GEOMATRIX

SOIL SAMPLING AND GROUNDWATER MONITORING REPORT
1351 Ocean Avenue
Emeryville, California

Prepared for

HFH Limited
Emeryville, California

February 1989

Project Number: 1382B

Geomatrix Consultants

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Spear Street Tower, Suite 717
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2/16/89
ALAMEDA COUNTY
DEPT. OF ENVIRONMENTAL HEALTH
HAZARDOUS MATERIALS

14 February 1989
Project 1382B

Mr. Andrew Getz
HFH Limited
1351 Ocean Avenue
Emeryville, California 94608

Subject: Soil Sampling and Groundwater Monitoring Report
1351 Ocean Avenue
Emeryville, California

Dear Mr. Getz:

Enclosed are three copies of the subject report. Two copies should be sent to Mr. Dennis Byrne of the Alameda County Department of Environmental Health in Oakland, California.

We appreciate the opportunity to provide our consulting engineering and hydrogeologic services to HFH Limited. At your request, we will be available to discuss the results of our work and to participate in meetings with regulatory agencies.

Please contact the undersigned if you have any questions or if further information is required.

Sincerely yours,
GEOMATRIX CONSULTANTS, INC.

Elizabeth R. Schoner
Senior Staff Scientist

Nancy T. Bice
Nancy T. Bice, C.E.G.
Senior Project Hydrogeologist

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GEOMATRIX

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FORMER UNDERGROUND DIESEL TANK LOCATION
1351 Ocean Avenue
Emeryville, California

1.0 INTRODUCTION

This report presents the results from a two-phased soil and groundwater quality investigation for potential diesel contamination at 1351 Ocean Avenue in Emeryville, California (Figure 1). This investigation was performed by Geomatrix Consultants, Inc. (Geomatrix) on behalf of Mr. Andrew Getz of HFH Limited, and at the request of Mr. Dennis Byrne of the Alameda County Department of Environmental Health (ACDEH).

2.0 BACKGROUND

According to Mr. Getz, a 4000-gallon fiberglass underground diesel storage tank was removed from the subject site in June 1988. The tank was reportedly in good condition, and was tested as "tight" upon removal. The excavation area was approximately 20 feet long, 10 feet wide, and 10 feet deep (Figure 2). Immediately after the tank was removed, Trace Analysis Laboratory, Inc. (TAL) of Hayward, California obtained two soil samples from the bottom of the excavation. During the sampling operation, Mr. Byrne from the ACDEH was present onsite and selected the two sampling locations. The two samples were analyzed by TAL for the presence of diesel fuel. The analytical results for one sample indicated less than 2 milligrams per kilogram (mg/kg or parts per million) of diesel; the results for the second sample indicated the presence of diesel at 930 mg/kg.

After receiving the laboratory test results, Mr. Getz directed the removal of additional soil in a localized area of the excavation, to a depth of about 1 foot beneath the location where the second soil sample had been collected. A third sample was collected by TAL at this location, and was tested for diesel fuel. The analytical results from the third sample

indicated no detection of diesel above 2 mg/kg. Analytical results from the three soil samples are presented in Appendix A.

Mr. Getz subsequently submitted the analytical results for the three soil samples to Mr. Byrne in a letter dated 28 July 1988. Mr. Byrne then requested, in a letter dated 8 August 1988, that Mr. Getz install a monitoring well within 10 feet of the former excavation in order to evaluate the shallow groundwater quality. Mr. Getz retained Geomatrix to perform the requested investigation.

3.0 PHASE I INVESTIGATION

Based on the analytical results from the first three soil samples collected from the former pit, Geomatrix recommended resampling the location in which the sample containing diesel fuel had been collected, and sampling additional areas within the former pit to further assess soil quality. Geomatrix collected four soil samples from the reopened excavation pit on 3 October 1988. Mr. Byrne visited the site on the same day to review the additional soil sampling locations and general site conditions.

3.1 Methods and Procedures

On 3 October 1988, a manually-operated backhoe was used to collect soil from the sides of the reopened excavation pit at locations where high groundwater marks were observed. Soil samples were collected from the backhoe bucket using clean, thin-walled brass tubes. The ends of the tubes were sealed with aluminum foil and tight-fitting plastic caps. The samples were stored in an ice-cooled chest, delivered to TAL on the same day, and analyzed for diesel fuel content on a 24-hour rush basis using modified EPA Test Method 8015. On 4 October 1988, a Geomatrix Senior Project Hydrogeologist and California-Registered Geologist visited the site to view the reopened pit and general site conditions.

3.2 Results and Recommendations

Analytical results indicated that diesel fuel was not present in any of the four soil samples above the detection limit of 2 mg/kg. A copy of the laboratory report is presented in Appendix A.

Mr. Byrne was notified by telephone on 4 October 1988 that diesel fuel was not detected in the soil samples. However, he indicated that he had observed a slight diesel odor in the reopened excavation pit on 3 October 1988, and he requested that a shallow groundwater monitoring well be installed within 10 feet of the former pit, located in a downgradient groundwater flow direction, for the purpose of assessing potential diesel concentrations in the shallow groundwater at the site.

4.0 PHASE II INVESTIGATION

On 3 November 1988, Geomatrix installed a shallow groundwater monitoring well approximately 10 feet west of the former diesel tank location. The purpose of the monitoring well was to assess the possible presence of diesel fuel in the onsite shallow groundwater in the direction generally downgradient of the former tank location.

