gettler — ryan inc.
general contractors

January 15, 1990

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

Attention: Mr. Larry Seto

Reference: Former Shell Service Station
461 Eigth Street
Oakland, California 94607

90 JAN 18 AM 11 05

Gentlemen:

As requested by Shell Oil Company, we are forwarding a copy of the Quarterly Report, dated January 10, 1990, documenting the groundwater sampling and site activies conducted between October - December 1989 at the above referenced location. The enclosed report also presents a proposed scope of work to further delineate the extent of contamination at the site.

Please do not hesitate to call should you have any questions or comments.

Sincerely,

John P. Werfal
Project Manager

JPW/ch

enclosure

cc: Ms. Wendy Howell, Shell Oil Company
Ms. Diane Lundquist, Shell Oil Company
Mr. Tom Callaghan, Regional Water Quality Control Board

1992 national avenue • hayward, california 94545-1787 • 783-7500

GeoStrategies Inc.

QUARTERLY REPORT

OCTOBER - DECEMBER 1989

Former Shell Service Station
461 8th Street
Oakland, California

Report No. 7644-4

January 10, 1990

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

January 10, 1990

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

Attn: John Werfal

Re: QUARTERLY REPORT
Former Shell Service Station
461 8th Street
Oakland, California

Gentlemen:

This quarterly report has been prepared for the above referenced site, for the October through December, 1989 quarter.

If you have any questions, please call.

GeoStrategies Inc. by,

David A. Ferreira
Geologist

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

REGISTERED GEOLOGIST
CHRISTOPHER M. PALMER
№ 1262
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

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

DAF/JLP/mlg

Report No. 7644-4

1.0 INTRODUCTION

This Quarterly Report has been prepared by GeoStrategies Inc. (GSI) for the Former Shell Service Station located at 461 8th Street, Oakland, California (Plate 1).

This report describes the results of the fourth quarterly ground-water sampling for 1989 performed by Gettler-Ryan Inc. (G-R), in accordance with the current quarterly monitoring plan for the site. Field work and laboratory analytical methods were performed in compliance with current State of California Water Resources Control Board (SCWRCB) procedures for conducting environmental investigations related to leaking underground fuel tanks. The field and chemical analytical data discussed in this report were collected between October 1 and December 31, 1989. In addition, this report also includes a proposed scope of work which addresses the need to further assess the horizontal and vertical extent of petroleum hydrocarbons in the soil and groundwater beneath the site and off-site.

2.0 SITE HISTORY

In January 1979, Bay Area Rapid Transit (BART) discovered gasoline leaking into an underground rail tube near the corner of the former Shell Service Station at 461 8th Street in Oakland, California. As a result, a total of seven monitoring wells were installed (S-1 through S-7) to evaluate soil and ground-water quality conditions at the site by Groundwater Technology Inc. (GTI) in August and September, 1981. Monitoring well S-5 was found to contain separate-phase petroleum hydrocarbons (floating product), approximately 0.5 feet in measured thickness.

In 1982, a ground-water recovery system was installed at the site. In August 1982, the recovery system was turned off. The discharge permit was reportedly revoked because gasoline concentration in effluent water exceeded established discharge requirements.
Well S-7 was destroyed in August 1985, due to freeway construction.

In 1986, EMCON Associates (EMCON) submitted a report addressing the necessary steps to remove the recovery system. In October 1987, floating product was pumped from Well S-5 using a vacuum truck. In November 1987, the BART tube was checked for gasoline seepage. No seepage or vapors were detected at that time.

Monitoring wells S-1, S-2 and S-3 have been inaccessible since August 1987, and it is believed that these wells were destroyed during construction activities at the site.

In October 1988, quarterly ground-water sampling began at the site. Wells S-4, S-5, and S-6 were sampled and analyzed for Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline), and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX). TPH-Gasoline concentrations in ground-water samples ranged from 0.13 parts per million (ppm) to 110 ppm. Benzene concentrations ranged from 0.0038 ppm to 29 ppm. The results of this sampling event are presented in the G-R Groundwater Sampling report dated December 6, 1988.

On February 14, 1989, G-R collected ground-water samples from monitoring wells S-4, S-5 and S-6. TPH-Gasoline concentrations were identified ranging from None Detected (ND) to 94 ppm. Benzene concentrations ranged from 0.0005 ppm to 18 ppm. The results of the February sampling are presented in the GSI Quarterly Report dated April 14, 1989.

On May 1, 1989, G-R collected ground-water samples from Wells S-5 and S-6. Well S-4 did not contain sufficient water for sampling. TPH-Gasoline concentrations of 120 ppm and 93 ppm and benzene concentrations of 29 ppm and 43 ppm were detected in Wells S-5 and S-6, respectively. The results of the May sampling are presented in the GSI Quarterly Report dated June 13, 1989.

On July 27, 1989, G-R collected ground-water samples for Wells S-5 and S-6. Well S-4 did not contain sufficient water for sampling. TPH-Gasoline concentrations of 110 ppm and 52 ppm were detected in Wells S-5 and S-6, respectively. Benzene was detected at a concentration of 20 ppm in both Well S-5 and Well S-6. The results of the July sampling are presented in the GSI Quarterly Report dated October 12, 1989.

