

INTERED
4-17-98
ap

LUST 1678
Unocal Bulk Plant 0206
Snohomish / Everett

RECEIVED

APR 13 1998

DEPT. OF ECOLOGY

DEPARTMENT OF ECOLOGY NWRO/TCP TANKS UNIT	
INTERIM CLEANUP REPORT	<input checked="" type="checkbox"/>
SITE CHARACTERIZATION	<input type="checkbox"/>
FINAL CLEANUP REPORT	<input type="checkbox"/>
OTHER _____	<input type="checkbox"/>
AFFECTED MEDIA: SOIL	<input checked="" type="checkbox"/>
OTHER _____ GW	<input type="checkbox"/>
INSPECTOR (INIT.) <u>FB</u> DATE <u>4/17/98</u>	

Results of Ground Water
Monitoring and Sampling

March 1998

76 Branded Bulk Plant 0206

Everett, Washington

April 10, 1998

For /
Tosco Distribution Company

LUST #: 1678

Site name: Unocal Bulk Plant 0286

County/city: Snohomish/Everett

Inspector SJ

Site address: 9826 7th Ave. SE, Everett.

UST #:

Depth to GW: 5.8-11.0' Media affected:

Report date: 4/10/98

ERTS #:

Free product:

GW Soil

Date received: 4/13/98

LUST#: 1678

GW flow: SSW

Extent of contam. known:

Yes No

Project status:

Cleanup started
 Awaiting cleanup
 Reported cleaned up

Monitoring
 NFA
 Unknown

Report status:

interim
 final

Remediation method:

Aeration/Vapor extraction
 Air stripping/Air sparging
 Biological treatment
 Carbon absorption
 Chemical destruction

Incineration
 Off-site containment/Landfill
 On-site containment/Landfill
 Physical separation
 Reuse/Recycling

Soil washing
 Solidification/Stabilization
 Solvent extraction
 Thermal desorption
 Vitrification
 Other

Comments:

- VES system shut down since 2/96 based on low vapor concentrations in emissions stack.
- BTEX detected at concentrations above MCAA levels in MW-1.

April 10, 1998

Consulting Engineers
and Geoscientists
Offices in Washington,
Oregon, and Alaska

Tosco Distribution Company
5528 Northwest Doane Avenue
Portland, Oregon 97207

Attention: Martin Cramer

Results of Ground Water
Monitoring and Sampling
March 1998
76 Branded Bulk Plant 0206
Everett, Washington
File No. 4823-242-00

INTRODUCTION

This letter summarizes the results of our March 1998 semiannual ground water monitoring and sampling at Tosco Distribution Company's (Tosco) 76 Branded Bulk Plant 0206. The active, fully operational bulk plant is located at 9826 Seventh Avenue Southeast, southwest of the intersection between Everett Mall Way and Seventh Avenue Southeast in Everett, Washington. The Washington State Department of Ecology (Ecology) underground storage tank (UST) site number is 008376 and the leaking underground storage tank (LUST) incident number for the site is 1678. The site layout, bulk plant facilities, and approximate monitoring well and vapor extraction well locations are shown in Figure 1.

GeoEngineers has provided environmental services at the site since May 1990. GeoEngineers' past site activities included excavation monitoring, soil sampling, subsurface explorations, ground water monitoring, and vapor extraction system (VES) monitoring. The VES has been shut down since February 1996, based on a trend of low vapor concentrations in the emissions stack. The results of our previous studies and monitoring efforts are summarized in reports that are on file at Tosco.

The purpose of our services in March 1998 was to monitor ground water conditions beneath the site and vapor concentrations in vapor extraction and monitoring wells. Depths to ground water and combustible vapor concentrations in the vapor extraction and monitoring wells were

GeoEngineers, Inc.
8410 154th Avenue N.E.
Redmond, WA 98052
Telephone (425) 861-6000
Fax (425) 861-6050
www.geoengineers.com

measured on March 10, 1998. Ground water samples were obtained from monitoring wells MW-1 through MW-4 on March 10, 1998. The monitoring wells were not purged prior to sampling.

GeoEngineers' scope of services completed for these activities is presented in Attachment A. Our field procedures are described in Attachment B. The combustible vapor concentrations, depths to ground water and ground water elevations for this reporting period and the last three monitoring events (four events total) are summarized in Table 1. The inferred direction of shallow ground water flow and ground water elevations at the monitoring wells and vapor extraction wells, based on our March 1998 measurements, are shown in Figure 1. The ground water analytical results for this and the three previous sampling events (four events total) are summarized in Table 2 and Figure 2. The laboratory reports and our review of the quality control program are included in Attachment C.

SUMMARY OF MONITORING RESULTS

- Combustible vapor concentrations were less than 400 parts per million (ppm) in monitoring wells MW-2 and MW-4, ranged from 600 to 8,500 ppm in monitoring wells MW-1 and MW-3 and vapor extraction well VW-4, and exceeded 10,000 ppm in vapor extraction wells VW-2, VW-3 and VW-5. The combustible vapor concentrations in VW-2, VW-3 and VW-5 have remained high since our September 1997 monitoring event. The combustible vapor concentrations in MW-1, MW-2 and VW-4 decreased relative to the last measurements (September 1997), but are consistent with previous data. The combustible vapor concentration in MW-3 was not greater than some of the previous measurements but was significantly greater than the last measurement (September 1997).
- The depths to ground water during this reporting period ranged from approximately 5.8 to 11.0 feet below the ground surface. The depths to ground water in the monitoring wells generally were less than the depths to ground water measured six months ago (in September 1997). The depths to ground water in the vapor extraction wells were approximately 1 foot higher than the measurements obtained in September 1997.
- Based on the March 1998 measurements, the inferred shallow ground water beneath the site is toward the south-southwest, which is consistent with our past interpretations.
- Benzene, ethylbenzene, toluene and xylenes (BETX) were detected at concentrations exceeding the Model Toxics Control Act (MTCA) Method A cleanup levels in the March 1998 water sample from MW-1. BETX compounds either were not detected or were detected at concentrations less than the MTCA Method A cleanup levels in the remaining samples.
- Gasoline-range hydrocarbons were detected at a concentration greater than the MTCA Method A cleanup level of 1 milligram per liter (mg/l) in the March 1998 water sample obtained from MW-1. Petroleum hydrocarbons either were not detected or the sum of gasoline-, diesel- and heavy oil-range hydrocarbon concentrations was less than the MTCA

Method A cleanup level of 1 mg/l in the March 1998 water samples obtained from MW-2 through MW-4.

- Chemical analytical data for the March 1998 samples from MW-2, MW-3 and MW-4 generally are consistent with data from the last reporting period (for September 1997). Gasoline-range hydrocarbons and BETX have increased compared to data from the last sampling event in the March 1998 sample from MW-1.
- The monitoring wells and vapor extraction wells were checked for the presence of free (floating) product during our current ground water monitoring activities. Free product was not detected in any of the vapor extraction or monitoring wells.

FUTURE MONITORING

We will continue to obtain semiannual ground water samples from monitoring wells MW-1 through MW-4, and monitor water levels and combustible vapor concentrations in the existing monitoring wells and vapor extraction wells. Ground water samples will be submitted for chemical analysis of BETX, and gasoline-, diesel- and heavy oil-range hydrocarbons. The results of our next monitoring event will be summarized in a report to Tosco.

LIMITATIONS

We have prepared this report for use by Tosco. This report may be made available for review by those designated by Tosco. The report is not intended for use by others and the information contained herein is not applicable to other sites.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.



We appreciate the opportunity to provide these continued services to Tosco. Please call if you have questions regarding this report.

Respectfully submitted,

GeoEngineers, Inc.

