GeoStrategies Inc.

WELL INSTALLATION REPORT

Chevron Service Station No. 4816
301 14th Street
Oakland, California

Report No. 7270-4

December 5, 1990

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

December 5, 1990

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

Re: WELL INSTALLATION REPORT
Chevron Service Station No. 4816
301 14th Street
Oakland, California

Gentlemen:

This report summarizes the ground-water monitoring, recovery well installation and soil sampling performed by GeoStrategies Inc. (GSI) at the above referenced location (Plate 1). Soil borings C-5 and CR-1 were drilled on October 18, 1990 and were subsequently completed as a ground-water monitoring well and recovery well, respectively. The location of these wells are shown on Plate 2.

SITE BACKGROUND

Conversations with the Alameda County Health Department indicate that in April and May, 1988, tank tests were performed on the underground storage systems at the site. The 10,000 gallon supreme unleaded tank failed. In August, 1988 a subsurface product line was repaired.

Chevron U.S.A. Inc.
2410 Camino Ramon, San Ramon, California • Phone (415) 842-9500
Mail Address PO Box 5004, San Ramon, CA 94583-0804

Marketing Operations

D. Moller
Manager, Operations
S. L. Patterson
Area Manager, Operations
C. G. Trimbach
Manager, Engineering

December 10, 1990

Mr. Edgar B. Howell
Alameda County Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

Re: Former Chevron Station #9-4816
301 14th Street
Oakland, California

Dear Mr. Smith:

Enclosed we are forwarding the Well Installation Report dated December 5, 1990, conducted by our consultant GeoStrategies, Inc. for the above referenced site. As indicated in the report, two (2) borings were advanced and completed into a groundwater monitoring well (C-5) and a future recovery well (CR-1). Vadose zone petroleum hydrocarbon contamination appears to be a result of dissolved hydrocarbons moving along the capillary fringe. Analytic testing of the groundwater is detecting petroleum hydrocarbon contamination in all of the groundwater monitoring wells. Separate-phase hydrocarbons were observed in Wells CR-1 and C-3 at measured thicknesses of 2.5 feet.

Chevron has instructed GeoStrategies, Inc. to permit and install additional off-site wells to complete the characterization of the hydrocarbon plume. This phase of the assessment has been held up while required documentation is being compiled as part of the City of Oakland's encroachment permitting requirements. We plan to schedule drilling within the first quarter of 1991. Technical reports documenting this additional assessment work will be forwarded to your office.

A section titled "Planned Site Activities" has been incorporated within this report for your information. As indicated in this section, weekly bailing of the separate-phase hydrocarbon and quarterly chemical analysis will continue until the additional wells are installed and all improvements removed. At this time, a proposed remediation workplan will be forwarded to your office for your review.

In June 1990, eight exploratory borings (C-A through C-D and C-1 through C-4, were drilled on-site (Plate 2). Borings C-1 through C-4 were completed as ground-water monitoring wells. Soil samples from the borings indicated that the highest levels of Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) were detected from the 20-foot depth interval, where concentrations ranged from 3 to 1900 parts per million (ppm) in Borings C-A through C-D, C-1, and C-3. Benzene was detected in these same soil samples at concentrations ranging from 0.32 to 12 ppm. Ground-water samples were collected from monitoring wells C-1, C-2, and C-4. TPH-Gasoline was detected at concentrations ranging from 440 to 26000 parts per billion (ppb). Benzene was identified in these same wells at concentrations ranging from 47 to 2800 ppb. Well C-3 contained greater than 3.0 feet of separate-phase hydrocarbons. Results of this investigation are presented in the GSI Soil Boring and Well Installation Report dated August 9, 1990.

Additional site background information is not available to GSI at this time. If information becomes available it will be presented with the next report on this site.

FIELD PROCEDURES

Two exploratory soil borings (C-5 an CR-1) were drilled using a truck mounted, hollow-stem auger drilling rig. The borings were subsequently completed as a ground-water monitoring well (C-5) and a recovery well (CR-1). Field work was performed according to GSI Field Methods and Procedures (Appendix A). Soil samples were collected at five-foot depth intervals, using a modified California split-spoon sampler fitted with clean brass tube liners. A GSI geologist supervised the drilling, described soil samples using the Unified Soil Classification System (ASTM D-2488) as well as geologic observations and prepared a lithology log for each borehole. Exploratory boring logs are presented in Appendix B.

Soil Sampling

A 4-inch long brass tube of soil from each sampled interval was collected to perform head-space analysis in the field to screen for the presence of Volatile Organic Compounds (VOCs). Head-space analysis involved transferring soil from the brass liner into a clean glass jar and immediately covering the jar with aluminum foil secured with a ring type threaded lid. After approximately twenty minutes, the foil was pierced and the head-space within the jar was tested for total organic vapor measured in parts per million (ppm) using an Organic Vapor Monitor (OVM) photoionization detector. Head-space analysis results are presented on the exploratory boring logs in Appendix B.

Selected soil samples retained for chemical analysis were collected in clean brass liners, covered on both ends with aluminum foil and sealed with plastic end caps. The samples were labeled, entered on a Chain-of-Custody form and transported in a cooler with blue ice to Superior Analytical Laboratory (Superior), a State-certified laboratory located in Martinez, California.

Monitoring Well Construction

Borings C-5 and CR-1 were drilled with 8-inch-diameter hollow-stem augers to total depths of 36.0 and 32.5 feet below existing grade. Recovery well CR-1 was drilled to a depth of 25.5 feet below grade using 8-inch-diameter augers and then reamed using 12-inch augers-diameter to the total depth of 32.5 feet. Well C-5 was constructed using 2-inch-diameter Schedule 40 PVC well casing and 0.020-inch factory slotted well screen. Recovery well CR-1 was constructed using 6-inch-diameter Schedule 40 PVC well casing and 0.020-inch continuous wrap well screen. Each well was constructed through the hollow-stem-augers. Lonestar #2/12 sand was placed in the annular space across the entire screened interval and extended a minimum of 2-feet above the top of the well screen. A 2-foot bentonite seal was placed above the sand pack, followed by a concrete to ground surface. A vault box with a cover was placed at ground surface for each well. A locking cap with lock was then placed on Well C-5 and a well cap was placed on recovery well CR-1. The well construction details are presented with the boring logs in Appendix B.

A sieve analysis was performed on a representative sample of the aquifer material from boring CR-1 to confirm the filter-pack size selection and well screen slot size for the recovery well design. The results of the analysis indicated the aquifer material is composed of 17% medium sand, 76% fine sand, and 7% silt. The filter pack and well screen slot size selected appears to be in agreement with the calculated sediment distribution. In our opinion, the well design is adequate to retain aquifer material and allow sufficient groundwater flow into the recovery well. A copy of the sieve analysis is presented in Appendix C.

HYDROGEOLOGIC CONDITIONS

The site is located on the San Francisco Bay fringe, approximately one mile east of San Francisco Bay. Lake Merritt is located approximately 1/4-mile to the east of the site. The area is underlain by unconsolidated, Pleistocene age silty and clayey sand of the Merritt Formation and at depth by the Alameda Formation. The Merritt Formation is approximately 40 feet thick in this area and overlies a sandy, silty clay which comprises the upper part of the Alameda Formation (Radbruch, 1957).

Lithology beneath the site consists of silty sand and sand underlain by silt at approximately 32.0 to 35.5 feet below grade. The silt layer was observed in previous borings at a thickness of approximately 4 feet and appears to form a continuous basal aquitard beneath the site. Sand was observed to a depth of 35.5 feet and became silty in the depth interval of approximately 7 to 14 feet in each boring. The aquifer zone is believed to occur in the interval from 22 feet below grade to the contact of the sand with the surmised aquitard unit.

Ground-water was encountered at approximately 24.0 to 24.5 feet below grade in each boring. Depth to water measurements, taken by Gettler-Ryan Inc. (G-R) October 30, 1990, indicated that ground-water levels stabilized in Wells C-5 and CR-1 at 22.11 and 23.81 feet below the surveyed top of the well box, respectively. Water-levels for the entire monitoring network on October 30, 1990 ranged from 21.72 to 23.81 feet below grade. A hydraulic gradient of 0.004 was calculated from potentiometric data. Groundwater flows to the south beneath the site based on the hydraulic gradient calculation. Ground-water elevation data has been plotted and contoured and is presented on Plate 3 as a potentiometric map. A summary of the potentiometric data is presented on Table 1.

CHEMICAL ANALYSES

Soil and ground-water samples were analyzed for TPH-Gasoline, according to EPA Method 8015 (Modified), and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), according to EPA Method 8020. In addition, ground-water samples from Well C-1 were analyzed for Volatile Organics according to EPA Method 8240, Base/Neutral and Acid Extractables according to EPA Methods 8270 and 3510, and Priority Pollutant Metals according to EPA 200 Series Methods to comply with groundwater discharge permit requirements. Chemical analyses of soil and ground-water samples were performed by Superior Analytical Laboratories (Superior), a State-certified environmental laboratory located in San Francisco and Martinez, California.

Soil Analytical Results

Soil samples were selected from the 15.5 and 20.5 foot depth intervals in Borings C-5 and CR-1 for chemical analysis. TPH-Gasoline was detected in each soil sample analyzed at concentrations ranging from 1 to 1200 ppm. Benzene was identified in each sample at concentrations ranging from 0.17 to 9.5 ppm. The highest TPH-Gasoline and benzene concentrations were reported from the 20.5 foot interval in Boring CR-1. A summary of the soil analytical data is presented in Table 2. Soil chemical analytical reports are presented in Appendix D.

Ground-water Analytical Results

Ground-water samples were collected from monitoring wells C-1, C-2, C-4, and C-5 by G-R on October 30, 1990. Monitoring well C-3 and recovery well CR-1 contained approximately 2.5 feet of separate-phase hydrocarbons in measured thickness and subsequently were not sampled. TPH-Gasoline was detected in Wells C-1, C-2, C-4, and C-5 at concentrations of 67,000, 13,000, 210, and 20,000 ppb, respectively. Benzene was identified in Wells C-1, C-2, C-4, and C-5 at concentrations of 6,700, 2,800, 72, and 2,500 ppb, respectively.

A summary of TPH-Gasoline and BTEX ground-water analytical results are presented in Table 1. TPH-Gasoline and benzene concentrations from this sampling have been presented on Plate 4. The G-R ground-water sampling report, Chain-of-Custody forms, and Superior analytical reports are presented in Appendix E.

DISCUSSION

The recently installed monitoring well (C-5) located to the west of the tank complex at the site contained elevated dissolved hydrocarbon concentrations. In addition, the conflicting groundwater flow direction and dissolved hydrocarbon data have not been resolved from current data. Previous potentiometric data indicated a groundwater flow direction to the west, while the present data indicate a southerly groundwater flow. Dissolved hydrocarbon concentrations have continued to indicate a north-easterly groundwater flow directions. In our opinion, the current potentiometric data are inconclusive and may indicate an anomalous groundwater flow direction. Additional wells proposed on Harrison Street and 14th Street are anticipated to provide further data to evaluate groundwater flow direction and delineate the areal extent of the dissolved plume to the east and north of the site. Bailing of separate-phase hydrocarbons from Well C-3, initiated on June 14, 1990, has continued on a weekly basis. Recovery well CR-1 was added to the bailing schedule on November 9, 1990. A total of approximately 133 gallons of separate-phase hydrocarbons have been bailed from Wells C-3 and CR-1 through November 16, 1990. A copy of the G-R monitoring data is presented in Appendix F.

Summary of Findings

The results of this investigation are summarized below.

- Two exploratory borings were drilled on October 18, 1990. The borings were completed as a ground-water monitoring well (C-5) and a recovery well (CR-1).

- Based on the exploratory borings, the lithology of the site appears to consist of primarily silty sand and sand underlain by silt to the total depth explored of 36.0 feet. The basal silt layer has been observed at a thickness of up to 4 feet and appears to be continuous beneath the site.

- TPH-Gasoline was detected in soil samples from the 20.5 foot interval in Borings C-5 and CR-1 at concentrations of 6 and 1200 ppm, respectively. Benzene was identified in these same samples at concentrations of 0.088 and 9.5 ppm, respectively.

- Ground-water samples collected by G-R on October 30, 1990 detected TPH-Gasoline in Wells C-1 (67,000 ppb), C-2 (13,000 ppb), C-4 (210 ppb) and C-5 (20,000 ppb). Separate-phase hydrocarbons were detected in Wells C-3 and CR-1 at measured thicknesses of approximately 2.5 feet.

PLANNED SITE ACTIVITIES

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

- One well will be installed off-site in Harrison Street to further evaluate the areal extent of the hydrocarbon plume in the apparent cross-gradient direction (Plate 2).

