QUARTERLY GROUNDWATER MONITORING
SECOND QUARTER 1991
BEACON STATION NO. 720
1088 MARINA BOULEVARD
SAN LEANDRO, CALIFORNIA
FOR
ULTRAMAR, INC.

NO. EU-501/E189-01
JUNE 18, 1991

ENVIRONMENTAL GEOTECHNICAL CONSULTANTS, INC.
CONSULTANTS IN APPLIED EARTH SCIENCE

EGC

ENVIRONMENTAL GEOTECHNICAL CONSULTANTS, INC.
CONSULTANTS IN APPLIED EARTH SCIENCE

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No. EU-501/E189-01
June 18, 1991

Ultramar, Inc.
525 W. Third Street
Hanford, CA 93232-0466

Attention: Mr. Terrence A. Fox

SUBJECT: Quarterly Groundwater Monitoring, Second Quarter 1991, Beacon Station No. 720, 1088 Marina Boulevard, San Leandro, California

Dear Mr. Fox:

Environmental Geotechnical Consultants, Inc., (EGC) is pleased to present the results of quarterly groundwater monitoring at the above-referenced site. This work was authorized by Ultramar, Inc., (Ultramar) as your Task Order Number 720-11-0000-C. Sampling and analysis were conducted in accordance with EGC's "Groundwater Sampling and Analysis" Protocols, included as Appendix A.

The location of the subject site is shown in Figure 1. On May 14, 1991, water levels were measured and samples were obtained from each of the five groundwater monitoring wells at the site. The locations of the wells and other site features are shown on Figure 2. Water purged from the wells before sampling was placed in one labelled 55-gallon drum which is being stored at the site. The samples were transported under chain-of-custody protocol for laboratory analysis. Samples were analyzed for Total Petroleum Hydrocarbons as Gasoline (TPHg) by standard method GC FID/5030 and Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX) by Environmental Protection Agency (EPA) method 602. In addition, one sample (MW-3) was analyzed for Total Dissolved Solids by EPA method 160.1, Nitrates by EPA method 300, and eight inorganic substances by various methods. Laboratory analyses were conducted by Applied Analytical Environmental Laboratories of Fremont, California, a laboratory certified by the State of California to conduct the analyses.

Discussion

Groundwater elevations were measured prior to purging the monitoring wells and sampling groundwater. The elevations, as measured by EGC, are approximately one foot higher than those measured by DuPont Environmental Remediation Services (DERS) during their

last sampling event (Report No. 90-Q15-153, dated March 14, 1991). The groundwater gradient on May 14, 1991, was directed towards the west-southwest at a magnitude of approximately 0.002-foot per foot (see Figure 2). Groundwater elevation data are summarized in Table 1.

Figure 3 represents an interpretive isopleth map of benzene concentrations in groundwater beneath the subject site. Laboratory analytical results indicate that the maximum concentration of benzene is highest in monitoring well MW-5.

The analytical results for TPHg and BTEX are summarized in Table 2. Laboratory analytical reports are included as Appendix B.

Results of the analysis for Total Dissolved Solids indicated a concentration of 530 parts per million (ppm) in the sample from monitoring well MW-3. Results for Nitrates showed "not detected" at a detection limit of 0.1-ppm.

The eight inorganic substances analyzed for, the analytical methods used and the concentrations detected are listed in the laboratory analytical reports, included as Appendix B. Arsenic, Barium, Chromium amd Mercury were present above laboratory detection limits, with Barium present at the highest concentration, 0.44-ppm.

The next quarterly sampling for the site is scheduled for August 1991.

Reporting Responsibility

Responsibility for the reporting of these results to the regulatory agencies guiding this project lies with Ultramar. EGC therefore recommends that Ultramar provide this report to the following agencies:

Guidance Agencies

Regional Water Quality Control Board
San Francisco Bay Region
Toxics Cleanup Division
2101 Webster Street, Suite 500
Oakland, CA 94612
Attention: Mr. Donald D. Dalke, Chief

Alameda County Department of Environmental Health
Division of Hazards Materials
80 Swan Way, Room 200
Oakland, California 94621
Attention: Mr. Lowell Miller

LIMITATIONS

The scope of work for this project was strictly limited to the sampling and analysis of groundwater and the preparation of this report. Our services have been performed in accordance with generally accepted geoenvironmental consulting practice. No other representation, express or implied, and no warranty or guarantee is included or intended as to professional opinions, the recommendations or the laboratory analytical results provided.

EGC appreciates the opportunity to work with you. Please call us if you have any questions.

Very truly yours,

ENVIRONMENTAL GEOTECHNICAL CONSULTANTS, INC.

Don R. Poindexter
Senior Principal
C-24420, Exp. 12/31/93

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E18901C.GMW

Attachments: Figure 1--Project Site Location Map
Figure 2--Groundwater Gradient Map
Figure 3--Isopleth Map of Benzene Concentrations in Groundwater

Table 1--Summary of Groundwater Analytical Results
Table 2--Groundwater Elevations

Appendix A--Groundwater Sampling and Analysis Protocols
Appendix B--Chain of Custody Record and Laboratory Analytical Results

TABLE 1

GROUNDWATER ELEVATIONS
Beacon Station 720
1088 Marina Boulevard
San Leandro, California
Page 1 of 5