4.1 Location of Monitoring Well W-1

The site is located on bay plain deposits which emerge from the Berkeley Hills and slope gently westward toward San Francisco Bay. Based on a review of available published information, the general direction of groundwater movement in the vicinity of the site is estimated to be toward the west ("Geohydrology and Groundwater - Quality Overview, East Bay Plain Area, Alameda County, California, 205(J) Report," Alameda County Flood Control and Water Conservation District, June 1988). The monitoring well was therefore installed approximately 10 feet west of the western edge of the former diesel tank excavation (Figure 2).

4.2 Methods and Procedures

The installation, development, and sampling procedures for monitoring well W-1 were performed in accordance with Geomatrix Protocols 1, 2, and 3 presented in Appendix B. Drilling services were performed by Pitcher Drilling Company of San Jose, California under the supervision of Geomatrix. The boring log and well construction details for monitoring well W-1 are shown in Figure 3. Soil samples collected from depths of approximately 4 and 10 feet were submitted to Brown and Caldwell Laboratories of Emeryville,

California for analysis for diesel fuel content using modified EPA Test Method 8015.

Development of well W-1 was performed by Geomatrix on 11 November 1988. A total of 50 gallons of groundwater were pumped from the well and stored onsite in 55-gallon drums. Sampling of the well was performed on 17 November 1988 and a groundwater sample and duplicate were delivered to Brown and Caldwell Laboratories the same day. The sample was held by Brown and Caldwell over the 14-day holding limit for analysis, so well W-1 was resampled on 11 December 1988. The second sample was analyzed four days after receipt by the laboratory.

4.3 Findings

4.3.1 Hydrogeologic Conditions. The shallow hydrogeologic conditions at the site were evaluated based on observations made during site visits when the former tank excavation was reopened and on the boring log prepared during drilling of well W-1. The site is underlain by brown silty clay to a depth of approximately 10 feet. Between depths of 10 and 12.5 feet, a coarse-grained water-bearing zone consisting of silty and gravelly sand was encountered. The shallow water-bearing zone was underlain by gray, brown and blue gray silty clay to the bottom of the boring at a depth of 15.5 feet.

During drilling on 3 November 1988, groundwater was encountered at a depth of approximately 10 feet. During sampling of Well W-1, groundwater was measured at a depth of 5 feet.

4.3.2 Analytical Results. Analytical results for the two soil samples collected during the drilling of W-1 indicate that no diesel fuel was present above the detection limit of 10 mg/kg. Analytical results from the groundwater sample collected on 11 December 1988 indicate that diesel fuel was not present in shallow groundwater at a concentration above the detection limit of 1.0 mg/l. The analytical results are summarized in Table 1, and analytical laboratory reports are presented in Appendix A.

5.0 CONCLUSIONS

Analytical results of the soil samples collected from the excavation pit (three by TAL and four by Geomatrix) indicated the presence of diesel fuel at this location. Analytical results of a groundwater sample collected from a shallow groundwater monitoring well located in the presumed downgradient direction of from the former tank location indicated that no diesel fuel was present above 1.0 milligrams per liter (mg/l). The results of our two-phased investigation and previous investigations at the former diesel tank location indicated that the soil and shallow groundwater surrounding the former tank location have not been significantly impacted by the presence of diesel fuel.

6.0 RECOMMENDATIONS

Geomatrix recommends that monitoring well W-1 be resampled three months after the initial sampling (February 1988) to verify the absence of diesel fuel in the shallow groundwater at the site downgradient of the former evacuation. If the analytical results of the resampling indicate the absence of diesel fuel content, it is recommended that monitoring well W-1 be abandoned in accordance with State and County guidelines.