- Based on hydrocarbon concentrations detected in well C-1, three monitoring wells will be installed off-site in 14th Street to assess the extent of offsite migration of hydrocarbons in the suspected down-gradient direction (Plate 2).

- The remedial treatment system will be constructed and activated coincident with beginning groundwater extraction from recovery well CR-1.

- Bailing of separate-phase hydrocarbons will continue on a weekly schedule until the recovery well is installed and pumping activated.

- The monitoring wells will be sampled quarterly for TPH-Gasoline and BTEX according to EPA Methods 8015 (Modified) and 8020.

- A one-half mile radius well survey will be performed to identify wells that could potentially be impacted by hydrocarbons as well as their current usage.

If you have any questions, please call.

GeoStrategies Inc. by,

Robert C. Mallory
Geologist

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

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

RCM/CMP/mlg

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

Appendix A. Field Methods and Procedures
Appendix B. Exploratory Boring Logs/Well Construction Details
Appendix C. Sieve Analysis
Appendix D. Soil Analytical Report
Appendix E. Gettler-Ryan Inc. Groundwater Sampling Reports
Appendix F. Gettler-Ryan Inc. Monitoring Data

QC Review: JLP

References Cited

Radbruch, D.H., 1957, Areal and Engineering Geology of the Oakland West Quadrangle, California, Miscellaneous Geologic Investigations Map I-239, U.S. Geological Survey, Washington, D.C.

TABLE 1

GROUND-WATER ANALYSES DATA

WELL NO	SAMPLE DATE	ANALYZED DATE	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	WELL ELEV (FT)	STATIC WATER ELEV (FT)	PRODUCT THICKNESS (FT)	DEPTH TO WATER (FT)
C-1	30-Oct-90	05-Nov-90	67,000	6,700	8,700	900	5,000	30.82	9.10	----	21.72
C-2	30-Oct-90	05-Nov-90	13,000	2,800	1,900	240	1,000	30.91	9.10	----	21.81
C-3	30-Oct-90	----	----	----	----	----	----	31.02	9.21	2.5	23.81
C-4	30-Oct-90	02-Nov-90	210	72	13	1	11	31.42	8.94	----	22.48
C-5	30-Oct-90	05-Nov-90	20,000	2,500	3,300	320	2,200	31.25	9.14	----	22.11
CR-1	30-Oct-90	----	----	----	----	----	----	30.52	8.71	2.5	23.81
TB	30-Oct-90	07-Nov-90	<50	<0.5	<0.5	<0.5	<0.5	----	----	----	----

CURRENT REGIONAL WATER QUALITY CONTROL BOARD MAXIMUM CONTAMINANT LEVELS
Benzene 1.0 ppb Xylenes 1,750 ppb Ethylbenzene 680 ppb

CURRENT DHS ACTION LEVELS
Toluene 100 ppb

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPB = Parts Per Billion TB = Trip Blank

Notes: 1. All data shown as <x are reported as ND (none detected).
2. Static Water elevations referenced to mean sea level (MSL). Elevations are corrected for free product using a correction factor of 0.8.
3. DHS Action Levels and MCLs are subject to change pending State review.

TABLE 2

SOIL ANALYSES DATA

SAMPLE NO	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
C-5-15.5	18-Oct-90	24-Oct-90	6	0.088	0.30	0.094	0.56
C-5-20.5	18-Oct-90	24-Oct-90	3	0.17	0.49	0.071	0.51
CR-1-15.5	18-Oct-90	24-Oct-90	1	0.54	0.17	0.059	0.11
CR-1-20.5	18-Oct-90	24-Oct-90	1200	9.5	56	18	110

TPH-G = Total Petroleum Hydrocarbons as Gasoline
PPM = Parts Per Million

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

TABLE 3

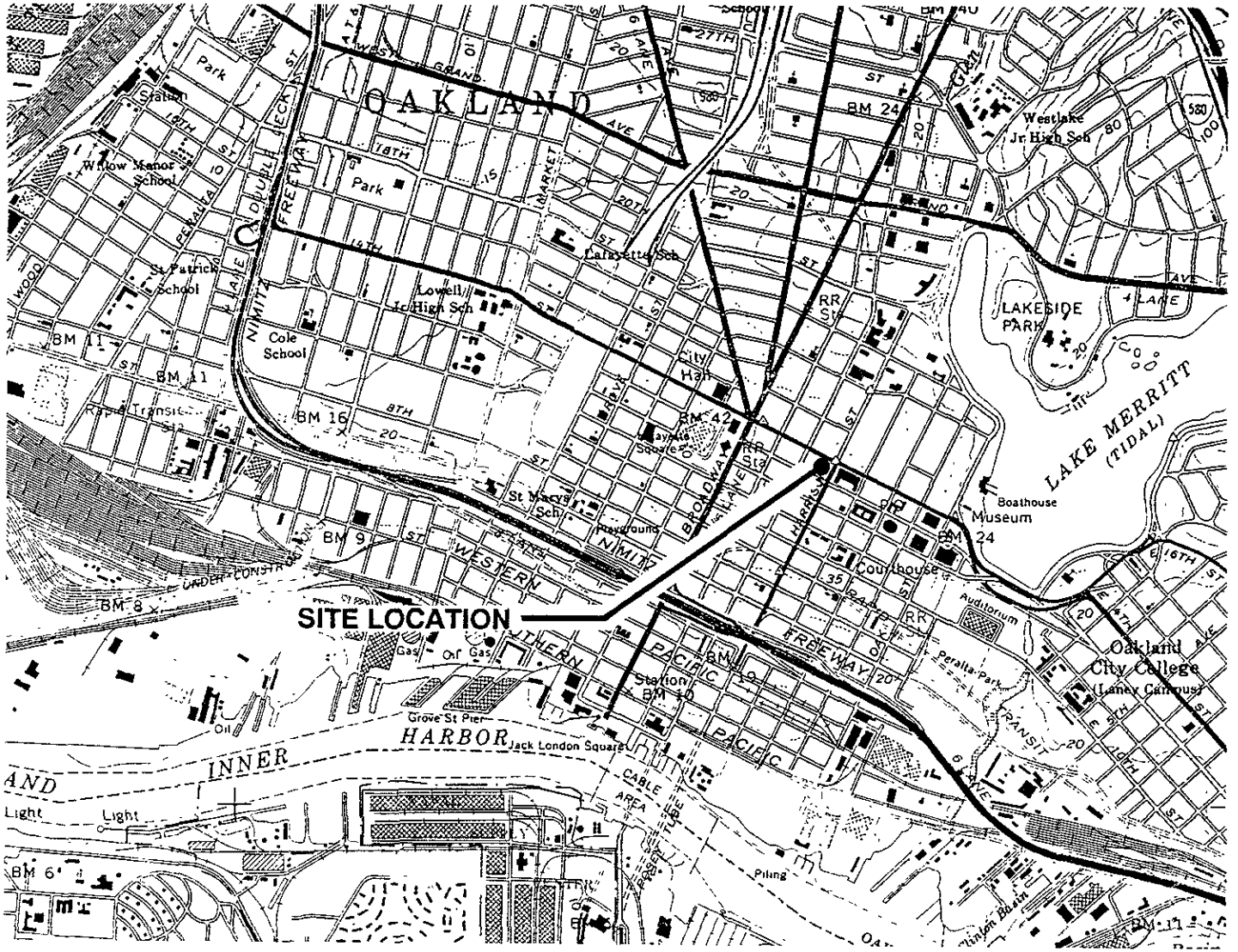
HISTORICAL GROUNDWATER QUALITY DATABASE

SAMPLE DATE	SAMPLE POINT	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	E.B. (PPB)	XYLENES (PPB)
13-Jun-90	C-1	26000	2800	5100	400	2600
30-Oct-90	C-1	67000	6700	8700	900	5000
13-Jun-90	C-2	15000	1100	1900	260	1700
30-Oct-90	C-2	13000	2800	1900	240	1000
13-Jun-90	C-4	440	47	47	3	61
30-Oct-90	C-4	210	72	13	1	11
30-Oct-90	C-5	20000	2500	3300	320	2200

TPH-G = Total Petroleum Hydrocarbons calculated as gasoline
E.B. = Ethylbenzene
PPB = Parts per billion

NOTE: 1. All data shown as <X are reported as ND (none detected)

ILLUSTRATIONS



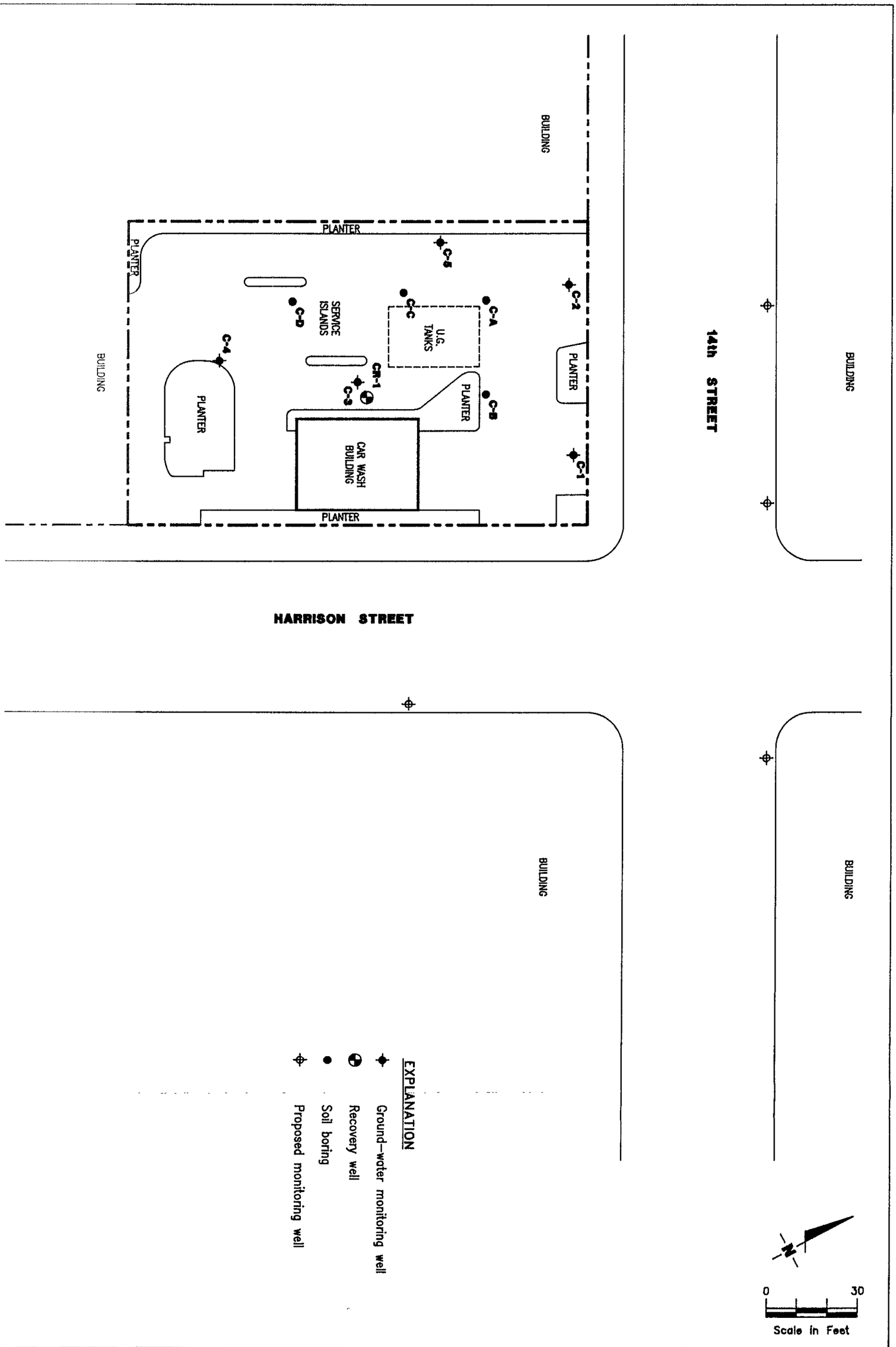
Base Map: USGS Topographic Map

GeoStrategies inc.

