SR 7/23/95 eu

DEPARTMENT OF ECOLOGY
NWRO/TCP TANK UNIT
1659

INTERIM CLEANUP REPORT	☑
SITE CHARACTERIZATION	☐
FINAL CLEANUP REPORT	☐
OTHER _____	☐
AFFECTED MEDIA: SOIL	☑
OTHER _____ GW	☑
INSPECTOR (INIT.) WSM	DATE 5-22-95

Results of Ground Water Sampling
June and September 1994
Unocal Service Station 5905
Bothell, Washington

November 18, 1994

Independent Action Report Update

Site Name: Unoc 5905

Inc. #: 1659 Date of Report: 11-18-94

County: King Date Report Rec'd: 11-21-94

Reviewed by: Wally Moon

Comments (please include: free prod., tank info., contaminant migration, GW depth & flow, conc. trends, PCS treated?):

BTEX made an appearance in several MWs in 1994, possibly a release assoc with existing systems. Levels have decreased from ~~early high~~ high in early 94. GW flows SE at 9-13' bgs.

al CERT - Northern Region

File No. 0161-183-R04

GeoEngineers

November 18, 1994

Geotechnical,
Geoenvironmental and
Geologic Services

Unocal CERT - Northern Region
P.O. Box 76
Seattle, Washington 98111

Attention: Mr. Leigh Carlson

Results of Ground Water Sampling
June and September 1994
Unocal Service Station 5905
Bothell, Washington
File No. 0161-183-R04

INTRODUCTION

This letter summarizes the results of our June and September 1994 ground water sampling and testing at former Unocal Service Station 5905, located at 18015 Bothell Way Northeast in Bothell, Washington. The Ecology (Washington State Department of Ecology) UST (underground storage tank) site identification number for Service Station 5905 is 008485. The LUST (leaking UST) incident number for the site is 1659. The property is currently owned by Mr. Lowell Haynes. All Unocal facilities were removed from the site in 1991 and 1992; extensive excavation of petroleum-contaminated soil occurred during this time interval. A new service station facility was constructed at the site in 1993 by parties other than Unocal. The general layout of the site, with approximate monitoring well locations and former and current facilities, is shown in Figure 1.

SCOPE

GeoEngineers' scope of services completed during this reporting period is summarized below.

1. Measure the depths to ground water in the existing monitoring wells.
2. Measure combustible vapor concentrations in the monitoring well casings.

GeoEngineers, Inc.
8410 154th Avenue N.E.
Redmond, WA 98052
Telephone (206) 861-6000
Fax (206) 861-6050

3. Obtain ground water samples from the existing monitoring wells for laboratory testing of the following: BETX (benzene, ethylbenzene, toluene and xylenes) by EPA Method 8020, gasoline-range hydrocarbons by Ecology Method WTPH-G, and diesel- and heavy oil-range hydrocarbons by Ecology Method WTPH-D extended.
4. Obtain a sample from the purge and decontamination water generated during ground water sampling and submit the sample for analytical testing of BETX, and fats, oil and grease by EPA Method 413.2 for disposal characterization.
5. Dispose of purge and decontamination water at GeoEngineers' Redmond sanitary sewer connection under Metro Discharge Authorization Number 393.

JUNE AND SEPTEMBER 1994 SAMPLING EVENTS

WATER TABLE ELEVATIONS

A representative of GeoEngineers measured the depths to ground water in MW-5, MW-10 and MW-11 on June 21 and in MW-5, MW-9, MW-10 and MW-11 on September 30, 1994. The depths to ground water and ground water elevations measured from March 1992 through the current reporting period are presented in Table 1. Ground water elevations, inferred ground water contours and inferred ground water flow directions based on the September 1994 measurements are shown in Figure 2. Field procedures are described in Attachment A.

The depths to ground water beneath the site ranged from approximately 8.2 to 8.8 feet on June 21, 1994 and from 9.3 to 12.6 feet on September 30, 1994. The apparent shallow ground water flow direction indicated by the June and September measurements is toward the east, which is generally consistent with our previous measurements.

COMBUSTIBLE VAPOR CONCENTRATIONS

GeoEngineers measured combustible vapor concentrations in the monitoring well casings of MW-5, MW-10 and MW-11 on June 21 and in MW-5, MW-9, MW-10 and MW-11 on September 30, 1994. The measurements from March 1992 through the current reporting period are presented in Table 1. Field procedures are described in Attachment A.

The combustible vapor concentrations were greater than 10,000 ppm (parts per million) in MW-5 during both monitoring events, in MW-9 during the September event, and in MW-10 in the June event. The combustible vapor concentrations were 2,000 ppm in MW-10 during the June event, and were less than the lower threshold of significance of the TLV Sniffer, 400 ppm (parts per million), in MW-11 during the September monitoring event.

GROUND WATER QUALITY DATA

GeoEngineers obtained ground water samples from MW-5 and MW-9 through MW-11 in June and September 1994. The samples were analyzed for BETX, and gasoline-, diesel- and heavy oil-range hydrocarbons. The ground water analytical data from March 1992 through the

current reporting period are summarized in Table 2 and Figure 3. The MTCA Method A ground water cleanup levels also are included in Table 2 and Figure 3 for reference. Field procedures are described in Attachment A. The laboratory reports, chain-of-custody records and our evaluation of the laboratory quality assurance/quality control program are included in Attachment B.

Ethylbenzene, toluene, xylenes, and gasoline-, diesel- and heavy oil-range hydrocarbons either were not detected or were detected at concentrations less than the MTCA Method A cleanup level in the ground water samples obtained from the monitoring wells in June and September 1994. Benzene was not detected in the June and September samples obtained from MW-11. Benzene was detected at concentrations exceeding the MTCA Method A cleanup level in the June and September samples obtained from MW-5, MW-10 and MW-11, at concentrations ranging from 10 to 350 μg/l (micrograms per liter) in June and 29 to 88 μg/l in September.

DISCUSSION

Diesel- and heavy oil-range hydrocarbons have been detected in the past in ground water samples obtained from MW-5, MW-9 and MW-10 at concentrations exceeding the MTCA Method A ground water cleanup level. Diesel- and heavy oil-range hydrocarbons have not been detected in ground water samples since March 1993 in MW-5 and since June 1993 in MW-9 and MW-10. Since those times, diesel- and heavy oil-range hydrocarbons have not been detected in MW-9 and MW-10 for six consecutive monitoring events, and have not been detected in MW-5 for seven consecutive monitoring events.