3.0 GROUND-WATER LEVEL MONITORING

3.1 Potentiometric Data

Prior to ground-water sampling, water levels were measured in each monitoring well using an electronic interface probe. Static water-levels were measured from the surveyed top of the well box and recorded to the nearest $\pm$ 0.01 foot (Table 1). The locations of the monitoring wells are presented on Plate 2.

Ground-water elevation data for the fourth quarter have been plotted and contoured and are presented on Plate 3. Water-level measurements used to prepare the quarterly potentiometric map were taken from data collected on the same day that ground-water sampling occurred.

3.2 Floating-Product Measurements

Measurements for floating product were made in each well using a calibrated portable electronic oil-water interface probe. Visual inspection using a clean, clear, acrylic bailer was also made to confirm the interface probe results. Floating product was observed in Well S-5 at 0.01 feet in measured thickness.

4.0 CHEMICAL ANALYTICAL DATA

A ground-water sample was collected from monitoring well S-6 on October 5, 1989. Well S-4 contained insufficient water for sampling and Well S-5 contained floating product and, therefore, these wells were not sampled. The ground-water sample was analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020. Analyses were performed by International Technology (IT) Analytical Services, a State-certified analytical laboratory located in San Jose, California.

Well S-6 contained detectable concentrations of TPH-Gasoline (55 ppm) and benzene (20 ppm) during the fourth quarterly sampling event. Water-quality data for this quarter are summarized in Table 1. TPH-Gasoline and benzene chemical analytical data were used to prepare a chemical concentration map for this quarter (Plate 4).

4.1 Quality Control

The Quality Control (QC) sample for this quarterly ground-water sampling was a trip blank. The trip blank was prepared in the IT Laboratory using organic-free water to evaluate laboratory handling and analytical procedures. QC procedures for field sampling are presented in the G-R Field Methods and Procedures in Appendix A. The G-R Groundwater Sampling Report, Chain-of-Custody Forms, and the IT Analytical Services chemical analytical report for this quarterly ground-water sampling are presented in Appendix B.

5.0 PROPOSED SCOPE OF WORK

GSI has reviewed available field and chemical data for this site. Based on our review, additional work is needed to evaluate the extent of petroleum hydrocarbons in the soil and the groundwater at the site. Seven additional monitoring wells will be installed to further assess the lateral and vertical extent of the petroleum hydrocarbons in the soil and groundwater. Proposed field activities will be performed according to the GSI Field Methods and Procedures (Appendix A). Four wells will be installed off-site. Two wells will be installed downgradient along Sixth Street (one on each side of the BART tube complex), one cross-gradient well near Washington Street, and one well on Seventh Street east of the BART tube complex. Three wells will be installed on-site to replace Wells S-1, S-2 and S-3, which are suspected to have been destroyed during construction at the site. Well S-4, which may have been damaged, will be properly abandoned according to State and local regulations. The well borings will be drilled to an anticipated depth of 45 feet or to the base of the first encountered saturated zone. Soil samples will be collected for lithologic description, organic vapor presence using an OVM, and for chemical and physical analysis. As a minimum, soil samples will be collected at 5-foot intervals and at significant lithologic changes. Selected soil and ground-water samples will be analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020. Additional samples may be collected for lithologic descriptions, chemical analysis, and/or physical testing. The locations of the seven proposed wells are shown on Plate 2.

The proposed monitoring wells will be installed with a minimum 3-foot well screen extending above the equilibrated water-level to accommodate for separate-phase product (if present), and any potential diurnal and seasonal ground-water fluctuations. Notwithstanding, the wells will be designed to be compatible with observed subsurface geologic conditions. No well screens will be installed that potentially could permit cross-contamination of adjacent aquifers.

In addition to the proposed seven monitoring wells, GSI will perform a tidal study to assess the degree of influence, if any, tides exhibit on water levels in the monitoring wells. The tidal study will include monitoring water levels in selected wells for a minimum period of 48 hours using a portable electronic datalogger/transducer system to record water-level data continuously. Water-level fluctuations in San Francisco Bay will also be monitored to establish a relationship between time and water-level changes observed at the site.

The rationale for the above proposed scope of work is based on the following criteria:

- o Dissolved petroleum hydrocarbons have migrated off-site. Benzene concentrations have been detected above RWQCB MCLs in Well S-6 (20 ppm). These data are included in the G-R Groundwater Sampling Report dated October 31, 1989 (Appendix B).
- o Floating product was observed in Well S-5 this quarter.
- o The lateral and vertical extent of the hydrocarbons has not been delineated. Historically, petroleum hydrocarbons have been detected downgradient and in the existing BART tube complex. The influence of the BART tube complex on hydrocarbon migration needs to be evaluated further.
- o Well S-4 appears to have sustained surface damaged. Therefore, the integrity of this well is in question as a viable monitoring point. Additionally, the top of the well screen is too low to monitor shallow ground-water conditions. Therefore, it is of limited benefit for ground-water monitoring.
- o The shallow groundwater beneath the site is most likely influenced by the tides. The effects of tidal influences on the potentiometric surface and, consequently, the distribution of hydrocarbons needs to be evaluated.