VICINITY MAP
Chevron Service Station #4816
301 14th Street
Oakland, California

PLATE
1

JOB NUMBER	REVIEWED BY: RG/CEG	DATE	REVISED DATE
7270		11/90	

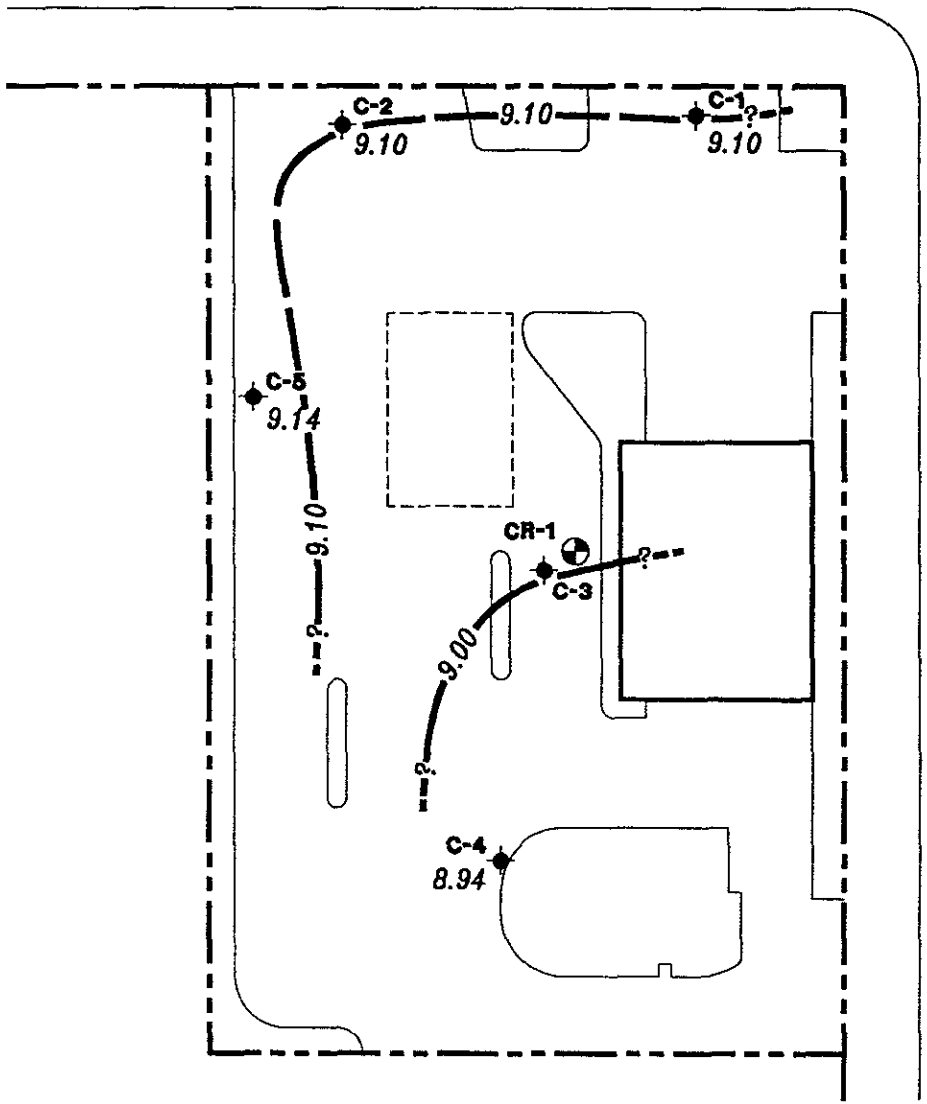


GeoStrategies Inc.

SITE PLAN
Chevron Service Station #4816
301 14th Street
Oakland, California

PLATE 2

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE
7270	CMP CEG 12/92	8/90	



EXPLANATION

- Ground-water monitoring well
- Recovery well
- 99.99 — Ground-water elevation contour Approximate Gradient = 0.004
- 9.99 — Ground-water elevation in feet referenced to Mean Sea Level (MSL) measured on October 30, 1990

Notes:

1. Contours may be influenced by irrigation practices and/or site construction activities.
2. Wells C-3 and CR-1 are not used in contouring due to the presence of separate-phase hydrocarbons.

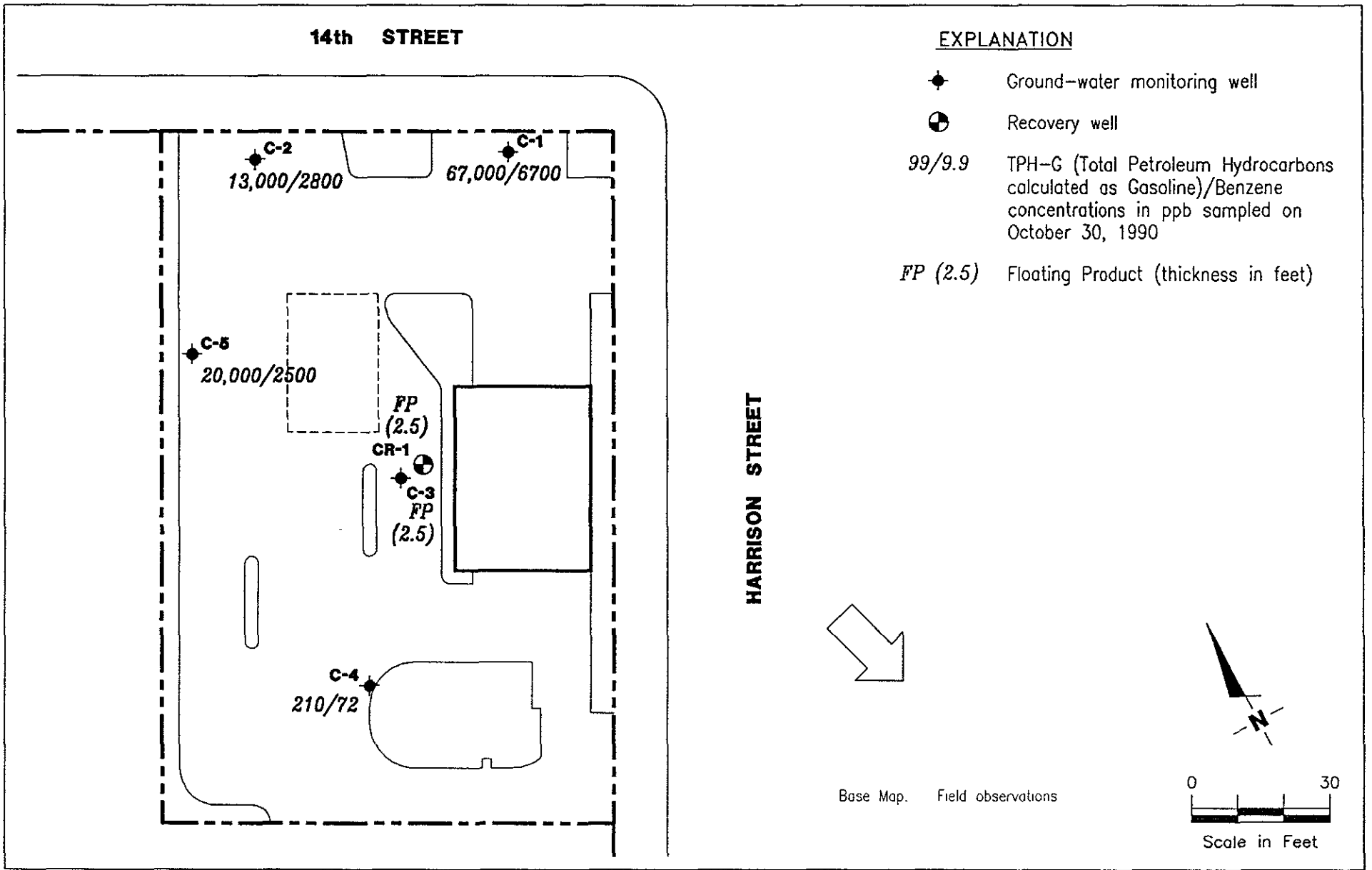
Base Map: Field observations

GeoStrategies Inc.

POTENTIOMETRIC MAP
Chevron Service Station #4816
301 14th Street
Oakland, California

PLATE 3

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE
7270	CWP CEG 12/21	12/90	



GeoStrategies Inc.

TPH-G/BENZENE CONCENTRATION MAP
Chevron Service Station #4816
301 14th Street
Oakland, California

PLATE
4

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE
7270	CMP CEG 1262	12/90	

APPENDIX A

FIELD METHODS AND PROCEDURES

FIELD METHODS AND PROCEDURES

EXPLORATION DRILLING

Mobilization

Prior to any drilling activities, GeoStrategies Inc. (GSI) will verify that necessary drilling permits have been secured.

Utility locations will be located and drilling will be conducted so as not to disrupt activities at a project site. GSI will obtain and review available public data on subsurface geology and if warranted, the location of wells within a half-mile of the project site will be identified. Drillers will be notified in advance so that drilling equipment can be inspected prior to performing work.

Drilling

The subsurface investigations are typically performed to assess the lateral and vertical extent of petroleum hydrocarbons present in soils and groundwater. Drilling methods will be selected to optimize field data requirements as well as be compatible with known or suspected subsurface geologic conditions.

Monitoring wells are installed using a truck-mounted hollow-stem auger drill rig or mud-rotary drill rig. Typically, the hollow-stem rig is used for wells up to 100 feet, if subsurface conditions are favorable. Wells greater than 100-feet deep are typically drilled using mud-rotary techniques. When mud rotary drilling is used, an electric log will be performed for additional lithological information. Also during mud rotary drilling, precautions will be taken to prevent mud from circulating contaminants by using a conductor casing to seal off contaminated zones. Samples will be collected for lithologic logging by continuous chip, and where needed by drive sample or core as specified by the supervising geologist.

Soil Sampling

Shallow soil borings will be drilled using a truck-mounted hollow-stem auger drilling rig, unless site conditions favor a different drilling method. Drilling and sampling methods will be consistent with ASTM Method D-1452-80. The auger size will be a minimum 6-inch nominal outside-diameter (O.D). No drilling fluids will be used during this drilling method. The augers and other tools used in the bore hole will be steam cleaned before use and between borings to minimize the possibilities of cross-contamination between borings.

Soil samples are typically collected at 5-foot intervals as a minimum from ground surface to total depth of boring. Additional soil samples will be collected based on significant lithologic changes and/or potential chemical content. Soil samples from each sampling interval will be lithologically described by a GSI geologist (Figure 1). Soil colors will be described using the Munsell Color Chart. Rock units will be logged using appropriate lithologic terms, and colors described by the G.S.A. Rock Color Chart.

Head-space analyses will be performed to check for the evidence of volatile organic compounds. Head-space analyses will be performed using an organic vapor analyzer; either an OVA, HNU, or OVM. Organic vapor concentrations will be recorded on the GSI field log of boring (Figure 1). The selection of soil samples for chemical analysis are typically based on the following criteria:

1) Soil discoloration
2) Soil odors
3) Visual confirmation of chemical in soil
4) Depth with respect to underground tanks (or existing grade)
5) Depth with respect to ground water
6) OVA reading

Soil samples (full brass liners) selected for chemical analysis are immediately covered with aluminum foil and the liner ends are capped to prevent volatilization. The samples are labeled and entered onto a Chain-of-Custody form, and placed in a cooler on blue ice for transport to a State-certified analytical laboratory.

Soil cuttings are stockpiled on-site. Soils are sampled and analyzed for site-specific chemical parameters. Disposition of soils is dependent of chemical analytical results of the samples.

Soil Sampling - cont.

Soil borings not converted to monitoring wells will be backfilled (sealed) to ground surface using either a neat cement or cement-bentonite grout mixture. Backfilling will be tremied by continuously pumping grout from the bottom to the top of the boring where depth exceeds 20' or as required by local permit requirements.

All field and office work, including exploratory boring logs, are prepared under the direction of a registered geologist.

Monitoring Well Installation

Monitoring well casing and screen will be constructed of Schedule 40, flush-joint threaded polyvinylchloride (PVC). The well screen will be factory mill-slotted unless additional open area is required (eg. conversion to an extraction well in a low-yield aquifer). The screen length will be placed adjacent to the aquifer material to a minimum of 2-feet above encountered water. No screen shall be placed in a borehole that potentially creates hydraulic interconnection of two or more aquifer units. Screen slot size and well sand pack will be compatible with encountered aquifer materials, as confirmed by sieve analysis.

Monitoring wells will be completed below grade (Figure 2) unless special conditions exist that require above-grade completion design. In the event a monitoring well is required in an aquifer unit beneath an existing aquifer, the upper aquifer will be sealed off by installing a steel conductor casing with an annular neat cement or cement-bentonite grout seal. This seal will be continuously tremie pumped from the bottom of the annulus to ground surface.

The monitoring well sand pack will be placed adjacent to the entire screened interval and will extend a recommended minimum distance of 2-feet above the top of the screen. No sand pack will be placed that interconnects two or more aquifer units. A minimum 2-foot bentonite pellet or bentonite slurry seal will be placed above the sand pack. Sand pack, bentonite, and cement seal levels will be confirmed by sounding the annulus with a calibrated weighted tape. The remaining annular space above the bentonite seal will be grouted with a bentonite-cement mixture and will be tremie-pumped from the bottom of the annular space to the ground surface. The bentonite content of the grout will not exceed 5 percent by weight. A field log of boring and a field well completion form will be prepared by GSI for each well installed.

