gettler — ryan inc.
general contractors

June 26, 1990

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

Reference: Shell Service Station
461 Eighth Street
Oakland, California 94607

Gentlemen:

As requested by Shell Oil Company, we are forwarding a copy of the Site Update Report dated June 25, 1990. The enclosed report presents the results of the second quarter 1990 ground-water sampling at the above referenced location.

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

Sincerely,

John P. Werfal
Project Manager

JPW/ch

enclosure

cc: Mr. Paul Hayes, 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.

# SITE UPDATE

Former Shell Service Station
461 8th Street
Oakland, California

Report No. 7644-6

June 25, 1990

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

June 25, 1990

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

Attn: Mr. John Werfal

Re: SITE UPDATE
Former Shell Service Station
461 8th Street
Oakland, California

Gentlemen:

This Site Update has been prepared by GeoStrategies Inc. (GSI) for the above referenced site (Plate 1). The report presents the results of the April 30, 1990 ground-water sampling conducted by Gettler-Ryan Inc. (G-R). As shown on Plate 2, there are currently three ground-water monitoring wells off-site (S-4, S-5, and S-6). **The three on-site wells have been destroyed.** Potentiometric data were collected, wells were inspected for floating product, and ground-water samples were collected and analyzed according to current State of California Water Resources Control Board (SWRCB) guidelines.

Depth to groundwater in the uppermost water-bearing zone ranged from 14.48 to 22.10 feet below ground surface. A potentiometric contour map has been prepared from these data (Plate 3). Potentiometric data indicate that the **shallow groundwater** beneath the **site flows to the west** with an approximate hydraulic gradient of 0.02.

Floating product was not observed in any site monitoring wells sampled during this quarter.

Chemical analyses reported detectable concentrations of Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) in Wells S-5 and S-6 at concentrations of 100 parts per million (ppm) and 39 ppm, respectively. Benzene concentrations of 13 ppm were reported in Wells S-5 and S-6 and exceed the current Regional Water Quality Control Board Maximum Contaminant Level. Well S-4 was reported as none detected for all chemical constituents analyzed. Plate 4 presents the TPH-Gasoline and benzene chemical analytical reports.

Ground-water samples were analyzed by International Technology (IT) Analytical Services, a State-certified environmental laboratory located in San Jose, California. The IT Analytical Services certified analytical report is included in the G-R Groundwater Sampling Report attached to this letter. The G-R Ground-water Sampling Protocol has been attached to this report.

GSI recommends that ground-water monitoring and sampling continue in accordance with the existing site monitoring plan. GSI also recommends that the work described in the January 10, 1990 GSI Quarterly Report be performed upon receipt of the necessary permits and property access agreements.

If you have any questions, please call.

GeoStrategies Inc. by,

David Ferreira
Geologist

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

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

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

DAF/JLP/mlg

Plate 1. Vicinity Map
Plate 2. Site Plan
Plate 3. Potentiometric Map
Plate 4. TPH/Benzene Map

Gettler-Ryan Inc. Groundwater Sampling Report (April 30, 1990)
Gettler-Ryan Inc. Groundwater Sampling Protocol

