JUL 20 '92 PWM

GROUNDWATER TECHNOLOGY, INC.

4057 Port Chicago Highway, Concord, CA 94520 (415) 671-2387
FAX: (415) 685-9148

ENVIRONMENTAL ASSESSMENT REPORT
CHEVRON SERVICE STATION NO. 9-1153
3126 FERNSIDE BOULEVARD
ALAMEDA, CALIFORNIA

020202747

JULY 16, 1992

Prepared for:
Ms. Nancy Vukelich
Chevron U.S.A. Products Company
2410 Camino Ramon
San Ramon, California 94583-0804

Groundwater Technology, Inc.
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Mike Wray for

Sandra L. Lindsey
Project Manager

Groundwater Technology, Inc.
Reviewed/Approved by

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Registered Geologist
No. 5136

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NO. 5136
STATE OF CALIFORNIA

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(030522)

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ENVIRONMENTAL ASSESSMENT REPORT
CHEVRON SERVICE STATION NO. 9-1153
3126 FERNSIDE BOULEVARD
ALAMEDA, CALIFORNIA

JULY 16, 1992

1.0 INTRODUCTION

This report summarizes the environmental assessment work conducted by Groundwater Technology, Inc. at the Chevron Service Station No. 9-1153 located at 3126 Fernside Boulevard, Alameda, California (Figure 1). The objective of this work was to further evaluate the lateral extent of the dissolved gasoline hydrocarbons in the groundwater beneath the site. The assessment work completed during May and June 1992 included drilling three soil borings, installing monitoring wells in the three borings, soil and groundwater sampling, analyzing the collected samples, and preparing this report.

2.0 BACKGROUND

The former Chevron Service Station No. 9-1153 site is currently a private residence. On August 18, 1986, three 3-inch-diameter monitoring wells (C-1, C-2, and C-3) were installed by Emcon Associates. According to a memorandum dated September 18, 1986, analytical results showed total petroleum hydrocarbons (TPH)-as-gasoline concentrations of 15,000 parts per billion (ppb), 1,000 ppb, and 50 ppb in groundwater samples collected from wells C-1, C-2, and C-3, respectively.

Ten monitoring and sampling events occurred between August 18, 1986, and March 3, 1992, according to a letter report prepared by Sierra Environmental Services dated March 31, 1992. A site map included in the March 31, 1992, letter report shows the location of one former used-oil tank, three other former underground storage tanks, and two former product pump islands.

3.0 WORK SCOPE

3.1 Site-Specific Health and Safety Plan/Permitting

Groundwater Technology prepared a site-specific health and safety plan required by the Occupational Health and Safety Administration (OSHA) Standard "Hazardous Waste Operations and Emergency Response" guidelines (29 CFR 1910.120). The site-specific health and safety plan was prepared by Groundwater Technology following a review of site conditions and any existing Site-Specific Health and Safety Plans for the site. The health and safety plan was reviewed and signed by all of Groundwater Technology's personnel and subcontractors before performing work at the site.

Groundwater Technology revlewed the site history and information with Chevron representatives before beginning work at the site. Drilling permits to install the monitoring wells were obtained from the Alameda County Flood Control and Water Conservation District (Appendix A). Before drilling in the public right of way, excavation permits were obtained from the City of Alameda.

3.2 Soil Borings

On May 15, 1992, Groundwater Technology supervised the drilling of three off-site soil borings (MW-4, MW-5, and MW-6) utilizing a truck-mounted drill rig equipped with 8-inch-diameter, hollow-stem augers. The soil borings were drilled to 16.5 feet below grade. A field geologist, under the supervision of a California Registered Geologist, logged the materials encountered during drilling using the Unified Soil Classification System (Appendix B).

The hollow-stem augers were steam cleaned between each boring. The steam cleaning water was stored in a labeled 55-gallon drum pending disposal. The soil from the borings was placed on, and covered by, polyethylene plastic pending characterization and disposal.

3.3 Soil Sampling

During drilling, soil samples were collected at 5-foot intervals, from approximately 5 feet below grade to the bottom of the boring. Samples were collected using a 2.5-inch outside diameter (O.D.) split-

3.6 Groundwater Monitoring

On June 4, 1992, each monitoring well was monitored to determine the depth to groundwater and the thickness of any separate-phase hydrocarbons. The water levels were measured using an ORS Environmental Equipment INTERFACE PROBE™ Well Monitoring System, consisting of a dual optical sensor and electrical conductivity probe, that distinguishes between water and petroleum products. **No separate-phase hydrocarbons were detected.**

3.7 Groundwater Sampling

On June 4, 1992, each of the site monitoring wells were purged and groundwater samples were collected from wells C-1, C-3, MW-4, MW-5, and MW-6 using a Teflon sampler. Immediately before collecting each water sample, a distilled water rinsate blank was collected from the Teflon sampler as a quality control check on the cleanliness of the sampler. A trip/lab blank was also collected for quality control. Each sample was acidified, labeled, placed on ice in an insulated container, and delivered to a California-certified laboratory. The samples were accompanied by a chain-of-custody record during transport. Each sample was analyzed for BTEX and TPH-as-gasoline using EPA Methods 5030/8020/8015. Water generated during the purging and development process was stored in a Department of Transportation (DOT)-approved water trailer and transported to the Chevron refinery in Richmond, California for recycling.

4.0 SITE CONDITIONS

4.1 Hydrogeology

Topographically, the site is situated at the eastern end of the relatively flat Alameda Island. The surface elevation at the site is approximately 4 feet above mean sea level. The local land surface slopes gently to the east. The site is approximately 400 feet west of a tidal canal that connects to the southeast end of Brooklyn Basin and the northeastern end of the San Leandro Bay.

The materials encountered during drilling consisted of silty fine sand above and below a layer of silty, sandy clay. On June 4, 1992, the groundwater levels at the site ranged between 3.25 feet below grade at well MW-5 to 4.08 feet below grade at well C-1. A potentiometric surface map (Figure 3) was prepared using the water level data collected on June 4, 1992. Figure 3 shows an easterly groundwater flow with a gradient of approximately 0.006 foot per foot. The groundwater level data are presented in Table 1.

4.2 Analytical Results for Soil

On May 15, 1992, the soil samples collected at 3 feet below grade from each boring (MW-4, MW-5, and MW-6) were submitted for chemical analyses. Analytical results for the soil samples collected from the borings show no BTEX or TPH-as-gasoline concentrations above method detection limits (MDL). Results of all soil sample analyses are summarized in Table 2 and the laboratory reports are enclosed in Appendix D.

