ENCLOSURE 16

Corporate Offices 41674 Christy Street, Fremont, CA 94538-3114 (415) 659-0404 Fax: (415) 651-4677 Contr. Lic. No. 464324

ensco environmental services, inc.

November 8, 1988

O.I. Glass Container Division, S.T.S.
3600 Alameda Avenue
Oakland, CA 94601

Attn: Mr. Robert Barber

Re: September Quarterly Ground-Water Sampling and Analysis
Owens Illinois Facility, Oakland, California
EES Project No. 1467G

Dear Mr. Barber:

This comprehensive report presents the results of the September quarterly ground-water sampling and laboratory analysis at the Owens Illinois facility located in Oakland, California. It includes the current and past analytical data acquired during the course of this investigation.

If you have any questions, please call.

Sincerely,
Ensco Environmental Services, Inc..

David Siegel
Project Geologist

Lawrence D. Pavlak, C.E.G. 1187
Senior Program Geologist

DS/LDP/sr
Enclosure

SEPTEMBER QUARTERLY GROUND-WATER SAMPLING AND ANALYSIS

FOR

O.I. GLASS CONTAINER DIVISION, S.T.S.
3600 ALAMEDA AVENUE
OAKLAND, CALIFORNIA

INTRODUCTION

Ensco Environmental Services, Inc. (EES) has completed the September quarterly sampling program to ascertain the ground-water conditions beneath the O.I. Glass Container facility located in the city of Oakland, Alameda County, California. Ground-water sampling was performed on September 14, 1988. This information is used to ascertain water quality as requested by the Regional Water Quality Control Board (RWQCB), San Francisco Bay Region. The sample program objectives are:

- Plot the ground-water contour surface and inferred flow direction.
- Investigate for the presence of hydrocarbon contamination by; 1) checking floating product thickness and; 2) Performing laboratory analyses of ground-water samples for the presence of either total volatile hydrocarbons (TVH) and the compounds benzene, toluene and xylenes (BTX), or total extractable hydrocarbons (TEH), or both.
- Ascertain the extent and concentrations of the hydrocarbon.
- Compare current and past data.

Eighteen ground-water monitoring wells (MW-1 through MW-18) and one recovery well (R-1) exist in the project area as shown on Figure 1. This map also presents the ground-water surface contours at the site based on data collected on September 14, 1988. The recovery system, utilizing one recovery

well, was taken out of service during remodeling at the plant and is not currently in operation. Prior to sampling each well, ground-water elevations were recorded and each well was checked for the presence of floating product. All ground water removed from each well was placed in properly labeled drums and left on the site. Analytical results of water samples collected in September are summarized in Table 1 along with past results. EES in-house sampling and laboratory procedures are attached in Appendices A and B, respectively. Laboratory reports with chain-of-custody are attached in Appendix C.

DISCUSSION

Ground-Water Occurrence

Ground-water beneath the site is tidally influenced daily due to its proximity to the Alameda Channel and San Francisco Bay. Past observations of the ground-water surface revealed fluctuations which varied from 0.1 to 6.0 feet. A ground-water elevation map for September 14, 1988 is attached (see Figure 1).

Ground-Water Sampling and Analysis

All monitoring wells except MW-1, MW-2, MW-3, MW-9 and MW-14 were sampled during this round of monitoring. Access to wells MW-1, MW-2, and MW-14 was obstructed. Wells MW-3 and MW-9 were not sampled due to the presence of floating product.

The wells were first checked for the presence of floating product. If less than 1/4 inch of floating product was measured on the ground water in a well, samples were collected and analyzed for TVH with BTX dinstinction and/or TEH. Wells were preselected for individual analyses given their proximity to the known contaminants (i.e., TVH and TEH in the vicinity of the power and forming building, where gasoline and diesel fuels spilled, TEH near the southwestern corner of the site where No. 2 oil was the contaminant). The results are

presented on Table 1 and the laboratory analytical reports are attached in Appendix C.

Analytical Results

The results of the chemical analyses showed that relatively low concentrations of TEH were found in most of the sampled wells but they ranged from 100 parts-per-billion (ppb) in wells MW-4, MW-11, and MW-15 to 140,000 ppb in MW-6. The highest concentrations of TEH were detected in the southwestern corner of the site. Well MW-17 was found to contain high concentrations of TEH (64,000 ppb) as well as TVH (54,000 ppb) while no concentrations of BTX were found. These results indicate that there may be be a light hydrocarbon other than gasoline present in this well.

Analytical results of the current sampling round are presented in Table 1 along with past available data. TEH analytical data from selected wells that have been sampled for several sampling rounds are presented graphically in Figures 2-9. The graphs show that the concentrations of TEH have decreased in wells MW-5, MW-8, and MW-10 but increased in wells MW-6, MW-7, MW-16, MW-17 and MW-18 since the June quarterly sampling. Overall, the concentrations of TEH in these wells have fluctuated during the last year but are currently at approximately the same levels as they were in September of 1987.

Contaminant Plume Movement

Floating oil was observed during the current sampling in wells MW-9 and MW-3, which is consistent with past observations. The concentrations of dissolved contaminants in MW-5, MW-6, MW-7, and MW-10 have remained high over the last few quarterly monitoring rounds. At the same time, the detected contaminant concentrations in MW-16, MW-17, and MW-18 have increased. Relatively small amounts of hydrocarbons (TEH) continue to be detected in the upgradient wells MW-12 and MW-4.

CONCLUSIONS AND RECOMMENDATIONS

1. The product recovery system should be reactivated and an additional recovery well should be installed in the vicinity of well MW-2.

2. The Monitoring of floating product and dissolved constituents should continue on a quarterly basis, as requested by the RWQCB.

Reporting Requirements

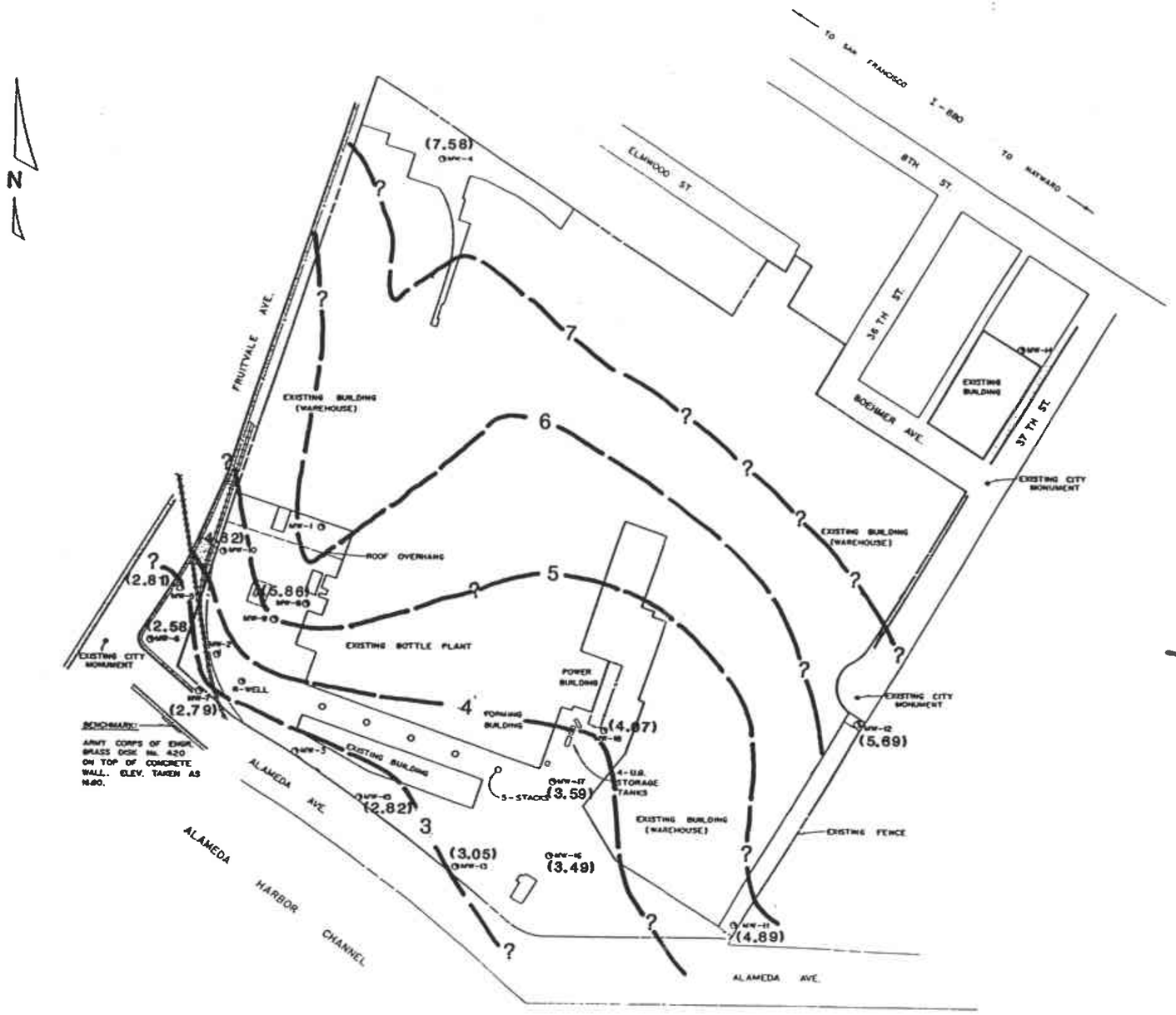
This report should be forwarded by the client in a timely manner to the following agency:

California Regional Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Oakland, California, 94607
Attn: Mr. Greg Zentner

LIMITATIONS

EES makes no warranty, expressed or implied, except that our services have been performed in accordance with generally accepted, existing, engineering, geological, hydrogeological, health and safety principles and applicable regulations at the time and location of the study.