TABLE

GEOMATRIX

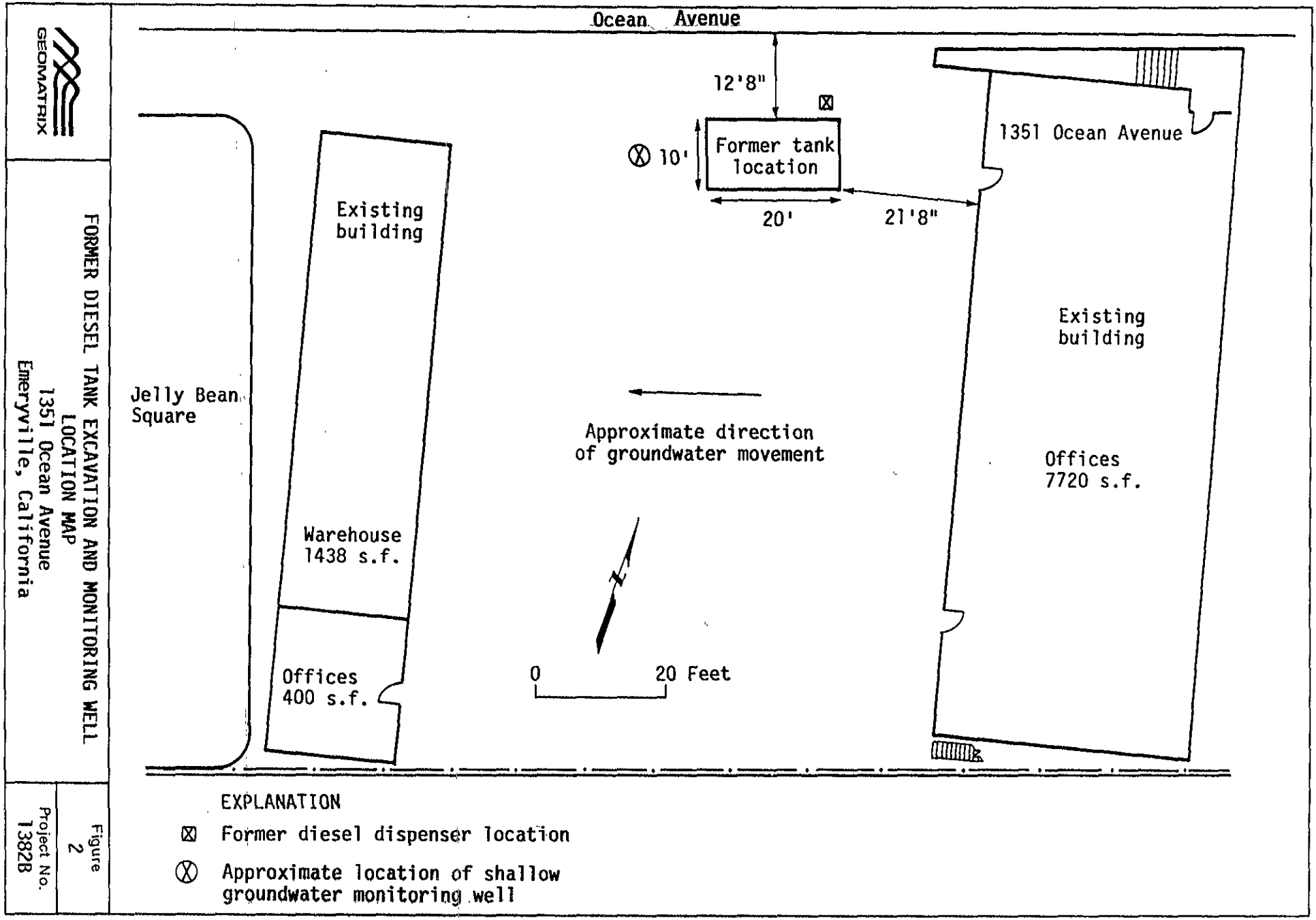
TABLE 1

ANALYTICAL RESULTS OF SOIL AND GROUNDWATER SAMPLING
1351 Ocean Avenue
Emeryville, California

DATE OF SAMPLING	SAMPLE MATRIX	SAMPLE LOCATION	CONCENTRATION OF DIESEL FUEL
6 June 1988	Soil	Former Pit	930 mg/kg (930,000 ug/kg)
6 June 1988	Soil	Former Pit	< 2.0 mg/kg (<2,000 ug/kg)
7 June 1988	Soil	Former Pit	< 2.0 mg/kg (<2,000 ug/kg)
3 October 1988	Soil	Former Pit	< 2 mg/kg
3 October 1988	Soil	Former Pit	< 2 mg/kg
3 October 1988	Soil	Former Pit	< 2 mg/kg
3 October 1988	Soil	Former Pit	< 2 mg/kg
3 November 1988	Soil	W-1 Boring, depth = 4 ft	< 10 mg/kg
3 November 1988	Soil	W-1 Boring, depth = 10 ft	< 10 mg/kg
11 December 1988	Water	Well W-1	< 1.0 mg/l

FIGURES

GEOMATRIX	SITE LOCATION MAP Emeryville, California	Figure 1 Project No. 1382B


GEOMATRIX
FORMER DIESEL TANK EXCAVATION AND MONITORING WELL LOCATION MAP
1351 Ocean Avenue
Emeryville, California
Project No. 1382B
Figure 2
Ocean Avenue
12'8"
10'
Former tank location
20'
21'8"
1351 Ocean Avenue
Existing building
Jelly Bean Square
Existing building
Approximate direction of groundwater movement
Offices 7720 s.f.
Warehouse 1438 s.f.
Offices 400 s.f.
0
20 Feet
EXPLANATION
Former diesel dispenser location
Approximate location of shallow groundwater monitoring well

PROJECT: GETZ/1351 Ocean Avenue
Emeryville, California

Log of Well No. W-1

BORING LOCATION: 1351/1354 Ocean Avenue

DATE STARTED: 11/3/88	DATE FINISHED: 11/3/88	CASING: NA	
DRILLING METHOD: 8'" hollow stem auger		DEPTH TO WATER ATD: 10.0'	
HAMMER WEIGHT: 140 lb.	DROP: 30"	LOGGED BY: DWN	CHECKED BY: NTB
SAMPLER: 2" California modified sampler			

DEPTH (feet)	SAMPLES: Sample No.	SAMPLES: Sample	SAMPLES: Blows/ Foot	MATERIAL DESCRIPTION	TEST RESULTS	WELL CONSTRUCTION DETAILS
				Surface Elevation:		
0				SILTY CLAY (CL) Dark brown, damp, moderate plasticity		Slip Cap
2				SILTY CLAY (CL) Dark brown mottled orangish red, damp, very stiff, moderate plasticity		Cement with 5% bentonite powder
4	1-1		22	Some fine to medium grained sand		Blank 2" SCH 40 casing
6				Color change to light brown		Bentonite pellets
8						Lonestar #3 sand
10	1-2		41	GRAVELLY SAND (SW) Medium brown, saturated, very dense, sand fine to medium grained, gravel subrounded to rounded		2" SCH 40 0.020" slotted casing
12				SILTY SAND (SM) Orangish brown, saturated, dense, sand fine to medium grained		End cap
14	1-3		12	SILTY CLAY (CL) Gray brown, slightly damp, stiff, medium plasticity, iron staining around trace coarse sand grains, trace micas		Bentonite pellets
16				SANDY CLAY (CL) Gray brown, slightly damp, stiff, low plasticity		
18				SILTY CLAY (CH) Light blue gray, slightly damp, firm, high plasticity		
				Bottom of boring 15.5 feet		