Decontamination of drilling equipment before drilling and between wells will consist of steam cleaning, and/or Alconox wash.

Well Development

All newly installed wells will be properly developed within 48 hours of completion. No well will be developed until the well seal has set a minimum of 12 hours. Development procedures will include one or more of the methods described below:

Bailing

Bailing will be used to remove suspended sediments and drilling fluids from the well, where applicable. The bailer will be raised and lowered through the column of water in the well so as to create a gentle surging action in the screened interval. This technique may be used in conjunction with other techniques, such as pumping, and may be used alone if the well is of low yield.

Pumping

Pumping will be used in conjunction with bailing or surging. The pump will be operated in such a manner as to gently surge the entire screened interval of the well. This may involve operating the pump with a packer type mechanism attached and slowly raising and lowering the pump, or by cycling the pump off and on to allow water to move in and out of the screened interval. Care will be used not to overpump a well.

Surging

Surging will be performed on wells that are screened in known or suspected high yield formations and/or on larger diameter (recovery) wells. A surge block will be raised and lowered through the entire screened interval, forcing water in and out of the well screen and sand pack. Pumping or air lifting will be used in conjunction with this method of development to remove any sediment brought into the well during surging.

Air Lifting

Air lifting will be used to remove sediment from wells as an alternative to pumping under certain conditions. When appropriate, a surge block designed for use with air lifting will be used to agitate the entire screened interval and water will be lifted out of the well using forced air. When air lifting is performed, the air source will be either nitrogen or filtered air and the procedure will be performed gently to prevent any damage to the well screen or casing and to insure that discharged water is contained.

Well Development - cont.

All well developing equipment will be thoroughly decontaminated prior to development using a steam cleaner and/or Alconox detergent wash and clean water rinse. During development procedures, field parameters (temperature, specific conductance and pH) will be monitored and recorded on well development forms (Figure 3). Equilibration requirements consist of a minimum of three readings with the following accuracy standards:

pH	± 0.1 pH units
Specific Conductance	± 10% of full scale reading
Temperature	± 0.5 degrees Celsius

The wells will be developed until water is visibly clear and free of sediment, and well purging parameters stabilized. A minimum of 8 to 10 well volumes will be purged from each well, if feasible. If well purging parameters have not stabilized before 10 casing volumes have been removed, well development will continue until purging parameters have stabilized and formation water is being drawn into the well. The adequacy of well development will be judged by the field technician performing the well development and based on known formation conditions.

Well Surveying

Monitoring wells will be surveyed to obtain top of box elevations to the nearest ±0.01 foot. Water level measurements will be recorded to the nearest ±0.01 foot and referenced to Mean Sea Level (MSL). If additional wells are required, then existing and newly installed wells are surveyed relative to MSL.

GROUND-WATER SAMPLING AND ANALYSIS

Quality Assurance/Quality Control Objectives

The sampling and analysis procedures employed by Gettler-Ryan Inc. (G-R) for ground-water sampling and monitoring follow specific Quality Assurance/Quality Control (QA/QC) guidelines. Quality Assurance objectives have been established by G-R to develop and implement procedures for obtaining and evaluating water quality and field data in an accurate, precise, and complete manner so that sampling procedures and field measurements provide information that is comparable and representative of actual field conditions. Quality Control (QC) is maintained by G-R by using specific field protocols and requiring the analytical laboratory to perform internal and external QC checks. It is the goal of G-R to provide data that are accurate, precise, complete, comparable, and representative. The definitions for accuracy, precision, completeness, comparability, and representativeness are as follows:

- Accuracy - the degree of agreement of a measurement with an accepted referenced or true value.

- Precision - a measure of agreement among individual measurements under similar conditions. Usually expressed in terms of the standard deviation.

- Completeness - the amount of valid data obtained from a measurement system compared to the amount that was expected to meet the project data goals.

- Comparability - expresses the confidence with which one data set can be compared to another.

- Representativeness - a sample or group of samples that reflects the characteristics of the media at the sampling point. It also includes how well the sampling point represents the actual parameter variations which are under study.

As part of the G-R QA/QC program, applicable federal, state, and local reference guidance documents are followed. The procedures outlined in these regulations, manuals, handbooks, guidance documents, and journals are incorporated into the G-R sampling procedures to assure that; (1) ground-water samples are properly collected, (2) ground-water samples are identified, preserved, and transported in a manner such that they are representative of field conditions, and (3) chemical analysis of samples are accurate and reproducible.

April 20, 1990

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

Water-Level Measurements (continued)

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

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

Well Purging

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

DOCUMENTATION

Sample Container Labels

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

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

Sampler's identification

Project number

Date and time of collection

Type of preservation used

Well Sampling Data Forms

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

Project number

Client

Location

Source (i.e. well number)

Time and date

Well accessibility and integrity

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

Calculated and actual purge volumes

Chain-of-Custody

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

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

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

TABLE 1

SAMPLE ANALYSIS METHODS, CONTAINERS, PRESERVATIONS, AND HOLDING TIMES

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

GeoStrategies Inc.

FIELD EXPLORATORY BORING LOG

FIGURE 1

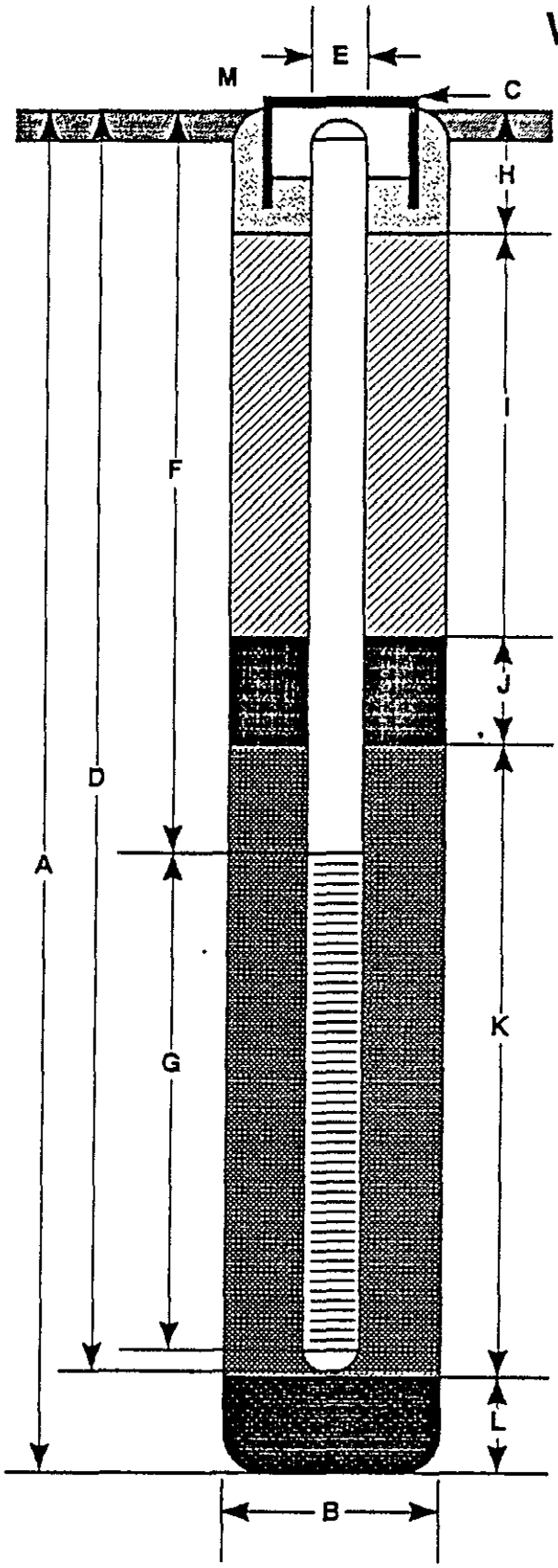
Field location of boring:	Project No.:	Date:	Boring No:
	Client:		
	Location:		
	City:		Sheet
	Logged by:	Driller:	of
Drilling method:	Casing installation data:		
Hole diameter:	Top of Box Elevation:		Datum:

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

Remarks:

WELL CONSTRUCTION DETAIL

FIGURE 2



A Total Depth of Boring _____ ft.

B Diameter of Boring _____ in.
Drilling Method _____

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

D Casing Length _____ ft.
Material _____

E Casing Diameter _____ in.

F Depth to Top Perforations _____ ft.

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

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

I Backfill from _____ to _____ ft.
Backfill Material _____

J Seal from _____ to _____ ft.
Seal Material _____

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

L Bottom Seal _____ ft.
Seal Material _____

M _____

Note: Depths measured from initial ground surface

GeoStrategies Inc.

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.

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 _____

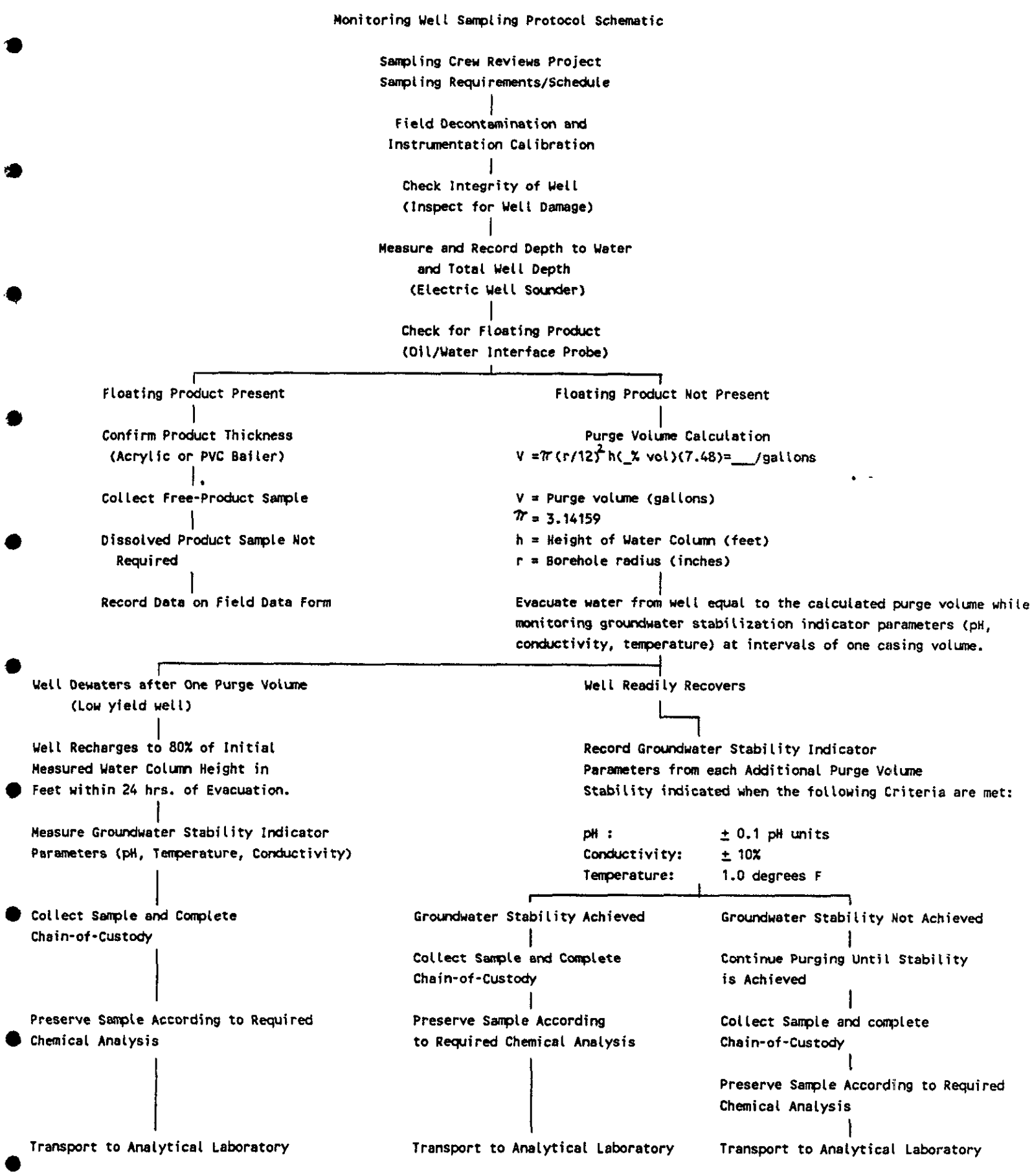
Sampling Time _____ Weather Conditions _____

Analysis _____ Bottles Used _____

Chain of Custody Number _____

COMMENTS _____

FIGURE 5


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

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

RELINQUISHED BY: _____ RECEIVED BY: _____

RELINQUISHED BY: _____ RECEIVED BY: _____

RELINQUISHED BY: _____ RECEIVED BY LAB: _____

DESIGNATED LABORATORY: _____ DHS #: _____

REMARKS: _____

DATE COMPLETED _____ FOREMAN _____

APPENDIX B
EXPLORATORY BORING LOGS
WELL CONSTRUCTION DETAILS

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

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

☒	- No Soil Sample Recoverd
■	- "Undisturbed" Sample
⊠	- Bulk or Classification Sample
▽	- First Encountered Ground Water Level
▼	- Piezometric Ground Water Level
Penetration	- Sample drive hammer weight - 140 pounds falling 30 inches. Blows required to drive sampler 1 foot are indicated on the logs

GeoStrategies Inc.