Lisa J. Bona

Lisa J. Bona
Project Geologist

Kurt SA
Kurt S. Anderson, C.P.G.
Associate

LJB:KSA:ja
P:\TOSCO\4823242\FINALS\482342P13.DOC

Attachments

cc: ✓ Dan Cargill
Washington State Dept. of Ecology
3190 160th Ave. S.E.
Bellevue, WA 98008-5452

TABLE 1
SUMMARY OF GROUND WATER ELEVATIONS
AND COMBUSTIBLE VAPOR CONCENTRATIONS

76 BRANDED BULK PLANT 0206
EVERETT, WASHINGTON

Monitoring Well ¹	Date Measured	Depth to Ground Water ² (feet)	Ground Water Elevation ³ (feet)	Combustible Vapor Concentrations ⁴ (ppm)
MW-1	09/05/96	8.86	91.88	9,800
	03/03/97	7.38	93.36	<400
	09/12/97	9.10	91.64	8,000
	03/10/98	7.78	92.96	600
MW-2	09/05/96	11.84	91.69	5,800
	03/03/97	10.13	93.40	<400
	09/12/97	11.44	92.09	1,600
	03/10/98	10.58	92.95	<400
MW-3	09/05/96	11.60	89.27	>10,000
	03/03/97	10.59	90.28	<400
	09/12/97	10.57	90.30	1,200
	03/10/98	11.04	89.83	8,500
MW-4	09/05/96	7.17	93.76	<400
	03/03/97	5.39	95.54	<400
	09/12/97	7.01	93.92	<400
	03/10/98	5.78	95.15	<400
VW-2	09/05/96	10.69	88.92	1,800
	03/03/97	10.01	89.61	1,200
	09/12/97	11.65	87.96	>10,000
	03/10/98	10.43	89.18	>10,000
VW-3	09/05/96	10.53	89.01	1,800
	03/03/97	9.72	89.82	1,700
	09/12/97	11.59	87.95	>10,000
	03/10/98	10.14	89.40	>10,000
VW-4	09/05/96	9.80	90.85	2,000
	03/03/97	7.91	92.74	1,300
	09/12/97	10.36	90.29	1,500
	03/10/98	8.91	91.47	800
VW-5	09/05/96	11.33	89.08	1,400
	03/03/97	10.70	89.71	1,400
	09/12/97	12.28	88.13	>10,000
	03/10/98	11.00	89.41	>10,000

Notes:

¹ Approximate vapor extraction and monitoring well locations are shown in Figure 1.

² Ground water level measured with respect to ground surface. Field procedures described in Attachment B.

³ Relative to temporary benchmark shown in Figure 1. The benchmark has an assumed elevation of 100.00 feet.

⁴ Measured with a Bacharach TLV Sniffer calibrated to hexane. Field procedures are described in Attachment B.

ppm = parts per million

Bolding indicates a measurement obtained during the current reporting period.

TABLE 2
SUMMARY OF GROUND WATER ANALYTICAL DATA
 76 BRANDED BULK PLANT 0206
 EVERETT, WASHINGTON

Monitoring Well Number	Sampling Date	BETX ¹				Petroleum Hydrocarbons (mg/l)		
		(µg/l)				Gasoline-range ²	Diesel-range ³	Heavy Oil-range ³
		B	E	T	X			
MW-1	09/05/96	204	256	<25.0	501	3.56	1.04	<0.75
	03/03/97	18.2	29.6	1.85	49.2	0.451	<0.250	<0.750
	09/12/97 ⁴	9.28	3.62	1.66	25.7	0.293	<0.250	<0.750
	03/10/98 ⁴	22.5	35.7	188	1,060	5.76	<0.250	<0.750
MW-2	09/05/96	6.34	<0.5	<0.5	<1.0	0.953	1.09	<0.75
	03/03/97	0.739	<0.500	<0.500	<1.00	<0.0500	0.845	<0.750
	09/12/97 ⁴	1.33	<0.500	<0.500	<1.00	0.0915	0.252	<0.750
	03/10/98 ⁴	<0.500	<0.500	<0.500	<1.00	0.0541	<0.250	<0.750
MW-3	09/05/96	<0.5	<0.5	<0.5	<0.5	<0.05	2.20	<0.75
	03/03/97	<0.500	<0.500	<0.500	<1.00	0.0976	<0.250	<0.750
	09/12/97 ⁴	<0.500	<0.500	<0.500	<1.00	0.123	0.344	<0.750
	03/10/98 ⁴	<0.500	<0.500	<0.500	<1.00	0.138	<0.250	<0.750
MW-4	09/05/96	<0.5	<0.5	<0.5	<1.0	<0.05	0.768	<0.75
	03/03/97	<0.500	<0.500	<0.500	<1.00	<0.0500	<0.250	<0.750
	09/12/97 ⁴	<0.500	<0.500	<0.500	<1.00	<0.0500	<0.250	<0.750
	03/10/98 ⁴	<0.500	<0.500	<0.500	<1.00	<0.0500	<0.250	<0.750
MTCA Method A Cleanup Levels		5	30	40	20	1 ⁵		

Notes:

¹B = benzene, E = ethylbenzene, T = toluene, X = xylenes. Analyzed by EPA Method 8020.

²Analyzed by Ecology Method WTPH-G.

³Analyzed by Ecology Method WTPH-D extended.

⁴The monitoring well was not purged prior to sampling.

⁵The MTCA Method A cleanup level for the sum of gasoline-, diesel- and heavy oil-range hydrocarbon concentrations is: 1.0 mg/l if carbon ranges are distinctly quantified using gas chromatography methods.

µg/l = micrograms per liter.

mg/l = milligrams per liter.

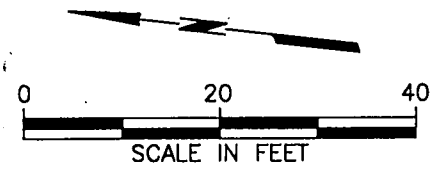
Shading indicates a concentration greater than the MTCA Method A cleanup level.

Bolding indicates a sample obtained during the current reporting period.

Chemical analyses for the current reporting period conducted by North Creek Analytical of Bothell, Washington. The laboratory report is presented in Attachment C.

7TH AVE. S.E.

Property Line



EXPLANATION:

MW-1 ● MONITORING WELL
 92.96 GROUND WATER ELEVATION (FEET)
 BASED ON 03/10/98 MEASUREMENTS

VW-2 ● VAPOR EXTRACTION WELL

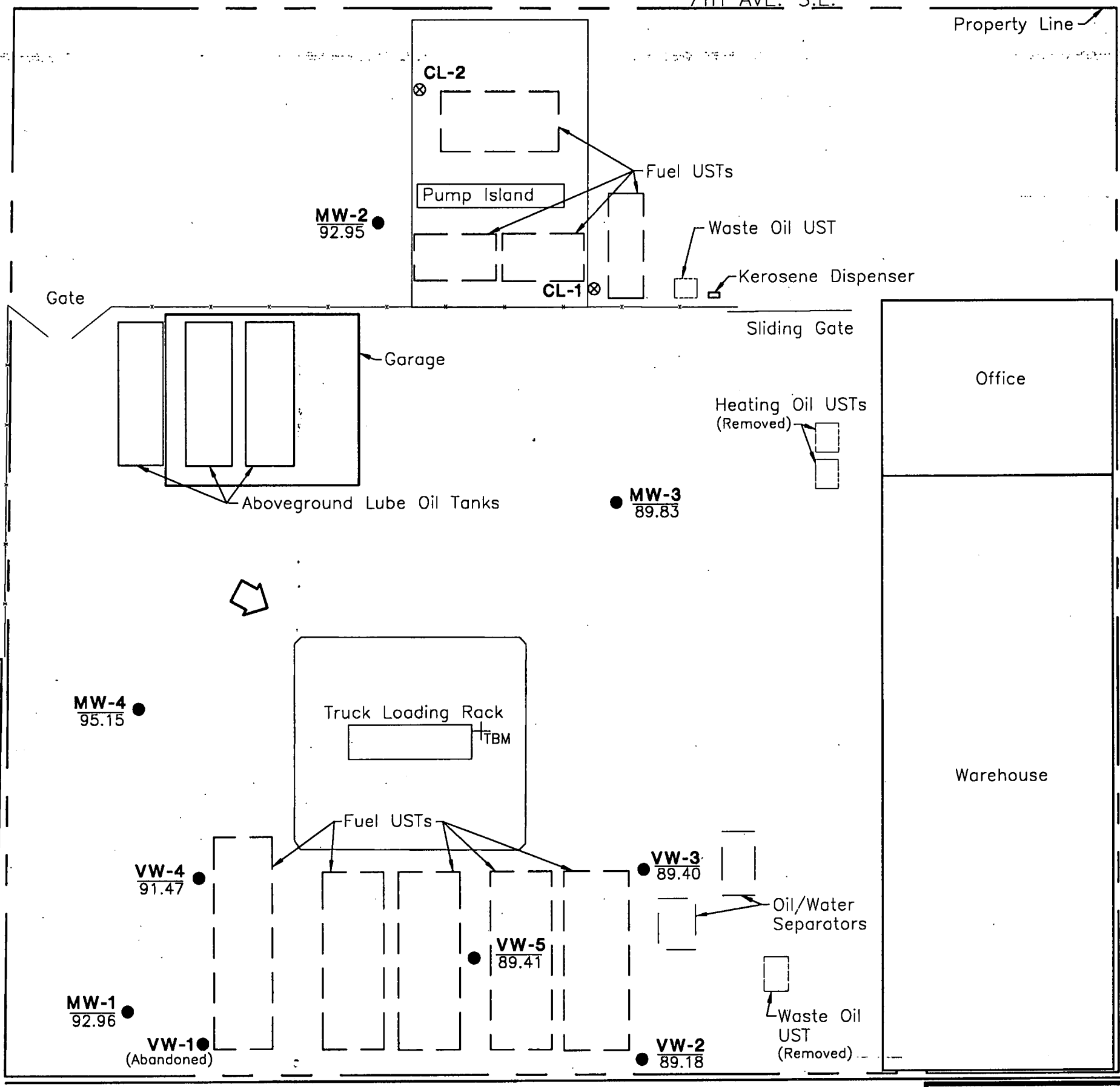
CL-1 ⊗ CARD LOCK OBSERVATION WELL

↗ GENERAL DIRECTION OF
 GROUND WATER FLOW

TBM+ TEMPORARY BENCHMARK
 ADJACENT TO TRUCK LOADING RACK
 ASSUMED ELEVATION OF 100.00 FEET

UST UNDERGROUND STORAGE TANK

Note: The locations of all features shown are approximate.