EES includes in this report chemical analytical data from a state-certified laboratory. The analytical results are performed according to procedures suggested by the U.S. EPA and State of California. EES is not responsible for laboratory errors in procedure or result reporting.



LEGEND

- GROUND-WATER MONITORING WELL
- (4.07) GROUND-WATER SURFACE ELEVATION IN FEET (DATUM: M.S.L. MEASURED 9/14/88)
- 5 GROUND-WATER SURFACE ELEVATION CONTOUR IN FEET. (DATUM: M.S.L.)

ensco environmental services, Inc.

SITE PLAN

GROUND-WATER CONTOUR MAP

OWENS-ILLINOIS GLASS CONTAINER DIVISION

OAKLAND, CALIFORNIA

REVIEWED BY:	APPROVED BY:
JOB #: 1467G	DRAWN BY: J.C.
DATE: 6-30-88	DRAWING #: FIG. 1

TABLE 1 Owens Illinois; #1467G.

GROUND-WATER ANALYSES DATA

WELL NUMBER	DATE SAMPLED	TEH (ppb)	TVH (ppb)	BENZENE (ppb)	TOLUENE (ppb)	XYLENES (ppb)	WELL ELEV. (ft.)	DEPTH TO WATER (ft)	PRODUCT THICKNESS (ft.)
MW-1	4/9/87	NA	BDL	BDL	BDL	BDL	16.02	8.98	0.005
	9/16/87	NOT SAMPLED	COVERED BY GLASS		---	---		---	
	12/1/87	NOT SAMPLED	COVERED BY GLASS		---	---		---	
	3/7/88	NOT SAMPLED	COVERED BY GLASS		---	---		---	
	6/8/88	NOT SAMPLED	COVERED BY GLASS		---	---		---	
	9/14/88	NOT SAMPLED	COVERED BY GLASS						
MW-2	4/9/87	NOT SAMPLED	---	---	---	---	17.11	---	3.85
	9/16/87	NOT SAMPLED	---	---	---	---		---	
	12/1/87	NOT SAMPLED	---	---	---	---		20.19	8.49
	3/7/88	NOT SAMPLED	COVERED BY DUMPSTER		---	---			
	6/8/88	NOT SAMPLED	COVERED BY DUMPSTER		---	---			
	9/14/88	NOT SAMPLED	COVERED BY TRAILER						
MW-3	4/9/87	NA	370	BDL	BDL	BDL	15.66	10.53	---
	9/16/87	NOT SAMPLED	---	---	---	---		11.44	0.04
	12/1/87	NOT SAMPLED	---	---	---	---		12.73	0.25
	3/9/88	190,000	NA	NA	NA	NA		15.22	0.71
	6/9/88	16,000	NA	NA	NA	NA		14.78	0.70
	9/14/88	NOT SAMPLED	NA	NA	NA	NA		---	0.43
MW-4	4/9/87	NA	BDL	BDL	BDL	BDL	18.05	8.73	---
	9/16/87	66	1.3	BDL	BDL	BDL		10.53	---
	12/1/87	100	BDL	BDL	BDL	8.9		9.08	---
	3/7/88	BDL	BDL	BDL	BDL	BDL		9.05	---
	6/8/88	BDL	BDL	BDL	BDL	BDL		9.25	---
	9/14/88	100	BDL	BDL	BDL	BDL		10.47	---

TABLE 1 (Cont.) Owens Illinois; #1467G.
GROUND-WATER ANALYSES DATA

WELL NUMBER	DATE SAMPLED	TEH (ppb)	TVH (ppb)	BENZENE (ppb)	TOLUENE (ppb)	XYLENES (ppb)	WELL ELEV. (ft.)	DEPTH TO WATER (ft)	PRODUCT THICKNESS (ft.)
MW-5	4/9/87	NA	54	BDL	BDL	BDL	16.19	12.02	---
	9/16/87	96,000	NA	NA	NA	NA		11.77	---
	12/1/87	2,000	NA	NA	NA	NA		11.37	Film
	3/9/88	BDL	NA	NA	NA	NA		13.06	---
	6/9/88	12,000	NA	NA	NA	NA		12.74	Film
	9/14/88	6,300	NA	NA	NA	NA		13.38	Film
MW-6	4/9/87	NOT SAMPLED	---	---	---	---	17.48	13.28	0.59
	9/16/87	400,000	NA	NA	NA	NA		13.40	Film
	12/1/87	30,000	NA	NA	NA	NA		13.04	Film
	3/9/88	9,800	NA	NA	NA	NA		15.00	---
	6/9/88	63,000	NA	NA	NA	NA		14.56	Film
	9/14/88	140,000	NA	NA	NA	NA		14.90	Film
MW-7	4/9/87	NOT SAMPLED	---	---	---	---	15.76	12.13	Film
	9/16/87	790,000	NA	NA	NA	NA		12.29	Film
	12/1/87	5,300	NA	NA	NA	NA		11.24	Film
	3/9/88	BDL	NA	NA	NA	NA		11.85	---
	6/9/88	12,000	NA	NA	NA	NA		12.46	Film
	9/14/88	67,000	NA	NA	NA	NA		12.97	Film
MW-8	4/9/87	NA	73	BDL	BDL	BDL	16.57	10.35	Film
	9/16/87	NOT SAMPLED	---	---	---	---		10.71	---
	12/1/87	630	NA	NA	NA	NA		9.89	---
	3/8/88	2,600	NA	NA	NA	NA		9.61	---
	6/9/88	1,700	NA	NA	NA	NA		9.96	---
	9/14/88	150	NA	NA	NA	NA		10.71	Sheen

TABLE 1 (Cont.) Owens Illinois; #1467G.

GROUND-WATER ANALYSES DATA

WELL NUMBER	DATE SAMPLED	TEH (ppb)	TVH (ppb)	BENZENE (ppb)	TOLUENE (ppb)	XYLENES (ppb)	WELL ELEV. (ft.)	DEPTH TO WATER (ft)	PRODUCT THICKNESS (ft.)
MW-9	4/9/87	NOT SAMPLED	---	---	---	---	---	---	---
	9/16/87	1,300	NA	NA	NA	NA		---	---
	12/1/87	18,000	NA	NA	NA	NA		6.83	---
	3/9/88	47,000	NA	NA	NA	NA		6.44	0.06
	6/8/88	NOT SAMPLED	ACCESS RESTRICTED					---	---
	9/14/88	NA	NA	NA	NA	NA		7.70	1.5
MW-10	4/9/87	NA	300	BDL	BDL	BDL	15.96	10.29	Film
	9/16/87	3,800	NA	NA	NA	NA		11.19	Film
	12/1/87	590	NA	NA	NA	NA		10.08	Film
	3/8/88	BDL	NA	NA	NA	NA		10.36	---
	6/8/88	3,800	NA	NA	NA	NA		10.89	Film
	9/14/88	570	NA	NA	NA	NA		11.34	---
MW-11	4/9/87	NA	BDL	BDL	BDL	BDL	13.99	9.02	---
	9/16/87	NA	BDL	BDL	BDL	BDL		9.96	---
	12/1/87	NA	BDL	0.8	BDL	10		9.44	---
	3/7/88	BDL	BDL	BDL	BDL	BDL		9.31	---
	6/8/88	BDL	BDL	BDL	BDL	BDL		9.42	---
	9/14/88	100	BDL	BDL	BDL	BDL		9.10	---
MW-12	4/9/87	NA	BDL	BDL	BDL	BDL	13.83	6.83	---
	9/16/87	NA	BDL	BDL	BDL	BDL		7.80	---
	12/1/87	NA	BDL	BDL	BDL	13		7.59	---
	3/7/88	BDL	BDL	BDL	BDL	BDL		7.02	---
	6/8/88	BDL	BDL	BDL	BDL	BDL		7.38	---
	9/14/88	120	BDL	BDL	BDL	BDL		8.14	---

TABLE 1 (Cont.) Owens Illinois; #1467G.