Date Sampled	Depth to Groundwater (Feet)	Groundwater Elevation (Feet)
Groundwater Monitoring Well MW-1:	**Elevation of Top of Casing = 29.89 feet**	
June 23, 1987	14.79	15.10
July 06, 1987	14.93	14.96
August 06, 1987	14.22	15.67
November 04, 1987	15.74	14.15
February 02, 1988	13.99	15.90
May 02, 1988	14.99	14.90
November 21, 1988	13.03	16.86
February 14, 1989	15.86	14.03
May 02, 1989	14.77	15.12
August 10, 1989	16.35	13.54
November 08, 1989	16.46	13.43
February 20, 1990	15.58	14.31
May 18, 1990	16.40	13.49
September 15, 1990	16.83	13.06
November 26, 1990	17.16	12.73
February 07, 1991	16.43	13.46
May 14, 1991	14.93	14.96
Groundwater Monitoring Well MW-2:	**Elevation of Top of Casing = 29.57 feet**	
June 23, 1987	14.51	15.06

TABLE 1

GROUNDWATER ELEVATIONS
Page 2 of 5

Date Sampled	Depth to Groundwater (Feet)	Groundwater Elevation (Feet)
July 06, 1987	14.63	14.94
August 06, 1987	14.95	14.62
November 04, 1987	15.45	14.12
February 02, 1988	13.74	15.83
May 02, 1988	14.63	14.94
November 21, 1988	12.99	16.58
February 14, 1989	15.66	13.91
May 02, 1989	14.56	15.01
August 10, 1989	16.22	13.35
November 08, 1989	16.19	13.38
February 20, 1990	15.34	14.23
May 18, 1990	16.20	13.37
September 15, 1990	16.42	13.05
November 26, 1990	16.83	12.74
February 07, 1991	16.13	13.44
May 14, 1991	14.62	14.95
Groundwater Monitoring Well MW-3:		**Elevation of Top of Casing = 29.13 feet**
June 23, 1987	14.13	15.00
July 06, 1987	14.24	14.89
August 06, 1987	14.52	14.61
November 04, 19887	15.09	14.04
February 02, 1988	13.37	15.76

TABLE 1

GROUNDWATER ELEVATIONS
Page 3 of 5

Date Sampled	Depth to Groundwater (Feet)	Groundwater Elevation (Feet)
May 02, 1988	14.22	14.91
November 21, 1988	13.01	16.12
February 14, 1989	15.22	13.91
May 02, 1989	14.16	14.97
August 10, 1989	15.61	13.52
November 08, 1989	15.75	13.38
February 20, 1990	14.95	14.18
May 18, 1990	15.79	13.34
Sepember 15, 1990	16.07	13.06
November 26, 1990	16.36	12.77
February 07, 1991	15.74	13.39
May 14, 1991	14.19	14.94
Groundwater Monitoring Well MW-4:	**Elevation of Top of Casing = 29.72 feet**	
June 23, 1987	14.77	14.95
July 06, 1987	14.91	14.81
August 06, 1987	15.19	14.53
November 04, 1987	15.72	14.00
February 02, 1088	14.03	15.69
May 02, 1988	14.89	14.83
November 21, 1988	12.88	16.84
February 14, 1989	15.83	13.89
May 02, 1989	14.75	14.97

TABLE 1

GROUNDWATER ELEVATIONS
Page 4 of 5

Date Sampled	Depth to Groundwater (Feet)	Groundwater Elevation (Feet)
August 10, 1989	16.30	13.42
November 08, 1989	16.29	13.43
February 20, 1990	15.62	14.10
May 18, 1990	16.34	13.38
September 15, 1990	16.79	12.93
November 26, 1990	17.08	12.64
February 07, 1991	16.37	13.35
May 14, 1991	14.87	14.85
Groundwater Monitoring Well MW-5:	**Elevation of Top of Casing = 29.55 feet**	
June 23, 1987	14.63	14.92
July 06, 1987	14.79	14.76
August 06, 1987	15.07	14.48
November 04, 1987	15.61	13.94
February 02, 1988	13.84	15.71
May 02, 1988	14.77	14.78
November 21, 1988	12.84	16.71
February 14, 1989	15.72	13.83
May 02, 1989	14.68	14.87
August 10, 1989	16.03	13.52
November 08, 1989	16.33	13.22
February 20, 1990	15.44	14.11

TABLE 1

GROUNDWATER ELEVATIONS
Page 5 of 5

Date Sampled	Depth to Groundwater (Feet)	Groundwater Elevation (Feet)
May 18, 1990	16.22	13.33
September 15, 1990	16.65	12.90
November 26, 1990	16.95	12.60
February 07, 1991	16.20	13.35
May 14, 1991	14.72	14.38

Notes:
1) All elevations surveyed to an arbitrary datum
2) Elevations and depths are given in feet
3) Groundwater Technology, Inc., made measurements until February 1989
4) Du Pont Environmental Services collected samples from February 1989 through February 1991
5) Environmental Geotechnical Consultants, Inc., made measurements beginning in May 1991

TABLE 2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
Beacon Station 720
1088 Marina Boulevard
San Leandro, California
Page 1 of 5

Well No.	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Xylenes (µg/L)	TPH-G (µg/L)	Comments
MW-1	Apr. 16, 1987	2,313	3,770	664.1	3,331	17,276	
	June 23, 1987	1,887	2,141	466.7	1,652	26,027	
	July 06, 1987	778.2	943.7	133.2	422.1	3,938	
	Aug. 06, 1987	1,270	1,576	288.7	873.7	6,079	
	Nov. 04, 1987	1,700	4,000	720	2,200	15,000	
	Feb. 02, 1988	1,500	1,700	230	740	14,000	
	May 02, 1988	3,500	700	4,900	2,700	33,000	
	Nov. 21, 1988	2,200	560	2,800	2,200	15,000	
	Feb. 14, 1989	1,700	1,700	340	1,500	12,000	Odor
	May 02, 1989	1,500	2,400	510	2,400	18,000	Odor, Slight Sheen
	Aug. 10, 1989	1,400	1,500	360	1,600	10,000	Odor
	Nov. 08, 1989	920	470	190	360	7,200	Odor
	Feb. 20, 1990	810	540	270	800	3,300	
	May 18, 1990	1,900	500	560	1,600	5,600	
	Sep. 15, 1990	320	110	150	520	5,200	Odor
	Nov. 26, 1990	370	59	150	370	3,000	Odor
	Feb. 07, 1991	750	570	480	1,800	14,000	
	May 14, 1991	1,000	1,400	600	2,500	41,000	Slight Odor
MW-2	Apr. 16, 1987	3,131	4,239	1,067	4,608	17,920	
	June 23, 1987	2,188	2,622	1,047	4,699	49,354	
	July 06, 1987	1,575	1,729	457	1,702	8,676	
	Aug. 06, 1987	2,623	3,722	702	2,882	14,376	
	Nov. 04, 1987	2,200	4,100	900	3,500	19,000	