04/01/98

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LJB:HLA

Reference: Unocal drawing "Site Plan, Everett Bulk Plant, 7th Ave. S.E. & Everett Mall Way, Everett, Washington," dated 01/10/90.



GROUND WATER ELEVATIONS
 03/10/98

FIGURE 1

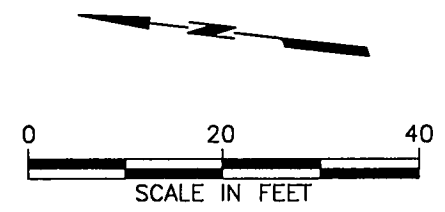
7TH AVE. S.E.

Property Line

MW-2	B	G	D	O
09/05/96	6.34	0.053	1.09	<0.750
03/03/97	0.739	<0.0500	0.845	<0.750
09/12/97	1.33	0.0915	0.252	<0.750
03/10/98	<0.500	0.0541	<0.250	<0.750
MTCA	5		1.0	

CL-2

CL-1



EXPLANATION:

MW-1 ● MONITORING WELL

VW-2 ● VAPOR EXTRACTION WELL

CL-1 ⊗ CARD LOCK OBSERVATION WELL

- B BENZENE (μg/l) BY EPA METHOD 8020
- G GASOLINE-RANGE HYDROCARBONS (mg/l) BY ECOLOGY METHOD WTPH-G
- D DIESEL-RANGE HYDROCARBONS (mg/l) BY ECOLOGY METHOD WTPH-D EXTENDED
- O HEAVY OIL-RANGE HYDROCARBONS (mg/l) BY ECOLOGY METHOD WTPH-D EXTENDED

MTCA MODEL TOXICS CONTROL ACT METHOD A GROUND WATER CLEANUP LEVELS

μg/l MICROGRAMS PER LITER

mg/l MILLIGRAMS PER LITER

MW-4	B	G	D	O
09/05/96	<0.500	<0.0500	0.768	<0.750
03/03/97	<0.500	<0.0500	<0.250	<0.750
09/12/97	<0.500	<0.0500	<0.250	<0.750
03/10/98	<0.500	<0.0500	<0.250	<0.750
MTCA	5		1.0	

MW-3	B	G	D	O
09/05/96	<0.500	<0.0500	2.20	<0.750
03/03/97	<0.500	0.0976	<0.250	<0.750
09/12/97	<0.500	0.123	0.344	<0.750
03/10/98	<0.500	0.138	<0.250	<0.750
MTCA	5		1.0	

MW-1	B	G	D	O
09/05/96	204	3.56	1.04	<0.750
03/03/97	18.2	0.451	<0.250	<0.750
09/12/97	9.28	0.293	<0.250	<0.750
03/10/98	22.5	5.76	<0.250	<0.750
MTCA	5		1.0	

VW-4 ●

VW-3 ●

VW-5 ●

VW-1 ●
(Abandoned)

VW-2 ●

Notes: 1. The locations of all features shown are approximate.

2. See Figure 1 for site facilities identification.

04/06/98

D:\4823242\4823242C.DWG

LJB:HLA

Reference: Unocal drawing "Site Plan, Everett Bulk Plant, 7th Ave. S.E. & Everett Mall Way, Everett, Washington," dated 01/10/90.



GROUND WATER CONTAMINANT CONCENTRATIONS

FIGURE 2

ATTACHMENT A

ATTACHMENT A

SCOPE OF SERVICES

The purpose of our most recent services was to monitor ground water conditions and static vapor concentrations beneath the site. Our specific scope of services completed for this monitoring period is summarized below.

1. Measure combustible vapor concentrations in the airspace of each monitoring well and vapor extraction well casing using a Bacharach TLV Sniffer.™
2. Measure the depths to ground water in the monitoring wells and vapor extraction wells and observe the water table interface for the possible presence of free (floating) product using a product interface probe.
3. Obtain ground water samples from the monitoring wells for chemical analysis of BETX by EPA Method 8020A, gasoline-range hydrocarbons by Ecology Method WTPH-G and diesel- and heavy oil-range hydrocarbons by Ecology Method WTPH-D extended with a sulfuric acid/silica gel cleanup.
4. Evaluate the field and laboratory data with regard to current regulatory criteria.

ATTACHMENT B

ATTACHMENT B

FIELD PROCEDURES

GROUND WATER ELEVATIONS

The depths to the ground water table relative to the vapor extraction and monitoring well casing rims were measured on March 10, 1998. The measurements were made using an electric water level indicator. The water level indicator was cleaned with a Liquinox™ wash and a distilled water rinse prior to use in each well. Ground water elevations were calculated by subtracting the water table depth from the surveyed casing rim elevations. The ground water elevations measured on March 10 are presented in Table 1 and Figure 1.

COMBUSTIBLE VAPOR CONCENTRATIONS

Combustible vapor concentrations were measured in the vapor extraction and monitoring well casings on March 10, 1998. A Bacharach TLV Sniffer™ (calibrated to hexane equipped with a flexible drop hose lowered to within 1 foot of the static water level) was used to measure the combustible vapor concentrations in the monitoring well casings. The range of significance for the TLV Sniffer™ in this application is 400 ppm to 10,000 ppm.

GROUND WATER SAMPLING

Ground water samples were obtained from the monitoring wells. Each water sample was obtained using a new disposable polyethylene bailer and clean bailing rope. The wells were not purged prior to sampling. The water samples were transferred in the field to laboratory-prepared sample containers and kept cool during transport to the testing laboratory. The sample containers were filled completely to eliminate headspace in the containers. Hydrochloric acid (a preservative) was present in the bottles used for collection of samples for analysis of BETX. Chain-of-custody procedures were followed in transporting the water samples to the testing laboratory. The ground water chemical analytical data are summarized in Table 2 and Figure 2. The laboratory data sheets and chain-of-custody records are included in Attachment C.

FREE PRODUCT

The presence of free product was checked using an electric oil/water interface probe in each of the wells.

ATTACHMENT C

ATTACHMENT C

CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

Chain-of-custody procedures were followed during the transport of the field samples to the analytical laboratory. The samples were held in cold storage pending extraction and/or analysis. The analytical results, analytical methods reference and laboratory quality control records are included in this attachment. The analytical results are also summarized in the text, Table 2 and Figure 2 of this report.

ANALYTICAL DATA REVIEW

The laboratory maintains an internal quality assurance program as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike recoveries, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory reports. The laboratory compared each group of samples with the existing data quality goals and noted any exceptions in the laboratory report. The data quality exceptions documented by the laboratory in the laboratory reports were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses" dated July 1988 (EPA document number EPA540/R94/083) and "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" dated February 1994 (EPA document number EPA540/R94/012).

ANALYTICAL DATA REVIEW SUMMARY

No significant data quality exceptions were noted in the laboratory report or during our review. Based on our data quality review, it is our opinion that the analytical data are of acceptable quality for their intended use.



NORTH CREEK ANALYTICAL

Environmental Laboratory Services

GeoEngineers

MAR 26 1998

BOTHELL ▪ (425) 481-9200 ▪ FAX 485-2992
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 906-9200 ▪ FAX 906-9210

Routing

LJB

Geo Engineers - Redmond
8410 154th Ave NE
Redmond, WA 98052

Project: UNOCA
File: 9161-242
Project Manager: Lisa Bona

Sampled: 3/10/98
Received: 3/10/98
Reported: 3/25/98 11:07

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	B803217-01	Water	3/10/98
MW-2	B803217-02	Water	3/10/98
MW-3	B803217-03	Water	3/10/98
MW-4	B803217-04	Water	3/10/98

North Creek Analytical, Inc.