GROUND-WATER ANALYSES DATA

WELL NUMBER	DATE SAMPLED	TEH (ppb)	TVH (ppb)	BENZENE (ppb)	TOLUENE (ppb)	XYLENES (ppb)	WELL ELEV. (ft.)	DEPTH TO WATER (ft)	PRODUCT THICKNESS (ft.)
MW-13	4/9/87	NA	BDL	BDL	BDL	BDL	13.98	10.79	---
	9/16/87	NA	BDL	BDL	BDL	BDL		10.98	---
	12/1/87	NA	BDL	1.6	BDL	12		10.21	---
	3/8/88	BDL	7.7	BDL	BDL	BDL		10.51	---
	6/8/88	BDL	BDL	BDL	BDL	BDL		10.85	---
	9/14/88	130	BDL	BDL	BDL	BDL		10.93	---
MW-14	4/9/87	NA	BDL	BDL	BDL	BDL	14.78	7.17	---
	9/16/87	56	1.7	BDL	BDL	BDL		8.78	---
	12/1/87	66	BDL	1.2	4	10		8.26	---
	3/7/88	BDL	20	BDL	BDL	BDL		7.26	---
	6/8/88	NOT SAMPLED	WELL INACCESSIBLE						
	9/14/88	NOT SAMPLED	WELL INACCESSIBLE						
MW-15	4/9/87	NA	BDL	BDL	BDL	BDL	15.16	11.88	---
	9/16/87	BDL	8.4	BDL	BDL	BDL		11.77	---
	12/1/87	NA	BDL	3.3	0.84	14		11.25	---
	3/8/88	BDL	90	0.8	BDL	BDL		11.24	---
	6/9/88	BDL	53	BDL	BDL	BDL		12.15	---
	9/14/88	100	NA	NA	NA	NA		12.34	---
MW-16	4/9/87	NA	BDL	BDL	BDL	BDL	13.48	9.47	---
	9/16/87	64	BDL	BDL	BDL	BDL		10.07	---
	12/1/87	150	120	1	0.37	9.1		9.23	---
	3/8/88	BDL	10	0.5	BDL	BDL		9.46	---
	6/8/88	BDL	BDL	BDL	BDL	BDL		9.56	---
	9/14/88	190	BDL	BDL	BDL	BDL		9.99	---

TABLE 1 (Cont.) Owens Illinois; #1467G.
GROUND-WATER ANALYSES DATA

WELL NUMBER	DATE SAMPLED	TEH (ppb)	TVH (ppb)	BENZENE (ppb)	TOLUENE (ppb)	XYLENES (ppb)	WELL ELEV. (ft.)	DEPTH TO WATER (ft)	PRODUCT THICKNESS (ft.)
MW-17	4/9/87	NA	BDL	BDL	BDL	BDL	14.17	9.95	0.005
	9/16/87	680	44	BDL	BDL	0.55		10.59	Film
	12/1/87	1,300	540	7.8	2.4	28		9.87	Film
	3/8/88	3,800	4,300	83	BDL	46		10.10	---
	6/8/88	NOT SAMPLED	COVERED BY DUMPSTER					---	---
	9/14/88	64,000	54,000	BDL	BDL	BDL		10.58	Film
MW-18	4/9/87	NA	BDL	BDL	BDL	BDL	14.89	9.91	---
	9/16/87	480	BDL	BDL	BDL	BDL		10.37	---
	12/1/87	18	BDL	BDL	BDL	6.6		10.19	---
	3/7/88	BDL	BDL	BDL	BDL	BDL		9.60	---
	6/8/88	BDL	BDL	BDL	BDL	BDL		10.01	---
	9/14/88	190	BDL	BDL	BDL	BDL		10.82	---

TEH = Total Extractable Hydrocarbons As Diesel
TVH = Total Volatile Hydrocarbons as Gasoline
ppb = parts per billion
BDL = Below Detection Limit
NA = Not Analyzed

Note: For detection limits, refer to laboratory reports

Current Department of Health Services Action Levels In Drinking Water
Benzene 0.7 ppb
Toluene 100 ppb
Xylenes 620 ppb
Note: Subject to change as reviewed by Department of Health Services