TABLE 1

GROUND-WATER ANALYSIS DATA

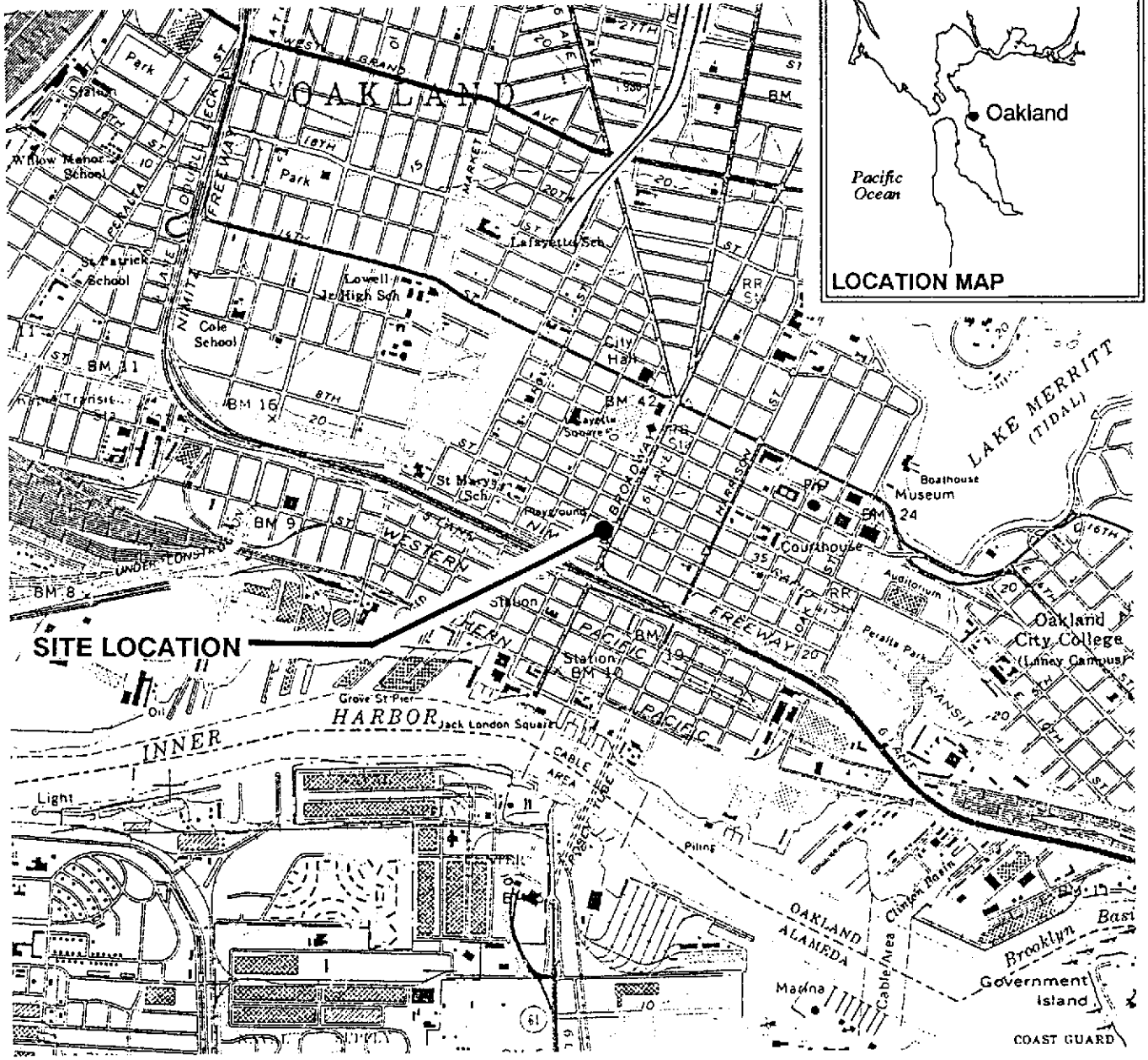
| WELL NO | SAMPLE DATE | ANALYSIS DATE | TPH (PPM) | BENZENE (PPM) | TOLUENE (PPM) | ETHYLBENZENE (PPM) | XYLENES (PPM) | WELL ELEV (FT) | STATIC WATER ELEV (FT) | PRODUCT THICKNESS (FT) | DEPTH TO WATER (FT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| S-4 | 30-Apr-90 | 03-May-90 | <0.050 | <0.0005 | <0.0005 | <0.0005 | <0.001 | 93.51 | 79.03 | ---- | 14.48 |
| S-5 | 30-Apr-90 | 03-May-90 | 100. | 13. | 22. | 2.1 | 11. | 99.36 | 78.40 | ---- | 20.96 |
| S-6 | 30-Apr-90 | 03-May-90 | 39. | 13. | 2.3 | 0.9 | 2.8 | 100.58 | 78.48 | ---- | 22.10 |
| TB | 30-Apr-90 | 03-May-90 | <0.050 | <0.0005 | <0.0005 | <0.0005 | <0.001 | ---- | ---- | ---- | ---- |

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 are reported as ND (none detected).
2. Water Level Elevations referenced to project site datum
3. DHS Action Levels and MCLs are subject to change pending State review.