6.0 SUMMARY

A summary of activities and findings associated with this quarterly report are presented below:

- o Water levels were measured in monitoring wells S-4, S-5 and S-6. The potentiometric map was constructed from static water-level data collected for the fourth quarter. The shallow ground-water gradient was calculated to be 0.01 to the east.
- o Floating product was observed in Well S-5 at 0.01 feet in measured thickness.
- o TPH-Gasoline was detected in Well S-6 at concentration of 55 ppm.
- o Benzene was detected in Well S-6 at concentration of 20 ppm.
- o Well S-4 contained insufficient water for sampling.

7.0 PLANNED SITE ACTIVITIES

The following activities are planned for the first quarter, January to March 1990, at the site:

- All scheduled wells will be sampled and analyzed for TPH-Gasoline according to EPA Method 8015 (Modified) and BTEX according to EPA Method 8020.
- Water levels will be measured monthly and selected data will be used to prepare a potentiometric map across the site. The local ground-water gradient will be calculated.
- Chemical data will be used to construct a concentration map for TPH-Gasoline and Benzene.
- Upon receipt of the necessary permits and property access approvals, the proposed scope of work contained in this document will be executed and a report documenting the findings will be prepared.

TABLE 1

GROUND-WATER ANALYSES 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-4	05-Oct-89	----	----	----	----	----	----	93.51	77.53	----	15.98
S-5	05-Oct-89	----	----	----	----	----	----	99.36	78.94	0.01	20.43
S-6	05-Oct-89	11-Oct-89	55.	20.	2.9	1.6	5.5	100.58	79.34	----	21.24
TB	05-Oct-89	10-Oct-89	<0.050	<0.0005	<0.001	<0.001	<0.003	----	----	----	----

CURRENT REGIONAL WATER QUALITY CONTROL BOARD MAXIMUM CONTAMINANT LEVELS

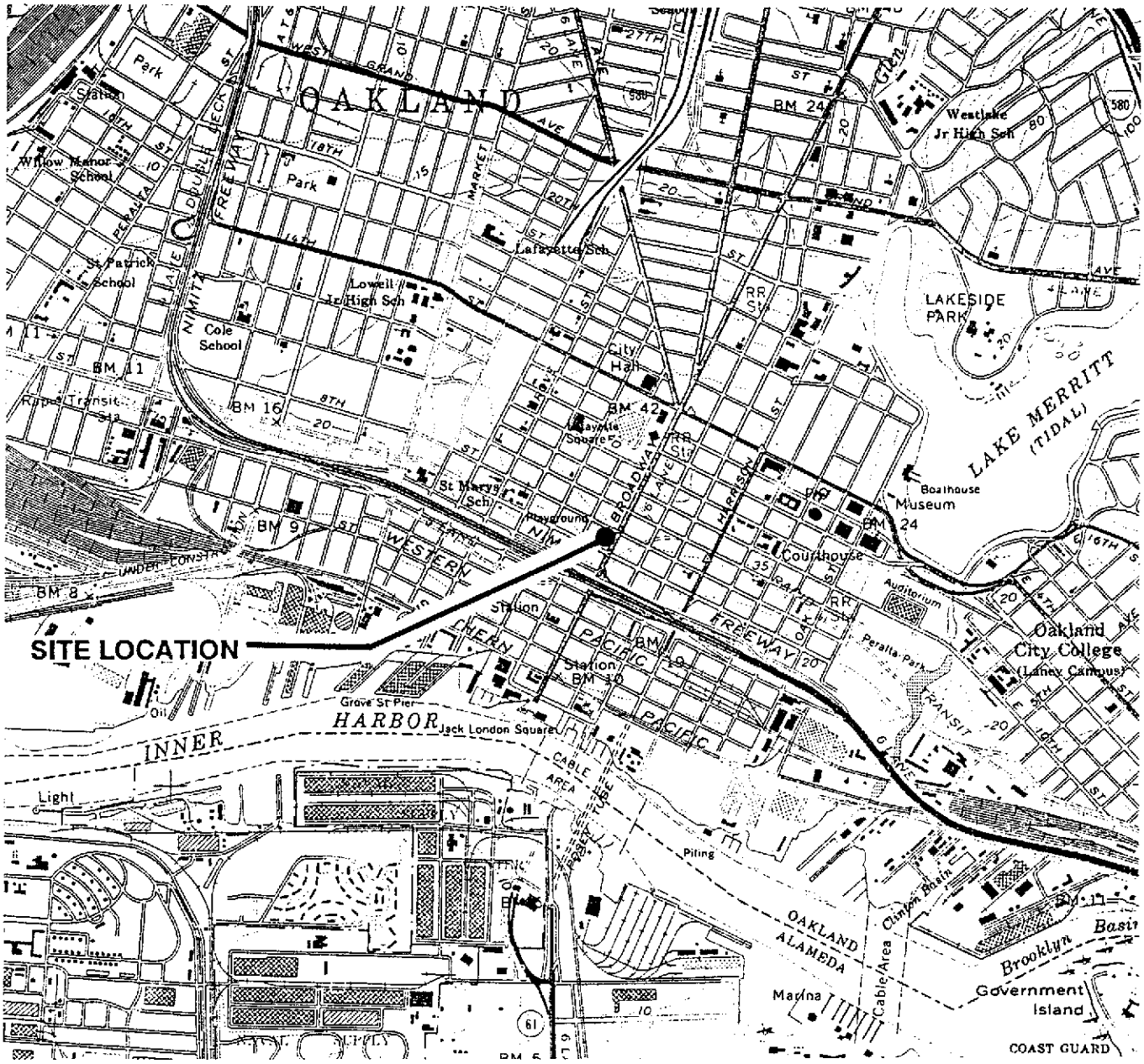
Benzene 0.001 ppm Xylenes 1.750 ppm Ethylbenzene 0.68 ppm