4.3 Analytical Results for Groundwater

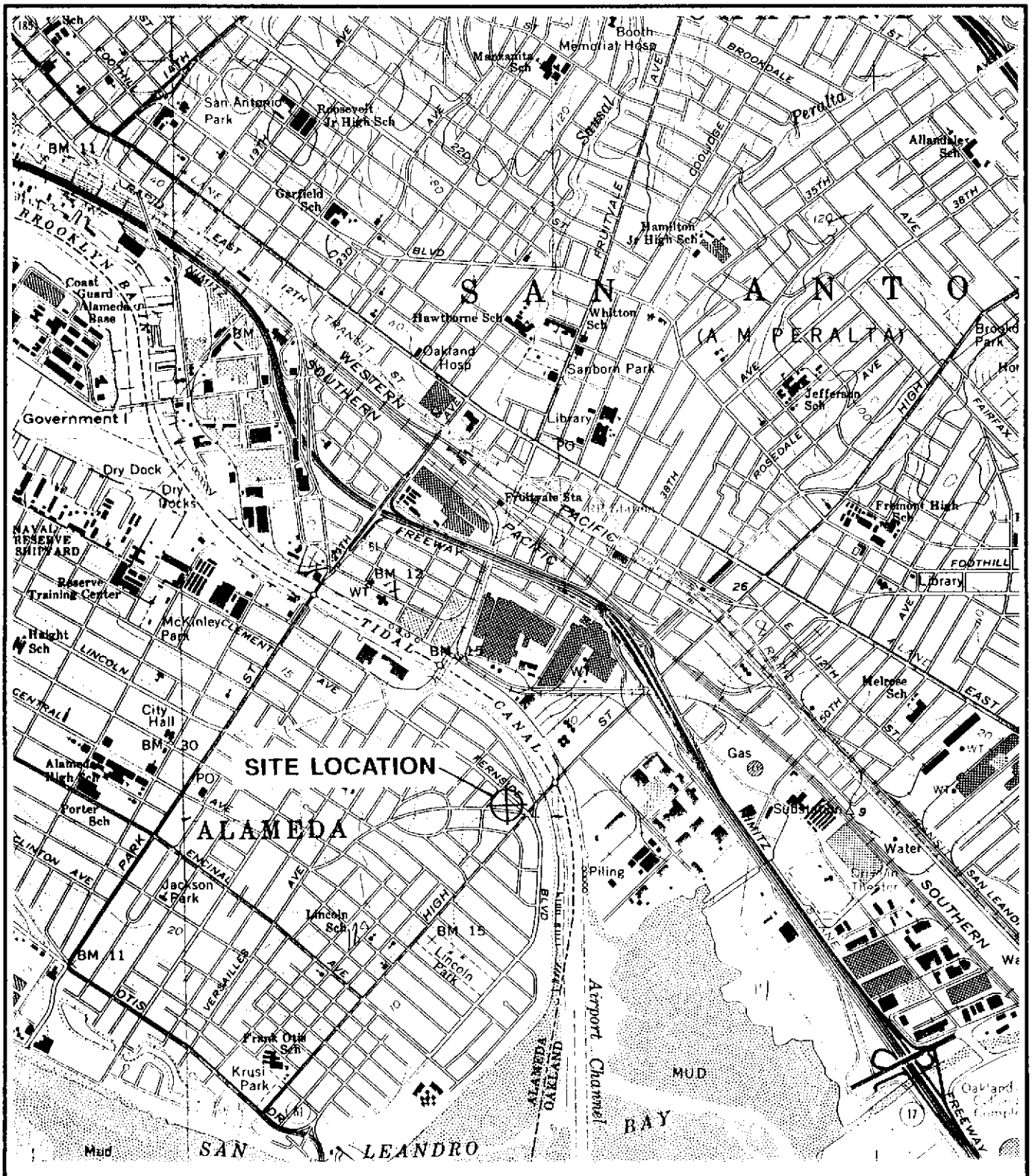
Analytical results for groundwater samples collected on June 4, 1992, reported detectable benzene concentrations in the samples collected from wells C-1, MW-4, MW-5, and MW-6. Benzene concentrations ranged between 0.8 ppb in the sample from well MW-4 to 9,400 ppb in the sample from well C-1. No BTEX or TPH-as-gasoline concentrations were reported above the MDL in the sample collected from well C-3. Results of all water sample analyses are summarized in Table 1, and the laboratory reports are enclosed in Appendix D.

5.0 REFERENCES

Emcon Associates, 1986, Memorandum, Former Chevron Service Station, Fernside Blvd. and Gibbons Drive, Alameda, California, Station # 1153 (unpublished).

Sierra Environmental Services, 1992, Correspondence, Former Chevron Service Station # 9-1153, Fernside Boulevard, Alameda, California (unpublished).