TABLE 2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
Page 2 of 5

Well No.	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Xylenes (µg/L)	TPH-G (µg/L)	Comments
MW-2	Feb. 02, 1988	6,200	6,500	1,000	4,000	54,000	
	May 02, 1988	6,800	1,300	7,100	5,400	53,000	
	Nov. 21, 1988	--	--	--	--	--	Free product
	Feb. 14, 1989	6,900	4,300	1,100	5,200	48,000	Film of free product
	May 02, 1989	6,100	8,800	2,100	16,000	111,000	Odor, sheen
	Aug. 10, 1989	4,200	2,900	1,000	5,800	39,000	Odor, sheen
	Nov. 08, 1989	3,700	1,500	740	2,200	45,000	Odor, heavy sheen
	Feb. 20, 1990	5,000	8,200	1,600	11,000	60,000	
	May 18, 1990	6,200	1,900	1,300	610	19,000	
	Sep. 15, 1990	1,400	820	660	3,000	27,000	Odor, sheen
	Nov. 26, 1990	1,100	880	700	3,800	28,000	Odor, sheen
	Feb. 07, 1991	2,100	1,900	1,300	6,200	63,000	Odor, sheen
	May 14, 1991	2,200	2,700	1,100	5,900	100,000	Moderate odor, slight sheen
MW-3	Apr. 16, 1987	1,371	2,438	472.3	2,617	9,967	
	June 23, 1987	646.2	822.9	320.9	1,280	16,824	
	July 06, 1987	340.3	384.2	116.5	420.2	3,395	
	Aug. 06, 1987	441.9	436.3	118.2	417.3	3,107	
	Nov. 04, 1987	320	280	74	250	2,600	
	Feb. 02, 1988	2,200	2,300	500	2,300	44,000	
	May 02, 1988	1,600	450	840	1,700	14,000	
	Nov. 21, 1988	1,200	220	560	810	8,100	
	Feb. 14, 1989	1,500	220	220	500	5,500	Odor

TABLE 2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
Page 3 of 5

Well No.	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Xylenes (µg/L)	TPH-G (µg/L)	Comments
	Aug. 10, 1989	750	10	190	210	2,700	Odor
	Nov. 08, 1989	370	90	ND	58	2,400	Odor
	Feb. 20, 1990	1,200	810	77	460	3,700	
	May 18, 1990	980	ND	330	250	2,300	
	Sep. 15, 1990	240	36	150	230	4,700	Odor
	Nov. 26, 1990	170	8.4	86	120	1,400	Odor
	Feb. 07, 1991	220	20	120	230	2,900	
	May 14, 1991	370	39	220	820	15,000	
MW-4	Apr. 16, 1987	5,896	3,797	893.9	4,106	19,309	
	June 23, 1987	4,030	1,842	850.0	3,254	31,429	
	July 06, 1987	2,710	1,247	308.2	1,312	8,117	
	Aug. 06, 1987	3,992	1,589	447.9	1,611	10,464	
	Nov. 04, 1987	9,500	17,000	2,800	11,000	55,000	
	Feb. 02, 1988	11,000	7,400	1,400	6,200	47,000	
	May 02, 1988	9,200	1,300	6,100	6,400	58,000	
	Nov. 21, 1988	5,700	1,600	3,100	7,600	48,000	
	Feb. 14, 1989	8,700	2,500	900	3,800	29,000	Odor & sheen
	May 02, 1989	4,800	5,600	1,800	8,800	69,000	Odor, slight sheen
	Aug. 10, 1989	15,000	6,600	1,800	12,000	67,000	Odor, slight sheen
	Nov. 08, 1989	11,000	3,200	1,100	4,400	71,000	Odor, slight sheen
	Feb. 20, 1990	8,100	4,500	930	3,500	19,000	
	May 18, 1990	45,000	12,000	5,000	27,000	100,000	
	Sep. 15, 1990	4,200	1,200	740	3,000	38,000	

TABLE 2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
Page 4 of 5

Well No.	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Xylenes (µg/L)	TPH-G (µg/L)	Comments
MW-4	Nov. 26, 1990	2,800	650	810	2,600	19,000	Odor
	Feb. 07, 1991	4,600	1,100	1,600	4,600	41,000	Odor, sheen
	May 14, 1991	[illegible]	830	3,900	3,600	100,000	[illegible]
MW-5	Apr. 16 1987	2,267	921.2	3,277	4,536	17,733	
	June 23, 1987	2,239	516.8	953.9	1,587	19,555	
	July 06, 1987	1,335	313.7	799.2	923.9	5,631	
	Aug. 06, 1987	1,890	881.2	576.8	93.4	6,450	
	Nov. 04, 1987	1,300	500	270	640	4,600	
	Feb. 02, 1988	3,100	1,500	550	1,400	24,000	
	May 02, 1988	4,400	490	1,200	1,500	17,000	
	Nov. 21, 1988	5,600	590	870	2,200	19,000	
	Feb. 14, 1989	4,300	810	410	1,300	13,000	Odor
	May 02, 1989	2,900	1,500	690	3,200	24,000	Odor, slight sheen
	Aug. 10, 1989	6,700	2,300	860	4,700	36,000	Odor, slight sheen
	Nov. 08, 1989	5,300	860	460	600	30,000	Odor
	Feb. 20, 1990	1,700	220	120	370	3,400	
	May 18, 1990	18,000	2,000	1,500	5,600	24,000	
	Sep. 15, 1990	2,600	2,200	1,000	4,900	42,000	Odor, sheen
	Nov. 26, 1990	1,900	280	260	800	8,500	Odor, sheen