Gasoline-range hydrocarbons and BETX were not detected at concentrations exceeding MTCA Method A cleanup levels in the ground water samples obtained from the existing monitoring wells through the June 1993 sampling event, with the exception of the initial sample (March 1992) from MW-10. We discontinued testing for these analytes in MW-5, MW-9, MW-10 and MW-11 in 1993.

Gasoline-range hydrocarbons and BETX were analyzed in March 1994 ground water samples in preparation for submitting the site to Ecology for closure. Gasoline-range hydrocarbons and BETX were detected in MW-9 and benzene was detected in MW-5 at concentrations exceeding the MTCA Method A cleanup levels during the March 1994 sampling event. Only trace amounts of BETX and gasoline-range hydrocarbons had been detected previously in these wells. Based on the high ratio of benzene to other compounds, and on a visual inspection of the chromatograms provided with the WTPH-G and WTPH-D extended analyses, the dissolved product detected in ground water samples obtained from MW-5 and MW-9 during the March 1994 sampling event appeared to be fresh gasoline, as discussed in our report dated May 12, 1994. The product does not appear to resemble the diesel- and heavy oil-range hydrocarbons previously detected in MW-5, MW-9 and MW-10.

During subsequent monitoring events, gasoline-range hydrocarbons and/or one or more BETX constituents continued to be present in MW-9 at concentrations exceeding the Method A cleanup levels. The contaminant concentrations have decreased over time in MW-9. Benzene has continued to be present in MW-5 at relatively stable concentrations exceeding the Method A cleanup levels, with the exception of the April 1994 sampling event when benzene and toluene were detected at much higher concentrations. Benzene was detected in MW-10 during the April 1994 sampling event at a concentration exceeding the Method A cleanup level. Benzene concentrations in MW-10 subsequently have increased.

Historical data, and the spatial distribution and chemical characteristics of the new contaminants in MW-5, MW-9 and MW-10 indicate that a release of gasoline occurred in the area of the current gasoline USTs, product lines or service islands between June 1993 and March 1994. The locations of MW-5, MW-9 and MW-10 with relation to these facilities make it difficult to determine the actual leak location. The initially high but rapidly decreasing concentration of benzene in MW-9, the apparent delay in the dissolved product reaching MW-10, and the subsequent increasing concentration of benzene in MW-10 suggest that the release occurred in the area of the gasoline USTs.

As described earlier, the benzene concentrations detected in MW-9 water samples have decreased steadily since March 1994. The available data suggest that a release occurred in late 1993 or early 1994 in the gasoline UST area, and that (1) the rate of the release has diminished significantly since that time, or (2) the release was a one-time event over a relatively short period of time.

FUTURE MONITORING

We recommend that ground water monitoring be discontinued at the site. The diesel- and heavy oil-range hydrocarbons previously present in MW-5, MW-9 and MW-10 have not been detected for the past six to seven monitoring events. Remaining ground water contamination at the site is related to activities at the site subsequent to Unocal's operations, in our opinion.

If Unocal wishes to submit the site to Ecology for closure, we recommend that two soil borings be completed in the immediate vicinity of MW-10 to delineate the limits of possible gasoline-related soil contamination in this area.

When closure is obtained, we recommend that Unocal evaluate whether to abandon the existing monitoring wells and underground treatment system piping.

We appreciate the opportunity to provide these continued services to Unocal. Please contact us if you have questions regarding our ongoing monitoring activities at the site.

Yours very truly,

GeoEngineers, Inc.

Lisa J. Bona
Staff Geologist

James A. Miller, P.E.
Principal

LJB:NLP:JAM:cms
Document ID: 0161183.R3

Attachments

Four copies submitted

cc: Mr. Wally Moon
Washington State Department of Ecology
3190 - 160th Ave. S.E.
Bellevue, WA 98008-5452

TABLE 1 (Page 1 of 2)
GROUND WATER ELEVATIONS AND COMBUSTIBLE VAPOR CONCENTRATIONS

Monitoring Well[1]	Date Measured	Water Depth from Ground Surface (feet)	Ground Water Elevation[2] (feet)	Combustible Vapor Concentration[3] (ppm)
MW-5	03/23/92	8.20	4.53	<400
	06/09/92	7.85	4.74	<400
	09/01/92	9.23	3.36	<400
	12/03/92	8.82	3.77	<400
	03/19/93	9.57	3.02	<400
	06/16/93	8.42	4.13	<400
	09/22/93	9.02	3.53	<400
	01/12/94	8.77	3.78	<400
	03/30/94	8.43	4.12	--
	06/21/94	**8.75**	**3.80**	**>10,000**
	09/30/94	**12.55**	**3.41**	**>10,000**
MW-6[4]	03/23/92	7.49	3.58	<400
	06/09/92	8.14	2.93	<400
	09/01/92	8.64	2.43	<400
	12/03/92	8.31	2.76	<400
MW-9	03/23/92	7.13	4.70	<400
	06/09/92	7.91	3.93	<400
	09/01/92	8.65	3.19	<400
	12/03/92[5]	--	--	--
	03/19/93	8.12	3.72	<400
	06/16/93	7.46	4.16	<400
	09/22/93	8.35	3.27	<400
	01/12/94	7.94	3.68	<400
	03/30/94	7.26	4.36	--
	06/22/94	--	--	--
	09/30/94	**11.62**	**3.15**	**>10,000**
MW-10	03/23/92	7.56	2.38	<400
	06/09/92	8.12	2.06	<400
	09/01/92	8.46	1.72	<400
	12/03/92	9.11	0.83	<400
	03/19/93	8.05	2.13	<400
	06/16/93	7.83	2.18	<400
	09/22/93	8.32	1.69	<400
	01/12/94	8.06	1.95	<400
	03/30/94	7.94	2.07	--
	06/21/94	**8.17**	**1.84**	**>10,000**
	09/30/94	**10.01**	**1.75**	**2,000**
MW-11[6]	06/22/92	8.71	0.74	<400
	09/01/92	8.77	0.68	<400
	12/03/92	8.35	1.10	<400
	03/19/93	8.51	0.94	<400
	06/16/93	8.27	1.00	<400
	09/22/93	8.59	0.68	<400
	01/12/94	8.45	0.82	<400
	03/30/94	8.37	0.90	--
	06/21/94	**8.45**	**0.82**	**900**
	09/30/94	**9.27**	**0.71**	**<400**

Notes appear on page 2 of 2.