FIGURES



GROUNDWATER TECHNOLOGY

4057 PORT CHICAGO HWY
CONCORD, CA 94520
(510) 671-2387

N

SCALE: 0 FEET 2000

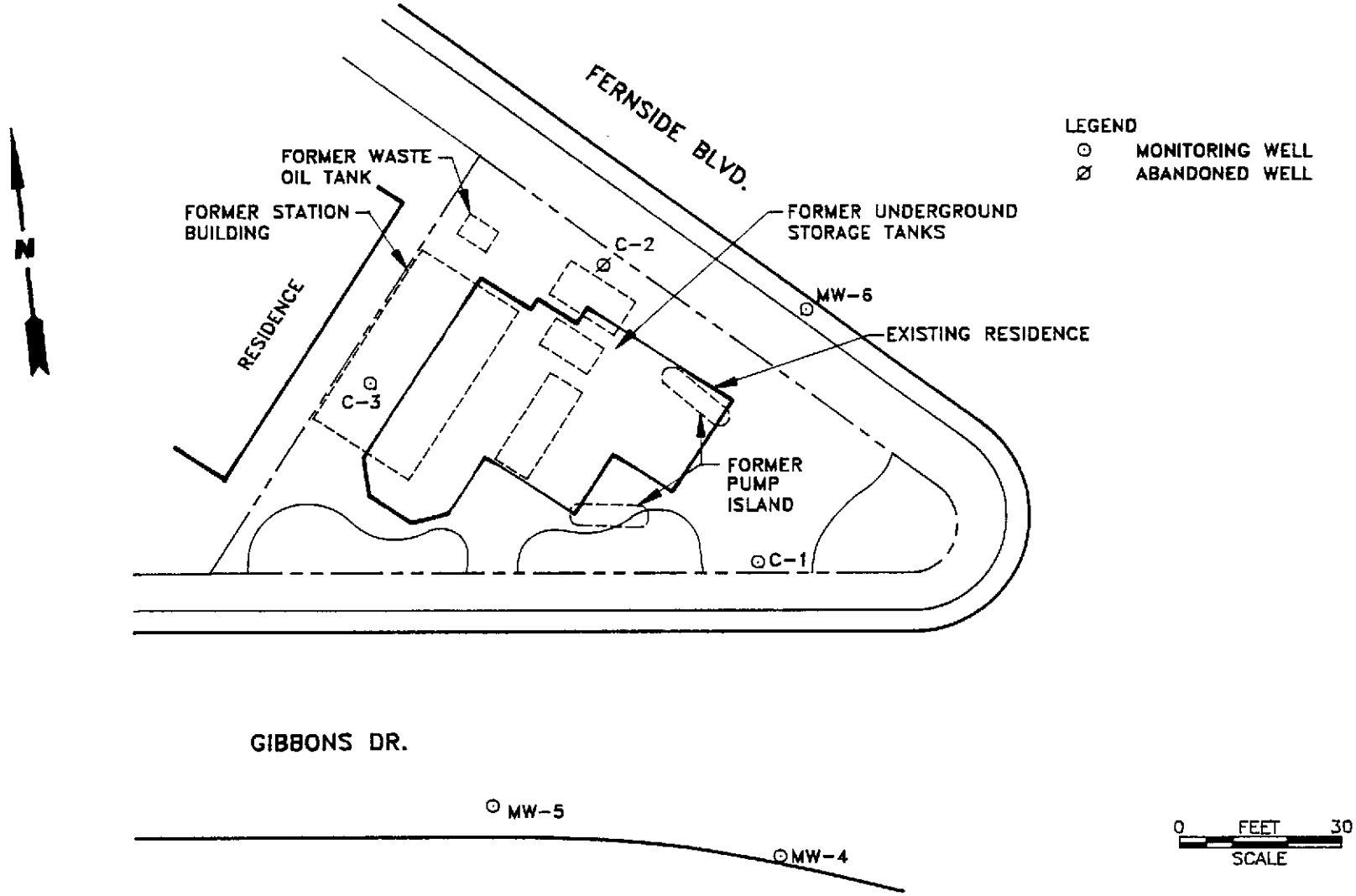
SITE LOCATION MAP

CLIENT: CHEVRON U.S.A. PRODUCTS CO.
SERVICE STATION No. 9-1153

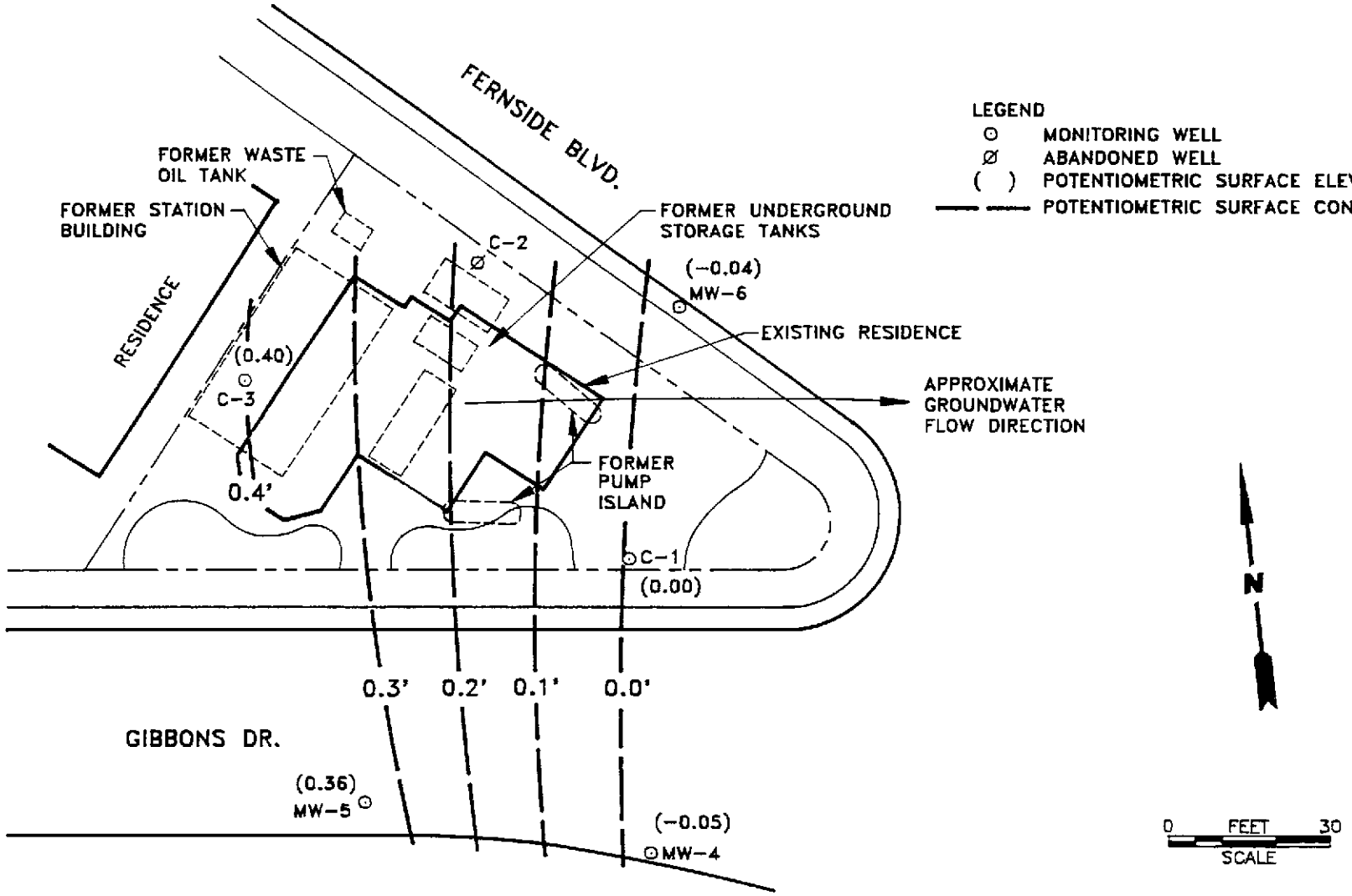
DATE: 7/14/92

LOCATION: 3126 FERNSIDE BLVD.
ALAMEDA, CALIFORNIA

FIGURE: 1



GROUNDWATER TECHNOLOGY 4057 PORT CHICAGO HWY CONCORD, CA 94520 (510) 671-2387				SITE PLAN		
CLIENT: CHEVRON U.S.A. PRODUCTS CO. SERVICE STATION No. 9-1153				LOCATION: 3126 FERNSIDE BLVD. ALAMEDA, CALIFORNIA	REV. NO.: 1	DATE: 7/2/92
PM: GAM	PE/RG: DRK	DESIGNED: GM	DETAILED: ML	ACAD FILE: SP692	PROJECT NO.: 020202747	FIGURE: 2