Base Map: USGS Topographic Map

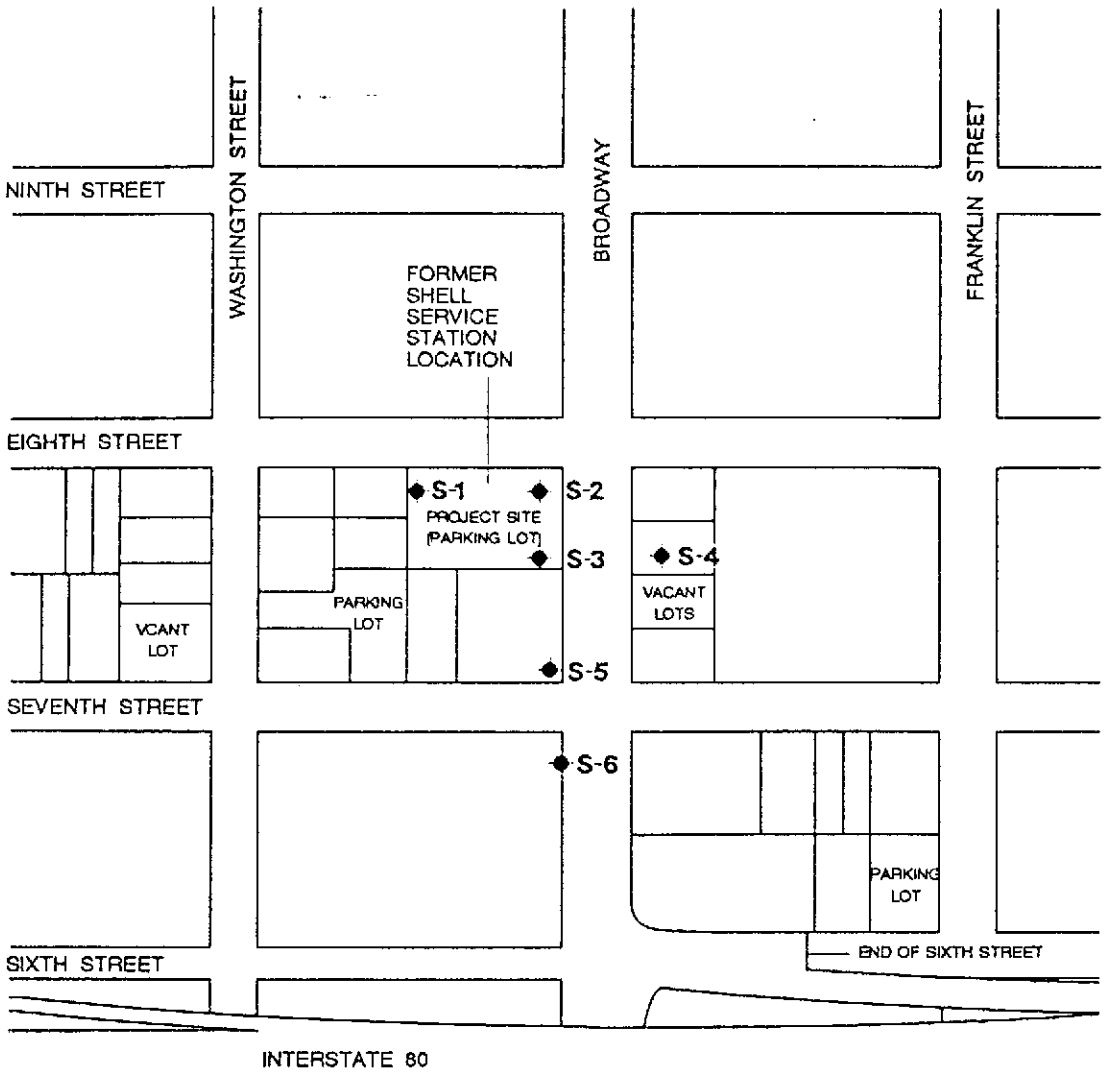
Approximate Scale : 1" = 2000'

GeoStrategies Inc.

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

PLATE
**1**

| JOB NUMBER | REVIEWED BY RG/CEG | DATE | REVISED DATE | REVISED DATE |