W-1-88

Geomatrix Consultants | Project No. 1382B | Figure 3

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APPENDIX A

ANALYTICAL LABORATORY REPORTS

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545 *(415) 783-6960*

TAL

DATE: 6/7/88

LOG NO.: 6048

DATE SAMPLED: 6/6/88

DATE RECEIVED: 6/6/88

CUSTOMER: Getz Construction Company

REQUESTER: Andrew Getz

PROJECT: J. T. Thorpe, 1351 Ocean Avenue, Emervyille, CA

		Sample Type: Soil			
		No. 1		No. 2	
Method and Constituent	Units	Concentration	Detection Limit	Concentration	Detection Limit
DHS Method:					
Total Petroleum Hydrocarbons as Diesel	ug/kg	930,000	2,000	< 2,000	2,000

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545 *(415) 783-6960*

TAL

DATE: 6/8/88

LOG NO.: 6058

DATE SAMPLED: 6/7/88

DATE RECEIVED: 6/7/88

CUSTOMER: Getz Construction Company

REQUESTER: Andrew Getz

PROJECT: J. T. Thorpe, 1351 Ocean Avenue, Emeryville, CA

	Sample Type: Soil		
		No. 1	
Method and Constituent	Units	Concentration	Detection Limit
DHS Method:			
Total Petroleum Hydrocarbons as Diesel	ug/kg	< 2,000	2,000

Hugh R. McLean
Supervisory Chemist

HRM:mln

Trace Analysis Laboratory, Inc.
3423 Investment Boulevard, #8 • Hayward, California 94545 *(415) 783-6960*

TAL

DATE: 10/4/88

LOG NO.: 6468

DATE SAMPLED: 10/3/88

DATE RECEIVED: 10/3/88

CUSTOMER: Getz Construction Company

REQUESTER: Andrew Getz

PROJECT: No. 1382, 1351 Ocean Avenue, Emeryville, CA

		Sample Type: Soil			
		1003-1		1003-2	
Method and Constituent	Units	Concentration	Detection Limit	Concentration	Detection Limit
DHS Method:					
Total Petroleum Hydrocarbons as Diesel	mg/kg	< 2	2	< 2	2

		1003-3		1003-4	
DHS Method:					
Total Petroleum Hydrocarbons as Diesel	mg/kg	< 2	2	< 2	2

Hugh R. McLean
Supervisory Chemist

HRM:mln

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-11-075

Received: 03 NOV 88
Reported: 17 NOV 88

Ms. Beth Schoner
Geomatrix Consultants
1 Market Plaza, Spear Tower, Ste.717
San Francisco, California 94105

Project: 1382B

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, SOIL SAMPLES	DATE SAMPLED
11-075-1	MW-1-1	03 NOV 88
11-075-2	MW-1-2	03 NOV 88

PARAMETER	11-075-1	11-075-2
Total Fuel Hydrocarbons		
Date Analyzed	11.14.88	11.14.88
Total Fuel Hydrocarbons, mg/kg	<10	<10
Other Total Fuel Hydrocarbons	---	---

L. D. Lessley

Sim D. Lessley, Ph.D., Laboratory Director

RECEIVED
NOV 21 1988
Geomatrix Consultants, Inc.

BROWN AND CALDWELL LABORATORIES
1255 POWELL STREET EMERYVILLE, CA 94608 • (415) 428-2300

ANALYTICAL REPORT

LOG NO: E88-12-288

Received: 12 DEC 88
Reported: 19 DEC 88

Ms. Beth Schoner
Geomatrix Consultants
1 Market Plaza, Spear Tower, Ste.717
San Francisco, California 94105

Project: 1394A

REPORT OF ANALYTICAL RESULTS

LOG NO	SAMPLE DESCRIPTION, GROUND WATER SAMPLES	DATE SAMPLED
12-288-1	1A, 1B	11 DEC 88

PARAMETER	12-288-1
Total Fuel Hydrocarbons	
Date Analyzed	12.15.88
Total Fuel Hydrocarbons, mg/L	<1.0
Other Total Fuel Hydrocarbons	---

Hedy J. Ficklin for
Sim D. Lessley, Ph.D., Laboratory Manager

RECEIVED
DEC 20 1988
Geomatrix Consultants, Inc.

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APPENDIX B

PROTOCOLS

Well Installation Procedures
Water Level Monitoring
Groundwater Sampling

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PROTOCOL NO. 1

WELL INSTALLATION PROCEDURES

The final borehole diameter will be sufficiently large to allow placement of a specified type and size of well casing, screen and filter pack.

The Geomatrix field representative shall specify to the driller the penetration rate, depth of soil sample collection, method of sample retrieval, and any other matters which might pertain to the satisfactory completion of the borings.

All drill cuttings and unused soil samples will be placed in 55-gallon drums for temporary storage. Final disposal of the soil and drums will be the responsibility of the client.

3. SAMPLING AND LOGGING

3.1 Obtaining Samples

Soil samples will be obtained for geologic classification on a continuous basis using the CME dry core continuous sampling method. A detailed log of these samples will be made.

Selected samples for chemical analysis will be collected in clean thin-walled brass tubes, sealed with aluminum foil, plastic end caps, and vinyl electrical tape. The samples will be labelled and placed in an ice-cooled chest for delivery to a state-certified laboratory for chemical analysis. Chain-of-custody records will be completed for each sample delivery.

3.2 Logging of Boreholes

The drill rig operator and the Geomatrix field representative will discuss significant changes in material penetrated by the drill, changes in drilling conditions, hydraulic pressure and drilling action. The Geomatrix field representative will be present during drilling of exploratory borings and will observe and record such changes by time and depth. The field representative will evaluate the relative moisture content of the samples

and note zones that produce water. The field representative will record such field notes to use in preparing a detailed lithologic log.
A detailed lithologic log for the exploratory borings shall be completed. The lithologic description of the log shall include soil or rock type, color, grain size, texture, hardness, degree of induration, calcareous content, presence of fossils and other materials (gypsum, hydrocarbons) and other pertinent information.