CURRENT DHS ACTION LEVELS

Toluene 0.100 ppm

TPH = Total Petroleum Hydrocarbons as Gasoline
PPM = Parts Per Million
TB = Trip Blank

Note: 1. All data shown as <x is reported as ND (none detected)
2. Water level elevations referenced to project site datum
3. Well S-4 had insufficient water for sampling
4. Well S-5 had free product and was not sampled
5. DHS Action Levels and MCL are subject to change pending State review



Base Map: USGS Topographic Map

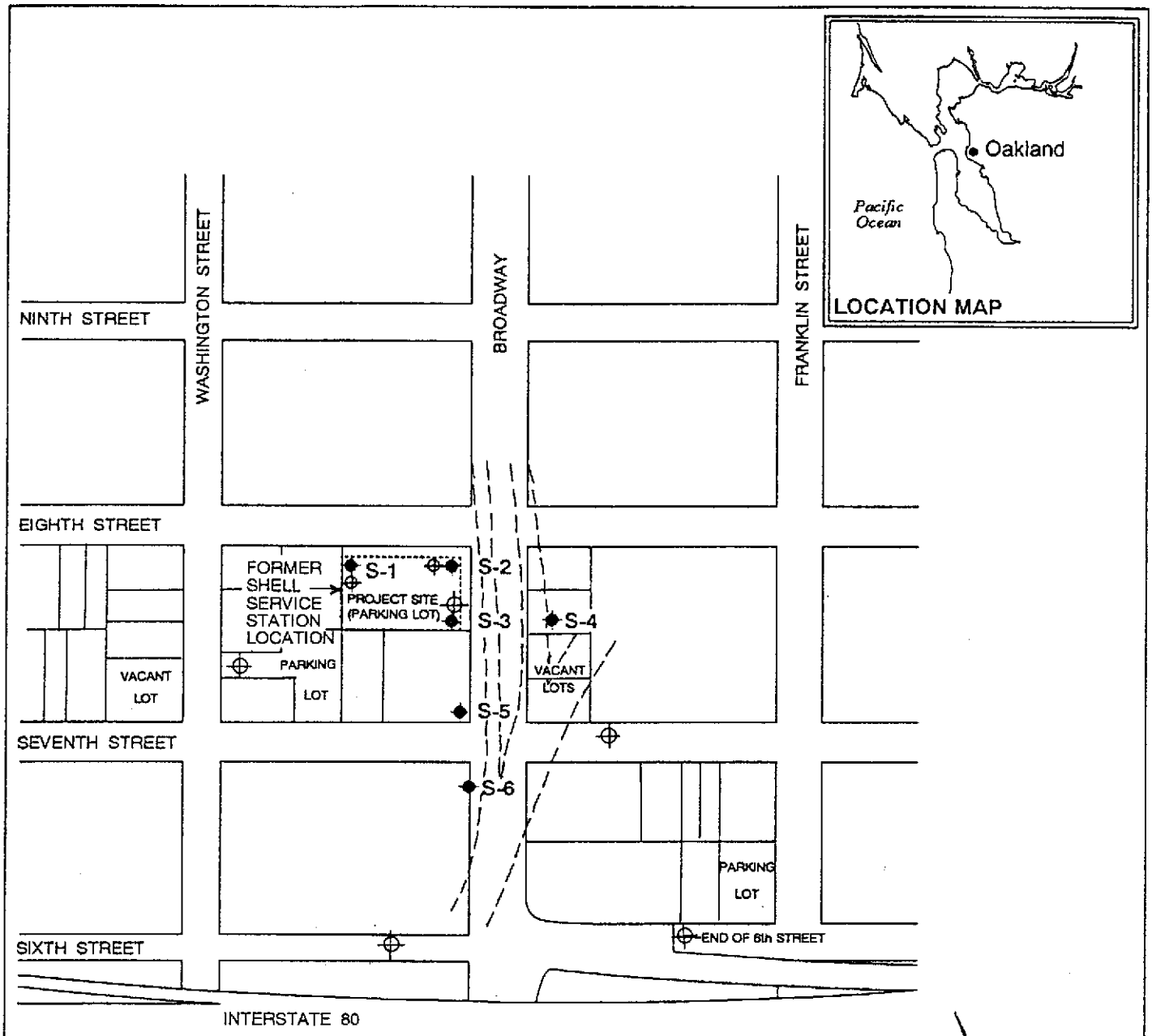
Approx. Scale: 1" = 2000'

GeoStrategies Inc.