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

Field location of boring: (See Plate 2)	Project No.: 7270	Date: 10/18/90	Boring No.: C-5
	Client: Chevron Service Station		
	Location: 301 14th Street/Harrison		
	City: Oakland, California		Sheet 1 of 2
	Logged by: R.C.M.	Driller: Bayland	
Drilling method: Hollow Stem Auger	Casing installation data: (See Well Construction Detail)		
Hole diameter: 8-Inches	Top of Box Elevation: 31.25'		Datum: MSL

Water Level	24.5'	22.1'
Time	11:20	16:10
Date	10/18/90	10/18/90

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				0				
				1				PAVEMENT SECTION - 1.5 feet
				2				
				3				
				4				
	12		C-5-	5				SAND (SP) - yellowish brown (10YR 5/6), medium dense,
0	24	S&H	5.5	6				damp; 100% fine to medium sand; no chemical odor.
				7				
				8				
				9				
	18		C-5-	10				SILTY SAND (SM) - brownish yellow (10YR 6/6), dense,
3	24	S&H	10.5	11				damp; 80% fine to medium sand; 20% silt; no chemical odor.
				12				
				13				Clay in cuttings at 12.5 feet.
				14				
	21		C-5-	15				SAND (SP) - dark yellowish brown (10YR 4/6), dry to
23	25	S&H	15.5	16				damp, very dense; 100% medium sand; weak chemical odor.
				17				
				18				
				19				

Remarks:

GeoStrategies Inc.

Log of Boring

BORING NO. C-5

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7270	CEG 12/92	10/90		

Field location of boring:	Project No.: 7270	Date: 10/18/90	Boring No:
(See Plate 2)	Client: Chevron Service Station		C-5
	Location: 301 14th Street/Harrison		
	City: Oakland, California		Sheet 2 of 2
	Logged by: R.C.M.	Driller: Bayland	
Drilling method: Hollow Stem Auger	Casing installation data:		
Hole diameter: 8-Inches	Top of Box Elevation:	Datum:	

	Water Level			
	Time			
	Date			

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
	14		C-5-	20				
1292	28	S&H	20.5					COLOR CHANGE to olive (5Y 4/3) at 19.5 feet, damp; strong chemical odor.
				21				
				22		▼		
				23				Saturated cuttings at 23.5 feet.
				24				
	14		C-5-	25		▽		Saturated; weak chemical odor.
17.5	32	S&H	25.5					
				26				
				27				
				28				
				29				
	19		C-5-	30				COLOR CHANGE to olive brown (2.5Y 4/4) at 29.5 feet, saturated; no chemical odor.
	29	S&H	30.5					
				31				
				32				
				33				
				34				
	8		C-5-	35				
	16	S&H	36.0					
	17			36				CLAYEY SILT (ML/CL) - olive (5Y 5/3), stiff, moist, medium plasticity; 70% silt; 25% clay; 5% fine sand; no chemical odor.
				37				
				38				Bottom of sample at 36.0 feet. Bottom of boring at 36.0 feet. 10/18/90
				39				

Remarks:

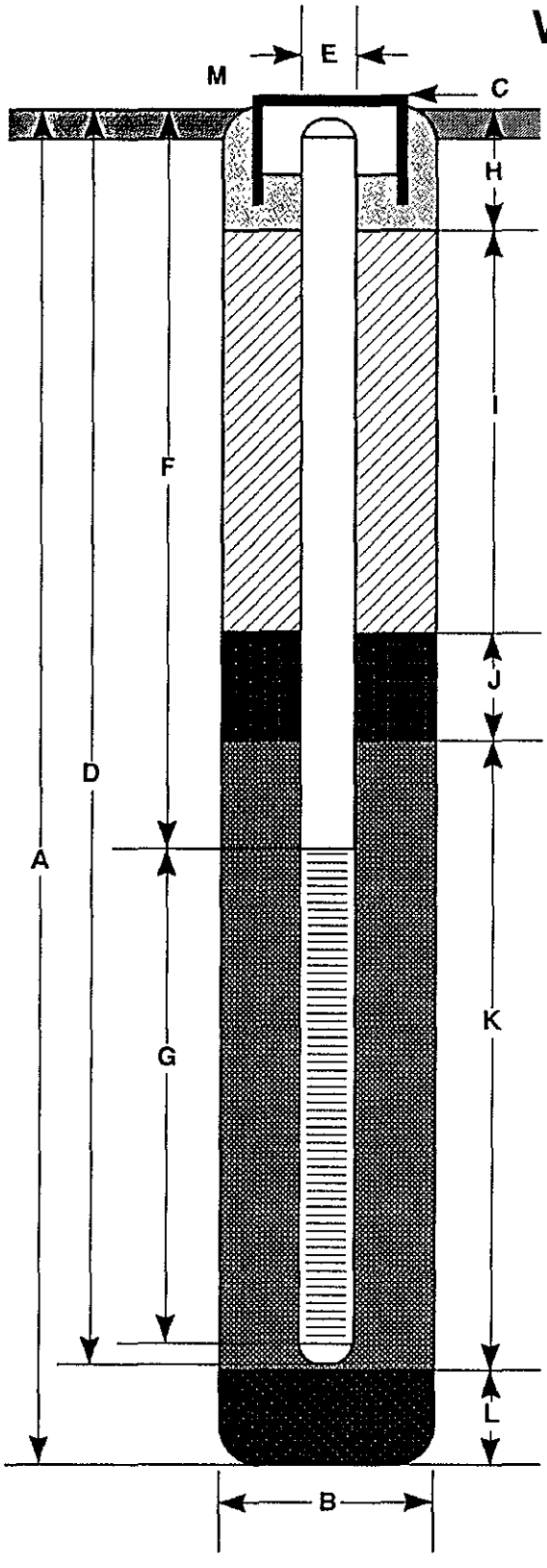
GeoStrategies Inc.

Log of Boring

BORING NO. **C-5**

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7270	CEG 1262	10/90		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring 36 ft.

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

C Top of Box Elevation 31.25 ft.
[X] Referenced to Mean Sea Level
[ ] Referenced to Project Datum

D Casing Length 34 ft.
Material Schedule 40 PVC

E Casing Diameter 2 in.

F Depth to Top Perforations 18 ft.

G Perforated Length 16 ft.
Perforated Interval from 18 to 34 ft.
Perforation Type Factory Slot
Perforation Size 0.020 in.

H Surface Seal from 0 to 1.5 ft.
Seal Material Cement Grout

I Backfill from 1.5 to 14 ft.
Backfill Material Cement Grout

J Seal from 14 to 16 ft.
Seal Material Bentonite Pellets

K Gravel Pack from 16 to 34 ft.
Pack Material Lonestar #2/12 Sand

L Bottom Seal 2 ft.
Seal Material Native Material

M Vault box with locking cap and cover.

Note: Depths measured from initial ground surface.

GeoStrategies Inc.

Well Construction Detail

WELL NO.
C-5

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7270	CWP CEG 1262	10/90		

Field location of boring: (See Plate 2)	Project No.: 7270	Date: 10/18/90	Boring No: CR-1
	Client: Chevron Service Station		
	Location: 301 14th Street/Harrison		
	City: Oakland, California		Sheet 1 of 2
	Logged by: R.C.M.	Driller: Bayland	
Drilling method: Hollow Stem Auger	Casing installation data: (See Well Construction Detail)		
Hole diameter: 12-Inches	Top of Box Elevation: 30.52'		Datum: MSL

Water Level	24.0'	
Time	14:35	
Date	10/18/90	

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
				0				
				1				PAVEMENT SECTION - 1.5 feet
				2				
				3				
				4				
	8			5				
3	13		CR-1-					SAND (SP) - dark yellowish brown (10YR 4/6), damp,
	28	S&H	5.5	6				dense; 100% fine to medium sand; no chemical odor.
				7				
				8				
				9				
	5		CR-1-	10				SILTY SAND (SM) - olive (5Y 5/3), moist, medium dense;
24.1	9	S&H	10.5					80%sand; 15% silt; 5% clay; weak chemical odor.
	9			11				
				12				
				13				
				14				
	10		CR-1-	15				SAND (SP) - olive (5Y 5/3), moist, dense; 95% sand; 5%
217	20	S&H	15.5					silt; moderate chemical odor.
	23			16				
				17				
				18				
				19				

Remarks:

GeoStrategies Inc.

Log of Boring

BORING NO. **CR-1**

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7270	CEG 12/92	10/90		

Field location of boring: (See Plate 2)	Project No.: 7270	Date: 10/18/90	Boring No: CR-1
	Client: Chevron Service Station		
	Location: 301 14th Street/Harrison		
	City: Oakland, California		Sheet 2 of 2
	Logged by: R.C.M.	Driller: Bayland	
Drilling method: Hollow Stem Auger	Casing installation data:		
Hole diameter: 12-Inches	Top of Box Elevation:	Datum:	

Water Level								
Time								
Date								

PID (ppm)	Blows/ft. or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description
	12		CR-1-	20				
872	23	S&H	20.5					Strong chemical odor.
	23			21				
				22				
				23				
				24		▽		
	11		CR-1-					Saturated with gasoline; strong chemical odor.
15.7	20	SPT	25.5	25				
	18			26				
				27				
				28				
				29				
				30				
				31				
				32				Silt noted on 4-Inch auger teeth upon extraction from boring.
				33				SILT (ML) - olive (5Y 5/3), moist, medium plasticity; 70% silt; 25% clay; 5% fine sand; no chemical odor (from disturbed sample).
				34				
				35				Bottom of sample at 25.5 feet.
				36				Bottom of boring at 32.5 feet. 10/18/90
				37				
				38				
				39				

Remarks:

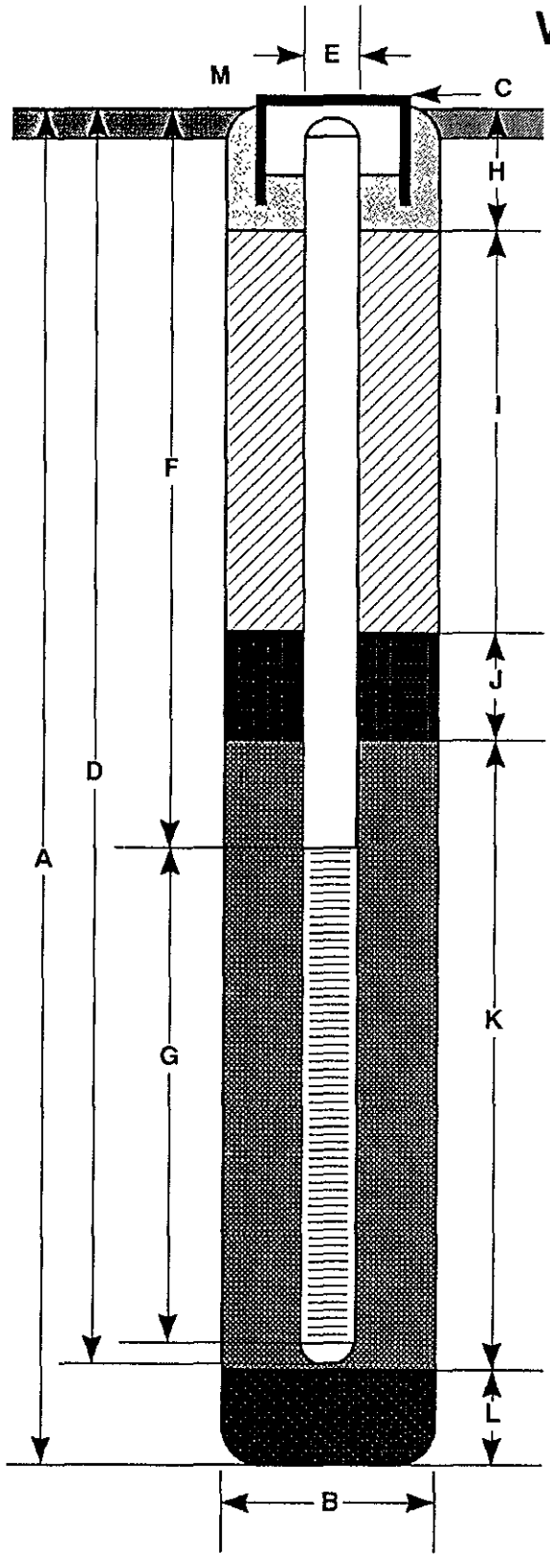
GeoStrategies Inc.