TABLE 1 (Page 2 of 2)

Notes:

[1]Approximate locations of monitoring wells are shown in Figures 1, 2 and 3.

[2]Elevations are measured relative to the benchmark shown in Figure 2. The benchmark has an elevation of 10.41 feet.

[3]Measured with a Bacharach TLV Sniffer calibrated to hexane equipped with a 2-inch-diameter slip cap. Field procedures are described in Attachment A. The lower threshold of significance for this instrument in this application is 400 ppm.

[4]MW-6 was destroyed during construction of new facilities after the 12/03/92 monitoring event.

[5]MW-9 was not accessible during this monitoring episode because of construction damage to the well.

[6]MW-11 was installed on 06/19/93.

ppm = parts per million

'--' = not measured

Bolding indicates measurement taken during current reporting period.

Document ID: 161183M1.WK1

TABLE 2 (PAGE 1 OF 4)
SUMMARY OF GROUND WATER CHEMICAL ANALYTICAL DATA
UNOCAL SERVICE STATION 5905
BOTHELL, WASHINGTON

Monitoring Well	Date Sampled	BETX[1] (µg/l) B	E	T	X	Gasoline-range Hydrocarbons[2] (mg/l)	Diesel-range Hydrocarbons[3] (mg/l)	Heavy Oil-range Hydrocarbons[3] (mg/l)	Dissolved Lead[4] (µg/l)
MW-3	06/09/92	3.2	0.66	<0.50	1.1	<0.05	<0.50	--	<1.0
	09/01/92	<0.50	<0.50	<0.50	<1.0	<0.05	0.40	--	<2.0
MW-5	03/23/92	<0.50	<0.50	<0.50	2.5	0.40	<0.50	--	--
	04/20/92	--	--	--	--	--	--	--	<2.0
	06/09/92	<0.50	<0.50	1.0	<0.50	0.24	<0.50	--	<1.0
	09/01/92	<0.50	<0.50	<0.50	<1.0	0.12	<0.25	--	<2.0
	12/03/92	<0.50	0.95	2.3	3.5	<0.05	0.30	<0.38	--
	03/19/93	<0.50	<0.50	<0.50	<0.50	<0.05	0.28	1.5	--
	06/16/93	<0.50	<0.50	<0.50	<0.50	<0.01	<0.25	<0.75	--
	09/22/93	--	--	--	--	--	<0.25	<0.75	--
	01/12/94	--	--	--	--	--	<0.25	<0.75	--
	03/30/94	23	<0.50	6.6	0.60	0.14	<0.25	<0.75	--
	04/13/94	220	<0.50	60	11	0.29	<0.25	<0.75	<3.0[5]
	06/21/94	**26**	**<0.50**	**0.60**	**<0.50**	**<0.1**	**<0.25**	**<0.75**	--
	09/30/94	**29**	**<0.50**	**<0.50**	**<1.0**	**0.17**	**<0.25**	**<0.75**	--
MW-6	03/23/92	<0.50	<0.50	<0.50	<0.50	<0.10	<0.50	--	--
	04/20/92	--	--	--	--	--	--	--	<2.0
	06/09/92	<0.50	<0.50	<0.50	<0.50	<0.05	<0.50	--	<1.0
	09/01/92	<0.50	<0.50	<0.50	<1.0	<0.05	<0.25	--	2.2
Dup 1[6]	09/01/92	<0.50	<0.50	<0.50	<1.0	<0.05	--	--	--
	12/03/92	<0.50	<0.50	<0.50	<0.50	<0.50	<0.12	<0.38	<2.0
921203-D[6]	12/03/92	<0.50	<0.50	<0.50	<0.50	<0.50	--	--	--
MW-7	03/23/92	<0.50	<0.50	<0.50	<0.50	<0.10	<0.50	--	--
	04/20/92	--	--	--	--	--	--	--	<2.0
	06/09/92	<0.50	<0.50	<0.50	<0.50	<0.05	<0.50	--	<1.0
	09/01/92	<0.50	<0.50	<0.50	<1.0	<0.05	<0.31	--	<2.0
MW-8	03/23/92	<0.50	<0.50	<0.50	<0.50	<0.10	<0.50	--	--
	04/20/92	--	--	--	--	--	--	--	<2.0
	06/09/92	<0.50	<0.50	<0.50	<0.50	<0.05	<0.50	--	<1.0
	09/01/92	<0.50	<0.50	<0.50	<1.0	<0.05	<0.25	--	<2.0
MTCA Method A Cleanup Levels		5.0	30.0	40.0	20.0		1.0[7]		5

Notes appear on page 4 of 4.

TABLE 2 (Page 2 of 4)