Vicinity Map
Former Shell Service Station
461 Eighth Street
Oakland, California

PLATE
1

JOBNUMBER	REVIEWEDBYRG/CEG	DATE	REVISEDDATE	REVISEDDATE
7644		11/89		



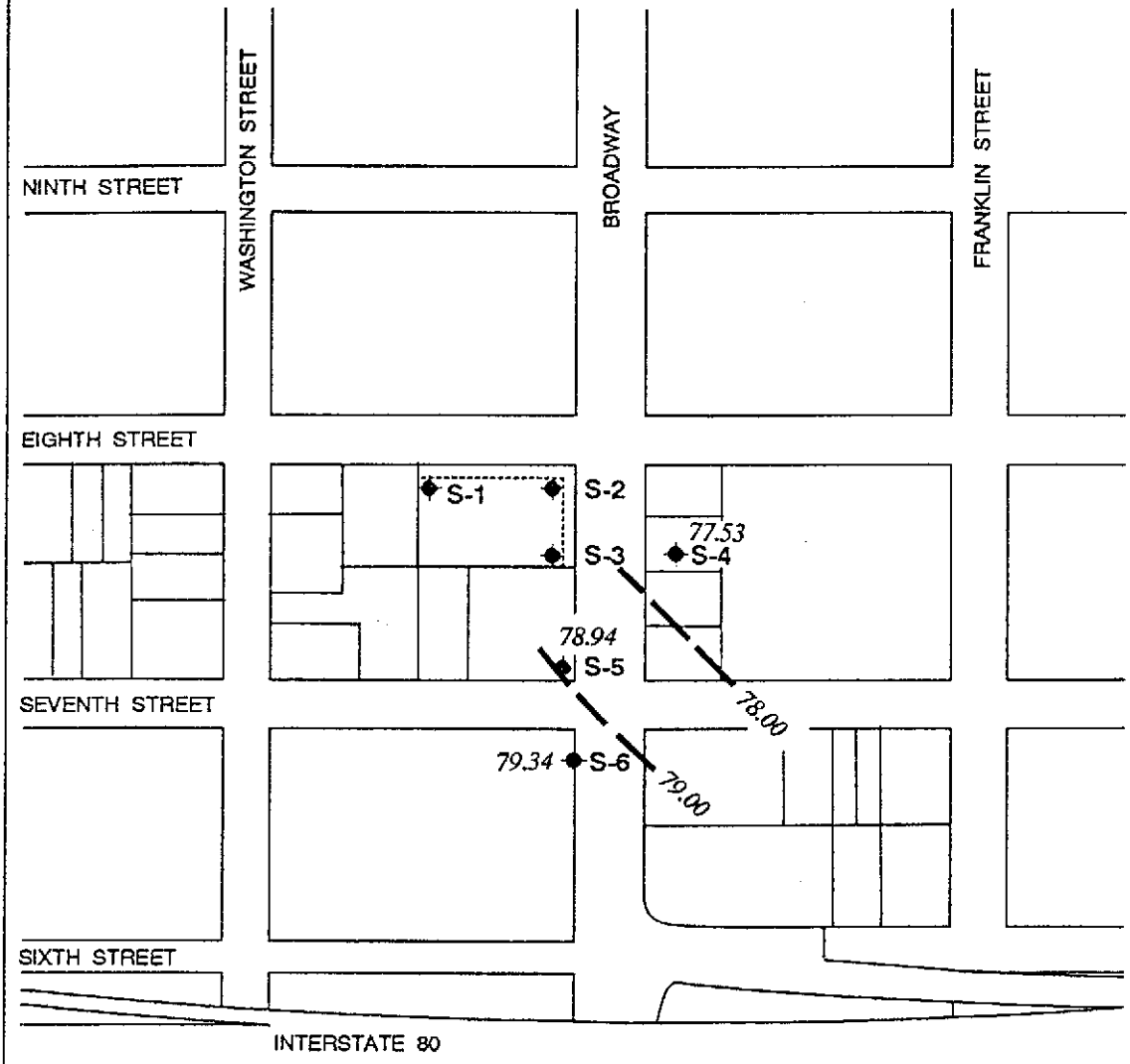
Note: Wells S-1, S-2 and S-3 are not accessible (see text)

GeoStrategies Inc.