*The results in this report apply to the samples analyzed in accordance with the chain of custody document.
This analytical report must be reproduced in its entirety.*

Joy B Chang, Project Manager

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508
East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132



NORTH CREEK ANALYTICAL

Environmental Laboratory Services

BOTHELL ▪ (425) 481-9200 ▪ FAX 485-2992
 SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
 PORTLAND ▪ (503) 906-9200 ▪ FAX 906-9210

Geo Engineers - Redmond 8410 154th Ave NE Redmond, WA 98052	Project: UNOCAL SS#0206 Project Number: 9161-242 Project Manager: Lisa Bona	Sampled: 3/10/98 Received: 3/10/98 Reported: 3/25/98 11:07
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Diesel Hydrocarbons (C12-C24) and Heavy Oil (C24-C40) by WTPH-D (extended) with Silica Gel Clean-up North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes
<u>MW-1</u>				<u>B803217-01</u>			<u>Water</u>	
Diesel Range Hydrocarbons	0380302	3/11/98	3/12/98		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	50.0-150		73.9	%	
<u>MW-2</u>				<u>B803217-02</u>			<u>Water</u>	
Diesel Range Hydrocarbons	0380302	3/11/98	3/12/98		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	50.0-150		81.6	%	
<u>MW-3</u>				<u>B803217-03</u>			<u>Water</u>	
Diesel Range Hydrocarbons	0380302	3/11/98	3/12/98		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	50.0-150		75.0	%	
<u>MW-4</u>				<u>B803217-04</u>			<u>Water</u>	
Diesel Range Hydrocarbons	0380302	3/11/98	3/12/98		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	50.0-150		82.7	%	

North Creek Analytical, Inc.

*Refer to end of report for text of notes and definitions.

Joy B Chang, Project Manager

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508
 East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
 9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132



NORTH CREEK ANALYTICAL

Environmental Laboratory Services

BOTHELL ■ (425) 481-9200 ■ FAX 485-2992
 SPOKANE ■ (509) 924-9200 ■ FAX 924-9290
 PORTLAND ■ (503) 906-9200 ■ FAX 906-9210

Geo Engineers - Redmond 8410 154th Ave NE Redmond, WA 98052	Project: UNOCAL SS#0206 Project Number: 9161-242 Project Manager: Lisa Bona	Sampled: 3/10/98 Received: 3/10/98 Reported: 3/25/98 11:07
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Gasoline Hydrocarbons (Toluene to Dodecane) and BTEX per WTPH-G and EPA 8020A North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1				<u>B803217-01</u>			<u>Water</u>	
Benzene	0380493	3/20/98	3/20/98		5.00	22.5	ug/l	
Toluene	"	"	"		5.00	188	"	
Ethylbenzene	"	"	"		5.00	35.7	"	
Xylenes (total)	"	"	"		10.0	1060	"	
Gasoline Range Hydrocarbons	"	"	"		500	5760	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		87.4	%	
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		101	"	
MW-2				<u>B803217-02</u>			<u>Water</u>	
Benzene	0380493	3/20/98	3/20/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		50.0	54.1	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		72.4	%	
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		83.0	"	
MW-3				<u>B803217-03</u>			<u>Water</u>	
Benzene	0380493	3/20/98	3/20/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		50.0	138	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		87.4	%	
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		101	"	
MW-4				<u>B803217-04</u>			<u>Water</u>	
Benzene	0380493	3/20/98	3/20/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		50.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		89.8	%	
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		100	"	

North Creek Analytical, Inc.

*Refer to end of report for text of notes and definitions.

Joy B Chang, Project Manager

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508
 East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
 9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132



NORTH CREEK ANALYTICAL

Environmental Laboratory Services

BOTHELL ■ (425) 481-9200 ■ FAX 485-2992
 SPOKANE ■ (509) 924-9200 ■ FAX 924-9290
 PORTLAND ■ (503) 906-9200 ■ FAX 906-9210

Geo Engineers - Redmond 8410 154th Ave NE Redmond, WA 98052	Project: UNOCAL SS#0206 Project Number: 9161-242 Project Manager: Lisa Bona	Sampled: 3/10/98 Received: 3/10/98 Reported: 3/25/98 11:07
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**Diesel Hydrocarbons (C12-C24) and Heavy Oil (C24-C40) by WTPH-D (extended) with Silica Gel Clean-up/Quality Control
 North Creek Analytical - Bothell**

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes
<u>Batch: 0380302</u>		<u>Date Prepared: 3/11/98</u>		<u>Extraction Method: EPA 3520C/600 Series</u>						
<u>Blank</u>		<u>0380302-BLK1</u>								
Diesel Range Hydrocarbons	3/12/98			ND	mg/l	0.250				
Heavy Oil Range Hydrocarbons	"			ND	"	0.750				
Surrogate: 2-FBP	"	0.320		0.276	"	50.0-150	86.2			
<u>LCS</u>		<u>0380302-BS1</u>								
Diesel Range Hydrocarbons	3/12/98	2.00		1.73	mg/l	60.0-120	86.5			
Surrogate: 2-FBP	"	0.320		0.272	"	50.0-150	85.0			
<u>Duplicate</u>		<u>0380302-DUP1</u>		<u>B803217-01</u>						
Diesel Range Hydrocarbons	3/12/98		ND	0.347	mg/l				44.0	
Surrogate: 2-FBP	"	0.641		0.540	"	50.0-150	84.2			



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 PORTLAND ▪ (503) 906-9200 ▪ FAX 906-9210

Geo Engineers - Redmond 8410 154th Ave NE Redmond, WA 98052	Project: UNOCAL SS#0206 Project Number: 9161-242 Project Manager: Lisa Bona	Sampled: 3/10/98 Received: 3/10/98 Reported: 3/25/98 11:07
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Gasoline Hydrocarbons (Toluene to Dodecane) and BTEX per WTPH-G and EPA 8020A/Quality Control North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0380493			Date Prepared: 3/20/98		Extraction Method: EPA 5030					
Blank			0380493-BLK1							
Benzene	3/20/98			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	50.0				
Surrogate: 4-BFB (FID)	"	50.0		44.6	"	50.0-150	89.2			
Surrogate: 4-BFB (PID)	"	50.0		49.3	"	50.0-150	98.6			
LCS			0380493-BS1							
Gasoline Range Hydrocarbons	3/20/98	1250		1160	ug/l	50.0-150	92.8			
Surrogate: 4-BFB (FID)	"	50.0		55.7	"	50.0-150	111			
LCS			0380493-BS2							
Benzene	3/20/98	20.0		21.7	ug/l	67.0-130	109			
Toluene	"	20.0		21.8	"	75.0-126	109			
Ethylbenzene	"	20.0		22.1	"	76.0-124	111			
Xylenes (total)	"	60.0		66.0	"	75.0-126	110			
Surrogate: 4-BFB (PID)	"	50.0		52.4	"	50.0-150	105			
Duplicate			0380493-DUP1 P803387-01							
Gasoline Range Hydrocarbons	3/20/98		10500	11800	ug/l			50.0	11.7	
Surrogate: 4-BFB (FID)	"	50.0		49.6	"	50.0-150	99.2			
Duplicate			0380493-DUP2 P803387-03							
Gasoline Range Hydrocarbons	3/20/98		3680	3720	ug/l			50.0	1.08	
Surrogate: 4-BFB (FID)	"	50.0		47.8	"	50.0-150	95.6			
Matrix Spike			0380493-MS1 P803387-02							
Benzene	3/20/98	20.0	ND	13.5	ug/l	67.0-130	67.5			
Toluene	"	20.0	ND	12.1	"	75.0-126	60.5			2
Ethylbenzene	"	20.0	0.936	14.3	"	76.0-124	66.8			2
Xylenes (total)	"	60.0	ND	42.3	"	75.0-126	70.5			2
Surrogate: 4-BFB (PID)	"	50.0		47.3	"	50.0-150	94.6			
Matrix Spike Dup			0380493-MSD1 P803387-02							
Benzene	3/20/98	20.0	ND	14.6	ug/l	67.0-130	73.0	13.0	7.83	
Toluene	"	20.0	ND	13.2	"	75.0-126	66.0	13.0	8.70	2

North Creek Analytical, Inc.

