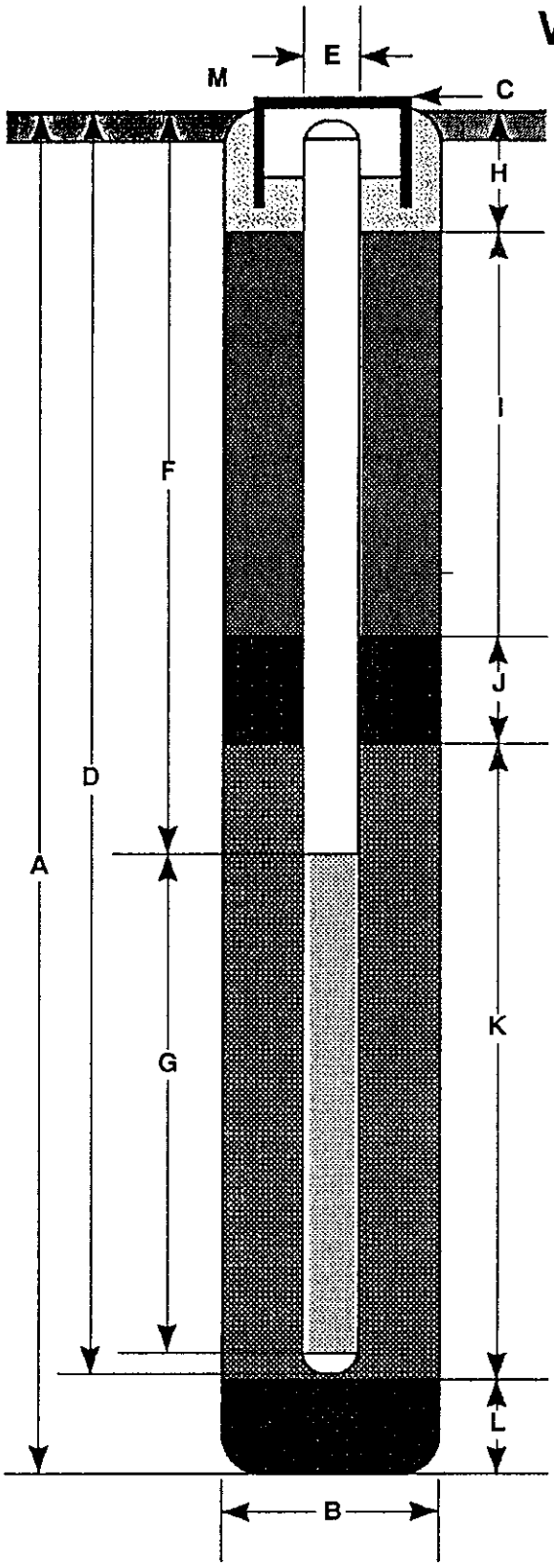
GeoStrategies Inc.

Log of Boring

BORING NO. S-9

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CAMPCEG1262	9/89		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 32 ft.

B Diameter of Boring 12 in.
Drilling Method Hollow-Stem Auger

C Top of Box Elevation 25.86 ft.
[X] Referenced to Mean Sea Level
[ ] Referenced to Project Datum

D Casing Length 30 ft.
Material Schedule 40 PVC

E Casing Diameter 3 in.

F Depth to Top Perforations 14 ft.

G Perforated Length 15.5 ft.
Perforated Interval from 29.5 to 14.0 ft.
Perforation Type Machine Slot
Perforation Size 0.02 in.

H Surface Seal from 0.5 to 0 ft.
Seal Material Concrete

I Backfill from 11.0 to 0.5 ft.
Backfill Material Concrete

J Seal from 13.0 to 11.0 ft.
Seal Material Bentonite Pellets

K Gravel Pack from 30.0 to 13.0 ft.
Pack Material 2/12 Lonestar Sand

L Bottom Seal 2 ft.
Seal Material Natural Clay

M Christy Box with locking well cap and lock

GeoStrategies Inc.

Well Construction Detail

WELL NO.