Site Plan
Former Shell Service Station
461 Eighth Street
Oakland, California

PLATE
2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7644		11/89		



EXPLANATION

- S-1 — Groundwater monitoring well location
- 78.94 — Groundwater elevation measured on October 5, 1989 in feet referenced to project datum
- 78.00 — Groundwater elevation contour
  Approx. Gradient = 0.01

N

0 200 400

Scale in Feet

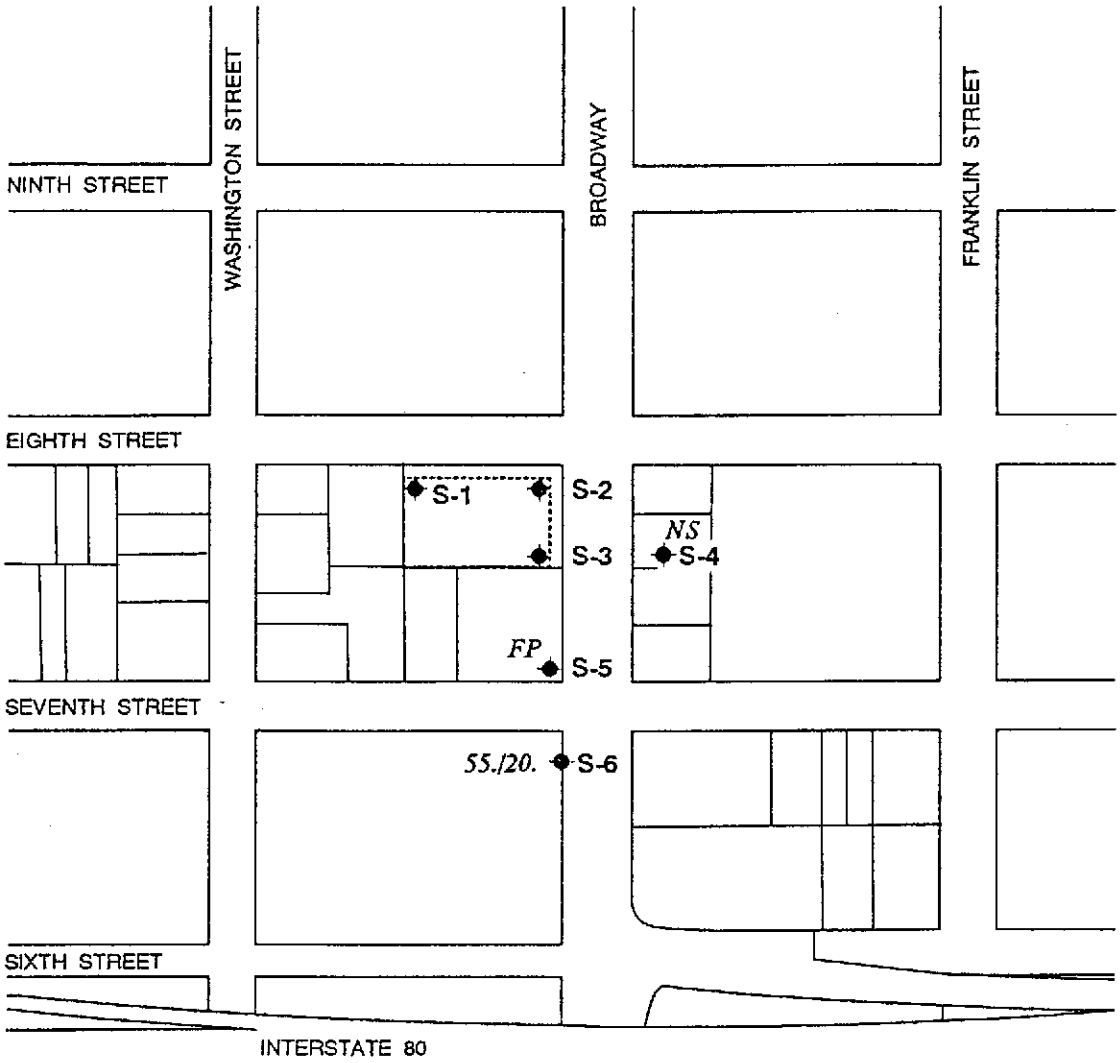
Note: Wells S-1, S-2 and S-3 are not accessible (see text)

GeoStrategies Inc.

Potentiometric Map
Former Shell Service Station
461 Eighth Street
Oakland, California

PLATE 3

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7644	CWM CEG 1262	11/89		



EXPLANATION

◆ S-1	Groundwater monitoring well location
55./20.	TPH (Total Petroleum Hydrocarbon)/Benzene concentrations measured on October 5, 1989 in ppm (parts per million)
FP	Floating Product
NS	Not Sampled due to insufficient water

Note: Wells S-1, S-2 and S-3 are not accessible (see text)

N

0 200 400

Scale in Feet

GeoStrategies Inc.

TPH/Benzene Concentration Map
Former Shell Service Station
461 Eighth Street
Oakland, California

PLATE **4**

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7644	Chmp CEG 1262	11/89		

APPENDIX A

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 $\pm$0.01 foot. Water level measurements will be recorded to the nearest $\pm$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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general and environmental contractors

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)

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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, 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.