Log of Boring

BORING NO. **CR-1**

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7270	CMP CEG 1262	10/90		

WELL CONSTRUCTION DETAIL



A Total Depth of Boring: 32.5 ft.

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

C Top of Box Elevation: 30.52 ft.
[X] Referenced to Mean Sea Level
[ ] Referenced to Project Datum

D Casing Length: 32 ft.
Material: Schedule 40 PVC

E Casing Diameter: 6 in.

F Depth to Top Perforations: 18 ft.

G Perforated Length: 14 ft.
Perforated Interval from 18 to 32 ft.
Perforation Type: Continuous Wrap
Perforation Size: 0.020 in.

H Surface Seal from 0 to 1.5 ft.
Seal Material: Concrete

I Backfill from 1.5 to 14 ft.
Backfill Material: Concrete

J Seal from 14 to 16 ft.
Seal Material: Bentonite Pellets

K Gravel Pack from 16 to 32 ft.
Pack Material: Lonestar #2/12 Sand

L Bottom Seal: 0.5 ft.
Seal Material: Native Material

M Vault box with well cap.

Note: Depths measured from initial ground surface.

GSI GeoStrategies Inc.

Well Construction Detail

WELL NO. CR-1

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7270	RMP CEG 12/62	10/90		

APPENDIX C
SIEVE ANALYSIS

Kaldveer Associates
Geoscience Consultants

GeoStrategies Inc.

TRANSMITTAL

TO Geostrategies
2140 W. Winton Ave
Hayward, Calif.

DATE 10-5-90
VIA Mail
JOB NO. L136-15

ATTENTION Mr. Bob Mallory

PROJECT GS #7270

DESCRIPTION Tan fine sand w/ tr. silt (SP)

ACTION
- ☐ As requested
- ☐ For your review and comment
- ☒ For your use
- ☐ For your use: please return when finished
- ☐ Other

Classification & Description (blanks) are left for your use as previously arranged

CC:

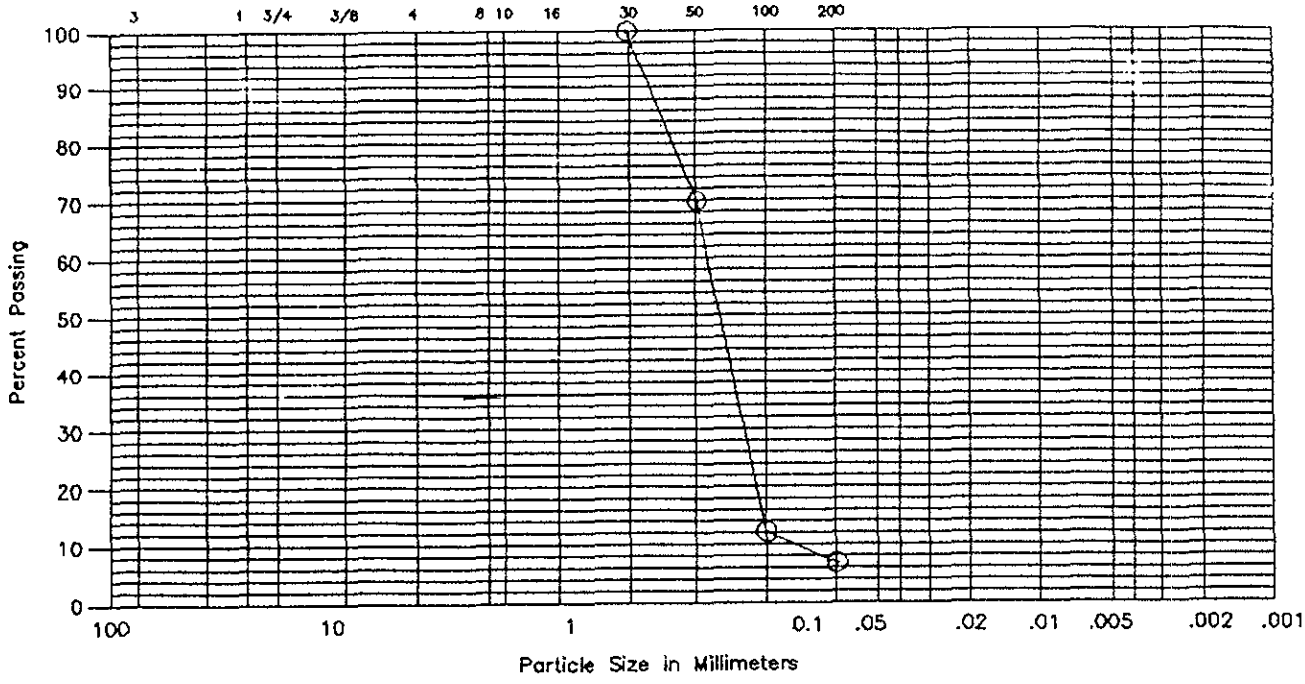
KALDVEER ASSOCIATES
By

If enclosures are not as noted, kindly notify us at once.

UNIFIED SOIL CLASSIFICATION SYSTEM

(ASTM D 422-72)

U.S. STANDARD SIEVE SIZES



gravel		sand			silt and clay
coarse	fine	coarse	medium	fine	

KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	ELEV. (feet)	UNIFIED SOIL CLASSIFICATION SYMBOL	SAMPLE DESCRIPTION
O	1	25.5	—		

Kaldveer Associates
Geoscience Consultants
A California Corporation

GRADATION TEST DATA

GS # 7270

PROJECT NO.	DATE	
L136-15	11-2-90	Figure

APPENDIX D

SOIL ANALYTICAL REPORT

SUPERIOR ANALYTICAL LABORATORIES, INC.

825 ARNOLD, STE. 114 • MARTINEZ, CALIFORNIA 94553 • (415) 229-1512

DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 81726
CLIENT: Geo Strategies
CLIENT JOB NO.: 7270

DATE RECEIVED: 10/19/90
DATE REPORTED: 10/26/90

Lab Number	Customer Sample Identification	Date Sampled	Date Analyzed
81726- 3	C-5-15.5	10/18/90	10/24/90
81726- 4	C-5-20.5	10/18/90	10/24/90
81726- 5	CR-1-15.5	10/18/90	10/24/90
81726- 6	CR-1-20.5	10/18/90	10/24/90

Laboratory Number:	81726 3	81726 4	81726 5	81726 6
ANALYTE LIST	Amounts/Quantitation Limits (mg/Kg)			
OIL AND GREASE:	NA	NA	NA	NA
TPH/GASOLINE RANGE:	6	3	1	1200
TPH/DIESEL RANGE:	NA	NA	NA	NA
BENZENE:	0.088	0.17	0.54	9.5
TOLUENE:	0.30	0.49	0.17	56
ETHYL BENZENE:	0.094	0.071	0.059	18
XYLENES:	0.56	0.51	0.11	110

SUPERIOR ANALYTICAL LABORATORIES, INC.
825 ARNOLD, STE. 114 • MARTINEZ, CALIFORNIA 94553 • (415) 229-1512
DOHS #319
DOHS #220

CERTIFICATE OF ANALYSIS

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
Diesel by Modified EPA SW-846 Method 8015
Gasoline by Purge and Trap: EPA MEthod 8015/5030
ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

QA/QC INFORMATION
SET: 81726

NA = ANALYSIS NOT REQUESTED
ND = ANALYSIS NOT DETECTED ABOVE QUANTITATION LIMIT

Mg/Kg = part per million (ppm)

OIL AND GREASE ANALYSIS By Standard Methods Method 503E:
Duplicate RPD NA
Minimum Detection Limit in Soil: 20mg/kg

Modified EPA Method 8015 for Extractable Hydrocarbons:
Minimum Quantitation Limit for Diesel in Soil: 10mg/kg
Daily Standard run at 200mg/L; %Diff Diesel = NA
MS/MSD Average Recovery = NA: Duplicate RPD = NA

8015/5030 Total Purgable Petroleum Hydrocarbons:
Minimum Quantitation Limit for Gasoline in Soil: 1mg/kg
Daily Standard run at 2mg/L; %Diff Gasoline = 7
MS/MSD Average Recovery = 117%: Duplicate RPD = 0

8020/BTXE
Minimum Quantitation Limit in Soil: 0.005 mg/Kg
Daily Standard run at 20ug/L; %Diff = <15%
MS/MSD Average Recovery = 100%: Duplicate RPD = 4

Richard Srna, Ph.D.
Laboratory Director

OUTSTANDING QUALITY AND SERVICE

81726 **Chain-of-Custody Record**

Chevron U.S.A. Inc.
P.O. Box 5004
San Ramon, CA 94583
FAX (415) 842-9591

Chevron Facility Number: 4916
Consultant Release Number:
Consultant Project Number: 7270
Consultant Name: GEOSTRATEGIES INC.
Address: 2150 WEST WINTON AVE
Fax Number: 783-1089
Project Contact (Name): JEFF RYAN
(Phone): 783-7500

Chevron Contact (Name): NANCY VUKELICH
(Phone):
Laboratory Name: SUPERIOR
Contract Number: 352 3000
Samples Collected by (Name): ROBERT C. MALLORY
Collection Date: 10/18/90
Signature: Robert C. Mallory

Sample Number	Lab Number	Number of Containers	Matrix S = Soil W = Water A = Air C = Charcoal	Type G = Grab C = Composite	Time	Sample Preservation	Iced	Analyses To Be Performed: Modified EPA 8015 Total Petro. Hydrocarb. as Gasoline	Modified EPA 8015 Total Petro. Hydrocarb. as Gasoline + Diesel	503 Oil and Grease	Arom. Volatiles - BTXE Soil: 8020/Wtr.: 602	Arom. Volatiles - BTXE Soil: 8240/Wtr.: 624	Total Lead DHS-Luft	EDB DHS-AB 1803			Remarks
C-5-15.5		1	S		10:58		✓	✓			✓						TPH-GAS, BTEX
C-5-20.5		1	S		11:10		✓	✓			✓						
CR-1-15.5		1	S		14:09		✓	✓			✓						
CR-1-20.5		1	S		14:21		✓	✓			✓						

Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Organization	Date/Time
Robert C. Mallory	GEOSTRATEGIES INC	10/19/90 5:45	Don Carson	Express IT	10/19/90 1545
Don Carson	Express IT	10/19/90			
			Received For Laboratory By (Signature)		Date/Time 10/19/90 6:10

Turn Around Time (Circle Choice): 24 Hrs, ~~48 Hrs~~, (5 Days), 10 Days

Printed in U.S.A.

MS 5136 (6 89)

APPENDIX E
GETTLER-RYAN INC. GROUNDWATER SAMPLING REPORT

gettler — ryan inc.