Monitoring Well	Date Sampled	BETX[1] (µg/l)				Gasoline-range Hydrocarbons[2] (mg/l)	Diesel-range Hydrocarbons[3] (mg/l)	Heavy Oil-range Hydrocarbons[3] (mg/l)	Dissolved Lead[4] (µg/l)
		B	E	T	X				
MW-9	03/23/92	<0.50	<0.50	<0.50	<0.50	<0.10	0.88	<1.0[8]	--
	04/20/92	--	--	--	--	--	--	--	<2.0
	06/09/92[9]	0.56	<0.50	0.95	1.2	<0.05	<0.50	--	<1.0
	09/01/92[10,11]	<0.50	<0.50	<0.50	<1.0	<0.05	0.46	--	<2.0
	12/03/92	--	--	--	--	--	--	--	--
	03/19/93	<0.50	<0.50	<0.50	<0.50	<0.05	0.39	1.7	--
	06/16/93	<0.50	<0.50	<0.50	<0.50	<0.10	0.31	1.1	--
930616-D[6]	06/16/93	<0.50	<0.50	<0.50	<0.50	<0.10	--	--	--
	09/22/93[6]	<0.50	<0.50	<0.50	<0.50	--	<0.25	<0.75	--
	01/12/94	--	--	--	--	--	<0.25	<0.75	--
	03/30/94	2,200	42	660	37	1.9	<0.25	<0.75	--
	04/13/94	1,700	0.90	610	40	1.6	<0.25	<0.75	<3.0[5]
	06/22/94	**350**	**<0.50**	**3.6**	**7.2**	**<0.10**	**<0.25**	**<0.75**	--
	09/30/94	**52**	**<0.50**	**<0.50**	**4.9**	**<0.05**	**<0.25**	**<0.75**	--
MW-10	03/23/92	55	<0.50	<0.50	10	<0.1	<0.50	--	--
Dup[6]	04/20/92	--	--	--	--	--	--	--	<2.0
	06/09/92	1.3	<0.50	<0.50	<0.50	0.073	<0.50	--	--
	06/09/92	--	--	--	--	--	<0.50	--	--
	09/01/92	4.9	<0.50	<0.50	<1.0	<0.05	<0.25	--	<2.0
	12/03/92	<0.50	<0.50	<0.50	<0.50	<0.05	0.17	<0.38	10.5
	03/19/93	<0.50	<0.50	<0.50	<0.50	<0.05	0.13	<0.38	--
	06/16/93	<0.50	<0.50	<0.50	<0.50	<0.1	0.29	0.90	<3.0
	09/22/93	--	--	--	--	--	<0.25	<0.75	--
	01/12/94	--	--	--	--	--	<0.25	<0.75	<3.0
	03/30/94	<0.50	<0.50	<0.50	<0.50	<0.10	<0.25	<0.75	--
	04/13/94	17	<0.50	1.7	<0.50	<0.10	<0.25	<0.75	--
	06/21/94	**10**	**<0.50**	**0.60**	**<0.50**	**<0.10**	**<0.25**	**<0.75**	--
	09/30/94	**88**	**<0.5**	**<0.5**	**<1.0**	**<0.05**	**<0.25**	**<0.75**	--
MTCA Method A Cleanup Levels		5.0	30.0	40.0	20.0		1.0[7]		5

Notes appear on page 4 of 4.

TABLE 2 (Page 3 of 4)

Monitoring Well	Date Sampled	BETX[1] (µg/l)				Gasoline-range Hydrocarbons[2] (mg/l)	Diesel-range Hydrocarbons[3] (mg/l)	Heavy Oil-range Hydrocarbons[3] (mg/l)	Dissolved Lead[4] (µg/l)
		B	E	T	X				
MW-11	06/22/92	<0.50	<0.50	<0.50	<0.50	<0.05	--	--	<1.0
	09/01/92	<0.50	<0.50	<0.50	<1.0	<0.05	<0.25	--	<2.0
	12/03/92	<0.50	<0.50	<0.50	<0.50	<0.05	0.16	<0.38	--
	03/19/93	<0.50	<0.50	<0.50	<0.50	<0.05	0.17	<0.38	--
930319-D[6]	03/19/93	<0.50	<0.50	<0.50	<0.50	<0.05	--	--	--
	06/16/93	<0.50	<0.50	<0.50	<0.50	<0.10	<0.25	<0.75	--
	09/22/93	--	--	--	--	--	<0.25	<0.75	--
	01/12/94	--	--	--	--	--	<0.25	<0.75	--
	03/30/94	<0.50	<0.50	<0.50	<0.50	<0.10	<0.25	<0.75	--
	04/13/94	<0.50	<0.50	<0.50	<0.50	<0.10	<0.25	<0.75	<3.0[5]
	06/21/94	**<0.50**	**<0.50**	**<0.50**	**<0.50**	**<0.10**	**<0.25**	**<0.75**	--
	09/30/94	**<0.5**	**<0.5**	**<0.5**	**<1.0**	**<0.05**	**<0.25**	**<0.75**	--
MTCA Method A Cleanup Levels		5.0	30	40	20		1.0[7]		5

Notes appear on page 4 of 4.

TABLE 2 (Page 4 of 4)

Notes:

[1]B = benzene, E = ethylbenzene, T = toluene, X = total xylenes. BETX analyzed by EPA Method 8020.

[2]Analyzed by Ecology Method WTPH-G.

[3]Analyzed by Ecology Method WTPH-D extended, except where footnoted.

[4]Dissolved lead analysis conducted on field-filtered ground water samples. Lead analyzed by EPA Method 7421.

[5]Sample also analyzed for total lead by EPA Method 7421. Total lead was detected at the following concentrations: 4.9 µg/l (MW-5), 5.9 µg/l (MW-9 and MW-10), and 6.9 µg/l (MW-11).

[6]Sample was obtained as a blind field duplicate.

[7]The MTCA Method A ground water cleanup level for the total of gasoline-, diesel- and heavy oil-range hydrocarbons is 1 mg/l if carbon ranges are distinctly quantified using gas chromatography methods.

[8]Chemical analysis by EPA Method 418.1.

[9]Additional samples were obtained from MW-9 on 06/09/92 and 07/15/92 and submitted to North Creek Analytical for analysis of heavy oil-range hydrocarbons by Ecology Method WTPH-418.1. Heavy oil-range hydrocarbons were detected in the 06/09/92 sample at a concentration of 8.2 mg/l, but were not detected in the 07/15/92 sample. Additional samples were obtained from MW-9 on 06/12/92 and 07/15/92 and submitted to NATEX/PNELI for analysis of heavy oil-range hydrocarbons by Ecology Method WTPH-418.1. Heavy oil-range hydrocarbons were not detected in the 06/12/92 sample, but were detected at a concentration of 1.3 mg/l in the 07/15/92 sample.

[10]Sample also analyzed for selected metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) by EPA 6000 and 7000 series methodology, flash point by ASTM Method D-93, and VOCs (volatile organic compounds) by EPA Methods 8010 and 8020. Barium was detected at a concentration of 0.33 mg/l. Other analytes were not detected. Flash point was greater than 210 degrees Fahrenheit.