Project # 1467G

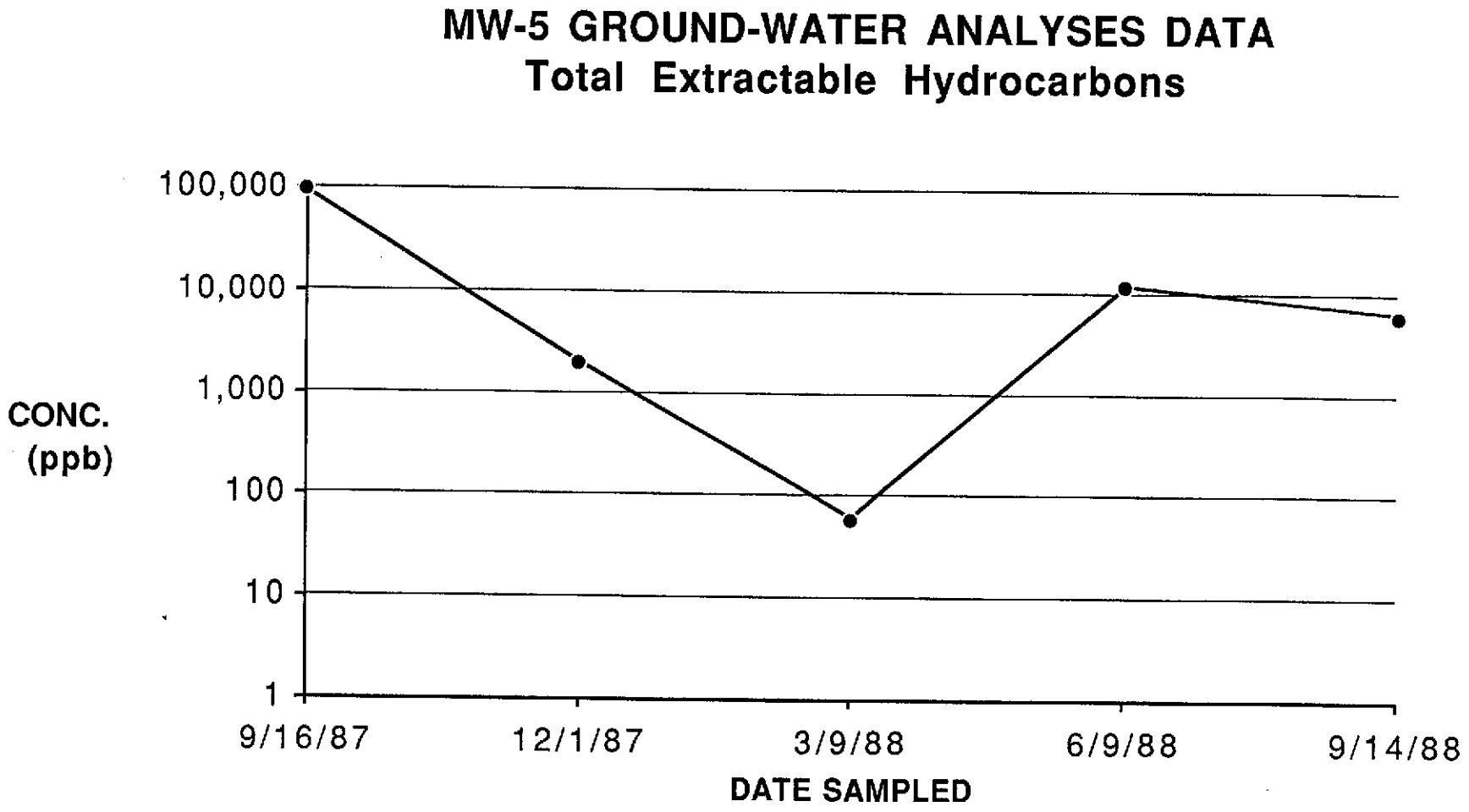


Figure # 2

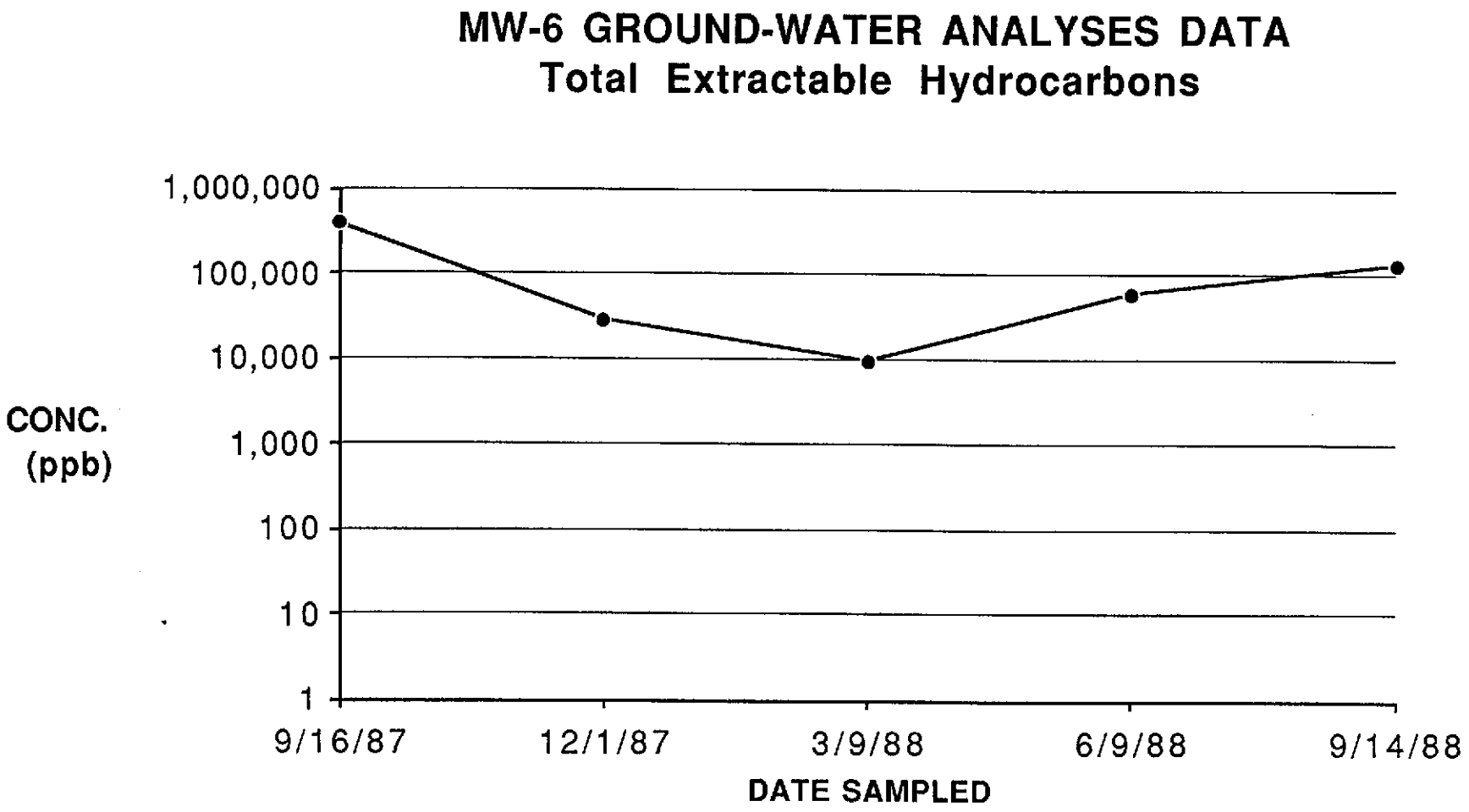

MW-6 GROUND-WATER ANALYSES DATA
Total Extractable Hydrocarbons
CONC. (ppb)
1,000,000
100,000
10,000
1,000
100
10
1
9/16/87
12/1/87
3/9/88
6/9/88
9/14/88
DATE SAMPLED

Figure # 3

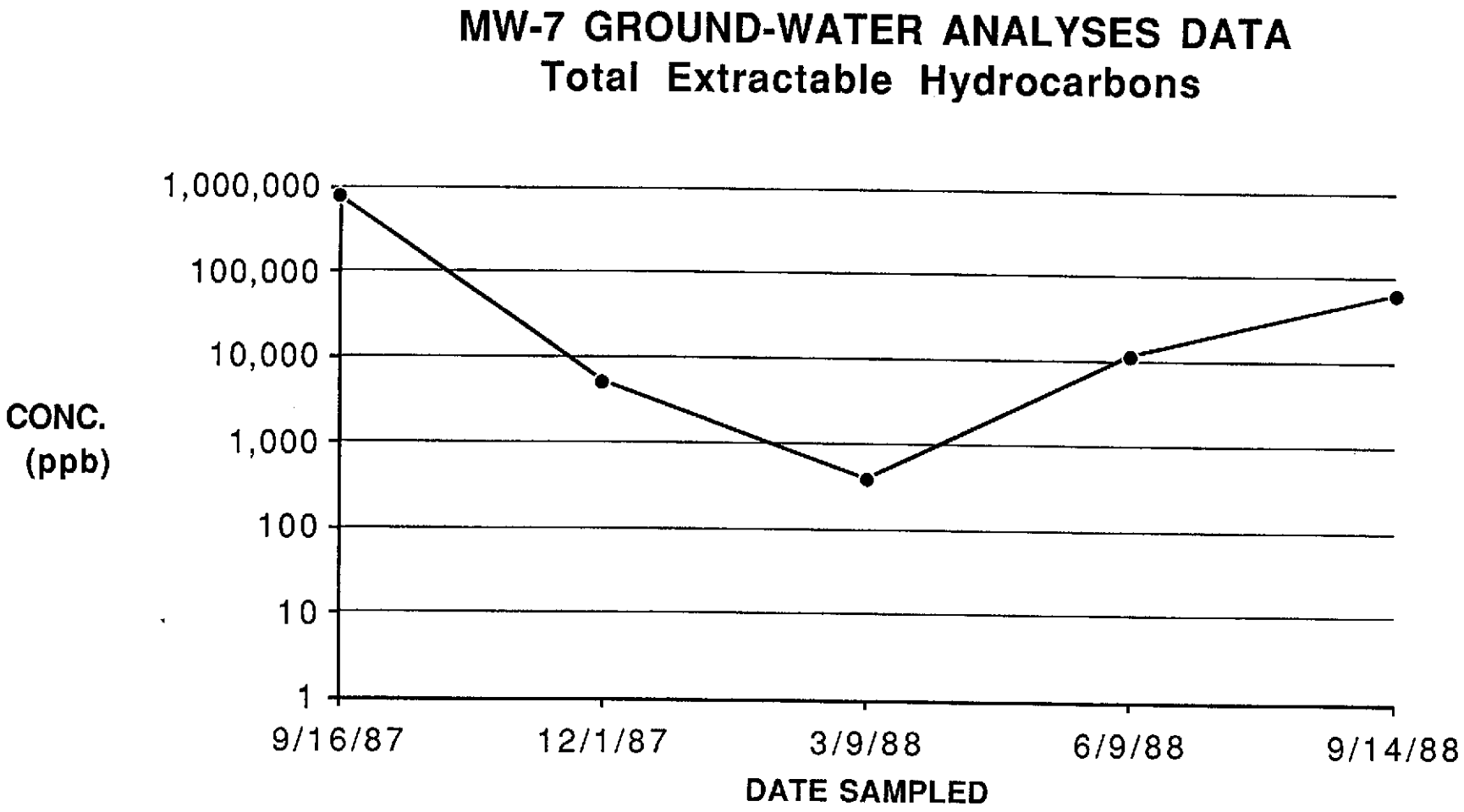

MW-7 GROUND-WATER ANALYSES DATA
Total Extractable Hydrocarbons
CONC. (ppb)
1,000,000
100,000
10,000
1,000
100
10
1
9/16/87
12/1/87
3/9/88
6/9/88
9/14/88
DATE SAMPLED