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oy B Chang, Project Manager

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 9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132

Geo Engineers - Redmond 8410 154th Ave NE Redmond, WA 98052	Project: UNOCAL SS#0206 Project Number: 9161-242 Project Manager: Lisa Bona	Sampled: 3/10/98 Received: 3/10/98 Reported: 3/25/98 11:07
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**Gasoline Hydrocarbons (Toluene to Dodecane) and BTEX per WTPH-G and EPA 8020A/Quality Control
 North Creek Analytical - Portland**

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD % Note
<u>Matrix Spike Dup (continued)</u>	<u>0380493-MSD1</u>		<u>P803387-02</u>						
Ethylbenzene	3/20/98	20.0	0.936	15.6	ug/l	76.0-124	73.3	15.0	9.28
Xylenes (total)	"	60.0	ND	45.9	"	75.0-126	76.5	13.0	8.16
Surrogate: 4-BFB (PID)	"	50.0		48.1	"	50.0-150	96.2		



Geo Engineers - Redmond 8410 154th Ave NE Redmond, WA 98052	Project: UNOCAL SS#0206 Project Number: 9161-242 Project Manager: Lisa Bona	Sampled: 3/10/98 Received: 3/10/98 Reported: 3/25/98 11:07
---	---	--

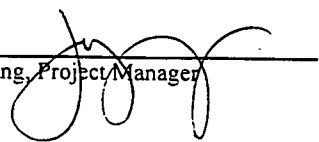
Notes and Definitions

#	Note
---	------

- 1 Analyses are not controlled on RPD values from sample concentrations less than 10 times the reporting limit.
- 2 The spike recovery for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- Recov. Recovery
- RPD Relative Percent Difference

North Creek Analytical, Inc.

Joy B Chang, Project Manager



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Quantitation Report

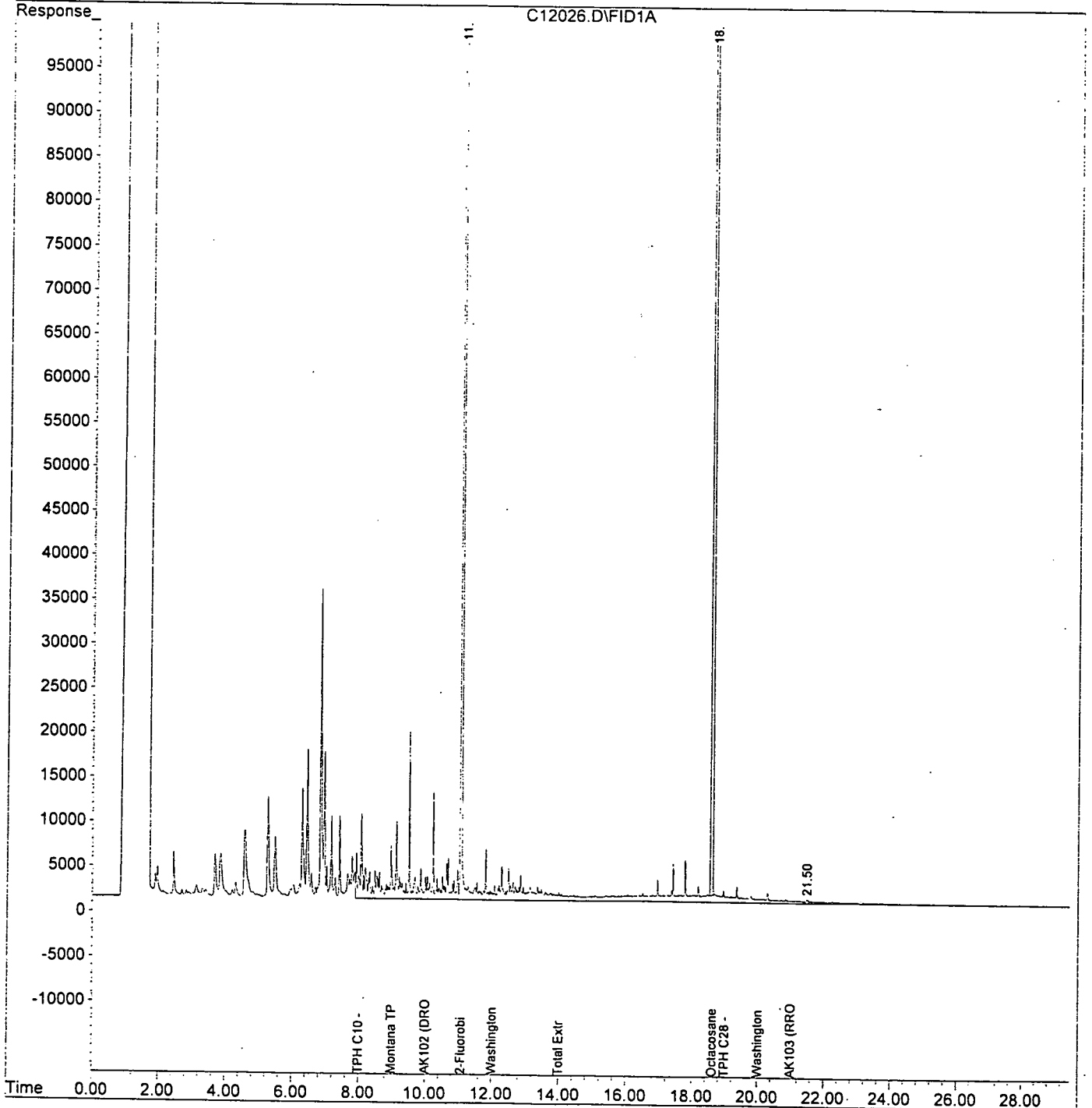
Data File : C:\HPCHEM\1\DATA\C12026.D
Acq On : 12 Mar 1998 6:59 pm
Sample : b803217-01
Misc : W
IntFile : SURR.E
Quant Time: Mar 12 22:20 1998

Vial: 7
Operator: ajg
Inst : GC #1
Multiplr: 1.00

Quant Results File: TPHD.RES

Quant Method : C:\HPCHEM\1\METHODS\TPHD.M (Chemstation Integrator)
Title : TPH-D Front Method
Last Update : Fri Feb 20 10:07:15 1998
Response via : Multiple Level Calibration
DataAcq Meth : TPHD.M

Volume Inj. :
Signal Phase :
Signal Info :



Data File : C:\HPCHEM\1\DATA.SEC\C12027.D

Vial: 8

Acq On : 12 Mar 1998 7:38 pm

Operator: ajg

Sample : b803217-02

Inst : GC #1

Misc : W

Multiplr: 1.00

IntFile : SURR.E

Quant Time: Mar 12 22:25 1998 Quant Results File: TPHD2.RES

Quant Method : C:\HPCHEM\1\METHODS\TPHD2.M (Chemstation Integrator)

Title : TPH-D Rear Method

Last Update : Fri Feb 20 10:06:33 1998

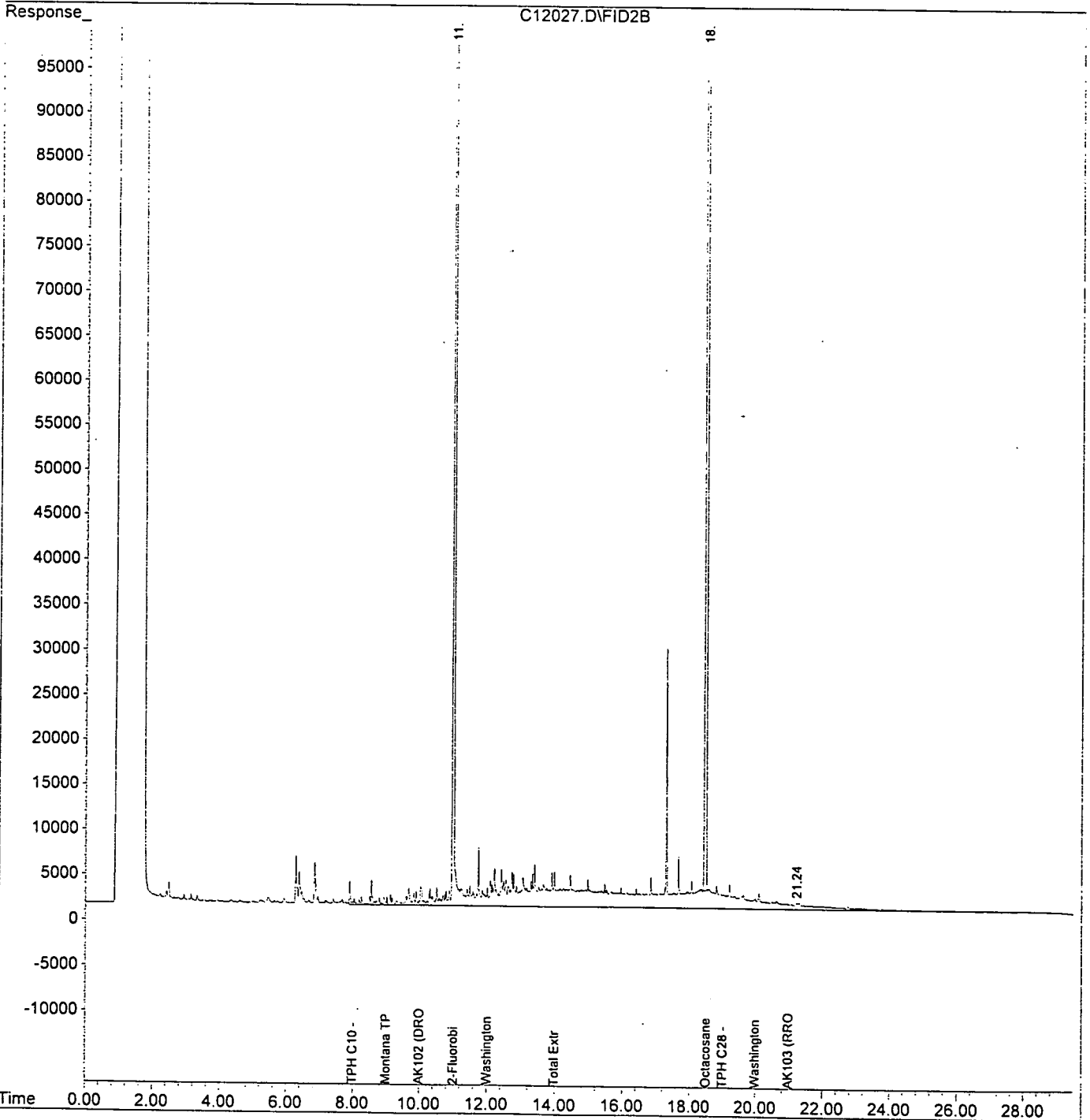
Response via : Multiple Level Calibration