|---|---|---|---|---|
| 7644 | | 5/90 | | |




EXPLANATION

◆ S-1 Ground-water monitoring well location

N

0 200 400

Scale in Feet

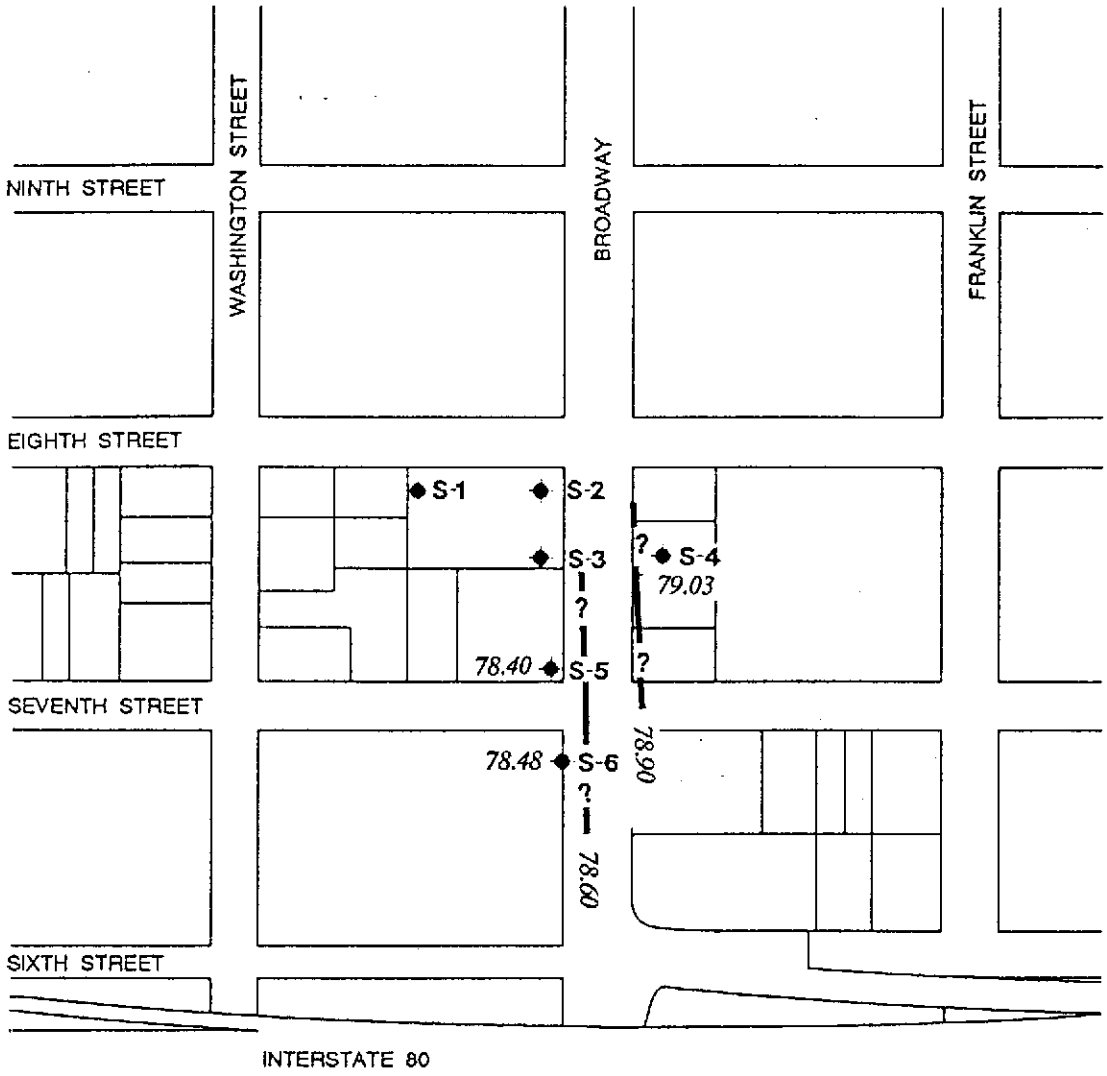
Note: Wells S-1, S-2 and S-3 are not accessible (see text)