Figure # 4

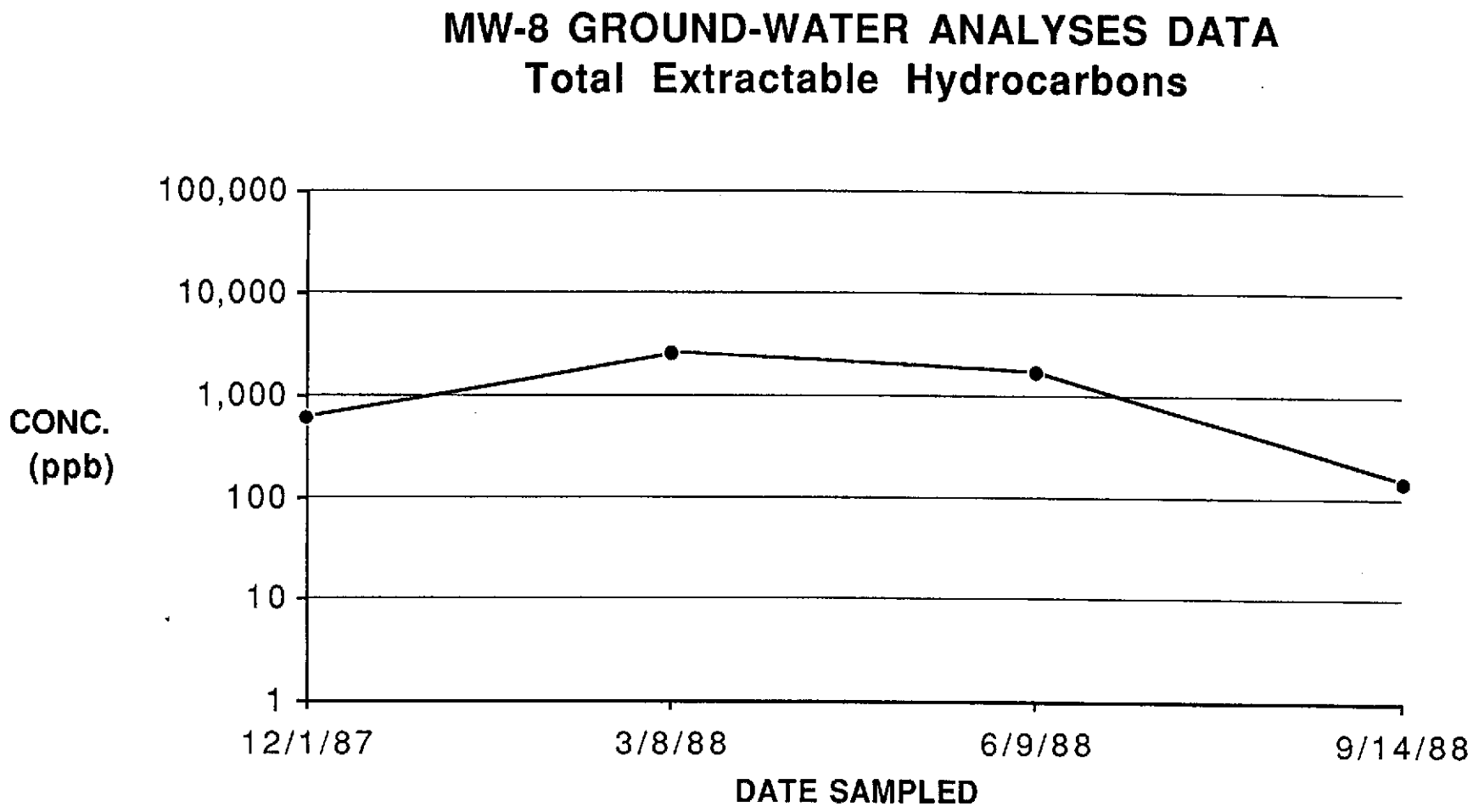

MW-8 GROUND-WATER ANALYSES DATA
Total Extractable Hydrocarbons
CONC. (ppb)
100,000
10,000
1,000
100
10
1
12/1/87
3/8/88
6/9/88
9/14/88
DATE SAMPLED

Figure # 5

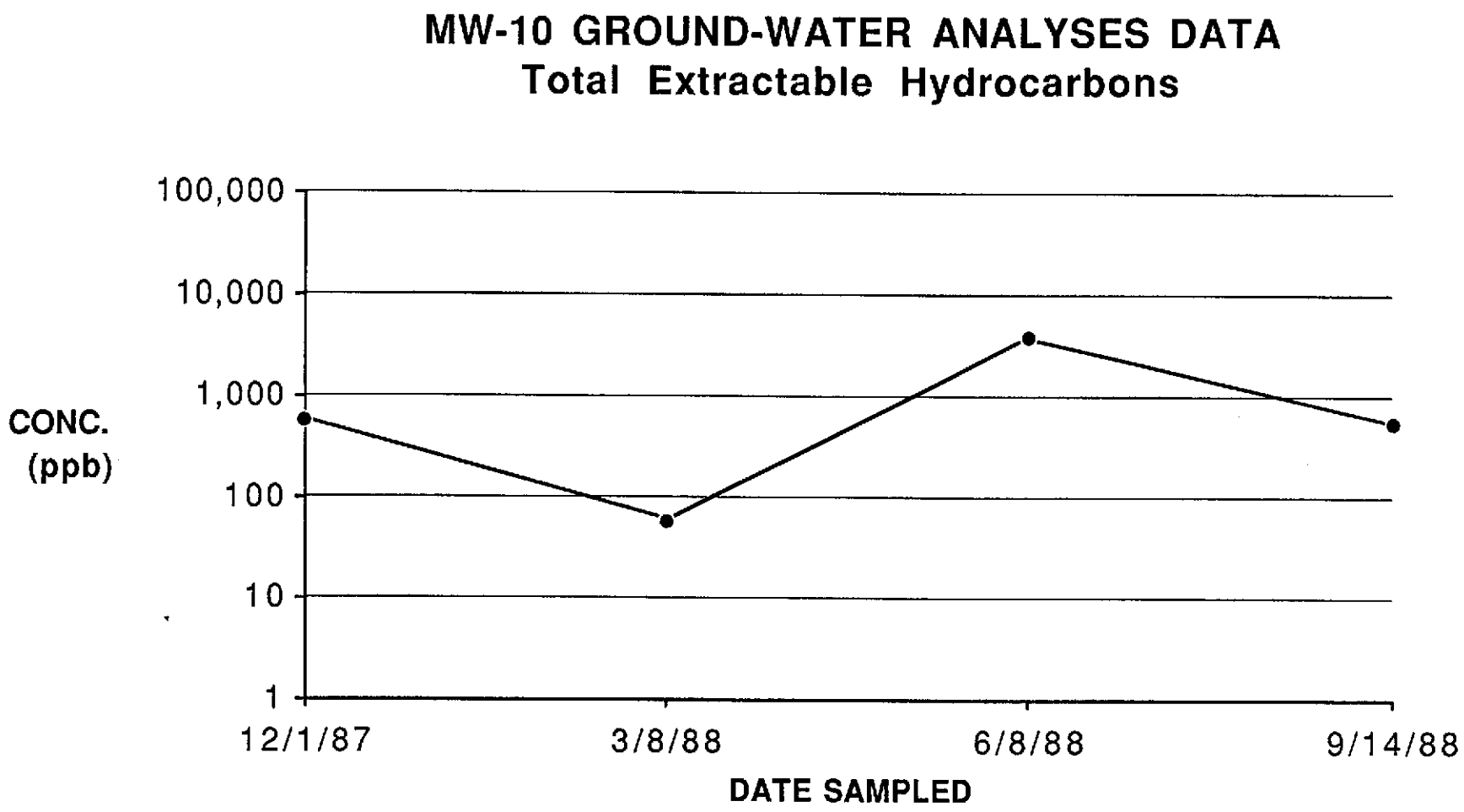

MW-10 GROUND-WATER ANALYSES DATA
Total Extractable Hydrocarbons
CONC. (ppb)
100,000
10,000
1,000
100
10
1
12/1/87
3/8/88
6/8/88
9/14/88
DATE SAMPLED

Figure # 6

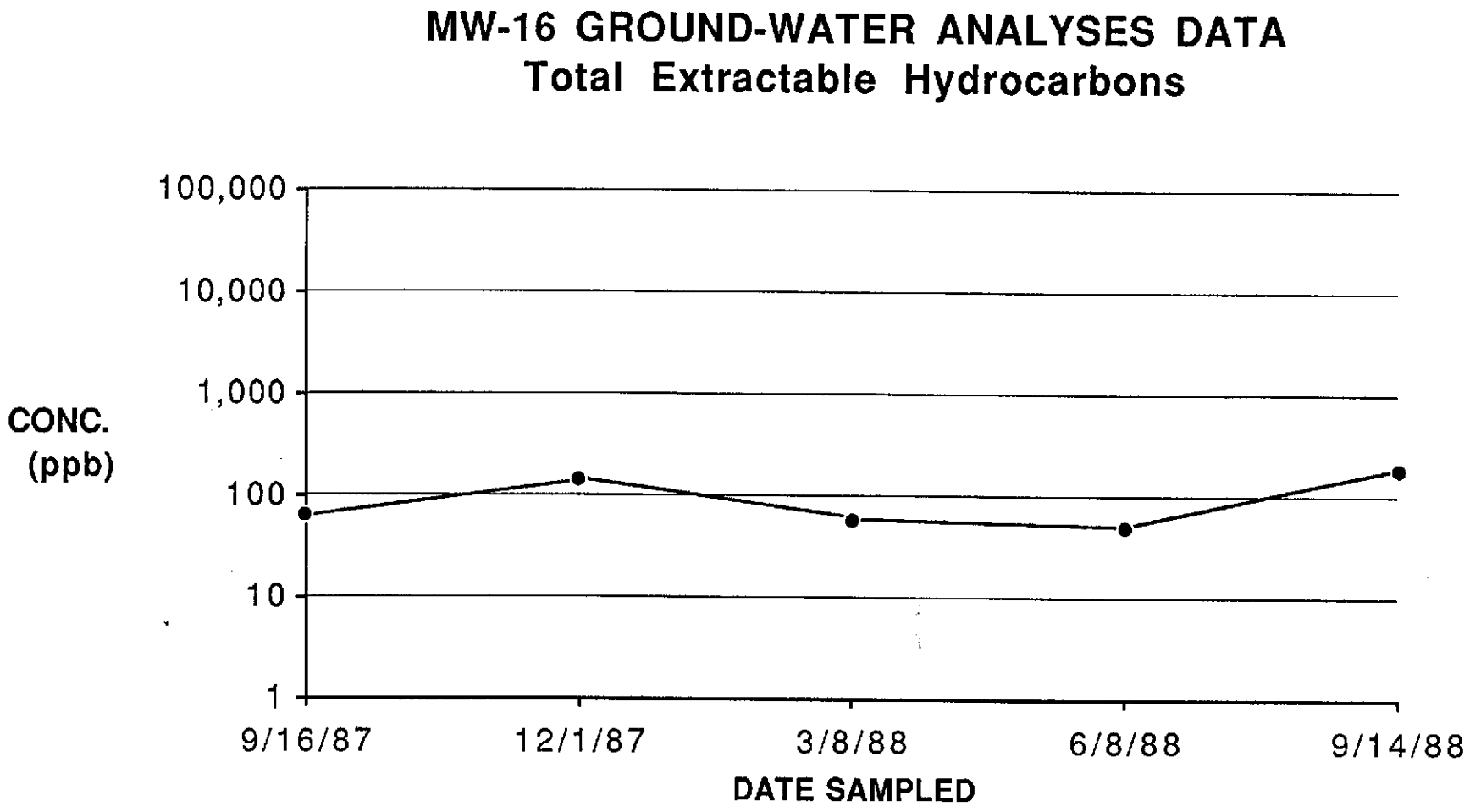

MW-16 GROUND-WATER ANALYSES DATA
Total Extractable Hydrocarbons
CONC.
(ppb)
100,000
10,000
1,000
100
10
1
9/16/87
12/1/87
3/8/88
6/8/88
9/14/88
DATE SAMPLED