Field notes recorded by the Geomatrix field representative during the drilling of each exploratory boring shall be transferred to the log forms. The original logs shall be sent to the Geomatrix office in San Francisco for storage in the project files.

4. MONITORING WELL MATERIALS

The monitoring wells assembly will consist of two-inch-diameter polyvinyl chloride (PVC) schedule 40 (minimum) flush threaded casing.

The perforated casing (well screen) shall be factory slotted. The perforations will be 0.020 inches in size. These perforated casing sections are not intended to provide optimum flow but only to provide hydraulic connection between the pervious material in the water-bearing zone and the monitoring well.

Filter material will be a well graded, clean, sand or gravel, with less than 2 percent by weight passing a No. 200 sieve and less than 5 percent by weight of calcareous material, such as Lonestar Lapis Lustre No. 3 sand.

5. WELL CONSTRUCTION

5.1 Setting Screens and Riser Casing

Upon completion of drilling, the well will be assembled and lowered to the bottom of the boring. The well assembly will be designed so that the well

screen is approximately opposite the water-bearing zone. The bottom of the screen shall be approximately flush with the bottom of the well and shall be capped with a threaded cap or plug. The pipe joints shall be flushed coupled and threaded. No PVC cement or other solvents are permitted to be used to fasten the joints of casing or screen.

After the well assembly has been lowered to the specified depth, filter sand or gravel will be placed in the annular space in a calculated quantity sufficient to fill the annular space to a level of about 1 foot above the top of the perforated casing. The depth to the top of the filter pack must be verified by measuring, using the tremie pipe, or a weighted steel tape.

Once the depth to the top of the filter pack has been verified, a layer of bentonite pellets will be placed by pouring the pellets into the annular space in a calculated quantity sufficient to fill the annular space to a level of not more than 2 feet above the top of the filter pack. The depth to the top of the bentonite pellets layer must be verified by measuring, using the tremie pipe, or a weighted steel tape.

A neat/cement grout seal will be emplaced above the bentonite pellets layer. The neat/cement grout shall be a water/cement mixture with a water/cement ratio of 5 gallons water to 1 sack (94 pounds) of cement. Only clean water from a municipal supply shall be used to prepare the grout. The grout seal will extend from the top of the bentonite pellets layer to the ground surface. After grouting, no work will be done on the monitoring well until the grout has set a minimum of 48 hours.

5.2 Capping Monitoring Well

Upon completion of the work, a suitable water-tight screw cap will be fitted on the end of the rise casing to prevent the entry of surface runoff or foreign matter. A steel well cover with a locking top will be attached to the riser casing for protection. The steel protective well cover will be

completed below the ground surface in a pre-cast concrete valve box with a traffic-rated cover.

5.3 Well Development

When the well installation is complete, the well will be developed by surging, and bailing and/or pumping. A minimum of 48 hours must pass between completion of grouting and development, to allow sufficient curing of the grout.

During development, pH, specific conductance, and temperature of the return water will be measured. Well development will proceed until these field water quality parameters have stabilized and the produced water is, in the judgment of the Geomatrix field representative, at its maximum possible clarity.

Water generated during development procedures will be placed in 55-gallon drums for temporary storage. Final disposal will be the responsibility of the client.

5.4 Documentation

A Well Construction Diagram for each well will be completed by the Geomatrix field representative and checked by the registered geologist or engineer overseeing the drilling operations when the work has been completed. In addition, the details of well installation, construction, development and field measurements of water quality parameters will be summarized as daily entries in a field notebook or on data sheets. The field notebook and/or data sheets and the well construction diagram will be submitted to the Project Manager when the work has been completed.

6. CLEANING OF WELL MATERIALS

Well casing shall be cleaned thoroughly before it is installed. The

following cleaning procedure has generally been found to be effective and may be used or adapted as appropriate for site conditions.

1. Swab surfaces, inside and out, with detergent-water solution.

2. Steam wash with a detergent-potable water solution or other solutions deemed appropriate.

3. Steam rinse with clean potable water.

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PROTOCOL NO. 2

WATER-LEVEL MONITORING

GEOMATRIX

PROTOCOL NO. 2

WATER-LEVEL MONITORING

1.0 INTRODUCTION

This document describes procedures to be followed during periodic water-level monitoring at 1351 Ocean Avenue in Emeryville, California. The procedures presented herein are intended to be of a general nature, and, when warranted, appropriate revisions will be made and approved by the Project Manager.

2.0 WATER-LEVEL MEASUREMENTS

Water-level measurements will be obtained from project monitoring wells at a frequency based on project requirements and as deemed necessary by the Project Manager. All water level measurements shall be recorded to the nearest one one-hundredths of a foot.

2.1 Water Level Measurements in Monitoring Wells

Water level measurements shall be done by one of the following methods:

A. Wetted-tape Method

The tape shall be prepared by coating several feet of the lower end of a steel tape with chalk. Lead weights are attached to the lower end of the steel tape to keep it taut. The tape is lowered into the well until a foot or two of the chalked portion is submerged. The proper length to lower the tape may have to be determined experimentally. Measurement shall be done as follows:

1. Lower and hold the tape at an even foot mark at the measuring point and note this tape reading.

2. Remove the steel tape from the well. Subtract the wetted length from the even foot mark noted in Step 1 and record this as Water Level Below Measuring Point (MP) on the Water Level Monitoring Record (Figure 2-1).