November 20, 1990

GROUNDWATER SAMPLING REPORT

Chevron U.S.A. Inc.
Post Office Box 5004
San Ramon, California 94583-0804

Referenced Site: Chevron Service Station #4816
301 14th Street/Harrison
Oakland, California

Sampling Date: October 30, 1990

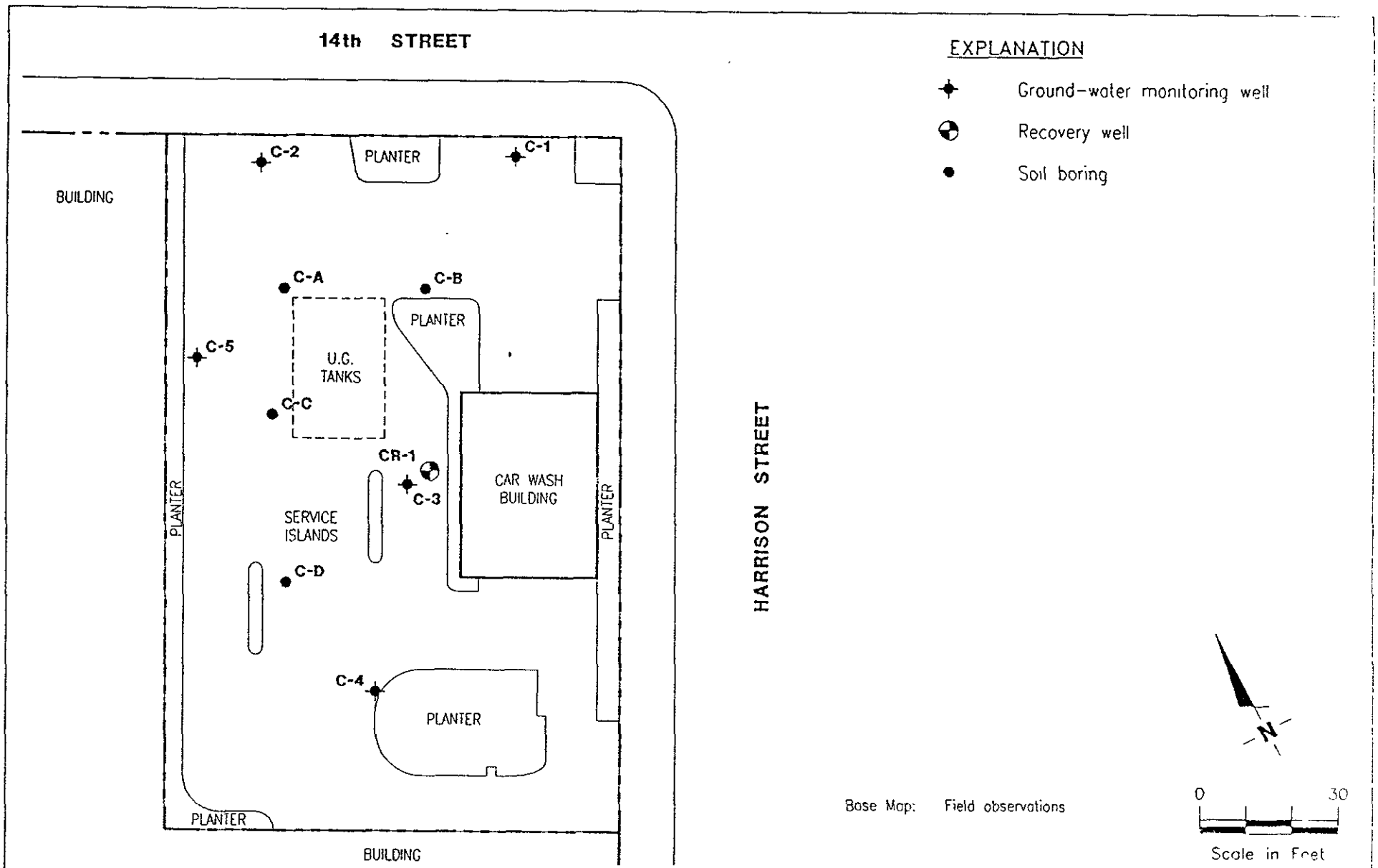
This report presents the results of the quarterly groundwater sampling and analytical program conducted by Gettler-Ryan Inc. on October 30, 1990 at the referenced location. The site is occupied by a service station located on the southwest corner of Harrison Street and Fourteenth Street. The service station has underground storage tanks containing regular leaded, unleaded and super unleaded gasoline products.

There are currently six groundwater monitoring wells on site at the location shown on the attached site map. Recently installed wells CR-1 and C-5 were developed on October 25, 1990. Prior to sampling, all wells were inspected for total well depth, water levels, and the presence of separate phase hydrocarbons using an electronic interface probe. A clean acrylic bailer was used to visually confirm the presence and thickness of separate phase hydrocarbons. Groundwater depths ranged from 21.72 to 23.81 feet below grade. Separate phase hydrocarbons were observed in Wells C-3 and CR-1.

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

Samples were collected, using Teflon bailers, in properly cleaned and laboratory prepared containers. All sampling equipment was thoroughly cleaned after each well was sampled and steam cleaned upon completion of work at the site. The samples were labeled, stored on blue ice, and transported to the laboratory for analysis. A trip 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.

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



GeoStrategies Inc.

SITE PLAN
Chevron Service Station #4816
301 14th Street
Oakland, California

PLATE
2

JOB NUMBER
270

REVIEWED BY RG/CEG

DATE

REVISED DATE

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 11137
CLIENT: Chevron USA
CLIENT JOB NO.: 3270

DATE RECEIVED: 10/30/90
DATE REPORTED: 11/07/90

Lab Number	Customer Sample Identification	Date Sampled	Date Analyzed
11137- 1	C-1	10/30/90	11/05/90
11137- 2	C-2	10/30/90	11/05/90
11137- 3	C-4	10/30/90	11/02/90
11137- 4	C-5	10/30/90	11/05/90
11137- 5	TRIP BLANK	10/30/90	11/07/90

Laboratory Number:	11137 1	11137 2	11137 3	11137 4	11137 5
ANALYTE LIST	Amounts/Quantitation Limits (ug/l)				
OIL AND GREASE:	NA	NA	NA	NA	NA
TPH/GASOLINE RANGE:	67000	13000	210	20000	ND<50
TPH/DIESEL RANGE:	NA	NA	NA	NA	NA
BENZENE:	NA	2800	72	2500	ND<0.5
TOLUENE:	NA	1900	13	3300	ND<0.5
ETHYL BENZENE:	NA	240	1	320	ND<0.5
XYLENES:	NA	1000	11	2200	ND<0.5

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081

C E R T I F I C A T E O F A N A L Y S I S

ANALYSIS FOR TOTAL PETROLEUM HYDROCARBONS
Diesel by Modified EPA SW-846 Method 8015
Gasoline by Purge and Trap: EPA MEthod 8015/5030
ANALYSIS FOR BENZENE, TOLUENE, ETHYL BENZENE & XYLENES
by EPA SW-846 Methods 5030 and 8020

QA/QC INFORMATION
SET: 11137

NA = ANALYSIS NOT REQUESTED
ND = ANALYSIS NOT DETECTED ABOVE QUANTITATION LIMIT

ug/L = part per billion (ppb)

OIL AND GREASE ANALYSIS By Standard Methods Method 503E:
Duplicate RPD NA
Minimum Detection Limit in Water: 5000ug/L

Modified EPA Method 8015 for Extractable Hydrocarbons:
Minimum Quantitation Limit for Diesel in Water: 1000ug/L
Daily Standard run at 200mg/L; %Diff Diesel = NA
MS/MSD Average Recovery = NA: Duplicate RPD = NA

8015/5030 Total Purgable Petroleum Hydrocarbons:
Minimum Quantitation Limit for Gasoline in Water: 50ug/L
Daily Standard run at 2mg/L; %Diff Gasoline = <15%
MS/MSD Average Recovery = 71%: Duplicate RPD = <1%

8020/BTXE
Minimum Quantitation Limit in Water: 0.50ug/L
Daily Standard run at 20ug/L; %Diff = <15%
MS/MSD Average Recovery = 107%: Duplicate RPD = <8%

Richard Srna, Ph.D.
Cecilia G. Joaquin (for)
Laboratory Director

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO. 11137-1
CLIENT: Chevron USA

DATE RECEIVED: 10/30/90
DATE REPORTED: 11/07/90
JOB NO. 3270

EPA SW-846 METHOD 8240 - VOLATILE ORGANICS
by Gas Chromatography/ Mass Spectrometry

SAMPLE: C-1

Compound	ug/l	Compound	ug/l
Chloromethane	ND<100	Cis-1,3-Dichloropropene	ND<30
Bromomethane	ND<100	Trichloroethene	ND<30
Vinyl Chloride	ND<100	Dibromochloromethane	ND<30
Chloroethane	ND<100	1,1,2-Trichloroethane	ND<30
Methylene Chloride	ND<100	Benzene (MDL=20)	6700
Acetone	ND<100	Trans-1,3-Dichloropropene	ND<30
Carbon disulfide	ND<30	2-Chloroethyl vinyl ether	ND<30
Trichlorofluoromethane	ND<30	Bromoform	ND<30
1,1-Dichloroethene	ND<30	4-Methyl-2-Pentanone	ND<100
1,1-Dichloroethane	ND<30	2-Hexanone	ND<100
1,2-Dichloroethene (total)	ND<30	Tetrachloroethene	ND<30
Chloroform	ND<30	1,1,2,2-Tetrachloroethane	ND<30
1,2-Dichloroethane(MDL=30)	100	Toluene (MDL=30)	8700
2-Butanone	ND<20	Chlorobenzene	ND<30
1,1,1-Trichloroethane	ND<30	Ethylbenzene (MDL=30)	900
Carbon Tetrachloride	ND<30	Styrene	ND<30
Vinyl Acetate	ND<100	Total Xylenes (MDL=30)	5000
Bromodichloromethane	ND<30	1,3-Dichlorobenzene	ND<30
1,2-Dichloropropane	ND<30	1,2&1,4-Dichlorobenzenes	ND<30

ug/l = part per billion (ppb)
QC DATA:

Surrogate Recoveries		QC Limits water	QC Limits soil
1,2-DCA-d4.....	91%	76-114	81-117
Toluene-d8.....	98%	88-110	81-140
Bromofluorobenzene.....	101%	86-115	74-121

comments:

Richard Srna, Ph.D.

Cecilia G. Joaquin (for)
Laboratory Director

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO.:11137-1
CLIENT: Chevron USA

DATE RECEIVED: 10/30/90
DATE REPORTED: 11/15/90
JOB NO.: 3270

ANALYSIS FOR BASE/NEUTRAL and ACID EXTRACTABLES
by EPA SW-846 Method 8270
Extraction Method: EPA 3510

Sample Identification: C-1

Analyte	Result (ug/l)	Quantitation Limit (ug/l)
Acenaphthene	ND	1
Acenaphthylene	ND	1
Aniline	ND	1
Anthracene	ND	1
Benzo(a)anthracene	ND	1
Benzo(b)fluoranthene	ND	2
Benzo(k)fluoranthene	ND	1
Benzo(ghi)perylene	ND	1
Benzo(a)pyrene	ND	1
Benzidine	ND	30
Butyl benzyl phthalate	ND	1
Bis(2-chloroethoxy)methane	ND	1
Bis(2-chloroethyl)ether	ND	1
Bis (2-chloroisopropyl) ether	ND	1
Bis (2-ethylhexyl) phthalate	ND	10
4-Bromophenyl phenyl ether	ND	1
4-Chloroanaline	ND	5
2-chloronaphthalene	ND	1
4-chlorophenyl phenyl ether	ND	1
Chrysene	ND	2
Dibenzo(a,h)anthracene	ND	1
Dibenzofuran	ND	1
Di-n-butyl phthalate	ND	1
1,2-Dichlorobenzene	ND	1
1,3-Dichlorobenzene	ND	1
1,4-Dichlorobenzene	ND	1
3,3'-Dichlorobenzidine	ND	40
Diethylphthalate	ND	1
Dimethyl phthalate	ND	10
2,4-Dinitrotoluene	ND	1
2,6-Dinitrotoluene	ND	1
Di-n-octylphthalate	ND	7
Fluoranthene	ND	1

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I • SAN FRANCISCO, CA 94124 • PHONE (415) 647-2081

Analyte	8270 Certificate Result (ug/l)	Quantitation Limit (ug/l)
Fluorene	ND	1
Hexachlorobenzene	ND	1
Hexachlorobutadiene	ND	1
Hexachlorocyclopentadiene	ND	1
Hexachloroethane	ND	1
Indeno(1,2,3-cd) pyrene	ND	1
Isophorone	ND	1
2-Methylnaphthalene	ND	1
2-Nitroanaline	ND	5
3-Nitroanaline	ND	5
4-Nitroanaline	ND	5
Naphthalene	120	1
Nitrobenzene	ND	1
N-Nitrosodi-n-propylamine	ND	5
N-Nitrosodiphenylamine	ND	1
Phenanthrene	ND	1
Pyrene	ND	1
1,2,4-Trichlorobenzene	ND	1
ACID EXTRACTABLES		
Benzyl alcohol	ND	1
4-Chloro-3-methylphenol	ND	1
2-Chlorophenol	ND	1
2,4-Dichlorophenol	ND	1
2,4-Dimethylphenol	ND	1
2,4-Dinitrophenol	ND	5
2-Methyl-4,6-dinitrophenol	ND	1
2-Methylphenol	31	1
4-Methylphenol	21	1
4-Nitrophenol	ND	5
2-Nitrophenol	ND	1
Pentachlorophenol	ND	1
Phenol	ND	6
2,4,5-Trichlorophenol	ND	1
2,4,6-Trichlorophenol	ND	1

ND = Not detected ug/l = part per billion (ppb)
Analysis subcontracted to Clayton Environmental Labs

Richard Srna, Ph.D.

Laboratory Director

SUPERIOR ANALYTICAL LABORATORY, INC.
1555 BURKE, UNIT I · SAN FRANCISCO, CA 94124 · PHONE (415) 647-2081

CERTIFICATE OF ANALYSIS

LABORATORY NO.: 11137-1
CLIENT: Chevron USA

DATE RECEIVED: 10/30/90
DATE REPORTED: 11/15/90
JOB NO.: 3270

13 PRIORITY POLLUTANT METALS
Methods: EPA 200 series

SAMPLE: C-1

Compound	Results (mg/l)	(mg/l) Detection limit	EPA METHOD
Antimony	ND	0.005	200.7
Arsenic	0.08	0.03	206.2
Beryllium	ND	0.002	200.7
Cadmium	ND	0.003	200.7
Chromium (total)	0.035	0.005	200.7
Copper	0.036	0.005	200.7
Lead	0.025	0.01	239.2
Mercury	0.0006	0.0005	245.1
Nickel	0.080	0.005	200.7
Selenium	ND	0.03	270.2
Silver	ND	0.002	200.7
Thallium	ND	0.005	200.7
Zinc	ND	0.005	200.7

mg/l = part per million (ppm)

Analysis subcontracted to Clayton Environmental Lab.