Figure # 7

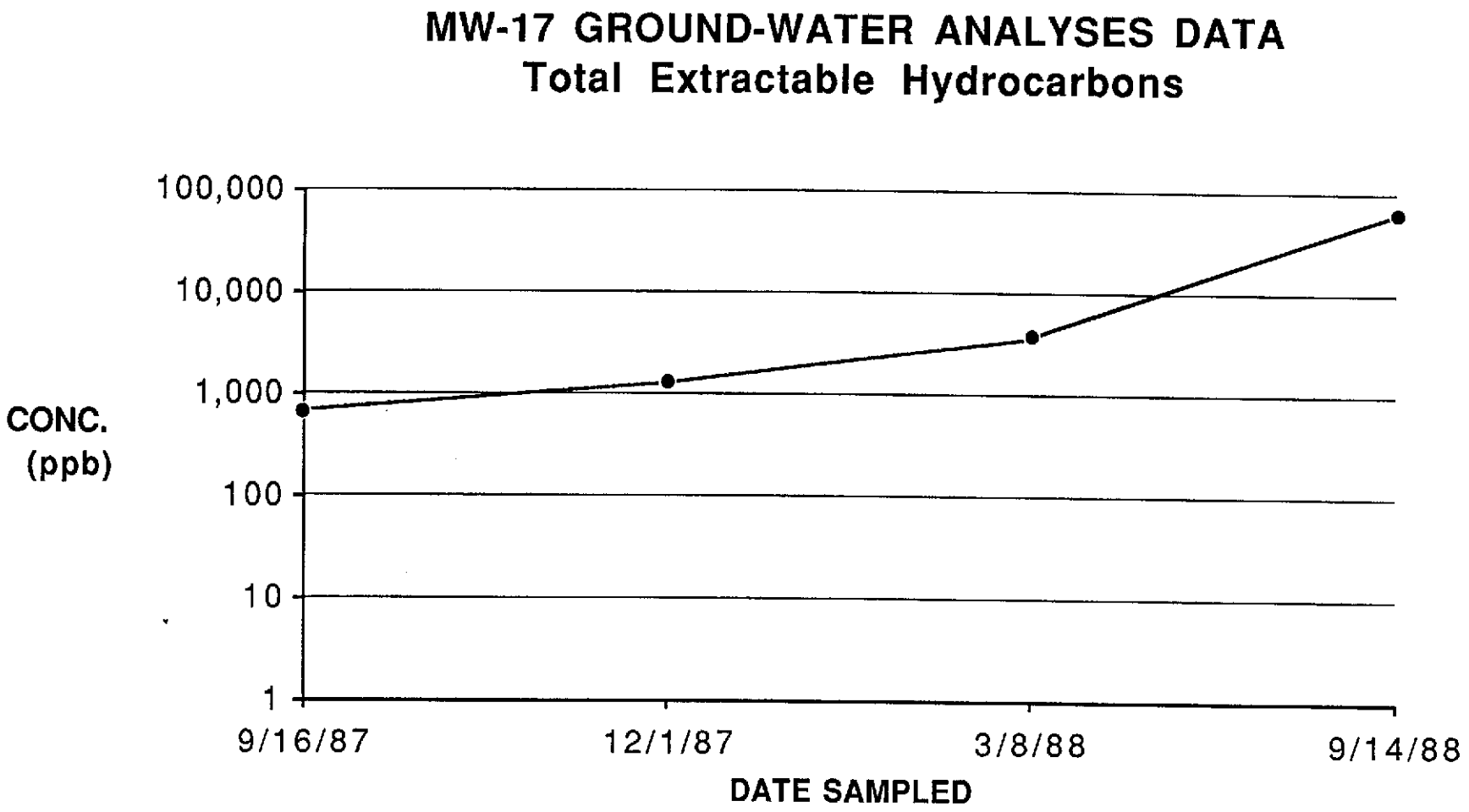

MW-17 GROUND-WATER ANALYSES DATA
Total Extractable Hydrocarbons
CONC. (ppb)
100,000
10,000
1,000
100
10
1
9/16/87
12/1/87
3/8/88
9/14/88
DATE SAMPLED

Figure # 8

MW-18 GROUND-WATER ANALYSES DATA
Total Extractable Hydrocarbons

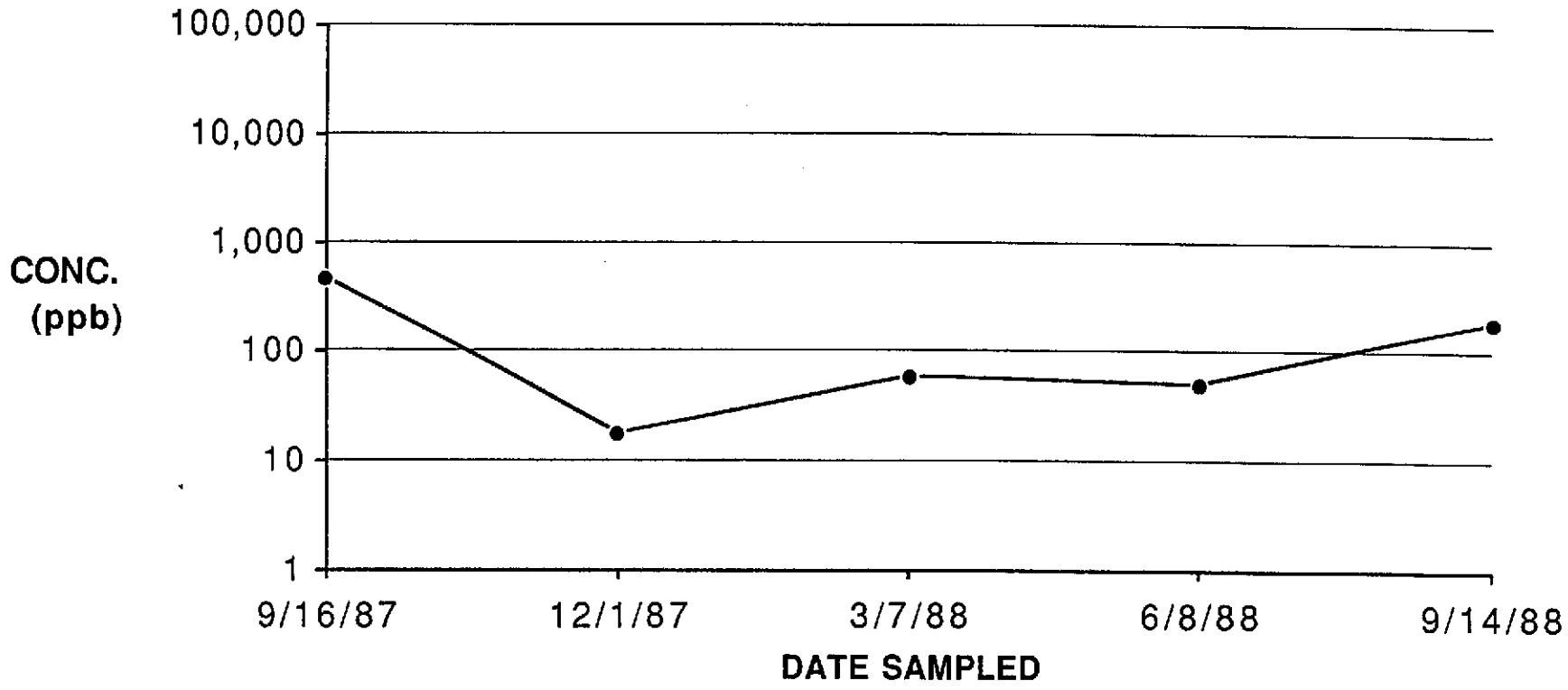


Figure # 9

ENSCO ENVIRONMENTAL SERVICES, INC.

LABORATORY PROCEDURES

LABORATORY PROCEDURES

Selection of the Laboratory

The laboratories selected to perform the analytical work are certified by the California State Department of Health Services as being qualified to perform the selected analyses. The selected laboratories are reviewed by Ensco Environmental Services, Inc. to ensure that an adequate quality control program is in place and certified by the State of California.