[11]Sample analyzed by North Creek Analytical for heavy oil-range hydrocarbons by Ecology Method WTPH-418.1. The analyte was not detected.

ppm = parts per million

µg/l = micrograms per liter

mg/l = milligrams per liter

"--" = not tested

Shading indicates that analyte was detected at concentration greater than the MTCA Method A ground water cleanup level.

Bolding indicates that sample was analyzed during current reporting period.

Document ID: 161183H2.WK1

ORMBREK STREET

Property Line

N

0 20 40

SCALE IN FEET

Convenience Store

Service Station Building

Undocumented Pre-Unocal UST

MW-2 (Destroyed)

Waste Oil UST

Heating Oil UST

Gasoline USTs

Gasoline USTs

MW-1 (Destroyed)

MW-9

MW-8 (Abandoned)

Service Islands

Service Islands

MW-4 (Destroyed)

MW-7 (Abandoned)

MW-10

MW-3 (Abandoned)

MW-11

BOTHELL WAY

Planter

MW-5

MW-6 (Destroyed)

N.E. 180TH STREET

EXPLANATION:

MW-5 ● MONITORING WELL

——— - - - - ——— FACILITIES REMOVED IN 1991 AND 1992

UST UNDERGROUND STORAGE TANK

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

2. Existing facilities are operated by parties other than Unocal.

Reference: Drawing entitled "General Arrangement, Service Station 5905, N.E. 180th Street and Bothell Way, Bothell, Washington," by Unocal, dated 07/24/86 and untitled, undated, drawing by Roger Ollenburg, Architect.

Geo Engineers

SITE PLAN

FIGURE 1

LJB:ANG:KKT 183B001.DWG 0161183B62-101293

ORMBREK STREET

Property Line

N

0 20 40

SCALE IN FEET

EXPLANATION:

MW-5 / 4.12 ● MONITORING WELL
GROUND WATER ELEVATION (FEET) ON 09/30/94

1.0 —— GROUND WATER ELEVATION CONTOUR (FEET) BASED ON 09/30/94 DATA

GENERAL DIRECTION OF GROUND WATER FLOW ON 09/30/94

TBM + TEMPORARY BENCHMARK: UNOCAL EMBEDDED NAIL IN SIDEWALK AT SOUTHEAST CORNER OF PROPERTY; ELEVATION OF 10.41 FEET

MW-2 (Destroyed)

MW-8 (Abandoned)

MW-10 1.75

MW-3 (Abandoned)

MW-11 0.71

MW-4 (Destroyed)

MW-7 (Abandoned)

MW-9 3.15

MW-1 (Destroyed)

MW-5 3.41

MW-6 (Destroyed)

BOTHELL WAY

N.E. 180TH STREET

TBM

2.0 1.5 1.0 2.5 4.0

Notes:
1. The locations of all features shown are approximate.
2. See Figure 1 for current and former site facilities identification.
3. Existing facilities are operated by parties other than Unocal.

Reference: Drawing entitled "General Arrangement, Service Station 5905, N.E. 180th Street and Bothell Way, Bothell, Washington," by Unocal, dated 07/24/86 and untitled, undated, drawing by Roger Ollenburg, Architect.

Geo Engineers

GROUND WATER ELEVATION CONTOURS 09/30/94

FIGURE 2

LJB:ANC:BDH 183b001.DWG 0161183R62:040794

ORMBREK STREET

Property Line

N

0 20 40

SCALE IN FEET

MW-8	B	G	D	O
06/09/92	0.56	<0.05	<0.5	NOTE (3)
09/01/92	<0.5	<0.05	0.46	NOTE (3)
12/03/92	--	--	--	--
03/19/93	<0.5	<0.05	0.39	1.7
06/16/93	<0.5	<0.1	0.31	1.1
09/22/93	--	--	<0.25	<0.75
01/12/94	--	--	<0.25	<0.75
03/30/94	2,200	1.9	<0.25	<0.75
04/13/94	1,700	1.6	<0.25	<0.75
06/22/94	350	<0.1	<0.25	<0.75
09/30/94	52	<0.05	<0.25	<0.75
MTCA	5.0	1.0		

MW-10	B	G	D	O
06/09/92	1.3	0.073	<0.5	--
09/01/92	4.9	<0.05	<0.25	--
12/03/92	<0.5	<0.05	0.17	<0.38
03/19/93	<0.5	<0.05	0.13	<0.38
06/16/93	<0.5	<0.1	0.29	0.90
09/22/93	--	--	<0.25	<0.75
01/12/94	--	--	<0.25	<0.75
03/30/94	<0.5	<0.1	<0.25	<0.75
04/13/94	17	<0.1	<0.25	<0.75
06/21/94	10	<0.1	<0.25	<0.75
09/30/94	88	<0.05	<0.25	<0.75
MTCA	5.0	1.0		

MW-11	B	G	D	O
06/22/92	<0.5	<0.05	--	--
09/01/92	<0.5	<0.05	<0.25	--
12/03/92	<0.5	<0.05	0.16	<0.38
03/19/93	<0.5	<0.05	0.17	<0.38
06/16/93	<0.5	<0.1	<0.25	<0.75
09/22/93	--	--	<0.25	<0.75
01/12/94	--	--	<0.25	<0.75
03/30/94	<0.5	<0.1	<0.25	<0.75
04/13/94	<0.5	<0.1	<0.25	<0.75
06/21/94	<0.5	<0.1	<0.25	<0.75
09/30/94	<0.5	<0.05	<0.25	<0.75
MTCA	5.0	1.0		

MW-8 (Abandoned)

MW-3 (Abandoned)

MW-2 (Destroyed)

MW-4 (Destroyed)

MW-7 (Abandoned)

BOTHELL WAY

MW-5	B	G	D	O
06/09/92	<0.5	0.24	<0.5	--
09/01/92	<0.5	0.12	<0.25	--
12/03/92	<0.5	<0.05	0.3	<0.38
03/19/93	<0.5	<0.05	0.28	1.5
06/16/93	<0.5	<0.1	<0.25	<0.75
09/22/93	--	--	<0.25	<0.75
01/12/94	--	--	<0.25	<0.75
03/30/94	23	0.14	<0.25	<0.75
04/13/94	220	0.29	<0.25	<0.75
06/21/94	26	<0.1	<0.25	<0.75
09/30/94	29	0.17	<0.25	<0.75
MTCA	5.0	1.0		

MW-1 (Destroyed)

MW-6 (Destroyed)

N.E. 180TH STREET

EXPLANATION:

MW-5 ● MONITORING WELL

B BENZENE (μg/l)

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

-- NOT TESTED

MTCA MODEL TOXICS CONTROL ACT METHOD A GROUND WATER CLEANUP LEVELS

Notes:
1. The locations of all features shown are approximate.
2. See Figure 1 for current and former site facilities identification.
3. Sample was analyzed for TPH (total petroleum hydrocarbons) by Ecology Method WTPH-418.1. TPH was detected at a concentration of 8.5 mg/l on 06/09/92, but not detected (<0.5 mg/l) on 09/01/92. See Table 2 for a summary of chemical analytical data.
4. Existing facilities are operated by parties other than Unocal.