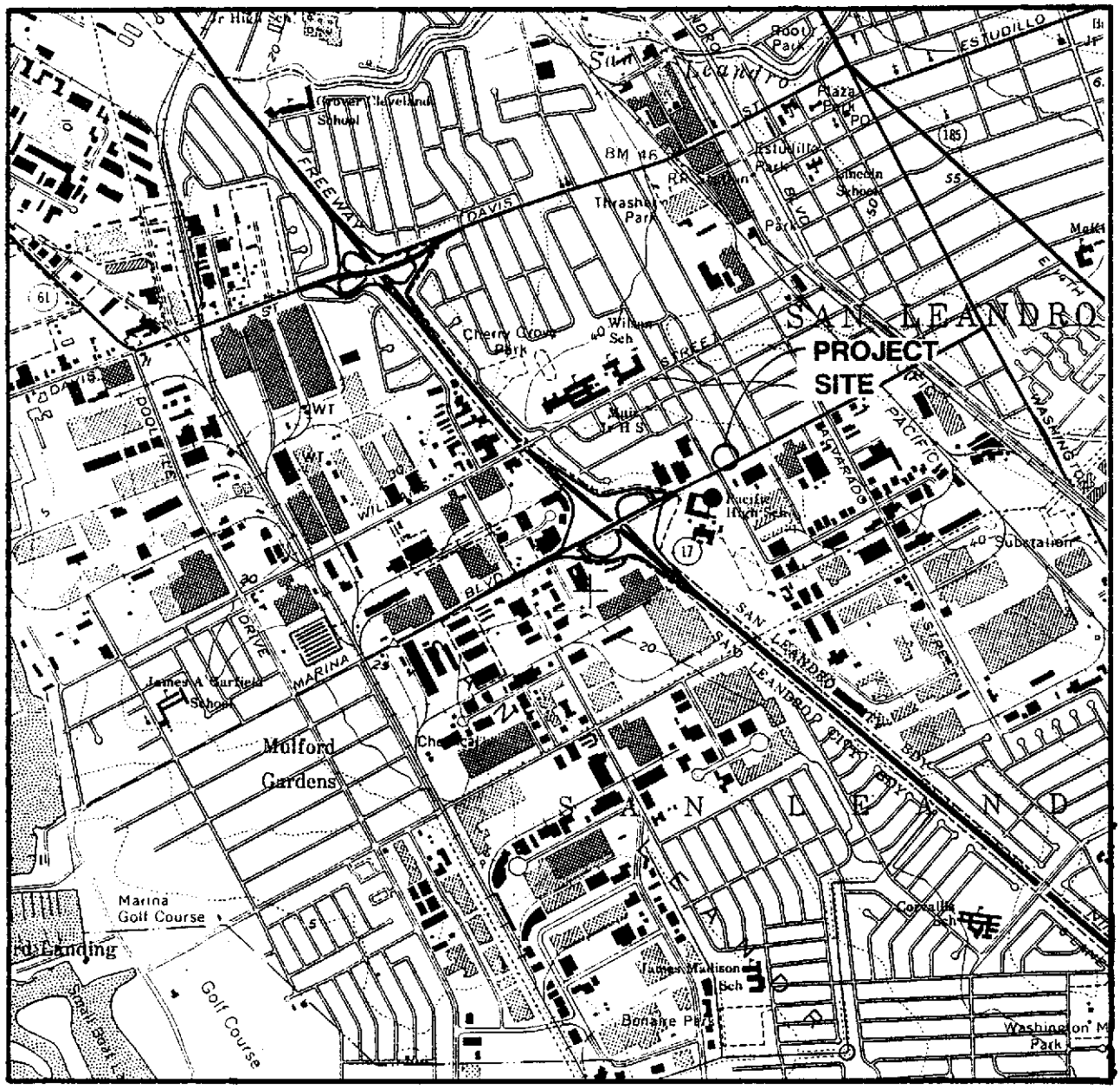
TABLE 2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
Page 5 of 5

	Feb. 07, 1991	1,500	1,200	610	2,700	24,000	Odor
	May 14, 1991	3,800	4,400	1,400	6,400	[illegible]	Odor, sheen

Notes:
1) TPH-G = Total Petroleum Hydrocarbons as gasoline
2) Odor refers to petroleum hydrocarbon odor
3) All results are presented in parts per billion
4) Groundwater Technology, Inc., collected samples prior to February 1989
5) Du Pont Environmental Services collected samples from February 1989 through February 1991
6) Environmental Geotechnical Consultants, Inc. collected samples beginning in May 1991