DataAcq Meth : TPHD.M

Volume Inj. :

Signal Phase :

Signal Info :



Data File : C:\HPCHEM\1\DATA\C12028.D

Acq On : 12 Mar 1998 7:38 pm

Sample : b803217-03

Misc : W

IntFile : SURR.E

Quant Time: Mar 12 22:21 1998 Quant Results File: TPHD.RES

Vial: 9

Operator: ajg

Inst : GC #1

Multiplr: 1.00

Quant Method : C:\HPCHEM\1\METHODS\TPHD.M (Chemstation Integrator)

Title : TPH-D Front Method

Last Update : Fri Feb 20 10:07:15 1998

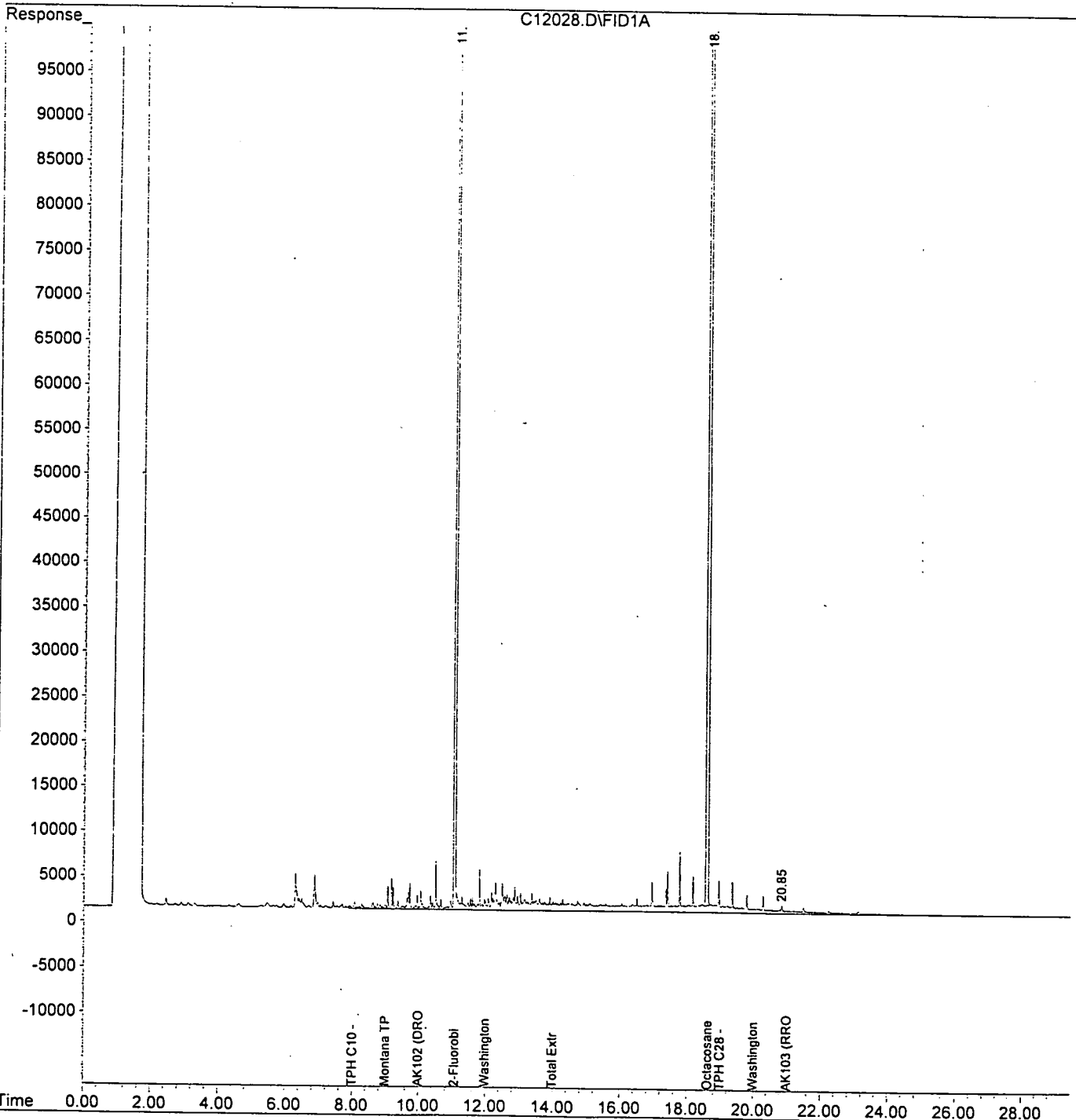
Response via : Multiple Level Calibration

DataAcq Meth : TPHD.M

Volume Inj. :

Signal Phase :

Signal Info :



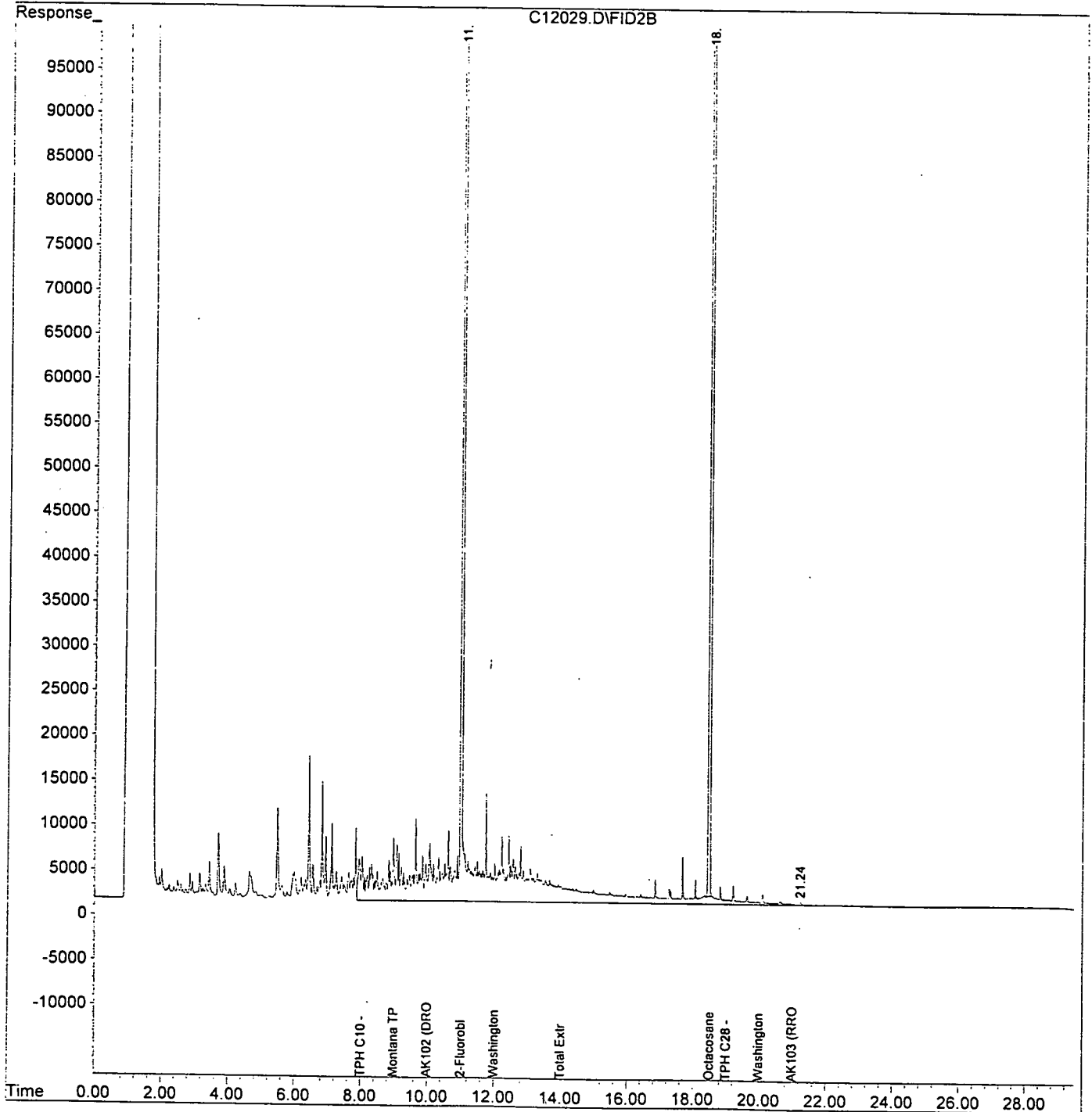
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Sample : b803217-04
Misc : W
IntFile : SURR.E
Quant Time: Mar 12 22:26 1998