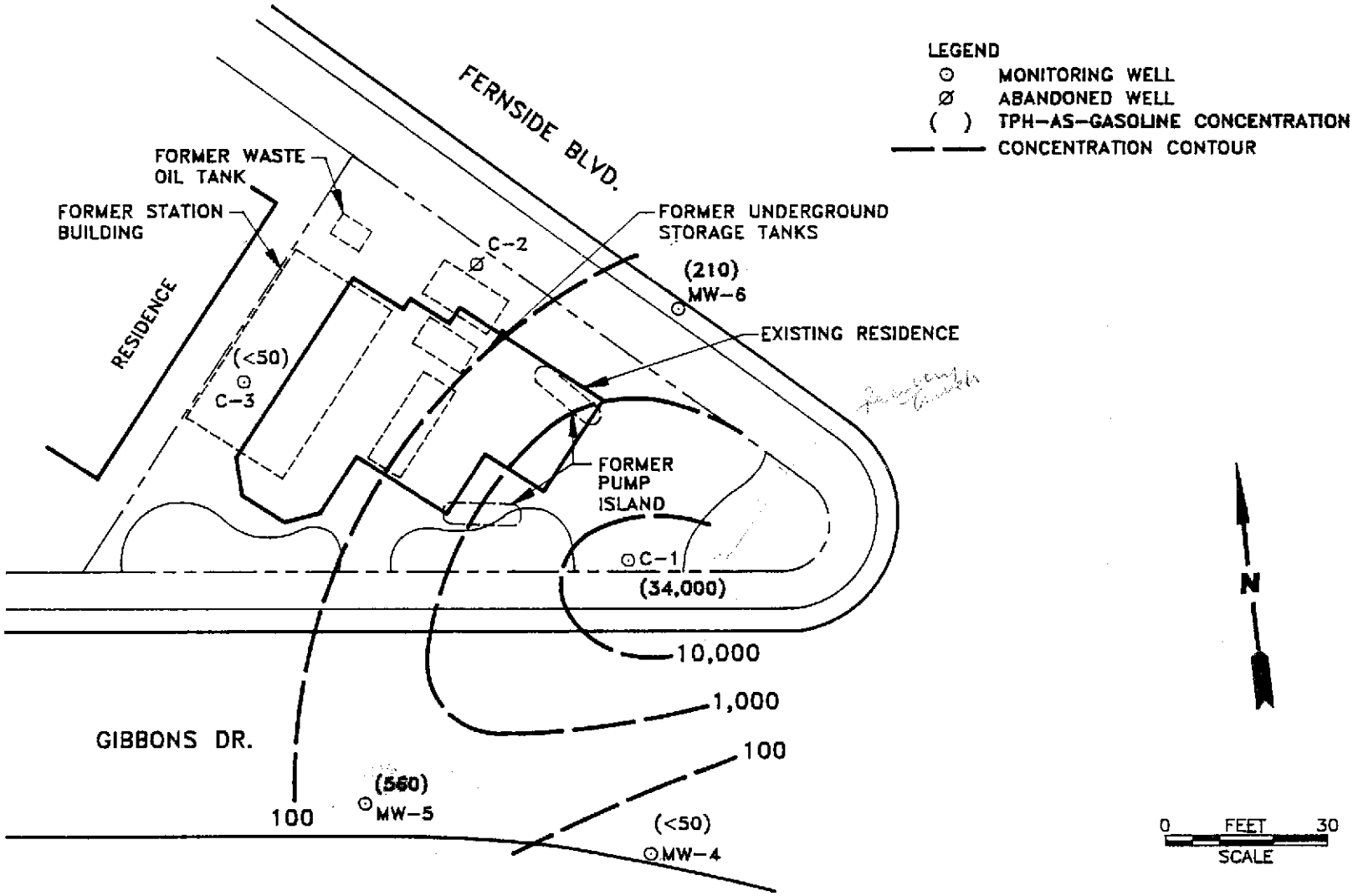


GROUNDWATER TECHNOLOGY
4057 PORT CHICAGO HWY
CONCORD, CA 94520
(510) 671-2387

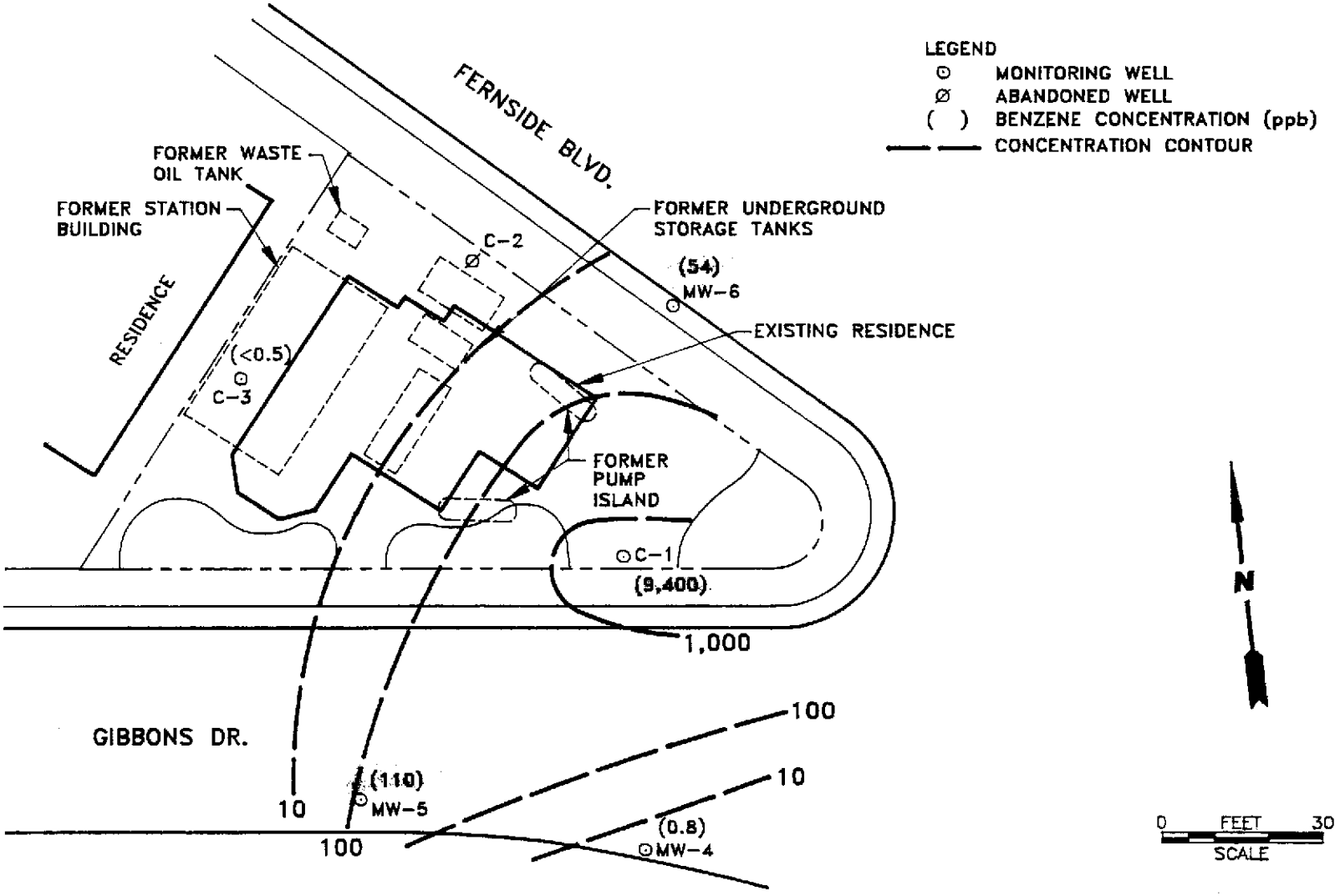
POTENTIOMETRIC SURFACE MAP (6/4/92)

CLIENT:	LOCATION:	REV. NO.:	DATE:
CHEVRON U.S.A. PRODUCTS CO. SERVICE STATION No. 9-1153	3126 FERNSIDE BLVD. ALAMEDA, CALIFORNIA	1	7/14/92

PM	PE/RG	DESIGNED	DETAILED	ACAD FILE:	PROJECT NO.:	FIGURE:
GAM	DRK	GM	ML	PSM6492/SP692	020202747	3



GROUNDWATER TECHNOLOGY 4057 PORT CHICAGO HWY CONCORD, CA 94520 (510) 671-2387				**DISSOLVED TPH-AS-GASOLINE CONCENTRATION MAP (6/4/92)**		
CLIENT: CHEVRON U.S.A. PRODUCTS CO. SERVICE STATION No. 9-1153				LOCATION: 3126 FERNSIDE BLVD. ALAMEDA, CALIFORNIA	REV. NO.: 1	DATE: 7/14/92
PM: GAM	PE/RG: DKK	DESIGNED: GM	DETAILED: ML	ACAD FILE: TPH6492/SP692	PROJECT NO.: 020202747	FIGURE: 4



GROUNDWATER TECHNOLOGY 4057 PORT CHICAGO HWY CONCORD, CA 94520 (510) 671-2387

DISSOLVED BENZENE CONCENTRATION MAP (6/4/92)

CLIENT:	LOCATION:	REV. NO.:	DATE:
CHEVRON U.S.A. PRODUCTS CO. SERVICE STATION No. 9-1153	3126 FERNSIDE BLVD. ALAMEDA, CALIFORNIA	1	7/14/92

PM	PE/RG	DESIGNED	DETAILED	ACAD FILE:	PROJECT NO.:	FIGURE:
GAM	DRK	GM	ML	BNZ6492/SP692	020202747	5

TABLES

TABLE 1
GROUNDWATER ANALYTICAL RESULTS AND MONITORING DATA
COLLECTED ON JUNE 4, 1992
(Concentrations in parts per billion)

SAMPLE ID/ ELEV.	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	TPH-AS-GASOLINE	DTW (ft)	SPT (ft)	GWE (ft)
C-1/4.08	9,400	350	290	1,200	34,000	4.08	0.00	0.00
C-3/4.41	<0.5	<0.5	<0.5	<0.5	<50	4.01	0.00	0.40
MW-4/3.58	0.8	<0.5	<0.5	<0.5	<50	3.63	0.00	-0.05
MW-5/3.61	110	0.5	37	2.2	560	3.25	0.00	0.36
MW-6/3.85	54	<0.5	1.9	2.4	210	3.89	0.00	-0.04

$\overline{\text{TPH}}$ = Total petroleum hydrocarbons
DTW = Depth to groundwater
SPT = Separate-phase hydrocarbon thickness
GWE = Groundwater elevation in feet above mean sea level referenced to a City of Alameda benchmark.