125311



NOTES

1. BASE MAP TAKEN FROM USGS SAN LEANDRO, CALIFORNIA 7.5 MINUTE TOPOGRAPHIC QUADRANGLE. (1980)

DATE	06/18/91
JOB NO.	E189-01
DWG NO.	E189-01/1
DRAWN	G BENAVIDES
CHK'D	J HOLMES
APP'D	D POINDEXTER

EGC ENVIRONMENTAL GEOTECHNICAL CONSULTANTS, INC.
CONSULTANTS IN APPLIED EARTH SCIENCE

PROJECT SITE LOCATION MAP

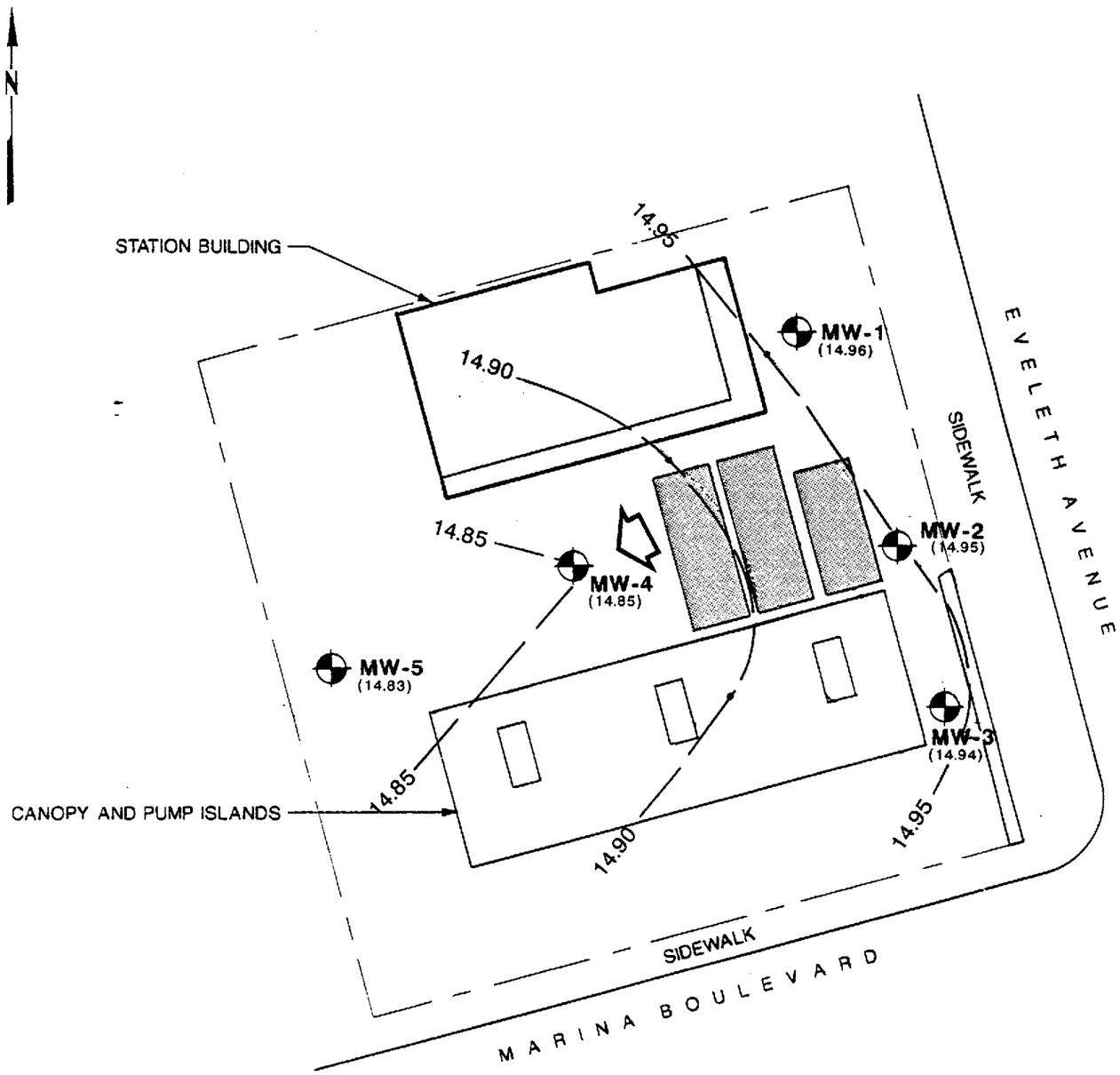
1088 MARINA BLVD., SAN LEANDRO, CALIFORNIA

ULTRAMAR, INC.

FIGURE NO. 1

REV NO.

120619



EXPLANATION

- PROPERTY LIMITS
- MW-5 (14.83) — MONITORING WELL WITH GROUNDWATER ELEVATIONS IN FEET
- UNDERGROUND FUEL STORAGE TANKS
- 14.95 — GROUNDWATER SURFACE CONTOUR WITH GROUNDWATER ELEVATIONS INDICATED IN 0.05-FT INTERVALS
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW ON MAY 14, 1991

0 25 50 FT
APPROXIMATE SCALE

NO.	DATE	ZONE	DESCRIPTION	DRAWN	APPROVED

REVISIONS

NOTES
1. BASE MAP TAKEN FROM PLAN BY DUPONT ENVIRONMENTAL REMEDIATION SERVICES, MARCH 14, 1991.

PROFESSIONAL SEAL

DATE 06/18/91
JOB NO. E189-01
DWG NO. E189-01/2
DRAWN G BENAVIDES
CHK'D J HOLMES
APP'D D POINDEXTER

EGC ENVIRONMENTAL GEOTECHNICAL CONSULTANTS, INC.
CONSULTANTS IN APPLIED EARTH SCIENCE

GROUNDWATER GRADIENT MAP

1088 MARINA BLVD., SAN LEANDRO, CALIFORNIA

ULTRAMAR, INC.

FIGURE NO. 2

REV NO.