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

A. Trip Blank: Used for purgeable organic compounds only; QC samples are collected in 40 milliliter (ml) 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.

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DOCUMENTATION

Sample Container Labels

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

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

Sampler's identification

Project number

Date and time of collection

Type of preservation used

Well Sampling Data Forms

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

Project number

Client

Location

Source (i.e. well number)

Time and date

Well accessibility and integrity

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

Calculated and actual purge volumes

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Chain-of-Custody

A Chain-of-Custody record (Figure 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.

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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

Logged by: | Driller: | of

Casing installation data:

Drilling method:

Hole diameter:

Top of Box Elevation: | Datum:

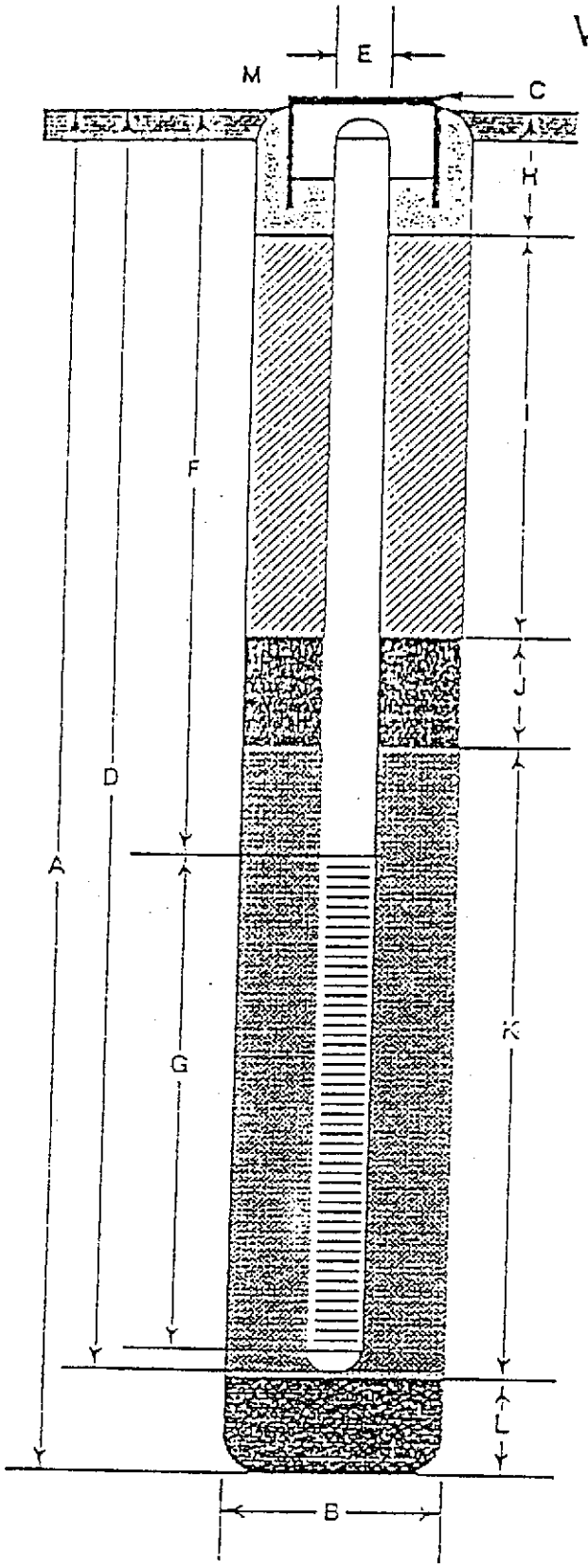
Water Level				
Time				
Date				

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 _____

GeoStrategies Inc.

Well Construction Detail

WELL NO.

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

FIGURE 2

General and Environmental Contractors

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 Date Form

Floating Product Not Present

Purge Volume Calculation

$V = (r/12)^2 h(\_\_\_\_ \text{ F vol})(7.48) = \_\_\_\_\_ \text{/gallons}$

V = Purge volume (gallons)
= 3.14159
h = Height of Water Colum (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 Colum 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%
Temperature:	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

Geltler - Ryan Inc.
ENVIRONMENTAL DIVISION

Chain of Custod

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

ELINQUISHED BY: RECEIVED BY:

ELINQUISHED BY: RECEIVED BY:

LINQUISHED BY: RECEIVED BY LAB:

ESIGNATED LABORATORY: _____ DHS #: _____

MARKS: _____

TE COMPLETED _____ FOREMAN _____

FIGURE 5

APPENDIX B

CHEMICAL ANALYTICAL REPORTS

GROUNDWATER SAMPLING REPORT

CHEMICAL ANALYTICAL REPORTS

gettler — ryan inc.