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 | RWP CEG 1262 | 6/90 | | |




## EXPLANATION

S-1 — Ground-water monitoring well location

78.90 — Ground-water elevation contour
Approximate Gradient = 0.02

78.48 — Ground-water elevation in feet referenced to project datum measured on April 30, 1990

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

Contours may be influenced by irrigation practices and/or site construction activities

N

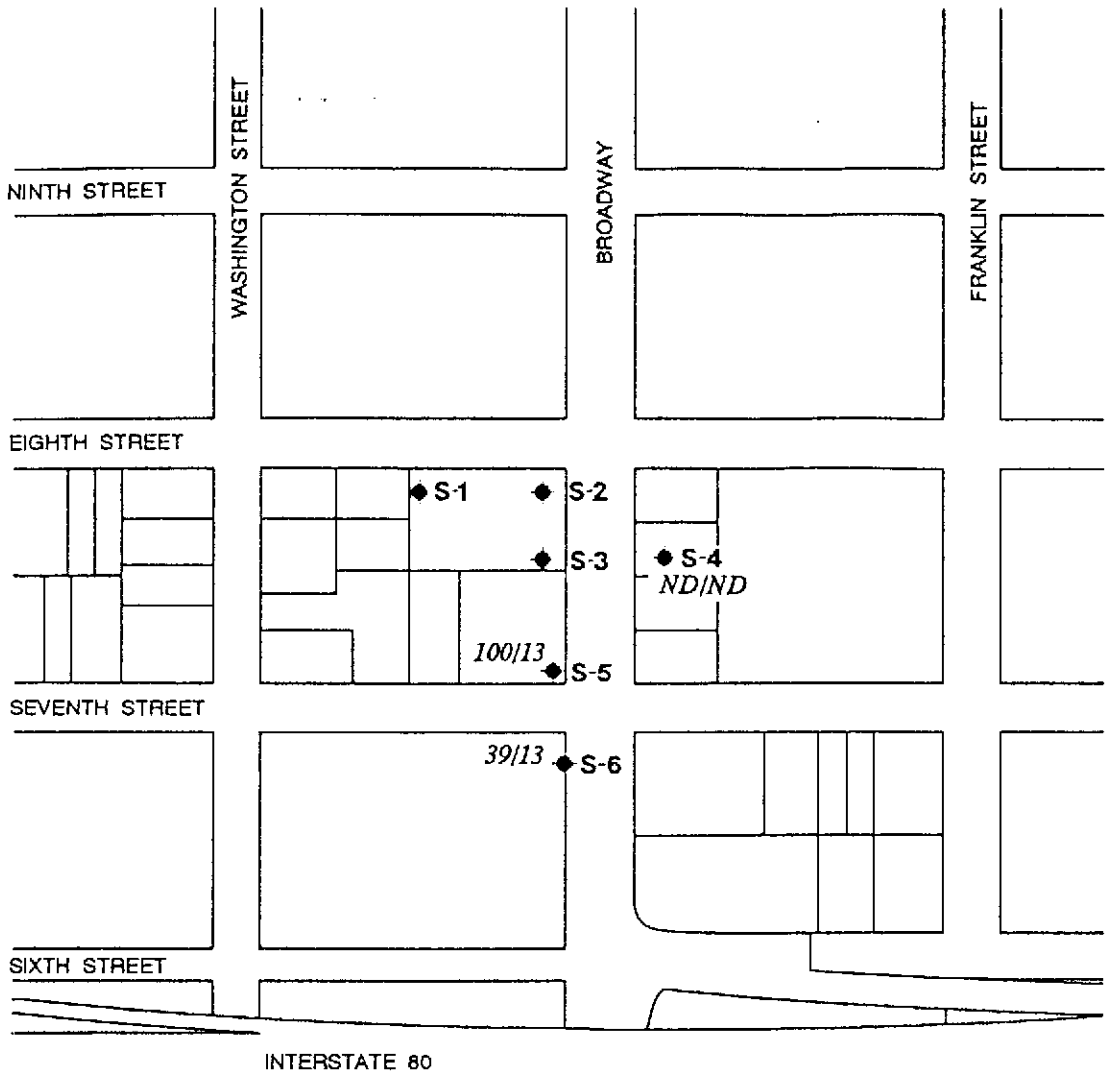
0 200 400
Scale in Feet

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 | RG CEG RGZ | 6/90 | | |




## EXPLANATION

◆ S-1 — Ground-water monitoring well location

*39/13* — TPH-G (Total Petroleum Hydrocarbons calculated as Gasoline)/Benzene concentrations in ppm sampled on April 30, 1990

*ND* — Not Detected (see laboratory reports for detection limits)

N

0 200 400

Scale in Feet

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

GeoStrategies Inc.

**TPH-G/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 | CWP CEG 1262 | 6/90 | | |

gettler — ryan inc.

May 18, 1990

**GROUNDWATER SAMPLING REPORT**

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

Sampling Date: April 30, 1990

This report presents the results of the quarterly groundwater sampling and analytical program conducted by Gettler-Ryan Inc. on April 30, 1990 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 14.48 to 22.10 feet below grade. Separate phase product was not observed in any monitoring wells.

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

Samples were collected, using Teflon bailers or 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.



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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) | 16.1 | 37.4 | 38.5 |
| Depth to Water (feet) | 14.48 | 20.96 | 22.10 |
| Free Product (feet) | none | none | none |
| Reason Not Sampled | ---- | ---- | ---- |
| Calculated 4 Case Vol.(gal.) | 4.2 | 43.4 | 43.3 |
| Did Well Dewater? | yes | no | no |
| Volume Evacuated (gal.) | 1.1 | 54.3 | 54.0 |
| Purging Device | Bailer | Bladder | Bladder |
| Sampling Device | Bailer | Bladder | Bladder |
| Time | 10:21 | 10:40 | 10:28 |
| Temperature (F)* | 63.6 | 67.8 | 67.6 |
| pH* | 6.67 | 6.28 | 6.11 |
| Conductivity (umhos/cm)* | 393 | 558 | 950 |

* 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

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 |
|---|---|---|---|---|
| 644 | | 4/89 | | |

INTERNATIONAL TECHNOLOGY CORPORATION

# ANALYTICAL SERVICES

## CERTIFICATE OF ANALYSIS

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

Date: 05/16/90

Work Order: TO-05-011 P.O. Number: MOH 880-021

This is the Certificate of Analysis for the following samples:

Client Work ID: GR3644, 461 8th St, Oakland
Date Received: 05/01/90
Number of Samples: 4
Sample Type: aqueous

**TABLE OF CONTENTS FOR ANALYTICAL RESULTS**



Reviewed and Approved:

Suzanne Veaudry
Project Manager

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 05/16/90
Client Work ID: GR3644, 461 8th St, Oakland

Work Order: TO-05-011

TEST NAME: **Petroleum Hydrocarbons**

SAMPLE ID: **S-4**
SAMPLE DATE: **04/30/90**
LAB SAMPLE ID: **T005011-01**
SAMPLE MATRIX: **aqueous**
RECEIPT CONDITION: **Cool pH < 2**

**RESULTS in Milligrams per Liter:**

| | METHOD | EXTRACTION DATE | ANALYSIS DATE |
|---|---|---|---|
| BTEX | 8020 | | 05/03/90 |
| Low Boiling Hydrocarbons | 8015 | | 05/03/90 |

| PARAMETER | DETECTION LIMIT | DETECTED |
|---|---|---|
| Low Boiling Hydrocarbons calculated as Gasoline | 0.050 | None |
| BTEX | | |
| Benzene | 0.0005 | None |
| Toluene | 0.0005 | None |
| Ethylbenzene | 0.0005 | None |
| Xylenes (total) | 0.001 | None |

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 05/16/90
Client Work ID: GR3644, 461 8th St, Oakland