APPENDIX A

GROUNDWATER SAMPLING AND ANALYSIS PROTOCOLS

GROUNDWATER SAMPLING AND ANALYSIS

Quality Assurance/Quality Control Objectives

The sampling and analysis procedures employed by EGC for groundwater sampling and monitoring follow specific Quality Assurance/Quality Control (QA/QC) guidelines. Quality Assurance objectives have been established by EGC 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 EGC by using specific field protocols and requiring the analytical laboratory to perform internal and external QC checks. It is the goal of EGC to provide data that are accurate, precise, complete, comparable, and representative. The definitions for accuracy, precision, completeness, comparability, and representativeness are as follows:

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

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

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

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

5. 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 EGC QA/QC program, applicable federal, state and local reference guidance documents are to be followed. The procedures outlined in these regulations, manuals, handbooks, guidance documents and journals are incorporated into the EGC sampling procedures to assure that: (1) groundwater samples are properly collected, (2) groundwater samples are identified, preserved, and transported in a manner such that they are representative of field conditions, and (3) chemical analyses of samples are accurate and reproducible.

GUIDANCE AND REFERENCE DOCUMENTS USED TO COLLECT GROUNDWATER SAMPLES

U.S.E.P.A. - 339/9-51-002	NEIC Manual for Groundwater/ Subsurface Investigation at Hazardous Waste Sites
U.S.E.P.A. - 503/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. - SW-846#, 3rd Edition (November,	Test Methods for Evaluating Solid Waste - Physical/Chemical Methods 1986)
40 CFR 136.3e. Table II (Code of Federal Regulations)	Required Containers, Preservation Techniques, and Holding Times
Resources Conservation and Recovery Act (OSWER 9950.1) (September, 1986)	Groundwater Monitoring Technical Enforcement Guidance Document
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)
Regional Water Quality Control Board (Central Valley Region)	Memorandum: Disposal, Treatment, and Refuse of Soils Contaminated with Petroleum Fractions (August, 1986)

State of California Department of Health Services	Hazardous Waste Testing Laboratory Certification List (March, 1987)
State of California Water Resources Control Board	Leaking Underground Fuel Tank (LUFT) Field Manual (May, 1988), and LUFT Field Manual Revision (April, 1989)
State of California Water Resources Control Board	Title 23, (Register #85.#33-8-17-85), Subchapter 16: Underground Tank Regulations; Article 3, Sections 2632 and 2634; Article 4, Section 2647 (October, 1986)
Alameda County Water District	Groundwater Protection Program: Guidelines for Groundwater and Soil Investigations at Leaking Underground Fuel Tank Sites (November, 1988)
American Public Health Association	Standard Methods for the Examination of Water and Wastewaters, 16th Edition
Analytical Chemistry (journal)	Principles of Environmental Analysis. Volume 55, Pages 2212-2218 (December, 1983)
Santa Clara Valley Water District	Guidelines for Preparing or Reviewing Sampling Plans for Soil and Groundwater Investigation of Fuel Contamination Sites (January, 1989)
American Petroleum Institute	Groundwater Monitoring & Sample Bias; API Publication 4367, Environmental Affairs Department, June 1983

Because groundwater samples collected by EGC are analyzed in the parts per billion (ppb) range for many compounds, care is exercised to prevent contamination of samples. When volatile or semi-volatile organic compounds are included for analysis, EGC 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. 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.

4. 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.

5. Volatile organic groundwater 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.

6. 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.

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:

1. 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.

2. 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.

3. Duplicates. Duplicate 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.

4. Equipment Blank. Period QC sample collected from field equipment rinsate to verify decontamination procedures.

The number and types of QC samples are determined on a site-specific basis.

SAMPLE COLLECTION

This section describes the routine procedures followed by EGC while collecting groundwater 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 EGC are to:

1. Collect groundwater samples that are representative of the sampled matrix.

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

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 which has been placed in a well shall be decontaminated by cleaning with Alconox or equivalent detergent followed by steam cleaning with deionized water before purging or sampling the next well.

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.

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

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 EGC Well Sampling Field Data Sheet. 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.

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 centrifugal pumping system; or (4) a Teflon or Stainless Steel bailer. Methods of purging will be assessed based on well size, location, accessibility, and known chemical conditions. Individual well purge volumes are calculated from casing volumes. As a general rule, a minimum of 3 to 5 casing 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 70 percent of the previously measured water column has been replaced by recharge. Removal of stagnant water will either be disposed of or stored in 55-gallon drums for future disposal as outlined for contaminated soil cuttings in the section on soil sampling protocol. Physical parameter measurements (temperature, pH, and specific conductance) are closely monitored throughout the well purging process and are used by the EGC 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. Collected field data during purging activities will be entered on the EGC Well Sampling Field Data Sheet. Copies of the EGC Field Data Sheets will be reviewed by the EGC Sampling Manager for accuracy and completeness.

DOCUMENTATION

Sample Container Labels

Each sample container will be labeled 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 EGC 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 shall be completed and accompany every shipment of samples to the analytical laboratory in order to establish the documentation necessary to trace sample possession from time of collection. 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. EGC 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.

Sample Handling Storage and Transport

All chemical sampling, handling and storage will be conducted under the direction of our consulting Analytical Chemist. All laboratory chemical testing will be accomplished by a State approved laboratory.

All equipment that contacts samples will be thoroughly cleaned prior to arrival to a site and between samplings. New or used samplers will be steam-cleaned or washed with an anionic detergent solution (i.e., Liquinox or Alconox), rinsed well with tap water, rinsed with distilled water, drained of excess water and air-dried or wiped dry with a clean towel.

Equipment blanks will be taken during the final stage of decontamination at the rate of no more than one per groundwater monitoring well. Selected method blanks will be subjected to chemical analysis for quality control.