October 31, 1989

GROUNDWATER SAMPLING REPORT

Referenced Site: Former Shell Service Station
461 Eighth Street
Oakland, California

Sampling Date: October 5, 1989

This report presents the results of the quarterly groundwater sampling and analytical program conducted by Gettler-Ryan Inc. on October 5, 1989 at the referenced location. The site, located on the northwest corner of 8th Street and Broadway, 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 off site at the locations shown on the attached site map. 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 the presence and thickness of separate phase product. Groundwater depths ranged from 15.98 to 31.37 feet below grade. Well S-4 contained insufficient water for sampling. Separate phase product was observed in well S-5.

The remaining well was 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. The purge water was drummed for proper disposal. Details of the final well purging results are presented on the attached Table of Monitoring Data.

Samples were collected, using Teflon bladder pumps, 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 blank, supplied by the laboratory, was included and analyzed to assess quality control. Analytical results for the trip blank 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.

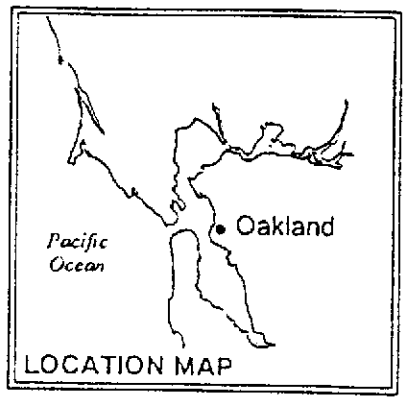
Tom Paulson
Sampling Manager

attachments

TABLE OF MONITORING DATA
GROUNDWATER WELL SAMPLING REPORT

WELL I.D.	S-4	S-5	S-6
Casing Diameter (inches)	4	4	4
Total Well Depth (feet)	16.19	----	38.5
Depth to Water (feet)	15.98	20.43	21.24
Free Product (feet)	----	0.01	none
Reason Not Sampled	insufficient water	free product	----
Calculated 4 Case Vol.(gal.)	----	----	45.6
Did Well Dewater?	----	----	no
Volume Evacuated (gal.)	----	----	57.3
Purging Device	----	----	Bladder
Sampling Device	----	----	Bladder
Time	----	----	13:11
Temperature (F)*	----	----	67.7
pH*	----	----	6.36
Conductivity (umhos/cm)*	----	----	924

* Indicates Stabilized Value



NINTH STREET

WASHINGTON STREET

BROADWAY

FRANKLIN STREET

FORMER SHELL SERVICE STATION LOCATION

EIGHTH STREET

S-1

S-2

S-3

S-4

S-5

SEVENTH STREET

S-6

SIXTH STREET

INTERSTATE 80

EXPLANATION

● S-1 Groundwater monitoring well location

N

0 200 400

Scale in Feet

GSI GeoStrategies Inc.

Site Plan
Shell Service Station
461 Eighth Street
Oakland, California

PLATE 1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
544		4/89		

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

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

Date: October 18, 1989

Work Order Number: S9-10-069

P.O. Number: MOH 890501A

This is the Certificate of Analysis for the following samples:

Client Project ID:	GR #3644, Shell, 461 8th/ Broadway, Oakland, CA
Date Received by Lab:	10/6/89
Number of Samples:	2
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
1 Page Following - Table of Results

Date: October 18, 1989
Client Project ID: GR #3644, Shell,
461 8th/Broadway, Oakland, CA

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order Number: S9-10-069

Lab Sample ID	Client Sample ID	Sample Date	Date Analysis Completed	Sample Condition on Receipt
S9-10-069-01	S-6	10/5/89	10/11/89	cool pH ≤2
S9-10-069-02	Trip Blank		10/10/89	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)
S9-10-069-01	S-6	55.	20.	2.9	1.6	5.5
Detection Limit		10.	0.1	0.2	0.2	0.6
S9-10-069-02	Trip Blank	ND	ND	ND	ND	ND
Detection Limit		0.050	0.0005	0.001	0.001	0.003

Gettler - Ryan Inc. ENVIRONMENTAL DIVISION 0100 Chain of Custody

COMPANY Shell Oil Company JOB NO.

JOB LOCATION 461 8th St. / Broadway

CITY Oakland, CA PHONE NO. (415) 787-7500

AUTHORIZED John Werfal DATE 10/5/89 P.O. NO. 3644

SAMPLE ID	NO. OF CONTAINERS	SAMPLE MATRIX	DATE/TIME SAMPLED	ANALYSIS REQUIRED	SAMPLE CONDITION LAB ID
S-6	3	Liquid	10-5/1311	TPH(5015) BTXE	OK/COOL
Trip Blank	1	↓	10-3/—	↓	↓

RELINQUISHED BY: Philip J. Frye 10/6/89 1335 RECEIVED BY:

RELINQUISHED BY: RECEIVED BY:

RELINQUISHED BY: RECEIVED BY LAB: Julie Clifford 10/6/89 13:35

DESIGNATED LABORATORY: ~~KK~~ ET SCV DHS #: 137

REMARKS: Normal TAT

DATE COMPLETED Oct 5, 1989 FOREMAN Philip J. Frye

ORIGINAL