S-9

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CMP CEG 12/92	9/89		

Field location of boring: (See Plate 1)	Project No.: 7610	Date: 07/24/89	Boring No: S-10
	Client: Shell Oil Company		
	Location: 2800 Telegraph Avenue		
	City: Oakland, California		Sheet 1 of 2
	Logged by: J. Vargas	Driller: Bayland	
	Casing installation data:		
Drilling method: Hollow-Stem Auger			
Hole diameter: 8-Inches	Top of Box Elevation: 26.95		Datum: Mean Sea-Level

	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
								PAVEMENT SECTION - Concrete/Base Rock/Sand
				1				
								FILL - sand (SP), loose, moist,95% fine to medium sand;
				2				5% clay; trace concrete and debris
				3				
				4				
	150	S&H						
0	150	push	S-10-5	5				SANDY CLAY (CL) - very dark gray (5Y 3/1), medium
								stiff, damp; 60% clay; 30% fine sand; 10% silt; medium
				6				plasticity, roots, brown oxidation, trace subrounded
				7				coarse sand; no chemical odor.
				8				
				9				
	150	S&H						
0	150	push		10				CLAYEY SAND to SANDY CLAY (CL/SC) - gray (5Y 5/1),
	150		S-10-10					medium stiff, moist; 40-50% fine sand; 40-50% clay; trace
				11				coarse subrounded sand, brown oxidation stains; no
				12				chemical odor.
				13				
				14		▽		
	12	S&H						
0	16			15				GRAVEL with CLAY and SAND (GP-GC) - olive brown
	30		S-10-15					(2.5Y 4/4), dense, saturated; 50-60% fine angular gravel;
				16				30-40% fine to coarse sand; trace - 10% clay; no
				17				chemical odor.
				18				
				19				

Remarks:

GeoStrategies Inc.

Log of Boring

BORING NO. S-10

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CMP CEG 1262	9/89		

Field location of boring:	Project No.: 7610	Date: 07/24/89	Boring No:
(See Plate 1)	Client: Shell Oil Company		S-10
	Location: 2800 Telegraph Avenue		
	City: Oakland, California		Sheet 2
	Logged by: J. Vargas	Driller: Bayland	of 2
	Casing installation data:		
Drilling method: Hollow-Stem Auger			
Hole diameter: 8-Inches	Top of Box Elevation: 26.95		Datum: Mean Sea-Level

	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
	8	S&H		20				
0	13							interbedded fine to medium sand lamina at 19.5 feet.
	9		S-10-20					
				21				
				22				
				23				
				24				SANDY CLAY (CL) - yellowish brown (10YR 5/4), medium stiff, moist; 60-70% clay; 30% fine sand; trace silt, medium plasticity, interbedded fine gravel lamina which are saturated, trace subangular coarse gravels, worm burrows, brown oxidation; no chemical odor.
	6	S&H		25				
	3							
	7							
				26				
				27				
				28				
				29				
	6	S&H		30				becoming damp, increased brown staining.
	7							
	9							
				31				Bottom of boring at 29.0 feet.
								Bottom of sample at 30.5 feet.
				32				07/24/89
				33				
				34				
				35				
				36				
				39				

Remarks:

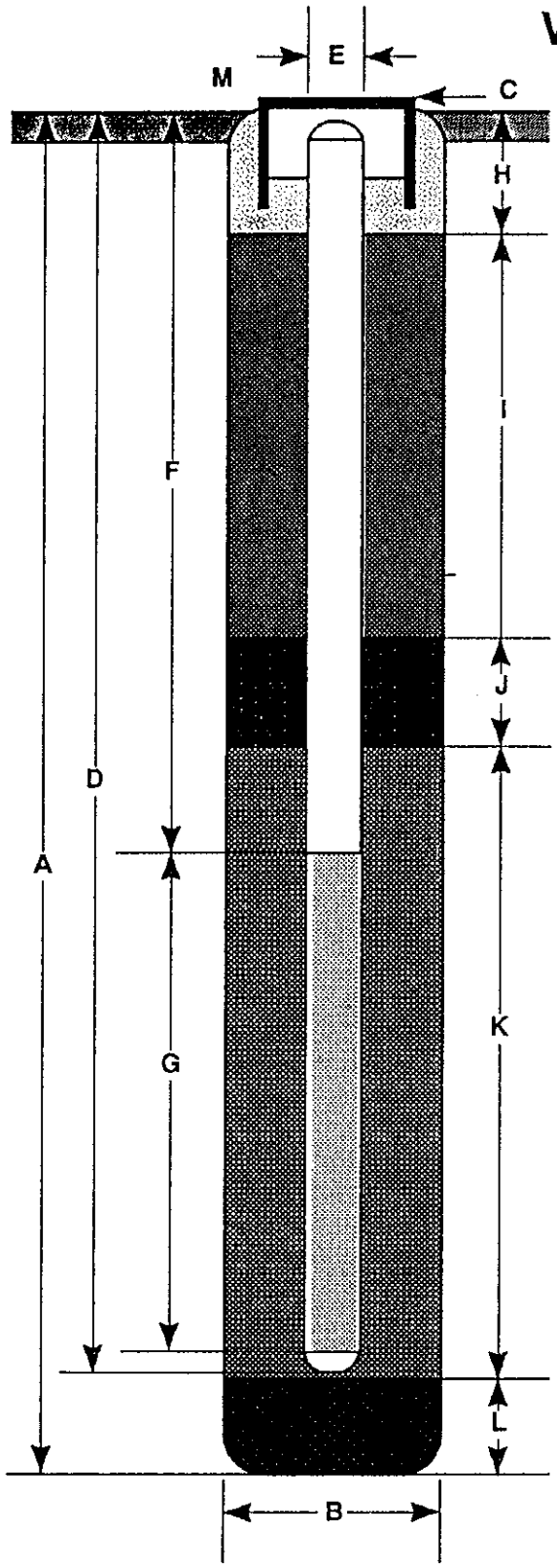
GeoStrategies Inc.