B. Electric Sounder Method

An electric sounder consists of a contact electrode that is suspended by an insulated electric cable from a reel that has an

ammeter, a buzzer, or other closed circuit indicator attached. The indicator shows a closed circuit and flow of current when the electrode touches the water surface. The electric sounders used in this survey shall be calibrated by measuring each interval and remarking them where necessary.

The procedure for measuring water levels with an electric sounder is as follows:

1. Switch on.

2. Lower the electric cable into the well unit until the ammeter or buzzer indicates a closed circuit. Raise and lower the electric cable slightly until the shortest length of cable that gives the maximum response on the indicator is found.

3. With the cable in this fixed position, note the length of cable at the measuring point.

4. Since the electric cable is usually graduated in 5-foot intervals, use a pocket steel tape measure to interpolate between consecutive 5-foot marks. Care must be taken that the tape measurements are subtracted from graduated mark footage value when the water level hold point (determined in Step 3) is below the mark and added when above the mark.

5. Water-levels obtained with the electric sounder will be calibrated at least once during each measuring period with a water-level measurement done with the Wetted-tape Method.

WATER LEVEL DATA

WELL LOCATION ______________________________ MEASURING POINT ______________________________

ELEVATION: MEASURING POINT ______________________ GROUND LEVEL ______________________

LOCATION ______________________

PROJECT ______________________

WELL or DATE	TIME	MEASURING DEVICE	READING	CONVERSIONS or CORRECTIONS	WATER LEVEL DEPTH	WATER LEVEL ELEVATION	BY	COMMENTS

Geomatrix Consultants

FIGURE 2-1

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PROTOCOL NO. 3

GROUNDWATER SAMPLING

PROTOCOL NO. 3

GROUNDWATER SAMPLING

1.0 INTRODUCTION

This document describes procedures to be followed during groundwater sampling at 1351 Ocean Avenue in Emeryville, California. Field measurements and groundwater samples will be collected from monitoring wells for water quality analyses. The procedures presented herein are intended to be of general use. As the work progresses, and if warranted, appropriate revisions will be made and approved by the Project Manager.

2.0 SAMPLING

2.1 Sample Collection

Individual samples from wells will be collected as follows:

A. Prior to purging and collection of water samples from the monitoring wells, water level elevations will be measured.

B. Wells will be pumped until the volume of water removed is equal to at least three volumes of the well's casing. To confirm that the water samples are representative of the aquifer, periodic measurements of the temperature, pH and specific conductance will be made. The sample will be collected only when the temperature, pH and specific conductance reaches a more or less constant value.

C. A positive-placement pump (bladder or reciprocating) will be used for evacuating the well casing (purging) of the monitoring wells in the groundwater sampling network. If the discharge rate using this equipment is too slow to be practical, a diaphragm pump will be used. A positive-placement Teflon bladder pump with Teflon tubing, a positive-placement PVC or Teflon reciprocating pump with PVC or Teflon tubing, and/or a Teflon bailer will be used to collect the water samples.

D. Where more than one well within a specific field or site is to be sampled, the sampling sequence will begin with the well having the least suspected contamination. Successive samples will be obtained from wells of increasing suspected contamination. If the relative degree of suspected contamination at each well cannot be reasonably assumed, sampling will proceed from the perimeter of the site towards the center of the site. The sampling sequence will be

arranged such that wells are sampled in order of increasing proximity to the suspected source of contamination.

E. Water samples for the analysis of purgeable organics and acid/base/neutral extractable organics will be collected in the following manner.

A sample container and cap provided by the analytical laboratory will first be rinsed thoroughly with the water to be sampled. The container will then be filled to overflowing (except when sampling for bacteriological analysis) to avoid trapping air at the top of the container. Splashing of the water in the sample container and exposure to the atmosphere shall be minimized during sampling. A container cap will be screwed on tightly immediately after filling the sample container such that no air bubbles exist in the container. Sample preservation requirements are discussed in Section 2.4.

F. A map will be used in the field to record sample locations. A Monitoring Well Sampling Record (Figure 3-1) will be used to record the following information:

(a) Sample number (or name)

(b) Date and time sampled

(c) Location

(d) Depth at which sample was taken

(e) Conditions of source (flowing pumping, etc.)

(f) Extraordinary circumstances (if any)

(g) Name of collector

(h) Results of field measurements (temperature, pH, specific conductance)

2.2 Sample Containers

The sample containers will be glass and will be obtained from the water analysis laboratory or other approved source. Bottles will be required for the following analysis: EPA Test Method 8015 for diesel fuel content.

2.3 Sample Labelling

Sample containers, either glass or plastic, will be labelled with self-adhesive, preprinted tags having the following information written on them.

A. Project number (or name)
B. Sample number (or name)
C. Date and time samples were obtained
D. Treatment (preservative added, filtered, etc.)
E. Initials of sample collector

Sample tags shall be filled out using waterproof ink.

2.4 Sample Preservation and Storage

Preservation and storage of samples is dependent on the chemical constituents to be analyzed and should be discussed with the laboratory prior to sample collection.

2.5 Storage and Transportation

Efforts will be made to store and transport supplies and samples safely. Exposure to dust, direct sunlight, high temperature, and adverse weather conditions will be avoided whenever possible. Samples shall be transported to the laboratory as soon as possible and according to the maximum holding times. Samples sent to the laboratory by common carrier will have proper hazardous-waste labelling affixed, if necessary.

3.0 FIELD MEASUREMENTS

The following field measurements will be performed on groundwater samples. Data obtained from field water quality measurements will be recorded on the Monitoring Well Sampling Record (Figure 3-1).