Work Order: TO-05-011

TEST NAME: **Petroleum Hydrocarbons**

SAMPLE ID: **S-5**
SAMPLE DATE: **04/30/90**
LAB SAMPLE ID: **TO05011-02**
SAMPLE MATRIX: **aqueous**
RECEIPT CONDITION: **Cool pH < 2**

**RESULTS in Milligrams per Liter:**

| | METHOD | EXTRACTION DATE | ANALYSIS DATE |
|---|---|---|---|
| BTEX | 8020 | | 05/03/90 |
| Low Boiling Hydrocarbons | 8015 | | 05/03/90 |

| PARAMETER | DETECTION LIMIT | DETECTED |
|---|---|---|
| Low Boiling Hydrocarbons calculated as Gasoline | 25. | 100. |
| BTEX | | |
| Benzene | 0.2 | 13. |
| Toluene | 0.2 | 22. |
| Ethylbenzene | 0.2 | 2.1 |
| Xylenes (total) | 0.5 | 11. |

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 05/16/90
Client Work ID: GR3644, 461 8th St, Oakland

Work Order: TO-05-011

TEST NAME: **Petroleum Hydrocarbons**

SAMPLE ID: **S-6**
SAMPLE DATE: **04/30/90**
LAB SAMPLE ID: **TO05011-03**
SAMPLE MATRIX: **aqueous**
RECEIPT CONDITION: **Cool pH < 2**

**RESULTS in Milligrams per Liter:**

| | METHOD | EXTRACTION DATE | ANALYSIS DATE |
|---|---|---|---|
| BTEX | 8020 | | 05/03/90 |
| Low Boiling Hydrocarbons | 8015 | | 05/03/90 |

| PARAMETER | DETECTION LIMIT | DETECTED |
|---|---|---|
| Low Boiling Hydrocarbons calculated as Gasoline | 25. | 39. |
| BTEX | | |
| Benzene | 0.2 | 13. |
| Toluene | 0.2 | 2.3 |
| Ethylbenzene | 0.2 | 0.9 |
| Xylenes (total) | 0.5 | 2.8 |

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 05/16/90
Client Work ID: GR3644, 461 8th St, Oakland

Work Order: T0-05-011

TEST NAME: **Petroleum Hydrocarbons**

SAMPLE ID: **Trip Blank**
SAMPLE DATE: **not spec**
LAB SAMPLE ID: **T005011-04**
SAMPLE MATRIX: **aqueous**
RECEIPT CONDITION: **Cool pH < 2**

**RESULTS in Milligrams per Liter:**

| | METHOD | EXTRACTION DATE | ANALYSIS DATE |
|---|---|---|---|
| BTEX | 8020 | | 05/03/90 |
| Low Boiling Hydrocarbons | 8015 | | 05/03/90 |

| PARAMETER | DETECTION LIMIT | DETECTED |
|---|---|---|
| Low Boiling Hydrocarbons calculated as Gasoline | 0.050 | None |
| BTEX | | |
| Benzene | 0.0005 | None |
| Toluene | 0.0005 | None |
| Ethylbenzene | 0.0005 | None |
| Xylenes (total) | 0.001 | None |

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company
Date: 05/16/90
Client Work ID: GR3644, 461 8th St, Oakland

Work Order: TO-05-011

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

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, ethylbenzene and xylenes.

**Gettler - Ryan Inc.** — TO-05-011 — ENVIRONMENTAL DIVISION — 0293 **Chain of Custody**

COMPANY Shell Oil Co. JOB NO.

JOB LOCATION 7th / Broadway

CITY Oakland, CA PHONE NO. 783-7500

AUTHORIZED Tam Paulson DATE 4-30-90 P.O. NO. [redacted] 3644

| SAMPLE ID | NO. OF CONTAINERS | SAMPLE MATRIX | DATE/TIME SAMPLED | ANALYSIS REQUIRED | SAMPLE CONDITION LAB ID |
|---|---|---|---|---|---|
| S-4 | 3 | liquid | 4/30/90 10:21 | THC (Gas) BTXE | Cool/ice (Yes) |
| S-5 | 3 | | 10:40 | | |
| S-6 | 3 | | 10:28 | | |
| Trip Blank | 1 | | 4-24-90 | | |

WIC 204-5508-6205

AFE 986619

EXP 5440

ENG: Diane Lundquist

RELINQUISHED BY: John P. Zwerzyzda 5-1-90 7:03 RECEIVED BY: 5-1-90 07:04

RELINQUISHED BY: 5-1-90 18:00 RECEIVED BY:

RELINQUISHED BY: RECEIVED BY LAB: 5/1/90 1800

DESIGNATED LABORATORY: IT/SCY DHS #: 137

REMARKS: Normal TAT (2 weeks)

DATE COMPLETED 4-30-90 FOREMAN John P. Zwerzyzda

ORIGINAL

## 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.



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

## Guidance and Reference Documents Used to Collect Groundwater Samples

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

A. Up to 2 wells - Trip Blank Only

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

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

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

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

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

## SAMPLE COLLECTION

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

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

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

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

### Decontamination Procedures

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

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

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

### Water-Level Measurements

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

Water-Level Measurements (continued)