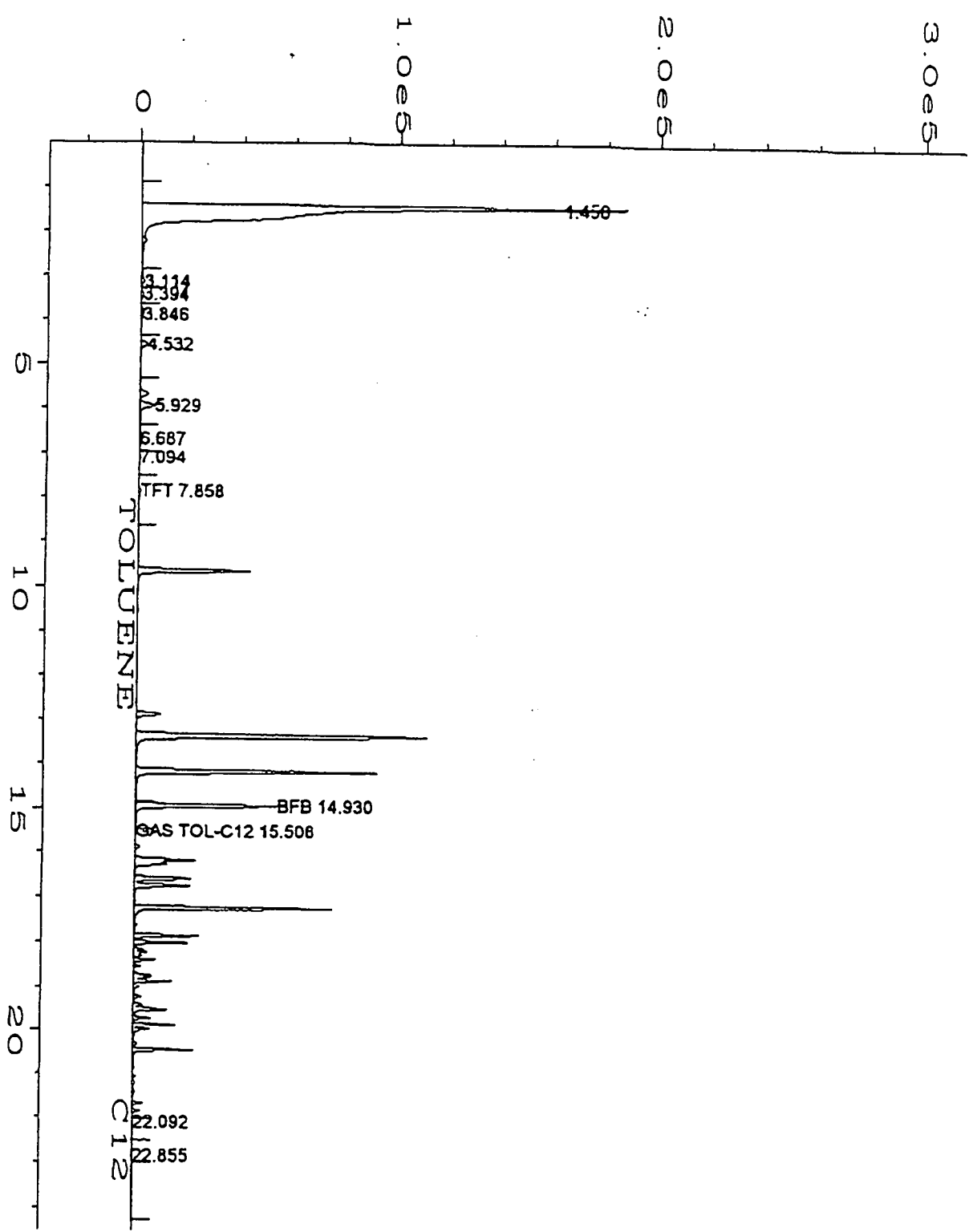
Vial: 10
Operator: ajg
Inst : GC #1
Multiplr: 1.00

Quant Results File: TPHD2.RES

Quant Method : C:\HPCHEM\1\METHODS\TPHD2.M (Chemstation Integrator)
Title : TPH-D Rear Method
Last Update : Fri Feb 20 10:06:33 1998
Response via : Multiple Level Calibration
DataAcq Meth : TPHD.M

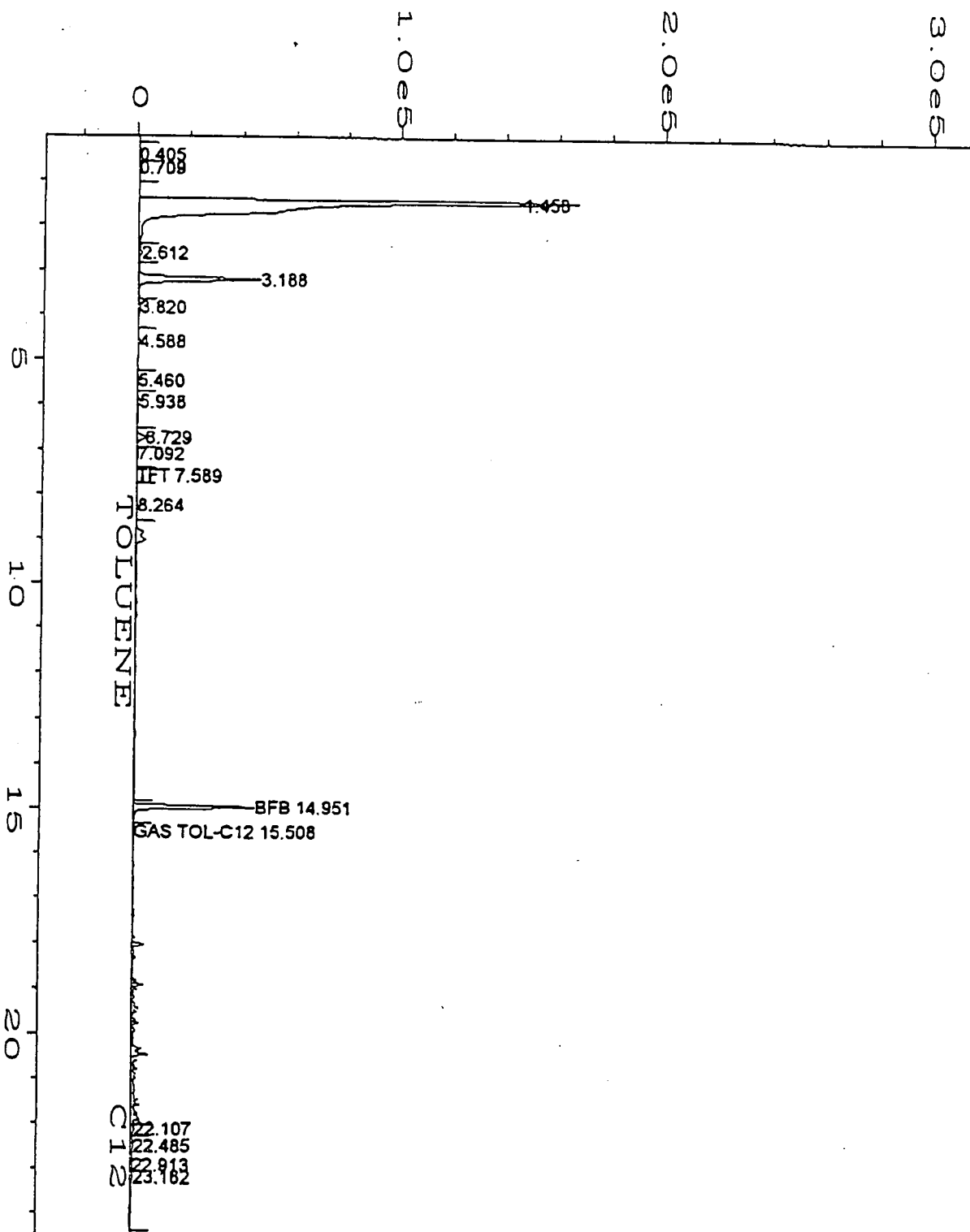
Volume Inj. :
Signal Phase :
Signal Info :