TABLE 2
ANALYTICAL RESULTS FOR SOIL SAMPLES
COLLECTED ON MAY 15, 1992
(Concentration in parts per million)

BORING	SAMPLE ID	SAMPLE DEPTH	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	TPH-AS-GASOLINE
MW-4	MW4A	3	<0.005	<0.005	<0.005	<0.005	<1
MW-5	MW5A	3	<0.005	<0.005	<0.005	<0.005	<1
MW-6	MW6A	3	<0.005	<0.005	<0.005	<0.005	<1

$\overline{\text{TPH}}$ = Total petroleum hydrocarbons

APPENDIX A

WELL INSTALLATION PERMITS

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94588 • (510) 484-2600

13 May 1992

Groundwater Technology
4057 Port Chicago Highway
Concord, CA 94520

Gentlemen:

Enclosed is drilling permit 92234 for a monitoring well construction project at 3126 Fernside Boulevard in Alameda for Chevron USA.

Please note that permit condition A-2 requires that a well construction report be submitted after completion of the work. The report should include drilling and completion logs, location sketch, and permit number.

If you have any questions, please contact Wyman Hong or me at 484-2600.

Very truly yours,

Craig A. Mayfield

Craig A. Mayfield
Water Resources Engineer

WH:mm
Enc.

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE ♦ PLEASANTON, CALIFORNIA 94566 ♦ (415) 484-2600

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 3126 Fernside Blvd.
Alameda, California
Chevron Site No. 9-1153

CLIENT
Name Chevron USA Products Company
Address P.O. Box 5004 Phone 842-9591
City San Ramon Zip 94583

APPLICANT
Name Groundwater Technology, Inc.
Address 4057 Port Chicago Phone 671-2387
City Concord Zip 94520

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	___	General	
Water Supply	___	Contamination	X
Monitoring	X	Well Destruction	___

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other None
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger X
Cable ___ Other ___

DRILLER'S LICENSE NO. 482390

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 25 ft.
Surface Seal Depth 5 ft. Number 3

GEOTECHNICAL PROJECTS
Number of Borings ___ Maximum
Hole Diameter ___ in. Depth ___ ft.

ESTIMATED STARTING DATE 5-15-92
ESTIMATED COMPLETION DATE 5-18-92

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S
SIGNATURE _____ Date _____

FOR OFFICE USE

PERMIT NUMBER 92234
LOCATION NUMBER _____

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A.) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

(B.) WATER WELLS, INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 11 May 92
Wyman Hong

51991

APPENDIX B

DRILL LOGS AND WELL CONSTRUCTION SPECIFICATIONS

Drilling Log

GROUNDWATER TECHNOLOGY

Monitoring Well **MW-4**

Project CHEVRON FERNSIDE — Owner CHEVRON U.S.A. INC.
Location 3126 Fernside Blvd. — Project No. 020202747 — Date drilled 05/15/92
Surface Elev. ____ — Total Hole Depth 16.5 ft. — Diameter 8 inches
Top of Casing 3.58 ft. — Water Level Initial 4.0 ft. — Static 3.63 ft.
Screen: Dia 2 in. — Length 12 ft. — Type/Size 0.020 in.
Casing: Dia 2 in. — Length 3.0 ft. — Type Sched. 40 PVC
Filter Pack Material Lapis Lustre No. 2/12 — Rig/Core Type Mobile B-53/split spoon
Drilling Company Kvilhaug Drilling — Method Hollow stem auger — Permit # ____
Driller Mike Crocker — Log By Steve Kranyak
Checked By David R. Kleesattel — License No. 5136

See Site Map For Boring Location

COMMENTS:

Depth (ft.)	Well Completion	PID (ppm)	Sample ID / Blow Count / % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
0						6 inches asphalt
						6 inches base coarse aggregate
2					SM	Brown silty fine SAND (loose, moist, no hydrocarbon odor)
			A 3 4			
4		0	4 6			Water level on 06/04/92
			B 9			*Encountered water at 4.0 feet below grade on 05/15/92.*
		0	15			
6						
8					CL	Brown silty CLAY with some fine sand (medium stiff, moist, no hydrocarbon odor)
10			5			(some fine gravels)
			C 5			
		0	6			
12						
14					SM	Brown silty fine SAND (loose, wet, no hydrocarbon odor)
			4			
			D 3			
16		0	5			End of boring at 16.5 below grade. Installed monitoring well.

Drilling Log

GROUNDWATER TECHNOLOGY

Monitoring Well **MW-5**

Project CHEVRON FERNSIDE Owner CHEVRON U.S.A. INC.
Location 3126 Fernside Blvd. Project No. 020202747 Date drilled 05/15/92
Surface Elev. ____ Total Hole Depth 16.5 ft. Diameter 8 inches
Top of Casing 3.61 ft. Water Level Initial 4.0 ft. Static 3.25 ft.
Screen: Dia 2 in. Length 12 ft. Type/Size 0.020 in.
Casing: Dia 2 in. Length 3.0 ft. Type Sched. 40 PVC
Filter Pack Material Lapis Lustre No. 2/12 Rig/Core Type Mobile B-53/split spoon
Drilling Company Kvilhaug Drilling Method Hollow stem auger Permit # ____
Driller Mike Crocker Log By Steve Kranvak
Checked By David R. Kleesattel License No. 5136

See Site Map For Boring Location

COMMENTS:

Depth (ft.)	Well Completion	PID (ppm)	Sample ID / Blow Count / % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
0						6 inches asphalt
						6 inches of base coarse aggregate
2						Brown silty fine SAND (loose, wet, no hydrocarbon odor)
			A 3 4 5		SM	
		0				Water elevation on 06/04/92
4						*Encountered water at 4.0 feet below grade on 05/15/92.*
6						
8					CL	Brown and gray mottled silty CLAY with some fine sand (soft, wet, no hydrocarbon odor)
10			B 5 5 6			
		0				
12						
14					SM	Brown silty fine SAND (loose, wet, no hydrocarbon odor)
			C 3 5 7			
16		0				End of boring at 16.5 below grade. Installed monitoring well.

Drilling Log

GROUNDWATER TECHNOLOGY

Monitoring Well MW-6

Project CHEVRON FERNSIDE Owner CHEVRON U.S.A. INC.
Location 3126 Fernside Blvd. Project No. 020202747 Date drilled 05/15/92
Surface Elev. ____ Total Hole Depth 16.5 ft. Diameter 8 inches
Top of Casing 3.85 ft. Water Level Initial 4.0 ft. Static 3.89 ft.
Screen: Dia 2 in. Length 12 ft. Type/Size 0.020 in.
Casing: Dia 2 in. Length 3.0 ft. Type Sched. 40 PVC
Filter Pack Material Lapis Lustre No. 2/12 Rig/Core Type Mobile B-53/split spoon
Drilling Company Kvilhaug Drilling Method Hollow stem auger Permit # ____
Driller Mike Crocker Log By Steve Kranvak
Checked By David R. Kleesattel License No. 5136

See Site Map For Boring Location

COMMENTS:

Depth (ft.)	Well Completion	PID (ppm)	Sample ID / Blow Count / % Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
-2 to 16		0	A 3 4 4		SM	Dark brown silty fine SAND (loose, moist, no hydrocarbon odor)
4						Water elevation on 06/04/92 *Encountered water at 4.0 feet below grade on 05/15/92.*
8 to 12		0	B 3 5 4		CL	Brown and grey mottled silty CLAY with some fine sand (soft, wet, no hydrocarbon odor)
14					SM	Brown silty fine SAND (loose, wet, no hydrocarbon odor)
16		0	C 4 5 7			End of boring at 16.5 below grade. Installed monitoring well.