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

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

Well Purging

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

## DOCUMENTATION

### Sample Container Labels

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

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

Sampler's identification

Project number

Date and time of collection

Type of preservation used

### Well Sampling Data Forms

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

Project number

Client

Location

Source (i.e. well number)

Time and date

Well accessibility and integrity

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

Calculated and actual purge volumes

Chain-of-Custody

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

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

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

TABLE 1

SAMPLE ANALYSIS METHODS, CONTAINERS, PRESERVATIONS, AND HOLDING TIMES

| Parameter | Analytical Method | Reporting Units | Container | Preservation | Maximum Holding Time |
|---|---|---|---|---|---|
| Total Petroleum Hydrocarbons (gasoline) | EPA 8015 (modified) | mg/l<br>ug/l | 40 ml. vial glass, Teflon | cool, 4 C<br>HC1 to pH<2 | 14 days (maximum) |
| Benzene<br>Toluene<br>Ethylbenzene<br>Xylenes (BTEX) | EPA 8020 | mg/l<br>ug/l<br><br>mg/l | 50 ml. vial glass, Teflon lined septum<br>1 l glass, Teflon | cool, 4 C<br>HC1 to pH<2 | 7 days (w/o preservative)<br>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<br>ug/l | 40 ml. vial glass, Teflon lined septum | cool, 4 C | 14 days (maximum) |
| Halogented Volatile Organics (chlorinated solvents) | 8010 | mg/l<br>ug/l | 40 ml. vial glass, Teflon lined septum | cool, 4 C | 14 days (maximum) |
| Non chlorinated solvents | 8020 | mg/l<br>ug/l | 40 ml. vial glass, Teflon lined septum | cool, 4 C<br>HCl to pH<2 | 14 days (maximum) |
| Volatile Organics | 8240 | mg/l<br>ug/l | 40 ml. vial glass, Teflon lined septum | cool, 4 C | 14 days (maximum) |
| Semi-Volatile Organics | 8270 | mg/l<br>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 | | | |

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# FIELD EXPLORATORY BORING LOG

**FIGURE 1**

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

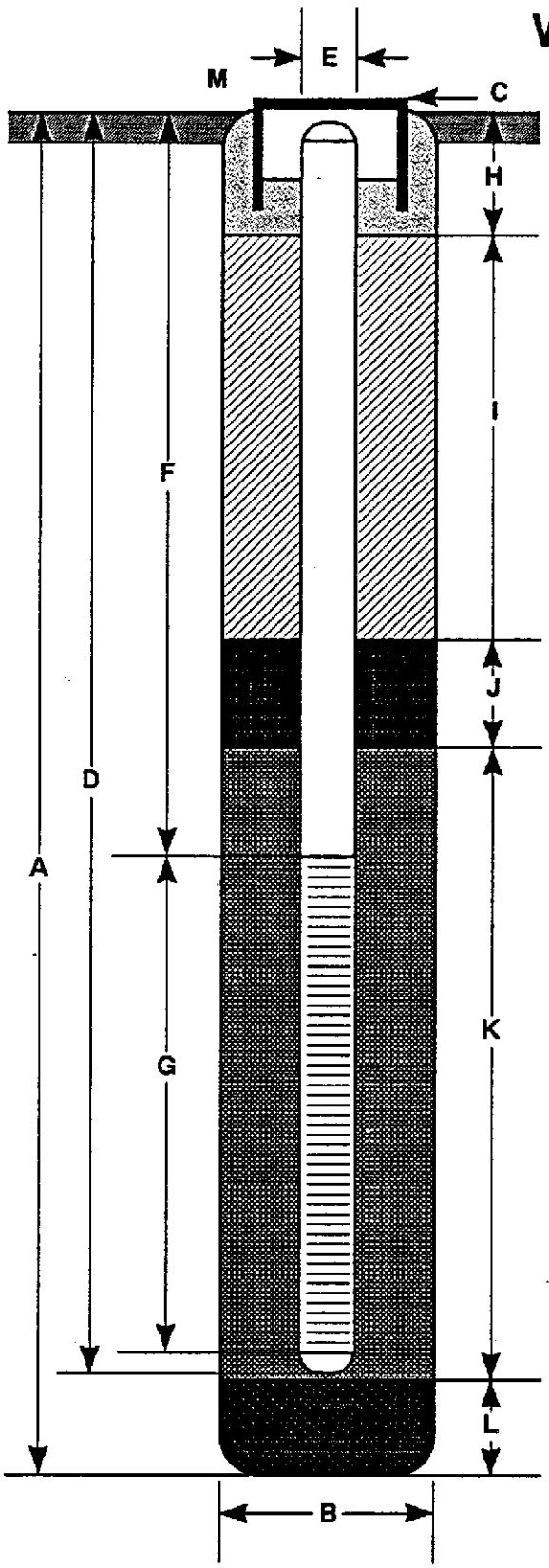
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Water Level | | | | | | | | |
| Time | | | | | | | | |
| Date | | | | | | | | |