Richard Srna, Ph.D.
Laboratory Director

SF #11137

Chain-of-Custody Re

Chevron U.S.A. Inc.
P.O. Box 5004
San Ramon, CA 94583
FAX (415) 842-9591

Chevron Facility Number: 4816
Consultant Release Number:
Consultant Project Number: 3270
Consultant Name: Gettler + Ryan Inc
Address: 2150 W Winton
Fax Number:
Project Contact (Name): Tom Paulson
(Phone): 415 783 7500

Chevron Contact (Name): Nancy VuKelich
(Phone):
Laboratory Name: Superior Lab
Contract Number: 3523000
Samples Collected by (Name): G. Sanchez
Collection Date: 10-30-90
Signature: Guadalupe Sanchez

Sample Number	Lab Number	Number of Containers	Matrix S = Soil W = Water A = Air C = Charcoal	Type G = Grab C = Composite	Time	Sample Preservation	Iced	Modified EPA 8015 Total Petro. Hydrocarb. as Gasoline	Modified EPA 8015 Total Petro. Hydrocarb. as Gasoline + Diesel	503 Oil and Grease	Arom. Volatiles - BTXE Soil: 8020/Wtr.: 602	Arom. Volatiles - BTXE Soil: 8240/Wtr.: 624	Total Lead DHS-Luft	EDB DHS-AB 1803	EPA 625	Priority Pollutant Metals
C-1		8	W		1423	HCl/HNO3	Yes	✓			✓	✓			✓	✓
C-2		3			1445	HCl		✓			✓					
C-4					1505			✓			✓					
C-5					1436			✓			✓					
tr. p blank		1			—			✓			✓					

Remarks: THC (Gas) BTXE, EPA 624, 625, & Priority Pollutant Metals
THC (Gas) BTXE

Please initial:
Samples Stored in ice
Appropriate containers.
Samples preserved.
VOA's without headspace.
Comments:

Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Organization	Date/Time
Guadalupe Sanchez	Gettler-Ryan	10-30-90 16:38	G/R Delivery	G/R	10-30-90 16:-
G/R Delivery		10-31-90 1607:30	x		
	Gettler Ryan	10/31/90 1050			

Received For Laboratory By (Signature):
Date/Time: 11/2/90

Turn Around Time (Circle Choice)
24 Hrs
48 Hrs
~~5 Days~~
10 Days

APPENDIX F
GETTLER-RYAN INC. MONITORING DATA

CHEVRON USA 4816 OAKLAND - 301 14TH/HARRISON JOB 5270

DATE	WELL	DTH	DTW	HT	BAILED	PPM	LEL	NORM	DTB	EMP	C.ELEV
19-Oct-90	CR1	21.50	23.08	1.58	0.0						
26-Oct-90	CR1	21.29	23.68	2.39	0.00						
30-Oct-90	CR1	21.30	23.81	2.51							
02-Nov-90	CR1	21.30	23.84	2.54	0.0						
09-Nov-90	CR1	21.34	23.77	2.43	4.0						
16-Nov-90	CR1	21.32	23.84	2.52	2.0						
12-Jun-90	C1		22.05	0.00						JZ	
13-Jun-90	C1		21.97	0.00						JZ	
14-Jun-90	C1		22.03	0.00						SM	
18-Jun-90	C1		22.02	0.00						TL	
20-Jun-90	C1		21.93	0.00						TL	
22-Jun-90	C1		22.11	0.00						TL	
25-Jun-90	C1		21.96	0.00						RA	
27-Jun-90	C1		21.94	0.00						RA	
29-Jun-90	C1		22.08	0.00						RA	
02-Jul-90	C1		21.98	0.00						SM	
06-Jul-90	C1		21.94	0.00						SM	
09-Jul-90	C1		21.94	0.00						TL	
11-Jul-90	C1		21.94	0.00						TL	
13-Jul-90	C1		21.94	0.00						TL	
16-Jul-90	C1		21.90	0.00						RA	
18-Jul-90	C1		21.94	0.00						RA	
20-Jul-90	C1		21.89	0.00						RA	
23-Jul-90	C1		21.88	0.00						SM	
25-Jul-90	C1		21.92	0.00						SM	
27-Jul-90	C1		21.92	0.00						SM	
30-Jul-90	C1		21.91	0.00						TL	
03-Aug-90	C1		21.89	0.00						TL	
10-Aug-90	C1		21.90	0.00						RA	
17-Aug-90	C1		21.86	0.00						SM	
24-Aug-90	C1		21.85	0.00						SM	
31-Aug-90	C1		21.82	0.00						RA	
07-Sep-90	C1		21.85	0.00						SM	
14-Sep-90	C1		21.83	0.00						RA	
21-Sep-90	C1		21.81	0.00						SM	
28-Sep-90	C1		21.71	0.00						RA	
05-Oct-90	C1		21.64	0.00						SM	
12-Oct-90	C1		21.61	0.00						RA	
19-Oct-90	C1		21.54	0.00						SM	
26-Oct-90	C1		21.55	0.00						RA	
30-Oct-90	C1		21.72	0.00						GS	
02-Nov-90	C1		21.71	0.00						SM	
09-Nov-90	C1		21.61	0.00						RA	
16-Nov-90	C1		21.67	0.00						SM	
12-Jun-90	C2		22.16	0.00							
13-Jun-90	C2		22.08	0.00							
14-Jun-90	C2		22.15	0.00							

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

DATE	WELL	DTH	DTW	HT	BAILED	PPM	LEL	NORM	DTB	EMP	C.ELEV
18-Jun-90	C2		22.13	0.00							
20-Jun-90	C2		22.05	0.00							
22-Jun-90	C2		21.99	0.00							
25-Jun-90	C2		22.09	0.00							
27-Jun-90	C2		22.09	0.00							
29-Jun-90	C2		21.94	0.00							
02-Jul-90	C2		22.09	0.00							
06-Jul-90	C2		22.07	0.00							
09-Jul-90	C2		22.09	0.00							
11-Jul-90	C2		22.10	0.00							
13-Jul-90	C2		22.04	0.00							
16-Jul-90	C2		22.00	0.00							
18-Jul-90	C2		22.06	0.00							
20-Jul-90	C2		22.00	0.00							
23-Jul-90	C2		22.04	0.00							
25-Jul-90	C2		22.03	0.00							
27-Jul-90	C2		22.06	0.00							
30-Jul-90	C2		22.04	0.00							
03-Aug-90	C2		22.05	0.00							
10-Aug-90	C2	22.01	(1.00)	0.00							
17-Aug-90	C2		21.99	0.00							
24-Aug-90	C2		21.98	0.00							
31-Aug-90	C2		21.93	0.00							
07-Sep-90	C2		21.94	0.00							
14-Sep-90	C2		21.93	0.00							
21-Sep-90	C2		21.91	0.00							
28-Sep-90	C2		21.83	0.00							
05-Oct-90	C2		21.77	0.00							
12-Oct-90	C2		21.80	0.00							
19-Oct-90	C2		21.77	0.00							
26-Oct-90	C2		21.76	0.00							
30-Oct-90	C2		21.81	0.00							
02-Nov-90	C2		21.82	0.00							
09-Nov-90	C2		21.81	0.00							
16-Nov-90	C2		21.83	0.00							
12-Jun-90	C3	21.75	24.75	3.00+							
13-Jun-90	C3	21.75	24.75	3.00+							
14-Jun-90	C3	21.65	24.40	2.75	4.0						
18-Jun-90	C3	21.64	24.24	2.60	2.0						
20-Jun-90	C3	21.59	24.28	2.69	2.5						
22-Jun-90	C3	21.64	24.32	2.68	2.5						
25-Jun-90	C3	21.63	24.16	2.53	4.0						
27-Jun-90	C3	21.61	24.26	2.65	4.0						
29-Jun-90	C3	21.60	24.12	2.52	4.0						
02-Jul-90	C3	21.60	24.18	2.58	5.0						
06-Jul-90	C3	21.57	24.20	2.63	5.0						
09-Jul-90	C3	21.59	24.24	2.65	2.5						
11-Jul-90	C3	21.57	24.26	2.69	2.5						

DATE	WELL	DTH	DTW	HT	BAILED	PPM	LEL	NORM	DTB	EMP	C.ELEV
13-Jul-90	C3	21.57	24.20	2.63	2.5						
16-Jul-90	C3	21.58	24.15	2.57	4.0						
18-Jul-90	C3	21.58	23.99	2.41	4.0						
20-Jul-90	C3	21.55	24.00	2.45	4.0						
23-Jul-90	C3	21.52	24.07	2.55	5.0						
25-Jul-90	C3	21.54	24.20	2.66	5.0						
27-Jul-90	C3	21.56	24.19	2.63	3.5						
30-Jul-90	C3	21.54	24.14	2.60	2.5						
03-Aug-90	C3	21.52	24.18	2.66	2.5						
10-Aug-90	C3	21.55	24.22	2.67	4.0						
17-Aug-90	C3	21.50	24.10	2.60	5.0						
24-Aug-90	C3	21.49	24.30	2.81	5.0						
31-Aug-90	C3	21.45	24.10	2.65	4.0						
07-Sep-90	C3	21.46	24.07	2.61	5.0						
14-Sep-90	C3	21.48	24.10	2.62	5.0						
21-Sep-90	C3	21.44	24.08	2.64	5.0						
28-Sep-90	C3	21.39	23.98	2.59	5.0						
05-Oct-90	C3	21.37	23.88	2.51	5.0						
12-Oct-90	C3	21.38	23.95	2.57	4.0						
19-Oct-90	C3	21.37	23.81	2.44	4.0						
26-Oct-90	C3	21.36	23.84	2.48	0.00						
30-Oct-90	C3	21.31	23.81	2.50							
02-Nov-90	C3	21.40	23.89	2.49	0.0						
09-Nov-90	C3	21.43	23.90	2.47	3.0						
16-Nov-90	C3	21.40	23.93	2.53	2.0						
12-Jun-90	C4		22.82	0.00							
13-Jun-90	C4		22.73	0.00							
14-Jun-90	C4		22.81	0.00							
18-Jun-90	C4		22.88	0.00							
20-Jun-90	C4		22.72	0.00							
22-Jun-90	C4		22.76	0.00							
25-Jun-90	C4		22.71	0.00							
27-Jun-90	C4		22.73	0.00							
29-Jun-90	C4		22.72	0.00							
02-Jul-90	C4		22.74	0.00							
06-Jul-90	C4		22.71	0.00							
09-Jul-90	C4		22.81	0.00							
11-Jul-90	C4		22.72	0.00							
13-Jul-90	C4		22.70	0.00							
16-Jul-90	C4		22.69	0.00							
18-Jul-90	C4		22.69	0.00							
20-Jul-90	C4		22.65	0.00							
23-Jul-90	C4		22.65	0.00							
25-Jul-90	C4		22.67	0.00							
27-Jul-90	C4		22.67	0.00							
30-Jul-90	C4		22.64	0.00							
03-Aug-90	C4		22.64	0.00							
10-Aug-90	C4		22.66	0.00							

DATE	WELL	DTH	DTW	HT	BAILED	PPM	LEL	NORM	DTB	EMP	C.ELEV
17-Aug-90	C4		22.59	0.00							
24-Aug-90	C4		22.58	0.00							
31-Aug-90	C4		22.55	0.00							
07-Sep-90	C4		22.59	0.00							
14-Sep-90	C4		22.57	0.00							
21-Sep-90	C4		22.53	0.00							
28-Sep-90	C4		22.47	0.00							
05-Oct-90	C4		22.45	0.00							
12-Oct-90	C4		22.51	0.00							
19-Oct-90	C4		22.45	0.00							
26-Oct-90	C4		22.44	0.00							
30-Oct-90	C4		22.48	0.00							
02-Nov-90	C4		22.51	0.00							
09-Nov-90	C4		22.49	0.00							
16-Nov-90	C4		22.49	0.00							
19-Oct-90	C5		22.17	0.00							
26-Oct-90	C5		22.16	0.00							
30-Oct-90	C5		22.11	0.00							
02-Nov-90	C5		22.20	0.00							
09-Nov-90	C5		22.24	0.00							
16-Nov-90	C5		22.21	0.00							