APPENDIX C

GROUNDWATER TECHNOLOGY'S STANDARD OPERATING PROCEDURES (SOPS)

GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE
CONCERNING GROUNDWATER MONITORING
SOP 8

Groundwater monitoring of wells at the site shall be conducted using an ORS Environmental Equipment (ORS) INTERFACE PROBE ™ and SURFACE SAMPLER™. The INTERFACE PROBE ™ is a hand-held, battery-operated device for measuring depth to petroleum product and depth to water as measured from an established datum (*i.e.*, top of the well casing which has ben surveyed). Separate-phase hydrocarbon (product) thickness is then calculated by subtracting the depth to product from the depth to water. In addition, water elevations are adjusted for the presence of fuel with the following calculation:

(Product Thickness) (0.8) + (Water Elevation) = Corrected Water Elevation

Note: The factor of 0.8 accounts for the density difference between water and petroleum hydrocarbons.

The INTERFACE PROBE ™ consists of a dual-sensing probe which utilizes an optical liquid sensor and electrical conductivity to distinguish between water and petroleum products. A coated steel measuring tape transmits the sensor's signals to the reel assembly where an audible alarm sounds a continuous tone when the sensor is immersed in petroleum product and an oscillating tone when immersed in water. The INTERFACE PROBE ™ is accurate to 1/16th inch.

A SURFACE SAMPLER™ shall be used for visual inspection of the groundwater to note sheens (difficult to detect with the INTERFACE PROBE ™), odors, microbial action, etc.

The SURFACE SAMPLER™ used consists of a 12-inch-long case acrylic tube with a Delrin ball which closes onto a conical surface creating a seal as the sampler is pulled up. The sampler is calibrated in inches and centimeters for visual inspection of product thickness.

To reduce the potential for cross contamination between wells, the monitorings shall take place in order from the least to the most contaminated wells. Wells containing separate-phase hydrocarbons (free product) should be monitored last. Between each monitoring the equipment shall be washed with laboratory-grade detergent and double rinsed with distilled water.

GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE
CONCERNING WATER SAMPLING METHODOLOGY
SOP 9

Before water sampling, each well shall be purged by pumping a minimum of four well volumes or until the discharge water indicates stabilization of temperature conductivity and pH. If the well is evacuated before four well volumes are removed or stabilization is achieved, the sample should be taken when the water level in the well recovers to 80 percent of its initial level.

Retrieval of the water sample, sample handling and sample preservation shall be conducted according to Standard Operating Procedure 10 concerning "Sampling for Volatiles in Water." The sampling equipment used shall consist of a Teflon® and/or stainless steel samplers which meet U.S. Environmental Protection Agency (EPA) regulations. Glass vials with Teflon® lids should be used to store the collected samples.

To ensure sample integrity, each vial shall be filled with the sampled water in such a way that the water stands above the lip of the vial. The cap should then be quickly placed on the vial and tightened securely. The vial should then be checked to ensure that air bubbles are not present prior to labeling of the sample. Label information should include a sample identification number, job identification, date, time, type of analysis requested, and sampler's name. Chain-of-custody records shall be completed according to Standard Operating Procedure (SOP) 11 concerning chain of custody.

The vials should be immediately placed in high quality coolers for shipment to the laboratory. The coolers should be packed with sufficient ice or freezer packs to ensure that the samples are kept below 4° Celsius (C). To minimize sample degradation the prescribed analysis shall take place within seven days of sample collection unless specially prepared acidified vials are used.

To minimize the potential for cross contamination between wells, all the well development and water sampling equipment which contacts the groundwater shall be cleaned between each sampling. As a second precautionary measure, the wells shall be sampled in order of increasing contaminant concentrations (the least contaminated well first, the most contaminated well last) as established by previous analysis.

STANDARD OPERATING PROCEDURE 10
CONCERNING SAMPLING FOR VOLATILES IN WATER
(DISSOLVED GASOLINE, SOLVENTS, ETC.)
SOP 10

1. Use only vials properly washed and baked.

2. Use clean sampling equipment. Scrub with Alconox or equivalent laboratory detergent and water followed by a thorough water rinse. Complete with a distilled water rinse.

   Sampling equipment which has come into contact with liquid hydrocarbons (free product) should be regarded with suspicion. Such equipment should have tubing and cables replaced and all resilient parts washed with laboratory detergent solution as indicated above. Visible deposits may have to be removed with hexane. Solvent washing should be followed by detergent washing, as indicated above.

   This procedure is valid for volatile organic analysis only. For extractable organics (for example, pesticides, or base neutrals for U.S. Environmental Protection Agency [EPA] Method 625 a final rinse with pesticide-grade isopropyl alcohol), followed by overnight or oven drying will be necessary.

3. Take duplicate samples. Mark on forms as a single sample with two containers to avoid duplication of analyses.

4. Take a site blank using distilled water or known uncontaminated source. This sample will be run at the discretion of the project manager.

5. Fill out labels and forms as much as possible ahead of time. Use an indelible marker.

6. Preservatives are required for some types of samples. Use specially prepared vials marked as indicated below, or use the appropriate field procedure (SOP 12 for acidification). Make note on forms that samples were preserved. Always have extra vials in case of problems. Samples for volatile analyses should be acidified below pH 2 upright. Eye protection, foot protection, and disposable vinyl gloves are required for handling. Samples designated for expedited service and analyzed within seven (7) days of sampling will be acceptable without preservation. Acid-causing burns. Glasses or goggles (not contact lenses) are necessary for protection of the eyes. Flush eyes with water for 15 minutes if contact occurs and seek medical attention. Rinse off hands frequently with water during handling.

   For sampling chlorinated drinking water supplies for chlorinated volatiles, samples shall be preserved with sodium thiosulfate. Use vials labeled "CONTAINS THIOSULFATE." No particular cautions are necessary.

7. Fill vial to overflowing with water, avoiding turbulence and bubbling as much as possible. Water should stand above lip of vial.

8. Carefully, but quickly, slip cap onto vial. Avoid dropping the Teflon® septum from cap by not inverting cap until it is in contact with the vial. Disc should have Teflon® face toward the water. Also avoid touching white Teflon® face with dirty fingers.

9. Tighten cap securely, invert vial, and tap against hand to see there are not bubbles inside.

10. Label vial, using indelible ink, as follows:

    A. Sample I.D. No.
    B. Job I.D. No.
    C. Date and Time
    D. Type of analysis required
    E. Your name

11. Unless the fabric-type label is used, place Scotch™ tape over the label to preserve its integrity.

12. For chain-of-custody reasons, sample vial should be wrapped end-for-end with Scotch™ tape or evidence tape and signed with indelible ink where the end of the tape seals on itself. The septum needs to be covered.

13. Chill samples immediately. Samples to be stored should be kept at 4° Celsius (C) (30° Fahrenheit [F]). Samples received at the laboratory above 10°C (as measured at glass surface by a thermocouple probe), after overnight shipping, will be considered substandard, so use a high quality cooler with sufficient ice or freezer packs.

14. Fill out Chain-of-Custody Manifest and Analysis Request Form (see Chain of Custody Procedures, SOP 11).

GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE
CONCERNING CHAIN OF CUSTODY
SOP 11

1. Samples must be maintained under custody until shipped or delivered to the laboratory. The laboratory will then maintain custody. A sample is under custody if:

    a) It is in your possession
    b) It is in your view after being in your possession
    c) You locked it up after it was in your possession
    d) It is in a designated secure area

2. Custody of samples may be transferred from one person to another. Each transferor and recipient must date, sign and note the time on the chain-of-custody form.