All samples will be collected in an order such that those parameters most sensitive to volatilization will be sampled first. A general order of collection for some common groundwater parameters follows:

- Volatile Organic Compounds (VOC's)
- Total Organic Halogens (TOX)
- Total Organic Carbon (TOC)
- Extractable Organics
- Total Metals
- Dissolved Metals
- Phenols
- Sulfate and Chloride
- Turbidity
- Nitrate and Ammonia

All samples will be held at 4°C by packing in ice in a covered ice chest specifically designated for that purpose. At no time will the elapsed time between sample collection and delivery at the outside laboratory be greater than 72 hours. Preservatives will not be added to any sample unless instructed, and preservatives will be supplied and requested by the outside laboratory. Under no circumstances will sample containers be opened by anyone other than laboratory personnel who will perform the specified chemical analysis.

If it is necessary for samples or sample chests to leave the immediate control of the sampler prior to delivery to the laboratory, such as shipment by a common carrier (e.g., Federal Express), a custody seal will be placed on each sample container and/or sample chest to ensure that the samples have not been tampered with during transportation. The custody seal will contain the sampler's signature, the date and time the seal was emplaced.

EGC

ENVIRONMENTAL GEOTECHNICAL CONSULTANTS, INC.

CONSULTANTS IN APPLIED EARTH SCIENCE

2195 INDUSTRIAL PARKWAY WEST, HAYWARD, CALIFORNIA 94545
TELEPHONE (415) 786-0215 · FAX (415) 732-0289

091592

Chain of Custody

CLIENT: Ultramar 720
ADDRESS:
PROJECT #: E189-01
SAMPLER: Dolly Fazeli
SHIP TO: Applied Analytical

DATE 5/15/91 PAGE 1 OF 1

SAMPLE NO	DATE	TIME	LOCATION	TPH G	TPH BTEX	Gen. Inorganic	TDS	Nitrates	SAMPLE TYPE OR MATRIX (e.g. water soil, filters, charcoal tube, asbestos, oil)	# CONTAINERS	OBSERVATIONS, COMMENTS, VOLUMES, SPECIAL OR ADDITIONAL TESTS
MW-1	5/14/91	5:20	San Leandro	✓	✓				water	3	
MW-2	5/14/91	6:10	"	✓	✓				water	3	
MW-3	5/14/91	3:30	"	✓	✓	✓	✓	✓	water	6	
MW-4	5/14/91	8:30	"	✓	✓				Water	3	
MW-5	5/14/91	7:30	"	✓	✓				water	3	

1) RELINQUISHED BY: Signature: Dolly Fazeli	DATE 5/15	2) RECEIVED BY: Signature: Laura Jordan	DATE 5-15	3) RELINQUISHED BY: Signature: Laura Jordan	DATE 5-15	4) RECEIVED BY: Signature:	DATE	18 TOTAL NUMBER OF CONTAINERS
Printed Name: Dolly Fazeli	TIME 0911	Printed Name: LAURA JORDAN	TIME 0911	Printed Name: LAURA JORDAN	TIME 1045	Printed Name:	TIME	METHOD OF SHIPMENT: Courier
Company: EGC		Company: EXPRESS-IT		Company: EXPRESS-IT		Company:		SPECIAL SHIPMENT-HANDLING OR STORAGE REQUIREMENTS: Nitrates test has a 48 hr. holding time
5) RELINQUISHED BY: Signature:	DATE	6) RECEIVED BY: Signature:	DATE	7) RELINQUISHED BY: Signature:	DATE	RECEIVED BY (Laboratory) Signature:	DATE 5/15/91	
Printed Name:	TIME	Printed Name:	TIME	Printed Name:	TIME	Printed Name: ANTHONY ENRIQUEZ	TIME 10:15	
Company:		Company:		Company:				

APPLIED ANALYTICAL

Environmental Laboratories

42501 Albrae St., Suite 100
Fremont, CA 94538
Bus: (415) 623-0775
Fax: (415) 651-8647

ANALYSIS REPORT

rpts

Attention:	Dolly Fazel	Date Sampled:	05-14-91
	EGC	Date Received:	05-15-91
	2495 Industrial Pkwy West	BTEX Analyzed:	05-20-91
	Hayward, CA 94545	TPHg Analyzed:	05-20-91
Project:	AGS 19505-L	TPHd Analyzed:	NR
	Stat.#720, E189-01	Matrix:	Water

	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPHg	TPHd
	ppb	ppb	ppb	ppb	ppb	ppm
Detection Limit:	0.5	0.5	0.5	0.5	50	100
SAMPLE Laboratory Identification						
MW-1 W1105239	1000	1400	600	2500	41000	NR
MW-2 W1105240	2200	2700	1100	5900	100000	NR
MW-3 W1105241	370	39	220	820	15000	NR
MW-4 W1105242	7300	3900	830	3600	100000	NR
MW-5 W1105243	3800	4400	1400	6400	120000	NR

ppb = parts per billion = µg/L = micrograms per liter.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not requested.

ANALYTICAL PROCEDURES

BTEX– Benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction using EPA Method 5030 followed by analysis using EPA Method 8020/602, which utilizes a gas chromatograph (GC) equipped with a photoionization detector (PID) and a flame-ionization detector (FID) in series.

TPHg–Total petroleum hydrocarbons as gasoline (low-to-medium boiling points) are measured by extraction using EPA Method 5030, followed by analysis using modified EPA Method 8015, which utilizes a GC equipped with an FID.