Chain-of-Custody Control

The following procedures are used during sampling and analytical activities to provide chain-of-custody control during transfer of samples from collection through delivery to the laboratories. Record keeping activities used to achieve chain-of-custody control are:

- Contact made by sampling organization with facility supervisor and laboratory prior to sampling to alert them of dates of sampling and sample delivery.
- Well location map with well identification number prominently displayed.
- Field log book for documenting sampling activities in the field.
- Labels for identifying individual samples.
- Chain-of-custody record for documenting transfer and possession of samples.
- Laboratory analysis request sheet for documenting analyses to be performed.

Analytical Procedures

The analysis of ground water samples is conducted in accordance with accepted quantitative analytical procedures. The following four publications are considered the primary references for ground water sample analysis, and the contracts with the laboratories analyzing the samples stipulate that the methods set out in these publications be used. Please note that procedures used are periodically updated by federal and state agencies, and the certified laboratories amend analysis as required by the update.

- Standard Methods for the Examination of Water and Wastewater, 16th Ed., American Public Health Association, et al., 1985.
- Methods for Chemical Analysis of Water and Wastes, U.S. EPA, 600/4-79-020, March 1979.
- Test Methods for Evaluation of Solid Waste: Physical/Chemical Methods, U.S. EPA SW-846, 1982.
- Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA, 600/4-82-057, 1982.
- Practical Guide for Ground water Sampling, EPA, 600/2-85/104, September 1985.
- RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, EPA, September 1986.

Analytical Methods

The analytical methods used by the selected laboratories are those required by the type of analysis (fuels, metals, etc.). These methods are those currently approved by the State Regional Water Quality Control Board.

ENSCO ENVIRONMENTAL SERVICES, INC.

SOIL SAMPLING PROTOCOL

SOIL SAMPLING PROTOCOL

I. SOIL SAMPLING BY DRILLING RIG

1) Review site proposal for boring locations and special instructions. Confirm boring locations in field with client. Have Underground Service Alert (USA) mark utilities in area prior to drilling.

2) Prior to initiating an exploratory boring, all equipment to be used during drilling and sampling operation is steam cleaned. Such equipment includes, but is not limited to, augers, bits, drilling rod, samplers, and brass sampler liners. Additionally, between sampling intervals, the sampler is thoroughly cleaned with a dilute trisodium phosphate solution and rinsed with clean tap water or distilled water.

3) Each exploratory boring is drilled with a truck-mounted drilling rig using either solid flight or hollow stem augers. The boring is advanced to the desired sampling depth and the sampler is lowered to the bottom of the hole. The sampler is driven a maximum of 18 inches by a 140-pound, rig-operated hammer falling 30 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the boring log. When necessary, the sampler may be pushed by the drill rig hydraulics. In this case, the pressure exerted (in pounds per square inch) is recorded. After the sampler has penetrated the full depth, it is retrieved to the surface.

4) The samplers commonly used are either a California-type sampler (3 inch or 2.5 inch) or a standard penetrometer (2 inch). The standard penetrometer is used to determine subsurface conditions. If samples are collected for laboratory analysis, the California sampler equipped

with brass liners is used except when the analysis will included copper or zinc. In this, sample should be taken with the standard penetrometer and placed in a labeled plastic bag.

Upon retrieval, the sampler is disassembled into its component parts. One or more of the liners is selected for chemical analysis. The ends of the selected liner(s) are sealed with foil or teflon tape, capped with plastic caps, labeled, logged on chain-of-custody and stored in a chilled ice chest for preservation in the field and during transport to the analytical laboratory. All labels are pre-written with indelible ink to minimize handling time.

5) Samples are observed for contamination in the field by the geologist. Any discoloration or odor is noted on the boring log. Each sample color is classified in the field by a geologist using the Unified Soil Classification System and a Munsell soil color chart. In addition, samples may also be field-screened with a photo ionization detector (calibrated daily) or threshold limit value sniffer. In either case, the instrument probe is held adjacent to freshly crumbled soil and the stabilized reading valve is recorded on the log. Other visual screening techniques include examination of the sample under hand-lens magnification as-well-as floating sheen inspection resulting from immersion in water.

6) Samples are held in the possession of Ensco Environmental Services personnel until transfer to the analytical laboratory. Transfer to the laboratory is accomplished with either delivery by Ensco Environmental Services personnel, pick-up by laboratory personnel, or transfer by a personal delivery service. Each transfer of responsibility is recorded on a chain-of-custody log that accompanies the sample.

II. SOIL SAMPLING BY HAND

1) Some situations require that samples be collected by hand without the assistance of a drill rig (e.g. soil stock piles, excavation sidewall sampling, etc.). When possible, soil samples will be collected using a slide hammer equipped with clean brass liners to advance into the soil. In other cases, the outer surface of the soil is removed and a brass liner is driven into the soil with a hammer. To avoid damaging the liner, a block of wood is held next to the liner so that the hammer strikes the block rather than the liner. The liner is removed and handled as described above. In deep excavations where safety factors preclude the direct sampling of the base or side wall, soil is retrieved by a backhoe bucket and this soil is sampled.

LIMITATIONS

Ensco Environmental Services makes no warranty, expressed or implied, except that our services have been performed in accordance with generally accepted, existing, engineering, geological, hydrogeological, health and safety principles and applicable regulations at the time and location of the study.

Ensco Environmental Services includes in this report chemical analytical data from a state-certified laboratory. The analytical results are performed according to procedures suggested by the U.S. EPA and State of California. Ensco Environmental Services is not responsible for laboratory errors in procedure or result reporting.

ENSCO ENVIRONMENTAL SERVICES, INC.

WATER SAMPLING PROTOCOL

WATER SAMPLING PROTOCOL

Sampling of monitoring wells is performed by Ensco Environmental Services technicians. Field sampling procedures are as follows:

1. Measurement of liquid surface elevation and depth of monitoring well.

2. Field check for presence of floating product.

3. If measurement of floating product is <1/4 inch, a ground water sample is taken.

4. Prior to sampling a minimum of four well casings volumes of water is removed.

5. During purging, water is monitored for temperature, pH, and specific conductance.

6. Samples for analysis are placed in EPA-approved containers.

7. Samples are immediately put in a chilled cooler for transportation to a state-certified analytical laboratory.

8. Appropriate documentation accompanies the sample at all times.

SAMPLING PROCEDURES

Equipment Cleaning - All water samples are placed in precleaned laboratory supplied glassware. Sample bottles and caps remain sealed until actual usage at the site. Before use at the site, all equipment which comes in contact with the well or ground water is thoroughly cleaned with trisodium phosphate and rinsed with deionized or distilled water. This procedure is followed between each well sampled, and wells are sampled in approximate order of increasing contamination. A pump blank is collected prior to all sampling. Pump blanks are analyzed periodically to ensure proper cleaning.

Water Level Measurements - Prior to checking for floating product, purging of the well, and sampling, the depth to water is measured in each well using a sealed sounding tape or a scaled electric sounder. Water levels are recorded in the field log book to the nearest 0.01 foot.

Floating Product Thickness - A field check for floating product is made with a clear acrylic or teflon bailer. Thickness of floating product is measured to the nearest 1/32 of an inch. Any observed film as-well-as odor and color of the water is recorded. If a teflon cord is used, the cord is cleaned. If a nylon or cotton cord is used, a new cord is used in each well.

Water Sampling Procedures

Immediately prior to sampling of the ground water, four well-casing volumes of water are removed. Water is removed by either bailer or submersible nitrogen-driven bladder pump. During the purging operation, purged water is monitored for temperature, pH and specific conductance. If the well is dewatered during purging, and recovery to 80% is estimated or observed to exceed a two hour duration, a sample will be collected when sufficient volume is available for the sampling parameter.

Field Filtration of Samples

Samplers will refrain from filtering TOC, TOX or other organic compound samples as the increased handling required may result in the loss of chemical constituents of interest. Allowing the samples to settle prior to analysis followed by decanting the sample is preferable to filtration of these instances. If filtration is necessary for the determination of extractable organic compounds, the filtration should be performed in the laboratory. It may be necessary to run parallel sets of filtered and unfiltered samples with standards to establish the recovery of hydrophobic compounds when sample must be filtered. All the materials' precautions used in the construction of the sampling train should be observed for filtration apparatus. Vacuum filtration of ground water samples is not recommended.

Water samples for dissolved inorganic chemical constituents (e.g., metals, alkalinity and anionic species) will be filtered in the field.

Sample Containers

Sample containers vary with each type of analytical parameter. Selected container types and materials are non-reactive with the sample and the particular analytical parameter being tested. Appropriate containers for volatile organics are glass bottles of at least 40 milliliters in size fitted with teflon-faced silicon septa. Sample containers are properly cleaned and sterilized by the certified laboratory according to the EPA protocol for the individual analysis.

Sample Preservation and Shipment

Various preservatives are used by the certified laboratory to retard changes in samples. Sample shipment from Ensco Environmental Services to laboratories performing the selected analyses routinely occurs within 24 hours of sample collection.

After the wells are purged and the temperature, pH, and specific conductance of the water stabilize, a water sample is collected. Samples for volatile organic and gasoline analyses are placed in EPA-approved 40-ml containers with teflon-septa caps. Sample bottles are completely filled with water with no observed air bubbles present within the bottle. Samples for acid, base and neutral organics, pesticides and heavy metals analysis are placed in appropriate laboratory prepared containers. Water sample containers are labeled with the appropriate sample number, location, project name and number, time, and date of collection. All samples are placed in an iced cooler and transported to a state-certified analytical laboratory.