Log of Boring

BORING NO. S-10

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CMP CEG 1262	9/89		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring: 30.5 ft.

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

C Top of Box Elevation: 26.95 ft.
[X] Referenced to Mean Sea Level
[ ] Referenced to Project Datum

D Casing Length: 24 ft.
Material: Schedule 40 PVC

E Casing Diameter: 3 in.

F Depth to Top Perforations: 12 ft.

G Perforated Length: 12 ft.
Perforated Interval from: 24 to 12 ft.
Perforation Type: Machine Slot
Perforation Size: 0.02 in.

H Surface Seal from: 0.5 to 0 ft.
Seal Material: Concrete

I Backfill from: 8.0 to 0.5 ft.
Backfill Material: Concrete

J Seal from: 10.0 to 8.0 ft.
Seal Material: Bentonite Pellets

K Gravel Pack from: 24.0 to 10.0 ft.
Pack Material: 2/12 Lonestar Sand

L Bottom Seal: 6.5 ft.
Seal Material: Bentonite Pellets

M Christy Box with locking well cap and lock

GSI GeoStrategies Inc.

Well Construction Detail

WELL NO. S-10

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7610	CWP CEG 1262	9/89		

APPENDIX C
GETTLER-RYAN INC.
GROUNDWATER SAMPLING REPORT

gettler — ryan inc.

September 7, 1989

GROUNDWATER SAMPLING REPORT

Referenced Site: Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

Sampling Date: August 3, 1989

This report presents the results of the quarterly groundwater sampling and analytical program conducted by Gettler-Ryan Inc. on August 3, 1989 at the referenced location. The site, located on the northeast corner of Telegraph and 28th Avenue, is no longer an operating service station. The former station had underground storage tanks which contained petroleum products.

There are currently three groundwater monitoring wells on site and seven off site at the locations shown on the attached site map. Prior to sampling, the 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 the presence and thickness of separate phase product. Groundwater depths ranged from 8.25 to 11.04 feet below grade. Separate phase product was observed in monitoring well S-3.

The wells were then purged and sampled. 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. In cases where a well dewatered or less than four case volumes were purged, groundwater samples were obtained after the physical parameters had stabilized. The purge water was contained in drums for proper disposal. Details of the final well purging results are presented on the attached Table of Monitoring Data.

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 field blank (SF-4), and trip blank, supplied by the laboratory, were included and analyzed to assess quality control. A duplicate sample (SD-1), 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.

1992 national avenue • hayward, california 94545-1787 • (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