TPHd–Total petroleum hydrocarbons as diesel (high boiling points) are measured by extraction using EPA Method 3550 for soils and EPA Method 3510 for water, followed by modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Laboratory Representative

May 23, 1991
Date Reported

APPLIED ANALYTICAL

Environmental Laboratories

42501 Albrae St., Suite 100
Fremont, CA 94538
Bus: (415) 623-0775
Fax: (415) 651-8647

ANALYSIS REPORT

tdswatr.rpt

Report Prepared for:
EGC
2495 Industrial Pkwy West
Hayward, CA 94545
Attention: Dolly Fazeli
Project #: E189-01

Date Sampled: 05-14-91
Date Received: 05-15-91
Date Analyzed: 05-15-90
Lab Job #: 19505-L
Matrix: Water

Sample #	Lab#	Result TDS,mg/L	Detection Limit TDS,mg/L
MW-3	W1105241	530	20

ND = Not detected. Compound(s) may be present at concentrations below the detection limit.

PROCEDURES

TDS: Total Dissolved Solids are measured according to EPA method 160.1.

Laboratory Representative

May 30, 1991
Date Reported

9105152

CHAIN-OF-CUSTODY RECORD

PROJ. NO.	PROJECT NAME
E189-01	Ultramar Station # 720
P.O. NO.	SAMPLERS (Signature)

DATE MM/DD/YY	TIME		No. of Cont-ainers	TPHgasoline (8015)	BTEX (602/8020)	TPHdiesel (8015)	General Inorganics	Nitrate				Preserved?	REMARKS	LABORATORY I.D. NUMBER
5-14-91		MW-3					X	X						
													* Nitrate 24 48 Hrs Holding time	

ANALYSIS

RELINQUISHED BY (Signature):	DATE / TIME	RECEIVED BY (Signature):
Anthony [illegible]	5/15 [illegible]	michelle e [illegible]
RELINQUISHED BY (Signature):	DATE / TIME	RECEIVED BY (Signature):
RELINQUISHED BY (Signature):	DATE / TIME	RECEIVED FOR LABORATORY BY (Signature):
		Gina Gillespie 5/15/91 1715

Laboratory: Med Tox

Turn Around: Normal

SEND RESULTS TO:

APPLIED ANALYTICAL
42501 Albrae Street
Fremont, CA 94538

Proj. Mgr.: Laura [illegible]

ANALYTICAL SERVICES

MED-TOX ASSOCIATES, INC

CERTIFICATE OF ANALYSIS

APPLIED ANALYTICAL
42501 ALBRAE STREET
FREMONT, CA 94538

ATTN: LAURA KUCK

CLIENT PROJ. ID: E189-01
DOHS CERTIFICATION NO: E772

REPORT DATE: 05/24/91

DATE SAMPLED: 05/14/91

DATE RECEIVED: 05/15/91

MED-TOX JOB NO: 9105152

ANALYSIS OF: WATER SAMPLE

Sample Identification Client Id.	Lab No.	Fluoride (mg/L)	Nitrate-Nitrogen (mg/L)
MW-3	01A	ND	ND
Detection limit		0.1	0.1

Method: 300

Instrument: DIONEX

Date Analyzed: 05/16/91

ND = Not Detected

Dave Sandusky, Manager
Inorganic Laboratory

Results FAXed 05/23/91

APPLIED ANALYTICAL

REPORT DATE: 05/24/91

CLIENT PROJ. ID: E189-01

MED-TOX JOB NO: 9105152

Sample Identification Client Id.	Lab No.	Arsenic (mg/L)	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Lead (mg/L)	Mercury (mg/L)	Silver (mg/L)	Selenium (mg/L)
MW-3	01B	0.031	0.44	ND	0.07	ND	0.0051	ND	ND
Detection limit		0.002	0.002	0.005	0.01	0.02	0.0003	0.005	0.004
Method:		7060	6010	6010	6010	6010	7470	6010	7740
Instrument:		V22	ICP	ICP	ICP	ICP	Hg	ICP	V22

Date Analyzed: 05/16/91

Mercury Analyzed: 05/21/91

ND = Not Detected

MED-TOX ASSOCIATES INC

QUALITY CONTROL DATA

APPLIED ANALYTICAL

CLIENT PROJ. ID: E189-01

MED-TOX JOB NO: 9105152

MATRIX: WATER

MED-TOX JOB NO: 9105152

CLIENT PROJECT ID: E189-01

MATRIX SPIKE RECOVERY SUMMARY

COMPOUND	INST./ METHOD	SAMPLE SPIKED	SAMPLE RESULT	SPIKE ADDED	OBSERVED RECOVERIES MS	MSD	% REC.	RPD	QC CONTROL LIMITS REC. % LIMIT	RPD LIMIT
As, Arsenic	V22/7060	9105132-01F	0.0045	0.040	0.0387	0.0389	85.6	0.5	56.1-141.7	16.0
Ba, Barium	ICP/6010	9105133-01F	0.168	2.0	2.01	1.98	91.3	1.70	86.8-105.5	4.2
Cd, Cadmium	ICP/6010	9105133-01F	ND	0.05	0.0505	0.0506	101.0	0.19	72.4-112.8	18.9
Cr, Chromium	ICP/6010	9105133-01F	ND	0.2	0.172	0.169	85.3	2.16	77.4-107.9	5.8
Hg, Mercury	Hg/7470	9105149-02A	ND	2.0	1.994	1.994	99.7	0.0	95.0-105.0	2.0
Pb, Lead	ICP/6010	9105133-01F	ND	0.5	0.440	0.435	87.5	1.31	80.1-110.7	6.5
Se, Selenium	V22/7740	9105132-01F	ND	0.080	0.066	0.068	83.6	3.0	51.1-136.2	17.4
Fluoride	DIONEX/300	9105143-01A	ND	100	94.0	98.1	96.0	4.3	84.1-114.5	5.8
Nitrate	DIONEX/300	9105143-01A	103	100	206	206	103.5	0.0	71.0-144.0	5.6

ND = Not Detected