3.1 Temperature Measurement

Temperature measurements will be made with a good grade mercury-filled Celsius thermometer, a bimetallic thermometer or electronic thermistor. Measurements will be recorded in degrees Celsius. A number of measurements will be taken until a stable temperature is obtained.

3.2 pH Measurement

The pH measurement will be made from groundwater contained in the same bailer as that from which the groundwater sample was collected. Sample bottles will not be reopened to obtain a pH measurement.

Calibration and measurements will be performed in accordance with the manufacturer's specifications as outlined in the Instruction Manual for the specific pH meter. For measurement of natural waters, buffers of pH 4, pH 7, and pH 10 will normally be used for instrument calibration. In measuring polluted waters and some exceptional natural waters, very high and low range buffers may be needed for calibration. Check that the pH and reference electrode(s) are properly filled with probe solution, if required. Remove the electrode cap and lower sleeve. Check the instrument battery.

Calibration will be performed using at least two buffer solutions. The buffers must have pH values that bracket the pH of the sample (e.g., between 7 and 10 or between 4 and 7). The temperature of the sample and the buffers should be approximately the same. This can sometimes be accomplished by immersing the buffer solutions in water to be sampled until the buffers reach the same temperature as the water. When it is not possible for the buffers and the sample to have the same temperature, always reset the temperature compensation dial on the pH meter to the temperature of the sample, following calibration with the buffers. Rinse the electrode with distilled water before it is immersed in a buffer for calibration. Wash it with sample water and allow it to soak for a minute before a sample measurement is taken. It is a good practice to discard the sample aliquot after the first measurement and remeasure using a second aliquot.

3.3 Specific Conductance Measurement

Conductivity will be measured by dipping the conductivity probe directly in the water source. The probe must be immersed above the vent. The temperature of the sample (see Section 3.1) will be used to calculate

specific conductance from the conductivity measurement. Measurements shall be reported in units of micromhos per centimeter at 25 degrees Celsius.

Calibrations and measurements will be performed in accordance with the manufacturer's specifications as outlined in the Instruction Manual for the particular conductivity meter. The conductivity meter will be periodically calibrated with standardized potassium chloride (KCl) solutions. Batteries will also be checked frequently. The conductivity probe will be checked periodically for signs of deterioration, and regeneration, replated or replaced as needed. Probes can be stored wet or dry.

3.4 Equipment Calibration

Equipment used for field measurements of pH and specific conductance shall be calibrated as discussed above. This calibration will be performed by Geomatrix Consultants personnel. Calibration shall be documented in a field log book or daily field record data sheet and shall include a description of the calibration method, identification number of equipment and/or reagents used in calibration, and the date calibration was performed.

4.0 DOCUMENTATION

4.1 Log Book or Field Records

A log book or field records containing information collected during sampling operations, as described above, will be maintained. Entries in the log book or field records shall be made with indelible ink. Errata may be marked out with a single line. The log book or field records will be placed in the project file when sampling is completed.

4.2 Chain-of-Custody Procedures

After samples have been collected and ~~labelled, they will~~ be maintained under chain-of-custody procedures. These procedures document the transfer of custody of samples from the field to a designated laboratory.

A Chain-of-Custody Record will be filled out for each shipment of samples to be sent to the laboratory for analysis (Figure 3-2). Information contained on the triplicate, carbonless form shall include:

- o date and time the sample was taken
- o sample number and the number of sample bottles
- o analyses required
- o remarks including preservatives added and any special conditions
- o container number in which sample has been packaged.

Cross out any blank space on the Chain-of-Custody Record between last sample number listed and signatures at the bottom of the sheet.

After carefully packaging the samples into numbered containers for transfer to the laboratory, the field sampler will sign the Chain-of-Custody Record and record the time and the date. The original and duplicate imprints of the Chain-of-Custody Record will accompany the sample containers. The triplicate copy will be retained by the Geomatrix representative on the site.

When shipping the containers by a common carrier, a Bill of Lading should be used. Receipts of Bill of Lading should be retained as part of the permanent documentation in the project files.

5.0 EQUIPMENT CLEANING

Sample bottles and bottle caps will be cleaned by the analytical laboratory subcontractor using standard EPA-approved protocols. Sample bottles and bottle caps will be protected from solvent contact, dust or other contamination between time of receipt by Geomatrix Consultants and time of actual usage at the sampling site.

Prior to installation of sampling equipment, all equipment surfaces that will be placed in the well or may come in contact with groundwater will be cleaned with a detergent-water solution and rinsed with deionized water to prevent the introduction of contaminants to each well. Sampling equipment that will be reused shall be cleaned after sampling of each well is completed. Thermometers, pH electrodes, and conductivity probes that are used from well to well shall also be cleaned after sampling of each well.

Cleaning procedures shall be accomplished as follows:

A. Scrub with a detergent-potable water solution or other solutions deemed appropriate using a hard bristle brush,

B. Rinse with clean potable water,

C. Rinse with deionized water,

D. Air dry, and

E. Package and seal equipment in plastic bags or other appropriate containers to prevent contact with solvent, dust or other contaminants.

Purge water and solutions resulting from cleaning procedures will be collected and transported to a central location by the field sampler. The owner will be responsible for their disposal.