3. In shipping, the container must be sealed with tape, and bear the sender's signature across the area of bonding at the ends of the tape to prevent undetected tampering. Each sampling jar should be taped and signed as well. Scotch tape works well.

4. Write "sealed by" and sign in the "Remarks" box at the bottom of the form before sealing the box. Place form in a plastic bag and seal it inside the box.

5. The "REMARKS" section of the form is for documenting details such as:

    a) Correlation of sample numbers if samples are split between labs.
    b) QC numbers when lab is logging in the samples.
    c) Sample temperature and condition when received by lab.
    d) Preservation notation.
    e) pH of samples when opened for analysis (if acidified).
    f) Sampling observation or sampling problem.

6. The chain-of-custody form should be included inside the shipping container. A copy should be sent to the project manager.

7. When the samples are received by the lab, the chain-of-custody form will be dated, signed, and the time noted by a laboratory representative. The form will be retained in the laboratory files along with shipping bills and receipts .

8. At the time of receipt of samples by the laboratory, the shipping container will be inspected and the sealing signature will be checked. The samples will be inspected for condition and bubbles, and the temperature of a representative sample container will be measured externally by a thermocouple probe (held tightly between two samples) and recorded. The laboratory QC numbers will be placed on the labels, in the accession log, and on the chain-of-custody form. If samples are acidified, their pH will be measured by narrow range pH paper at the time of opening for analysis. All comments concerning procedures requiring handling of the samples will be dated and initialed on the form by the laboratory person performing the procedure. A copy of the completed chain-of-custody form with the comments on sample integrity will be returned to the sampler.

GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE
CONCERNING SOIL SAMPLING METHODOLOGY
SOP 14

1. Soil samples should be collected and preserved in accordance with Groundwater Technology Standard Operating Procedure (SOP 15) concerning Soil Sample Collection and Handling when Sampling for Volatile Organics. A hollow stem soil auger should be used to drill to the desired sampling depth. A standard 2 inch diameter split spoon sampler 18 inches in length shall be used to collect the samples. The samples are contained in 2 inch diameter by 6 inch long thin walled brass tube liners fitted into the split spoon sampler (three per sampler).

2. The split spoon sampler should be driven the full depth of the spoon into the soil by a 140 pound hammer. The spoon shall then be extracted from the borehole and the brass tube liners containing the soil sample removed from the sampler. The ends of the liner tubes should be immediately covered with aluminum foil, sealed with a teflon or plastic cap, and taped with duct tape. After being properly identified with sample data entered on a standard chain of custody form the samples shall be placed on dry ice (maintained below 4~C) and transported to the laboratory within 24 hours.

3. One of the three soil samples retrieved at each sample depth shall be analyzed in the field using a photoionization detector and/or explosimeter. The purpose of the field analysis is to provide a means to choose samples to be laboratory analyzed for hydrocarbon concentrations and to enable comparisons between the field and laboratory analyses. The soil sample shall be sealed in a plastic bag and allowed to equilibrate with the air surrounding the soil for approximately 10 minutes. One of the two field vapor instruments shall be used to quantify the amount of hydrocarbon released to the air from the soils. The data shall be recorded on the drill logs at the depth corresponding to the sample point.

GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE
CONCERNING SOIL SAMPLE COLLECTION AND
HANDLING WHEN SAMPLING FOR VOLATILE ORGANICS
SOP 15

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1. Use a sampling means which maintains the physical integrity of the samples. The project sampling protocol will designate a preferred sampling tool. A split spoon sampler with liners, or similar tube sampler which can be sealed, is best.

2. The samples should be sealed in the liner, with teflon plugs (The "California Sampler") or plastic caps.

3. For sending whole-core samples (above):

   A. Seal ends of liner with teflon plugs or plastic caps, leaving no free air space inside.

   B. Tape with duct tape.

   C. Label the sample with the following information: sample identification, depth, date and time, project number and required analyses.

   D. Place in plastic bag labeled with indelible marker. Use Well #, depth, date, and job #.

   E. Place inside a second bag and place a labelling tag inside outer bag.

   F. Enclose samples in a cooler with sufficient ice or dry ice to maintain samples at 4 degrees C during shipment.

   G. Seal cooler with a lock, or tape with samplers signature so tampering can be detected.

   H. Package cooler in a box with insulating material. Chain of custody forms can be placed in a plastic bag in this outer box.

   I. If dry ice is used, a maximum of 5 pounds is allowed by Federal Express without special documents(documents are easy to obtain but are not necessary for under 5 pounds). Write "ORM-A dry ice", "_____ pounds, for research" on outside packaging and on regular airbill under classification. UPS does not accept dry ice.

   J. Soil cores kept a 4 degrees C are only viable for up to 7 days when aromatic hydrocarbons are involved. The lab should prepare the samples in methanol once in the lab.

4. Good sampling practice would include preparing 1 out of 5 samples to be prepared in duplicates for analysis. These 4 out of 20 samples will be used for the following purposes:

A. One in every 20 samples should be analyzed as a field replicate to evaluate the precision of the sampling technique. A minimum of 1 sample per data set is suggested.

B. An additional 1 in 20 samples should be selected by sampler to be prepared in duplicate as alternative to Step (A). Choose a different soil type if available.

C. The remaining 2 in 20 samples should be used by lab for spiking with reference materials for internal QC.

Other QC procedures can be specified at the project manager's discretion.

5. Decontamination of equipment in the field requires a detergent wash, with a distilled water rinse.

GROUNDWATER TECHNOLOGY, INC.
STANDARD OPERATING PROCEDURE
CONCERNING OPERATION/CALIBRATION OF
PHOTOIONIZATION ANALYZER
SOP 19

1. The Thermo Environmental Instruments Inc. Model 580B OVM Photoionization Analyzer shall be used, using photolonization, to measure the concentration of trace gases over a range of less than 1 ppm to 2,000 ppm. The specific instrument used for investigations related to hydrocarbon contamination should be calibrated for direct readings in parts per million (ppm) volume/volume of isobutylene. Specifics of the detection principle/theory and functions of various components can be found in the manufactures instruction manual.

2. To assure optimum performance, the photoionization analyzer should be calibrated with a standard gas mixture of known concentration from a pressurized container. A daily procedure for calibration involves bringing the probe and readout close to the calibration gas, cracking the valve on the tank and checking the instrument reading. This provides a useful spot check for the instrument.

3. A procedure conducted weekly for more accurate calibration of the instrument from a pressurized container is to connect one side of a "T" to the pressurized container of calibration gas, another side of the "T" to a rotameter and the third side of the "T" directly to the 8" extension to the photoionization probe (see Figure 2). Crack the valve of the pressurized container until a slight flow is indicated on the rotameter. The instrument draws in the volume of sample required for detection, and the flow in the rotameter indicates an excess of sample. Now adjust the span pot so that the instrument reads the exact value of the calibration gas. (If the instrument span setting is changed, the instrument should be turned back to the standby position and the electronic zero should be readjusted, if necessary).