Reference: Drawing entitled "General Arrangement, Service Station 5905, N.E. 180th Street and Bothell Way, Bothell, Washington," by Unocal, dated 07/24/86 and untitled, undated, drawing by Roger Ollenburg, Architect.

GeoEngineers

SUMMARY OF GROUND WATER ANALYTICAL DATA

FIGURE 3

LJB:ANC:BDH 183B002.DWG 0161183R62:042194

ATTACHMENT A

ATTACHMENT A

FIELD METHODS

GROUND WATER ELEVATIONS

The depths to the shallow ground water surface relative to the monitoring well casing rims were measured on June 21 and September 30, 1994 using an electric water level indicator. The indicator was cleaned with an Alconox wash solution and a distilled water rinse prior to its use in each well. Ground water elevations were calculated by subtracting the depths to water from the casing rim elevations. The ground water elevations measured on June 21 and September 30 are summarized in Table 1. The ground water elevations measured in September are shown in Figure 2.

COMBUSTIBLE VAPOR CONCENTRATIONS

Combustible vapor concentrations were measured in monitoring wells MW-5, MW-10 and MW-11 on June 21, 1994, and in MW-5 and MW-9 through MW-11 on September 30, 1994 using a Bacharach TLV Sniffer calibrated to hexane. The measurements in MW-5, MW-9 and MW-11 were obtained from each well casing using a 2-inch-diameter slip cap connected to the TLV Sniffer. A 4-inch-diameter slip cap was connected to the TLV Sniffer when measuring MW-10. The lower threshold of significance for the TLV Sniffer in this application is 400 ppm (parts per million), or 3.6 percent of the lower explosive limit of hexane. The combustible vapor concentrations measured on June 21 and September 30 are presented in Table 1.

GROUND WATER SAMPLING PROGRAM

Ground water samples were obtained by GeoEngineers from MW-5 and MW-9 through MW-11 on June 21 and September 30, 1994. The water samples were obtained with disposable polyethylene bailers after at least three well volumes of water were removed from each well casing. A new bailer and cord were used to sample each monitoring well. The water samples were transferred to laboratory-prepared bottles in the field and were kept cold during transport to the analytical laboratory. Chain-of-custody procedures were followed during transport of the samples to the analytical laboratory.

PURGE WATER DISPOSAL

Purge and decontamination water generated during the June and September 1994 sampling events was collected temporarily in a 55-gallon drum. A drum sample was obtained with a disposable bailer and analyzed for BETX, and fats, oil and grease on June 21, 1994. Based on chemical analytical results of a sample obtained from purge and decontamination water during June 1994, the BETX, and fats, oil and grease concentrations of the purge water were in compliance with GeoEngineers' Metro disposal permit criteria. The water, approximately 25 gallons, was transported to GeoEngineers' Redmond facility for disposal in the sanitary sewer under Metro Discharge Authorization Number 393 on September 30, 1994.

ATTACHMENT B

ATTACHMENT B

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 QA/QC (quality assurance/quality control) records are included in this attachment. The analytical results are also summarized in the text and tables 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 laboratory QA/QC and data quality exceptions documented by the laboratory were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "Guidance Document for the Assessment of RCRA Environmental Data Quality" draft dated 1988; "National Functional Guidelines for Organic Data Review" draft dated 1991; and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses" dated 1988.

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.

AnalyticalTechnologies,Inc. 560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335
Karen L. Mixon, Laboratory Manager

ATI I.D. # 9406-282

July 7, 1994

GeoEngineers
JUL 08 1994
Routing
File

GeoEngineers, Inc.
8410 154th Avenue N.E.
Redmond WA 98052

Attention : Lisa Bona

Project Number : 0161-183-R04

Project Name : Unocal #5905 - Bothell

Dear Mr. Bona:

On June 23, 1994, Analytical Technologies, Inc. (ATI), received five samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Please note that this report has a summary report for BETX, total petroleum hydrocarbons-gasoline and total petroleum hydrocarbons-diesel analyses. If you have any questions, please call.

Sincerely,

Elaine M. Walker

Elaine M. Walker
Project Manager

EMW/hal/mrj

Enclosure

Corporate Offices: 5550 Morehouse Drive San Diego, CA 92121 (619) 458-9141

Analytical**Technologies,**Inc.

ATI I.D. # 9406-282

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-183-R04
PROJECT NAME : UNOCAL #5905 - BOTHELL

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9406-282-1	MW-5	06/21/94	WATER
9406-282-2	MW-9	06/22/94	WATER
9406-282-3	MW-10	06/21/94	WATER
9406-282-4	MW-11	06/21/94	WATER
9406-282-5	DRUM-6-23-94	06/23/94	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	5

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

ATI I.D. # 9406-282

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-183-R04
PROJECT NAME : UNOCAL #5905 - BOTHELL

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020	R
TOTAL PETROLEUM HYDROCARBONS	GC/FID	WA DOE WTPH-G	R
TOTAL PETROLEUM HYDROCARBONS	GC/FID	WA DOE WTPH-D	R
OIL & GREASE	IR	EPA 413.2	R

R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PTL = ATI - Portland
ANC = ATI - Anchorage
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical Technologies, Inc.