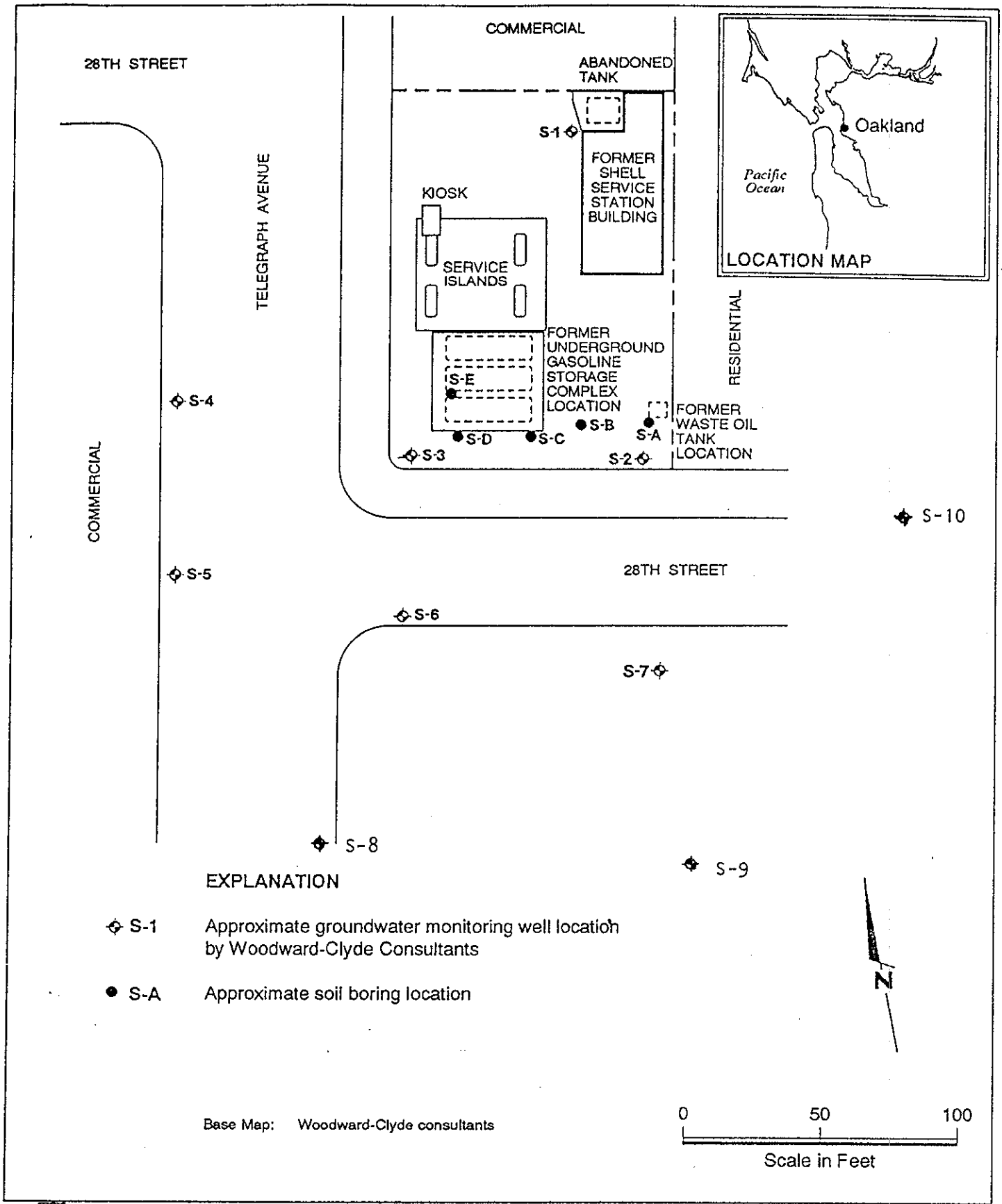
WELL I.D.	S-1 SD-1	S-2	S-3	S-4	S-5	S-6
Casing Diameter (inches)	3	3	3	3	3	3
Total Well Depth (feet)	28.00	25.50	----	29.10	30.58	22.10
Depth to Water (feet)	9.88	9.75	9.30	10.95	10.47	9.40
Free Product (feet)	none	none	0.03	none	none	none
Reason Not Sampled	----	----	free prod.	----	----	----
Calculated 4 Case Vol.(gal.)	----	----	----	----	----	----
Did Well Dewater?	no	no	----	yes	no	yes
Volume Evacuated (gal.)	37	37	----	21	39	15
Purging Device	Suction	Suction	----	Suction	Suction	Suction
Sampling Device	Bailer	Bailer	----	Bailer	Bailer	Bailer
Time	10:48	11:14	----	13:18	13:01	11:48
Temperature (F)*	66.6	66.0	----	70.2	69.8	71.2
pH*	6.38	6.55	----	6.36	6.56	6.55
Conductivity (umhos/cm)*	478	686	----	454	168	888

* Indicates Stabilized Value

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

WELL I.D.	S-7	S-8	S-9	S-10
Casing Diameter (inches)	3	3	3	3
Total Well Depth (feet)	30.80	19.30	30.00	24.30
Depth to Water (feet)	11.04	10.22	10.42	8.25
Free Product (feet)	none	none	none	none
Reason Not Sampled	----	----	----	----
Calculated 4 Case Vol.(gal.)	----	----	----	----
Did Well Dewater?	no	no	no	yes
Volume Evacuated (gal.)	38	21	38	21
Purging Device	Suction	Suction	Suction	Suction
Sampling Device	Bailer	Bailer	Bailer	Bailer
Time	09:19	12:20	09:45	10:17
Temperature (F)*	69.5	73.3	70.0	69.3
pH*	6.60	6.76	6.55	6.82
Conductivity (umhos/cm)*	873	716	635	437

* Indicates Stabilized Value



GeoStrategies Inc.