In cases where very oily contaminants are encountered teflon bailers may be substituted with stainless steel bailers. This will be done to minimize cross contamination.

Chain-of-custody forms are logged and signed and accompany the samples to the laboratory. One travel blank accompanies the samples and is held by the lab for possible analysis.

All sample containers issued by the laboratory are properly prepared by the laboratory for the requested analysis.

- Total Volatile Hydrocarbons and/or benzene, toluene and xylenes - 2 40-milliliter bottles
- Total Lead - 1 500-milliliter bottle
- Ethylene Dibromide - 1 500-milliliter bottle
- Metals - 1 500-milliliter bottle
- Pesticides/Herbicides - 2 2-liter bottles
- Acid Base Neutral Organics - 2 1-liter bottles
- Halogenated Volatile Organics - 2 40-milliliter bottles
- Aromatic Volatile Organics - 2 40-milliliter bottles (preserved)
- Total Phenolics - 1 1-liter bottle (preserved)

ENSCO ENVIRONMENTAL SERVICES, INC.

VADOSE OR AMBIENT AIR MONITORING PROTOCOL

VADOSE OR AMBIENT AIR MONITORING

Field check of vadose monitoring wells or ambient air is performed by Ensco Environmental Services technicians. Monitoring procedures are as follows:

1. Remove well cap to aerate the well for approximately five (5) minutes (well purge process).

2. Allow sufficient warm-up time for stabilization of the vapor meter.

3. Calibrate vapor monitoring meter.

4. Lower probe into the well (to screen interval) or place at monitoring point, as applicable.

5. Record reading.

6. Cap well.

Current "standard" protocols do not exist for vapor monitoring, protocols will be amended as required.

VADOSE WELL SAMPLING PROCEDURES

Equipment

1. Gasprobenehmer GS 212 or similar sampling equipment
2. Tedlar sample bags
3. Tygon tubing
4. P.I.D. sampler

Vadose Sampling Procedures

1. Remove well cap to aerate the well for approximately five (5) minutes.
2. Take P.I.D reading for background check.
3. Purge well with Gasprobenhmer (approximately 2 well volumes).
4. Attach Tedlar bag (using Tygon tubing) to sample pump for sample collection.
5. Place sample bag within isolation box.
6. Transport to laboratory (analysis should be performed within 24 hours).
7. Sample pump should be purged prior to, between, and after each sampling event. Purging gas should be nitrogen or ambient air.

Current "standard" protocols do not exist for vapor monitoring, protocols will be amended as required.

ENSCO ENVIRONMENTAL SERVICES, INC.
Vadose or Ambient Air Monitoring
Latest Revision: April 27, 1988

LABORATORY REPORTS

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

TAL

DATE: 10/6/88

LOG NO.: 6391 and 6392

DATE SAMPLED: 9/14/88

DATE RECEIVED: 9/15/88

CUSTOMER: ENSCO Environmental Services, Inc.

REQUESTER: Steve Costello

PROJECT: No. 1467G, Owens-Illinois

Sample Type: Water

Method and Constituent	Units	MW4 Concentration	MW4 Detection Limit	MW5 Concentration	MW5 Detection Limit	MW6 Concentration	MW6 Detection Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/l	100	60	6,300	60	140,000	600
Total Petroleum Hydrocarbons as Gasoline	ug/l	< 6	6				
Modified EPA Method 8020:							
Benzene	ug/l	< 0.2	0.2				
Toluene	ug/l	< 0.3	0.3				
Xylenes	ug/l	< 0.5	0.5				
Ethyl Benzene	ug/l	< 0.4	0.4				

Method and Constituent	Units	MW7		MW8		MW10	
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/l	67,000	200	150	60	570	60

DATE: 10/6/88
LOG NO.: 6391 and 6392
DATE SAMPLED: 9/14/88
DATE RECEIVED: 9/15/88
PAGE: Two

Sample Type: Water

Method and Constituent	Units	MW11 Concentration	MW11 Detection Limit	MW12 Concentration	MW12 Detection Limit	MW13 Concentration	MW13 Detection Limit
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/l	100	60	120	60	130	60
Total Petroleum Hydrocarbons as Gasoline	ug/l	< 6	6	< 6	6	< 6	6
Modified EPA Method 8020:							
Benzene	ug/l	< 0.2	0.2	< 0.2	0.2	< 0.2	0.2
Toluene	ug/l	< 0.3	0.3	< 0.3	0.3	< 0.5	0.5
Xylenes	ug/l	< 0.5	0.5	< 0.5	0.5	< 0.5	0.5
Ethyl Benzene	ug/l	< 0.4	0.4	< 0.4	0.4	< 0.4	0.4

		MW15		MW16		MW17	
DHS Method:							
Total Petroleum Hydrocarbons as Diesel	ug/l	100	60	190	60	64,000	200
Total Petroleum Hydrocarbons as Gasoline	ug/l			< 6	6	54,000	3,000
Modified EPA Method 8020:							
Benzene	ug/l			< 0.2	0.2	< 100	100
Toluene	ug/l			< 0.3	0.3	< 200	200
Xylenes	ug/l			< 0.5	0.5	< 300	300
Ethyl Benzene	ug/l			< 0.4	0.4	< 200	200

		MW18	
DHS Method:			
Total Petroleum Hydrocarbons as Diesel	ug/l	190	60
Total Petroleum Hydrocarbons as Gasoline	ug/l	< 6	6

DATE: 10/6/88
LOG NO.: 6391 and 6392
DATE SAMPLED: 9/14/88
DATE RECEIVED: 9/15/88
PAGE: Three

Sample Type: Water

Method and Constituent	Units	MW18 Concentration	MW18 Detection Limit
Modified EPA Method 8020:			
Benzene	ug/l	< 0.2	0.2
Toluene	ug/l	< 0.3	0.3
Xylenes	ug/l	< 0.5	0.5
Ethyl Benzene	ug/l	< 0.4	0.4

Hugh R. McLean
Supervisory Chemist

HRM:mln

TRACE

CHAIN OF CUSTODY RECORD

P.O. 10436

PROJECT NO	PROJECT NAME
6476	Oil King's - Tinnis

SAMPLERS: (Signature) Tristar [illegible] Meg Parnell

NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TEST REQUESTED: TPH(D)	TPH(G)	BTEX
MW18	9/14	12:15p				X	X	X
MW17	"	1:15p				X	X	X
MW16	"	1:05p				X	X	X
MW15	"	2:45					X	X
MW13	"	2:30p				X	X	X
MW10	"	3:35					X	X

Normal TAT

REMARKS

RELINQUISHED BY	DATE	TIME	RECEIVED BY	RELINQUISHED BY	DATE	TIME	RECEIVED BY
[illegible]	9/14/88	4:27p					
RELINQUISHED BY	DATE	TIME	RECEIVED BY	RELINQUISHED BY	DATE	TIME	RECEIVED BY LABORATORY
					9/14/88	4:29p	[illegible]

REMARKS: Report to Steve Costello

DISTRIBUTION

ensco environmental services, inc.
41474 Christy Street
Fremont, CA 94538-3114
(415) 659-0404
(415) 651-4677
Contr. Lic. No. 464324

FORM DATED 1-28-87

TRACE

CHAIN OF CUSTODY RECORD

P.O. 10436

PROJECT NO	PROJECT NAME
146764	Owens - Illinois

SAMPLERS (Signature): Rachel Hess

NO	DATE	TIME	DRIVE	GRAB	STATION AND LOCATION	TEST REQUESTED: TEH	TEH/BTX
MW4	9-14-88	12:35p			1 liter bottle & 2 preserved	X	X
MW12	9-14-88	1:00p			" " " "	X	X
MW1	9-14-88	1:25p			" " " "	X	X
MW3	9-14-88	1:45p			1 amber liter	X	
MW5	9-14-88	2:35p			↓ ↓ ↓	X	
MW6	9-14-88	2:50p				X	
MW7	9-14-88					X	

Normal TAT

REMARKS

RELINQUISHED BY	DATE	TIME	RECEIVED BY
Rachel Hess	9-14-88	4:27p	
RELINQUISHED BY	DATE	TIME	RECEIVED BY

RELINQUISHED BY:	DATE	TIME	RECEIVED BY
RELINQUISHED BY:	DATE	TIME	RECEIVED BY LABORATORY
	9/14/88	4:27p	Thomas Hall

REMARKS: Report to Steve Costello.

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ensco environmental services, inc.
5243 Investment Blvd., Unit C
Hayward, CA 94545
(415) 783-6960
Fax (415) 659-0404
Fax (415) 651-4677
Contr. Lic. No. 464324

ENSCO ANALYSIS LABORATORY
5243 Investment Blvd., Unit C
Hayward, CA 94545
(415) 783-6960
2346 Chinon Street
Pleasanton, CA 94566-3114
(415) 659-0404
Fax (415) 651-4677
Contr. Lic. No. 464324

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