ATI I.D. # 9406-282

CASE NARRATIVE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-183-R04
PROJECT NAME : UNOCAL #5905 - BOTHELL

CASE NARRATIVE: BETX - GASOLINE ANALYSIS

Five (5) water samples were received by ATI on June 23, 1994, and were analyzed for BETX by EPA method 8020 and gasoline range hydrocarbons by WA DOE WTPH-G according to Washington methodology.

Sample 9406-282-5 (DRUM-6-23-94) was run at a five fold dilution due to matrix interference. The sample foamed when analyzed undiluted.

Analytical Technologies, Inc.

ATI I.D. # 9406-282

CASE NARRATIVE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-183-R04
PROJECT NAME : UNOCAL #5905 - BOTHELL

CASE NARRATIVE: TOTAL PETROLEUM HYDROCARBONS ANALYSIS - WA DOE WTPH-D

Four (4) water samples were received by ATI on June 23, 1994, for WA DOE WTPH-D extended analysis. These samples were analyzed in accordance with Washington state methodology.

The relative percent difference (RPD) between sample 9406-270-2 and its duplicate was out of acceptance criteria due to matrix interference.

Analytical Technologies, Inc.

ATI I.D. # 9406-282

CASE NARRATIVE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-183-R04
PROJECT NAME : UNOCAL #5905 - BOTHELL

CASE NARRATIVE: OIL & GREASE ANALYSIS

One (1) water sample was received by ATI on June 23, 1994, for 413.2 analysis. This sample was extracted and analyzed in accordance with EPA methodology.

The blank spike (BS) associated with this sample set was within the established control limits. The relative percent difference (RPD) between the quality control sample and its duplicate was out of the established control limits. There was an insufficient sample volume for reanalysis.

Analytical Technologies, Inc.

ATI I.D. # 9406-282

OIL & GREASE
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE EXTRACTED	: 06/27/94
PROJECT #	: 0161-183-R04	DATE ANALYZED	: 06/27/94
PROJECT NAME	: UNOCAL #5905 - BOTHELL	UNITS	: mg/L
EPA METHOD	: 413.2	SAMPLE MATRIX	: WATER

ATI I.D. #	CLIENT I.D.	OIL & GREASE
9406-282-5	DRUM-6-23-94	1.2
METHOD BLANK	-	<1

AnalyticalTechnologies,Inc.

ATI I.D. # 9406-282

OIL & GREASE
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-183-R04
PROJECT NAME : UNOCAL #5905 - BOTHELL
EPA METHOD : 413.2
SAMPLE MATRIX : WATER

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 06/27/94
DATE ANALYZED : 06/27/94
UNITS : mg/L

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
OIL & GREASE	<1.00	N/A	N/A	10	10.3	103	10.1	101	2

	CONTROL LIMITS	% REC.	RPD
OIL & GREASE		52 - 106	20

Analytical Technologies, Inc.

ATI I.D. # 9406-282

OIL & GREASE
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: 9406-282-5
PROJECT #	: 0161-183-R04	DATE EXTRACTED	: 06/27/94
PROJECT NAME	: UNOCAL #5905 - BOTHELL	DATE ANALYZED	: 06/27/94
EPA METHOD	: 413.2	UNITS	: mg/L
SAMPLE MATRIX	: WATER		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
OIL & GREASE	1.15	2.50	74H	N/A	N/A	N/A	N/A	N/A	N/A

	CONTROL LIMITS	% REC.	RPD
OIL & GREASE		49 - 103	20

H = Out of limits.

Analytical**Technologies,**Inc. ATI Reference: 9406-282

Analytical Summary Report

Client: GeoEngineers, Inc.

Project: Unocal #5905 - Bothell (0161-183-R04)

Analysis: WA DOE WTPH-G/8020(BETX) **Matrix: WATER** **Units: ug/L**

ATI Sample #:	0	0	0	1	2	3
Client ID:	Method Blank	Method Blank	Method Blank	MW-5	MW-9	MW-10
Date Sampled:	N/A	N/A	N/A	06/21/94	06/22/94	06/21/94
Date Extracted:	N/A	N/A	N/A	N/A	N/A	N/A
Date Analyzed:	06/24/94	06/27/94	06/28/94	06/25/94	06/25/94	06/28/94
Benzene	<0.5	<0.5	<0.5	26	350 D5	10
Ethylbenzene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	<0.5	<0.5	<0.5	0.6	3.6	0.6
Total Xylenes	<0.5	<0.5	<0.5	<0.5	7.2	<0.5
Gasoline (Toluene to Dodecane)	<100	<100	<100	<100	<100	<100
Surrogate Recoveries (%)						
Bromofluorobenzene	102	102	98	99	98	99
Trifluorotoluene	104	103	101	102	97	99

ATI Sample #:	4	5	
Client ID:	MW-11	DRUM-6-23-94	
Date Sampled:	06/21/94	06/23/94	
Date Extracted:	N/A	N/A	
Date Analyzed:	06/27/94	06/28/94	
Benzene	<0.5	3.3	D3
Ethylbenzene	<0.5	<2.5	D3
Toluene	<0.5	<2.5	D3
Total Xylenes	<0.5	<2.5	D3
Gasoline (Toluene to Dodecane)	<100	-	
Surrogate Recoveries (%)			
Bromofluorobenzene	100	98	D3
Trifluorotoluene	98	-	

Surrogate Limits: (BFB:76-120 TFT:50-150)

D3 Value from a five fold diluted analysis.

D5 Value from a twenty fold diluted analysis.