Site Plan
Former Shell Service Station
2800 Telegraph Avenue
Oakland, California

PLATE 1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
610		6/89		

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Gettler-Ryan
1992 National Avenue
Hayward, CA 94545
ATTN: John Werfal

Date: August 23, 1989

Work Order Number: S9-08-060

P.O. Number: MOH 890501A

This is the Certificate of Analysis for the following samples:

Client Project ID:	GR #3610, Shell, 2800 Telegraph Ave./ 28th Street, Oakland, CA
Date Received by Lab:	8/4/89
Number of Samples:	I2
Sample Type:	Water

The method of analysis for low boiling hydrocarbons is taken from EPA Methods 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatography 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, ethyl benzene and xylenes.

Reviewed and Approved

Michael E. Dean
Project Manager

MED/an
2 Pages Following - Tables of Results

Date: August 23, 1989
Client Project ID: GR #3610, Shell,
2800 Telegraph Ave./28th St., Oakland

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order Number: S9-08-060

Lab Sample ID	Client Sample ID	Sample Date	Date Analysis Completed	Sample Condition on Receipt
S9-08-060-01	S-1	8/3/89	8/10/89	cool pH <2
S9-08-060-02	S-2	8/3/89	8/10/89	cool pH <2
S9-08-060-03	S-4	8/3/89	8/10/89	cool pH <2
S9-08-060-04	S-5	8/3/89	8/10/89	cool pH <2
S9-08-060-05	S-6	8/3/89	8/10/89	cool pH <2
S9-08-060-06	S-7	8/3/89	8/15/89	cool pH <2

Total Petroleum Hydrocarbons - Modified E.P.A. Methods 8015, 8020

ND = None Detected

Results - Milligrams per Liter

Lab Sample ID	Client Sample ID	Low Boiling Hydrocarbons (calculated as Gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes (total)
S9-08-060-01	S-1	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-08-060-02	S-2	0.43	0.073	0.001	0.014	0.007
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-08-060-03	S-4	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-08-060-04	S-5	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-08-060-05	S-6	7.1	2.4	ND	0.07	ND
Detection Limit		2.5	0.02	0.05	0.05	0.2
S9-08-060-06	S-7	5.0	0.66	0.38	0.23	0.71
Detection Limit		0.5	0.005	0.01	0.01	0.03

Date: August 23, 1989
Client Project ID: GR #3610, Shell,
2800 Telegraph Ave./28th St., Oakland

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order Number: S9-08-060

Lab Sample ID	Client Sample ID	Sample Date	Date Analysis Completed	Sample Condition on Receipt
S9-08-060-07	S-8	8/3/89	8/10/89	cool pH <2
S9-08-060-08	S-9	8/3/89	8/10/89	cool pH <2
S9-08-060-09	S-10	8/3/89	8/15/89	cool pH <2
S9-08-060-10	SD-1	8/3/89	8/15/89	cool pH <2
S9-08-060-11	SF-4	8/3/89	8/10/89	cool pH <2
S9-08-060-12	Trip Blank	7/31/89	8/10/89	cool pH <2

Total Petroleum Hydrocarbons - Modified E.P.A. Methods 8015, 8020

ND = None Detected

Results - Milligrams per Liter

Lab Sample ID	Client Sample ID	Low Boiling Hydrocarbons (calculated as Gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes (total)
S9-08-060-07	S-8	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-08-060-08	S-9	1.6	0.032	0.12	0.052	0.25
Detection Limit		0.1	0.001	0.002	0.002	0.006
S9-08-060-09	S-10	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-08-060-10	SD-1	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-08-060-11	SF-4	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003
S9-08-060-12	Trip Blank	ND	ND	ND	ND	ND
Detection Limit		0.05	0.0005	0.001	0.001	0.003

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

COMPANY Shell Oil Company JOB NO. 3610

JOB LOCATION 2800 Telegraph Ave / 28th Street

CITY Oakland, CA PHONE NO.

AUTHORIZED DATE 8-3-89 P.O. NO.

SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID
S-1	3	liquid	8-3-89 10:48	THC(gas), BTXE	
S-2	3		11:04		
S-4	3		~~11:43~~ 13:18		
S-5	3		~~12:30~~ 13:01		
S-6	3		11:48		
S-7	3		9:19		
S-8	3		12:20		
S-9	3		9:45		
S-10	3		10:17		
SD-1	3		—		
SF-4	3		13:18		
Trip Blank	~~3~~ 2		7-31-89		

RELINQUISHED BY: John P. Kingsbury 8-4-89 10:30 am

RECEIVED BY: 8-4-89 10:31 am

RELINQUISHED BY: 8-4-89 16:00

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY LAB: J. Clifford 8/4/89 16:05

DESIGNATED LABORATORY: IT/SCV DHS #: 137

REMARKS: Normal TAT Results Due 8-18-89

DATE COMPLETED 8-3-89 FOREMAN JPR GS

ORIGINAL

APPENDIX D
CHEMICAL ANALYTICAL REPORT

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Gettler-Ryan
1992 National Avenue
Hayward, CA 94545
ATTN: John Werfal

Date: August 7, 1989

Work Order Number: S9-07-252

P.O. Number: 7610

This is the Certificate of Analysis for the following samples:

Client Project ID:	GR #7610, Shell Oil Company 2800 Telegraph, Oakland
Date Received by Lab:	7/26/89
Number of Samples:	3
Sample Type:	Soil

The method of analysis for low boiling hydrocarbons is taken from EPA Methods 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatography 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, ethyl benzene and xylenes.

Reviewed and Approved

Michael E. Dean
Project Manager

MED/rs
1 Page Following - Tables of Results

Page: 1 of 1
Date: August 7, 1989
Client Project ID: GR #7610, Shell Oil Company
2800 Telegraph, Oakland

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order Number:
S9-07-252

Lab Sample ID	Client Sample ID	Sample Date	Extraction Date	Date Analysis Completed	Sample Condition on Receipt
S9-07-252-01	S-8-10	7/26/89	7/28/89	7/31/89	Cool
S9-07-252-02	S-8-15	7/26/89	7/28/89	7/31/89	Cool
S9-07-252-03	S-10-10	7/26/89	7/28/89	7/31/89	Cool

Total Petroleum Hydrocarbons - Modified E.P.A. Methods 8015, 8020

ND = None Detected

Results - Milligrams per Kilogram

Lab Sample ID	Client Sample ID	Low Boiling Hydrocarbons (calculated as Gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes (total)
S9-07-252-01	S-8-10	ND	ND	ND	ND	ND
S9-07-252-02	S-8-15	ND	ND	ND	ND	ND
S9-07-253-03	S-10-10	ND	ND	ND	ND	ND
Detection Limit		5.	0.05	0.1	0.1	0.3

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Gettler-Ryan
1992 National Avenue
Hayward, CA 94545
ATTN: John Werfal

Date: August 7, 1989

Work Order Number: S9-07-159

P.O. Number: 7610

This is the Certificate of Analysis for the following samples:

Client Project ID:	G-R #7610 Shell, 2800 Telegraph Ave., Oakland, CA
Date Received by Lab:	7/19/89
Number of Samples:	2
Sample Type:	Soil

The method of analysis for low boiling hydrocarbons is taken from EPA Methods 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatography 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, ethyl benzene and xylenes.

Reviewed and Approved

Michael E. Dean
Project Manager

MED/gg
1 Page Following - Table of Results

Date: August 7, 1989
Client Project ID: G-R #7610 Shell,
2800 Telegraph Ave., Oakland, CA

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order Number: S9-07-159

Lab Sample ID	Client Sample ID	Sample Date	Extraction Date	Date Analysis Completed	Sample Condition on Receipt
S9-07-159-01	S-9-5	7/17/89	7/24/89	7/25/89	Cool
S9-07-159-02	S-9-10	7/17/89	7/24/89	7/31/89	Cool

Total Petroleum Hydrocarbons - Modified E.P.A. Methods 8015, 8020

ND = None Detected

Results - Milligrams per Kilogram

Lab Sample ID	Client Sample ID	Low Boiling Hydrocarbons (calculated as Gasoline)	Benzene	Toluene	Ethyl Benzene	Xylenes (total)
S9-07-159-01	S-9-5	ND	ND	ND	ND	ND
Detection Limit		5.	0.05	0.1	0.1	0.3
S9-07-159-02	S-9-10	220.	ND	ND	1.3	7.
Detection Limit		20.	0.2	0.4	0.4	2.