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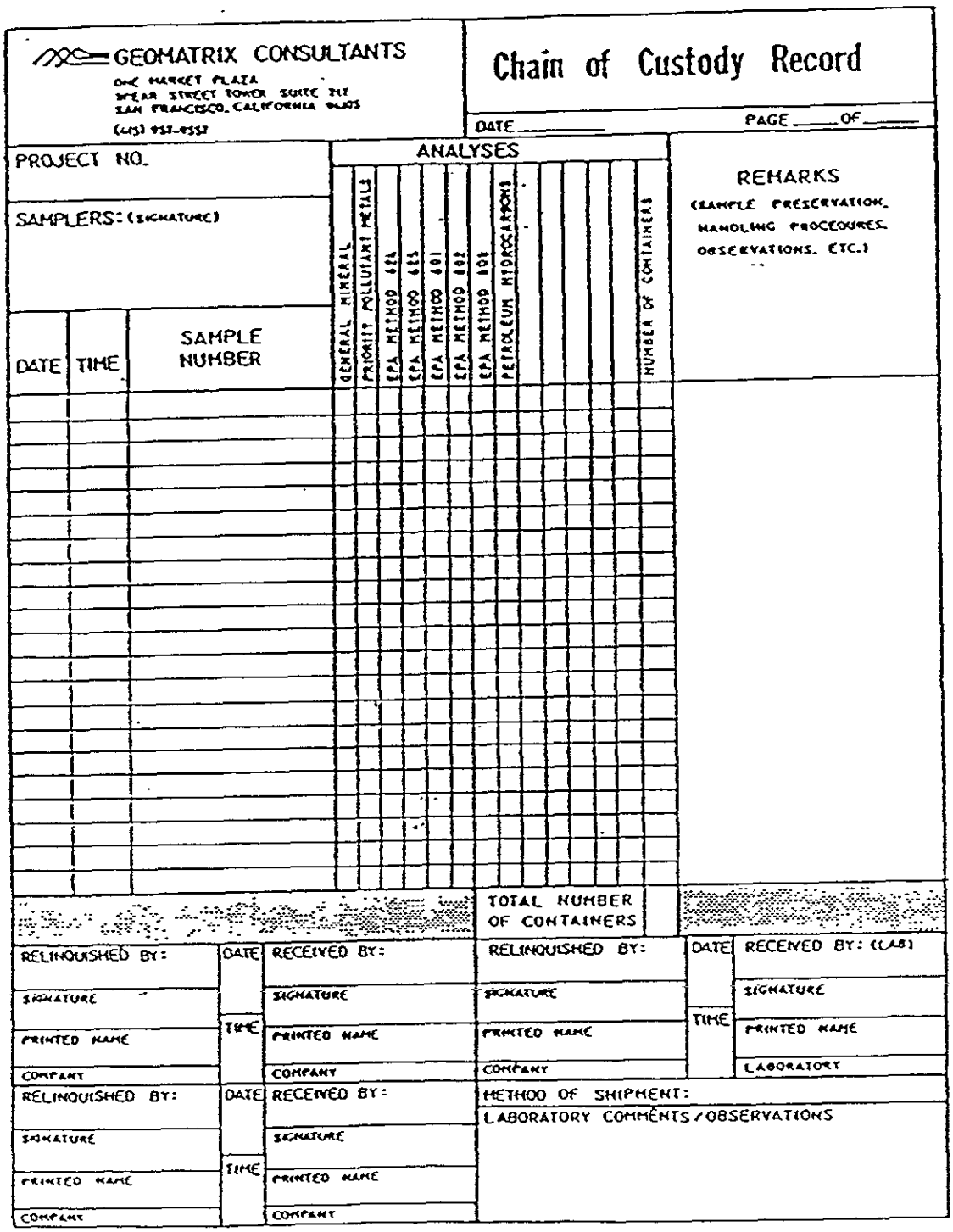
MONITORING WELL SAMPLING RECORD

WELL ID: _____ DEPTH TO WATER: _____
PROJECT NO: _____ TOTAL DEPTH OF WELL: _____
PROJECT NAME: _____ WELL DIAMETER: _____
DATE: _____ CASING VOLUME: _____
SAMPLED BY: _____ METHOD OF PURGING: _____

TIME	CUMULATIVE VOL. REMOVED (GALLONS)	TEMPERATURE (°C)	pH (UNITS)	SPECIFIC CONDUCTANCE (UMHOS/CM)	REMARKS (COLOR, TURBIDITY & SEDIMENT)

NOTES: _____

FIGURE 3-1



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Chain of Custody Record

DATE _____ PAGE ____ OF ____

PROJECT NO.

SAMPLERS: (SIGNATURE)

ANALYSES

REMARKS
(SAMPLE PRESERVATION, HANDLING PROCEDURES, OBSERVATIONS, ETC.)

DATE	TIME	SAMPLE NUMBER	GENERAL MINERAL	PRIORITY POLLUTANT METALS	EPA METHOD 624	EPA METHOD 625	EPA METHOD 601	EPA METHOD 602	EPA METHOD 801	PETROLEUM HYDROCARBONS						NUMBER OF CONTAINERS	

TOTAL NUMBER OF CONTAINERS

RELINQUISHED BY:	DATE	RECEIVED BY:	RELINQUISHED BY:	DATE	RECEIVED BY: (LAB)
SIGNATURE		SIGNATURE	SIGNATURE		SIGNATURE
PRINTED NAME	TIME	PRINTED NAME	PRINTED NAME	TIME	PRINTED NAME
COMPANY		COMPANY	COMPANY		LABORATORY

RELINQUISHED BY:	DATE	RECEIVED BY:	METHOD OF SHIPMENT:
SIGNATURE		SIGNATURE	LABORATORY COMMENTS / OBSERVATIONS
PRINTED NAME	TIME	PRINTED NAME	
COMPANY		COMPANY	

DISTRIBUTION: WHITE, CANARY - LABORATORY, PINK - ORIGINATOR

FIGURE 3-2