APPENDIX D

LABORATORY REPORTS
AND
CHAIN-OF-CUSTODY RECORDS

Superior Precision Analytical, Inc.
825 Arnold Drive, Suite 114 • Martinez, California 94553 • (510) 229-1512 / fax (510) 229-1526

GROUNDWATER TECHNOLOGIES INC.
Attn: Sandra Lindsey

Project 020202747
Reported 05/20/92

TOTAL PETROLEUM HYDROCARBONS

Lab #	Sample Identification	Sampled	Analyzed	Matrix
85735- 1	MW4A	05/15/92	05/19/92	Soil
85735- 4	MW5A	05/15/92	05/19/92	Soil
85735- 6	MW6A	05/15/92	05/20/92	Soil

RESULTS OF ANALYSIS

Laboratory Number:	85735- 1	85735- 4	85735- 6
Gasoline:	ND<1	ND<1	ND<1
Benzene:	ND<.005	ND<.005	ND<.005
Toluene:	ND<.005	ND<.005	ND<.005
Ethyl Benzene:	ND<.005	ND<.005	ND<.005
Xylenes:	ND<.005	ND<.005	ND<.005
Concentration:	mg/kg	mg/kg	mg/kg

Fax copy of Lab Report and COC to Chevron Contact: ☐ Yes ☐ No

85735

Chain-of-Custody-Record

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

Chevron Facility Number 9-1153
Facility Address 3126 Fernside Blvd, Alameda
Consultant Project Number 020202747
Consultant Name Groundwater Tech
Address 4057 Port Chicago Hwy. Concord
Project Contact (Name) Sandra Lindsay
(Phone) 510 671-2387 (Fax Number)

Chevron Contact (Name) Nancy Vukelich
(Phone) (510) 842 9581
Laboratory Name Superior Analytical
Laboratory Release Number 590 1400
Samples Collected by (Name) Steve Kramyck
Collection Date 5/5/92
Signature

Sample Number	Lab Sample Number	Number of Containers	Matrix S = Soil A = Air W = Water C = Charcoal	Type G = Grab C = Composite D = Discrete	Time	Sample Preservation	Iced (Yes or No)	Analyses To Be Performed: BTEX + TPH GAS (8020 + 8015)	TPH Diesel (8015)	Oil and Grease (5520)	Purgeable Halocarbons (8010)	Purgeable Aromatics (8020)	Purgeable Organics (8240)	Extractable Organics (8270)	Metals Cd,Cr,Pb,Zn,Ni (ICAP or AA)	Hardness				Remarks
MW4A	1	1	S	G	10:00		yes	X												
B	2															X				
C	3															X				
MW5A	4							X												
B	5															X				
MW6A	6							X												
B	7	↓	↓	↓	4:15		↓									X				

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
	GTE	5/15/92		Express-FT	5/15/92 12:00
Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Organization	Date/Time
	Express-FT	5/15/92 12:30			
Relinquished By (Signature)	Organization	Date/Time	Received For Laboratory By (Signature)		Date/Time
					12:30pm 5/15/92

Turn Around Time (Circle Choice)
24 Hrs.
48 Hrs.
5 Days
10 Days
As Contracted

Superior Precision Analytical, Inc.
1555 Burke, Unit I ▪ San Francisco, California 94124 ▪ (415) 647-2081 / fax (415) 821-7123

Groundwater Technology Inc.
Attn: Sandra Lindsey

Project 020302747
Reported 06/11/92

TOTAL PETROLEUM HYDROCARBONS

Lab #	Sample Identification	Sampled	Analyzed	Matrix
13159- 1	TB-LB	06/04/92	06/09/92	Water
13159- 2	RBC3	06/04/92	06/09/92	Water
13159- 3	C3	06/04/92	06/09/92	Water
13159- 5	MW5	06/04/92	06/09/92	Water
13159- 7	MW6	06/04/92	06/09/92	Water
13159- 9	MW4	06/04/92	06/11/92	Water
13159-11	C1	06/04/92	06/10/92	Water

RESULTS OF ANALYSIS

Laboratory Number:	13159- 1	13159- 2	13159- 3	13159- 5	13159- 7
Gasoline:	ND<50	ND<50	ND<50	560	210
Benzene:	ND<0.5	ND<0.5	ND<0.5	110	54
Toluene:	ND<0.5	ND<0.5	ND<0.5	0.5	ND<0.5
Ethyl Benzene:	ND<0.5	ND<0.5	ND<0.5	37	1.9
Xylenes:	ND<0.5	ND<0.5	ND<0.5	2.2	2.4
Concentration:	ug/L	ug/L	ug/L	ug/L	ug/L

Laboratory Number:	13159- 9	13159-11
Gasoline:	ND<50	34000
Benzene:	0.8	9400
Toluene:	ND<0.5	350
Ethyl Benzene:	ND<0.5	290
Xylenes:	ND<0.5	1200
Concentration:	ug/L	ug/L

Superior Precision Analytical, Inc.
1555 Burke, Unit I ▪ San Francisco, California 94124 ▪ (415) 647-2081 / fax (415) 821-7123

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

QA/QC INFORMATION
SET: 13159

NA = ANALYSIS NOT REQUESTED
ND = ANALYSIS NOT DETECTED ABOVE QUANTITATION LIMIT
ug/L = parts per billion (ppb)

OIL AND GREASE ANALYSIS By Standard Methods Method 5520F:
Minimum Detection Limit in Water: 5000ug/L

Modified EPA SW-846 Method 8015 for Extractable Hydrocarbons:
Minimum Quantitation Limit for Diesel in Water: 50ug/L

EPA SW-846 Method 8015/5030 Total Purgable Petroleum Hydrocarbons:
Minimum Quantitation Limit for Gasoline in Water: 50ug/L

EPA SW-846 Method 8020/BTXE
Minimum Quantitation Limit in Water: 0.5ug/L

ANALYTE	SPIKE LEVEL	MS/MSD RECOVERY	RPD	CONTROL LIMIT
Gasoline:	200 ng	98/87	12%	76-111
Benzene:	200 ng	101/101	0%	78-110
Toluene:	200 ng	94/94	0%	78-111
Ethyl Benzene:	200 ng	92/92	0%	78-118
Xylenes:	600 ng	93/94	1%	73-113

Richard Srna, Ph.D.
Laboratory Director

Fax copy of Lab Report and COC to Chevron Contact: ☐ Yes ☐ No 13154

Chain-of-Custody-Record

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

Chevron Facility Number 9-1153
Facility Address 3126 Fruitvale Blvd., Alameda, CA
Consultant Project Number 020302747
Consultant Name Groundwater Technology, Inc.
Address 4057 Port Chicago Hwy., Concord, CA
Project Contact (Name) Sandra Lindley
(Phone) 671-2387 (Fax Number) 685-9148

Chevron Contact (Name) Nancy Vukelich
(Phone) 842-9581
Laboratory Name Superior Analytical
Laboratory Release Number 5901400
Samples Collected by (Name) HECTOR MEDINO
Collection Date 6-4-92
Signature

Sample Number	Lab Sample Number	Number of Containers	Matrix S = Soil W = Water A = Air C = Charcoal	Type G = Grab C = Composite D = Discrete	Time	Sample Preservation	Iced (Yes or No)	BTEX + TPH GAS (8020 + 8015)	TPH Diesel (8015)	Oil and Grease (5520)	Purgeable Halocarbons (8010)	Purgeable Aromatics (8020)	Purgeable Organics (8240)	Extractable Organics (8270)	Metals Cd,Cr,Pb,Zn,Ni (ICAP or AA)			TPH-D			Remarks
TB-LB		1	W	G			Yes	X													
FBC3		1						X													
C3		3						X													
FB MW5		1																X			
MW5		3						X													
FB MW6		1																X			
MW6		3						X													
FB MW4		1																X			
MW4		3						X													
FB-C1		1																X			
C1		3	X	X			Yes	X													

Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Organization	Date/Time
	GTI	6/4/92			
Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Organization	Date/Time
Relinquished By (Signature)	Organization	Date/Time	Received for Laboratory By (Signature)		Date/Time
					6/4/92 5:10pm

Turn Around Time (Circle Choice)
24 Hrs.
48 Hrs.
5 Days
10 Days
As Contracted

COC-3.DWG/03 91/HCH