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

Remarks:

# WELL CONSTRUCTION DETAIL

**FIGURE 2**




**A** Total Depth of Boring _____ ft.

**B** Diameter of Boring _____ in.
Drilling Method _____

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

**D** Casing Length _____ ft.
Material _____

**E** Casing Diameter _____ in.

**F** Depth to Top Perforations _____ ft.

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

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

**I** Backfill from _____ to _____ ft.
Backfill Material _____

**J** Seal from _____ to _____ ft.
Seal Material _____

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

**L** Bottom Seal _____ ft.
Seal Material _____

**M** _____

Note: Depths measured from initial ground surface

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Well Construction Detail

WELL NO.

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

**WELL DEVELOPMENT FORM** FIGURE 3

Page_____ of_____

==========

(to be filled out in office)

Client_____ SS#_____ Job#_____

Name_____ Location_____

Well#_____ Screened Interval_____ Depth_____

Aquifer Material_____ Installation Date _____

Drilling Method_____ Borehole Diameter_____

Comments regarding well installation:_____

_____

_____

==========

(to be filled out in the field) Name_____

Date_____ Development Method_____

Total Depth_____ - Depth to liquid_____ = WaterColumn_____

Product thickness_____

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

Purge Start_____ Stop_____ Rate_____ gpm

---

| Gallons | Time | Clarity | Temp. | pH | Conductivity |
|---|---|---|---|---|---|
| 0 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Total gallons removed_____ Development stop time_____

Depth to liquid _____at_____(time)

Odor of water_____ Water discharged to_____

Comments_____

_____

_____

# GETTLER–RYAN INC.

General and Environmental Contractors

## WELL SAMPLING FIELD DATA SHEET

FIGURE 4

COMPANY _____ JOB # _____

LOCATION _____ DATE _____

CITY _____ TIME _____

Well ID. _____ Well Condition _____

Well Diameter _____ in. Hydrocarbon Thickness _____ ft.

Total Depth _____ ft.

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

Depth to Liquid– _____ ft.

(# 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 5**

## Monitoring Well Sampling Protocol Schematic

Sampling Crew Reviews Project Sampling Requirements/Schedule

↓

Field Decontamination and Instrumentation Calibration

↓

Check Integrity of Well (Inspect for Well Damage)

↓

Measure and Record Depth to Water and Total Well Depth (Electric Well Sounder)

↓

Check for Floating Product (Oil/Water Interface Probe)

### Floating Product Present

↓

Confirm Product Thickness (Acrylic or PVC Bailer)

↓

Collect Free-Product Sample

↓

Dissolved Product Sample Not Required

↓

Record Data on Field Data Form

### Floating Product Not Present

↓

Purge Volume Calculation

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

V = Purge volume (gallons)

$\pi = 3.14159$

h = Height of Water Column (feet)

r = Borehole radius (inches)

↓

Evacuate water from well equal to the calculated purge volume while monitoring groundwater stabilization indicator parameters (pH, conductivity, temperature) at intervals of one casing volume.

#### Well Dewaters after One Purge Volume (Low yield well)

↓

Well Recharges to 80% of Initial Measured Water Column Height in Feet within 24 hrs. of Evacuation.

↓

Measure Groundwater Stability Indicator Parameters (pH, Temperature, Conductivity)

↓

Collect Sample and Complete Chain-of-Custody

↓

Preserve Sample According to Required Chemical Analysis

↓

Transport to Analytical Laboratory

#### Well Readily Recovers

↓

Record Groundwater Stability Indicator Parameters from each Additional Purge Volume

Stability indicated when the following Criteria are met:

| | |
|---|---|
| pH : | ± 0.1 pH units |
| Conductivity: | ± 10% |
| Temperature: | 1.0 degrees F |

##### Groundwater Stability Achieved

↓

Collect Sample and Complete Chain-of-Custody

↓

Preserve Sample According to Required Chemical Analysis

↓

Transport to Analytical Laboratory

##### Groundwater Stability Not Achieved

↓

Continue Purging Until Stability is Achieved

↓

Collect Sample and complete Chain-of-Custody

↓

Preserve Sample According to Required Chemical Analysis

↓

Transport to Analytical Laboratory

**Gettler - Ryan Inc.**
ENVIRONMENTAL DIVISION

# Chain of Custody
**FIGURE 6**

COMPANY _____ JOB NO. _____

JOB LOCATION _____

CITY _____ PHONE NO. _____

AUTHORIZED _____ DATE _____ P.O. NO. _____

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

RELINQUISHED BY: _____ RECEIVED BY: _____

RELINQUISHED BY: _____ RECEIVED BY: _____

RELINQUISHED BY: _____ RECEIVED BY LAB: _____

DESIGNATED LABORATORY: _____ DHS #: _____

REMARKS: _____

DATE COMPLETED _____ FOREMAN _____