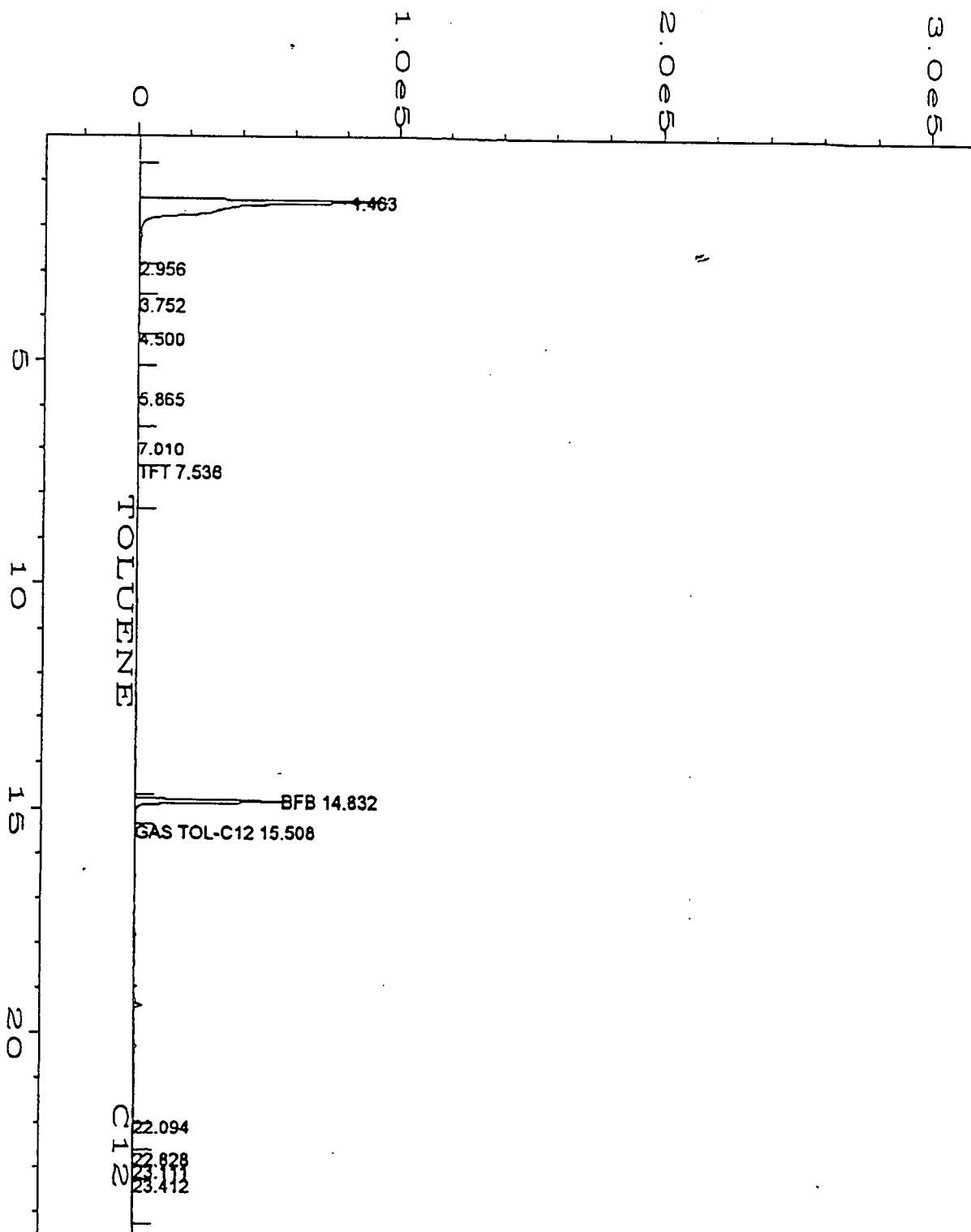
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Operator	: k1b	Vial Number	: 24
Instrument	: GC1	Injection Number	: 1
Sample Name	: p803403-01 B803277-01	Sequence Line	: 1
Run Time Bar Code:		Instrument Method:	WAGAS-G1.MTH
Acquired on	: 20 Mar 98 09:57 PM	Analysis Method	: WAGAS-G1.MTH
Report Created on:	20 Mar 98 10:21 PM	Sample Amount	: 0
Last Recalib on	: 11 MAR 98 04:25 PM	ISTD Amount	:
Multiplier	: 1		
Sample Info	: 500 uL		



user modified

Data File Name	: C:\HPCHEM\1\DATA\S032098\025F0101.D	Page Number	: 1
Operator	: klb	Vial Number	: 25
Instrument	: GC1	Injection Number	: 1
Sample Name	: p803403-02 B80321702	Sequence Line	: 1
Run Time Bar Code:		Instrument Method:	WAGAS-G1.MTH
Acquired on	: 20 Mar 98 10:29 PM	Analysis Method	: WAGAS-G1.MTH
Report Created on:	21 Mar 98 05:13 AM	Sample Amount	: 0
Last Recalib on	: 11 MAR 98 04:25 PM	ISTD Amount	:
Multiplier	: 1		



user modified

Data File Name	: C:\HPCHEM\1\DATA\S032098\027F0101.D	Page Number	: 1
Operator	: klb	Vial Number	: 27
Instrument	: GC1	Injection Number	: 1
Sample Name	: p803403-04 B 803217-04	Sequence Line	: 1
Run Time Bar Code:		Instrument Method:	WAGAS-G1.MTH
Acquired on	: 20 Mar 98 11:35 PM	Analysis Method	: WAGAS-G1.MTH
Report Created on:	21 Mar 98 00:00 AM	Sample Amount	: 0
Last Recalib on	: 11 MAR 98 04:25 PM	ISTD Amount	:
Multiplier	: 1		
Sample Info	: 5 mL		

UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: SB# 0206

Site Address: 7th Ave SE

City, State, ZIP: Everett WA

Site Release Number:

Unocal Manager: Martin Cramer

CERT INFO: (check one) Evaluation Remediation
 Detection Demolition Closure Miscellaneous

CONSULTANT INFORMATION

Firm: GEI Project# 9161-242

Address: Reclunouel

Phone: 425 861-6000 Fax: 425 861-6050

Project Manager: Lisa Bone

Sample Collection by: Brick Spangler

Chain of Custody Record #:
B803217

Quality Assurance Data Level:
 A K
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days:
 10 5 3 2 1

SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	MATRIX (W,S,O)	# OF CONTAINERS
1. <u>AAW-1</u>	<u>3/10/98 1200</u>	<u>W</u>	<u>3</u>
2. <u>AAW-2</u>	<u>1215</u>	<u>W</u>	<u>3</u>
3. <u>AAW-3</u>	<u>1230</u>	<u>W</u>	<u>3</u>
4. <u>AAW-4</u>	<u>1245</u>	<u>W</u>	<u>3</u>
5.			
6.			
7.			
8.			
9.			
10.			

RES

OR WA AK NV Series

TPH-HCID	TPH-Gas	BTEX EPA 8021 Mod.	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-Diesel-Ext. w/SG Cleanup	Halogen. Volatiles EPA 8021	Pesticides/PCBs or PCBs Only	GC/MS Volatiles EPA 8260	GC/MS Semi-Vols. EPA 8270	PAH's: EPA 8270 SIM or 8310	Lead:	Total or Dissolved TCLP or RCRA	Metals (8)
		X	X			X								
		X	X			X								
		X	X			X								
		X	X			X								

NCA SAMPLE NUMBER
B.803217 -01
02
03
04

Relinquished by: <u>Brick Spangler</u>	Firm: <u>GEI</u>	Date & Time: <u>3/10/98 1325</u>	Received by: <u>Lisa Bone</u>	Firm: <u>NET</u>	Date & Time: <u>3/10/98 1325</u>
3.					

Final Report Approval

Were all requested results provided? yes no Define

Were results within requested turnaround? yes no "No"

Final Approval Signature: _____ on back