AnalyticalTechnologies,Inc. ATI Reference: 9406-282

Quality Control Summary Report

Client: GeoEngineers, Inc. **Project: Unocal #5905 - Bothell (0161-183-R04)**

Analysis: WA DOE WTPH-G/8020(BETX) **Matrix: WATER** **Units: ug/L** **Blank Spike/Blank Spike Duplicate**

Extracted: N/A **Analyzed: 06/24/94** **Sample ID: Blank**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	Spike Dup. RPD	Limits %Rec	Limits RPD
BENZENE	<0.500	N/A	N/A	20.0	19.9	100	N/A	N/A	N/A	89-110	10
TOLUENE	<0.500	N/A	N/A	20.0	19.9	100	N/A	N/A	N/A	89-113	10
TOTAL XYLENES	<0.500	N/A	N/A	40.0	39.2	98	N/A	N/A	N/A	89-111	10
GASOLINE	<100	N/A	N/A	1000	982	98	N/A	N/A	N/A	78-116	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
BROMOFLUOROBENZENE	102	101	N/A	76-120
TRIFLUOROTOLUENE	104	104	N/A	50-150

Analysis: WA DOE WTPH-G/8020(BETX) **Matrix: WATER** **Units: ug/L** **Blank Spike/Blank Spike Duplicate**

Extracted: N/A **Analyzed: 06/27/94** **Sample ID: Blank**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	Spike Dup. RPD	Limits %Rec	Limits RPD
BENZENE	<0.500	N/A	N/A	20.0	19.8	99	N/A	N/A	N/A	89-110	10
TOLUENE	<0.500	N/A	N/A	20.0	20.3	102	N/A	N/A	N/A	89-113	10
TOTAL XYLENES	<0.500	N/A	N/A	40.0	39.1	98	N/A	N/A	N/A	89-111	10
GASOLINE	<100	N/A	N/A	1000	929	93	N/A	N/A	N/A	78-116	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
BROMOFLUOROBENZENE	102	100	N/A	76-120
TRIFLUOROTOLUENE	103	104	N/A	50-150

Analytical Technologies, Inc. ATI Reference: 9406-282

Quality Control Summary Report

Client: GeoEngineers, Inc.

Project: Unocal #5905 - Bothell (0161-183-R04)

Analysis: WA DOE WTPH-G/8020(BETX) **Matrix: WATER** **Units: ug/L** **Blank Spike/Blank Spike Duplicate**

Extracted: N/A **Analyzed: 06/28/94** **Sample ID: Blank**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	Spike Dup. RPD	Limits %Rec	Limits RPD
BENZENE	<0.500	N/A	N/A	20.0	19.9	100	N/A	N/A	N/A	89-110	10
TOLUENE	<0.500	N/A	N/A	20.0	19.8	99	N/A	N/A	N/A	89-113	10
TOTAL XYLENES	<0.500	N/A	N/A	40.0	39.1	98	N/A	N/A	N/A	89-111	10
GASOLINE	<100	N/A	N/A	1000	946	95	N/A	N/A	N/A	78-116	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
BROMOFLUOROBENZENE	98	98	N/A	76-120
TRIFLUOROTOLUENE	101	102	N/A	50-150

Analysis: WA DOE WTPH-G/8020(BETX) **Matrix: WATER** **Units: ug/L** **Matrix Spike/Matrix Spike Duplicate**

Extracted: N/A **Analyzed: 06/28/94** **Sample ID: 9406-297-2**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	Spike Dup. RPD	Limits %Rec	Limits RPD
GASOLINE	<100	<100	NC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Sample Dup.	Spike Dup.	Limits
TRIFLUOROTOLUENE	97	98	N/A	50-150

Analysis: WA DOE WTPH-G/8020(BETX) **Matrix: WATER** **Units: ug/L** **Matrix Spike/Matrix Spike Duplicate**

Extracted: N/A **Analyzed: 06/24/94** **Sample ID: 9406-274-1**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	Spike Dup. RPD	Limits %Rec	Limits RPD
BENZENE	<0.500	N/A	N/A	20.0	19.8	99	20.1	101	2	86-113	10
TOLUENE	<0.500	N/A	N/A	20.0	20.1	101	19.9	100	1	87-114	10
TOTAL XYLENES	<0.500	N/A	N/A	40.0	39.1	98	38.9	97	1	85-113	10
GASOLINE	<100	<100	NC	1000	965	97	970	97	1	80-113	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
BROMOFLUOROBENZENE	100	101	100	76-120
TRIFLUOROTOLUENE	100	103	103	50-150

Analytical Summary Report

Client: GeoEngineers, Inc.

Project: Unocal #5905 - Bothell (0161-183-R04)

Analysis: WA DOE WTPH-D **Matrix: WATER** **Units: mg/L**

ATI Sample #:	0	1	2	3	4
Client ID:	Method Blank	MW-5	MW-9	MW-10	MW-11
Date Sampled:	N/A	06/21/94	06/22/94	06/21/94	06/21/94
Date Extracted:	06/24/94	06/24/94	06/24/94	06/24/94	06/24/94
Date Analyzed:	06/25/94	06/26/94	06/26/94	06/26/94	06/26/94
Diesel (C12-C24)	<0.25	<0.25	<0.25	<0.25	<0.25
Motor Oil (C24-C34)	<0.75	<0.75	<0.75	<0.75	<0.75
Surrogate Recoveries (%)					
O-Terphenyl	99	107	94	96	108

Surrogate Limits: (O-T:50-150)

Quality Control Summary Report

Client: GeoEngineers, Inc.

Project: Unocal #5905 - Bothell (0161-183-R04)

Analysis: WA DOE WTPH-D **Matrix: WATER** **Units: mg/L** **Blank Spike/Blank Spike Duplicate**

Extracted: 06/24/94 **Analyzed: 06/25/94** **Sample ID: Blank**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	RPD	Limits %Rec	Limits RPD
DIESEL	<0.250	N/A	N/A	2.50	2.63	105	2.27	91	15	70-114	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
O-TERPHENYL	99	110	96	50-150

Analysis: WA DOE WTPH-D **Matrix: WATER** **Units: mg/L** **Matrix Spike/Matrix Spike Duplicate**

Extracted: 06/24/94 **Analyzed: 06/25/94** **Sample ID: 9406-270-1**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	RPD	Limits %Rec	Limits RPD
DIESEL	0.763	0.691	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Sample Dup.	Spike Dup.	Limits
O-TERPHENYL	98	94	N/A	50-150

Analysis: WA DOE WTPH-D **Matrix: WATER** **Units: mg/L** **Matrix Spike/Matrix Spike Duplicate**

Extracted: 06/24/94 **Analyzed: 06/25/94** **Sample ID: 9406-270-2**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	RPD	Limits %Rec	Limits RPD
DIESEL	5.87	7.49	24F	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Sample Dup.	Spike Dup.	Limits
O-TERPHENYL	85	109	N/A	50-150

F Out of limits due to matrix interference.

Quality Control Summary Report

Client: GeoEngineers, Inc.

Project: Unocal #5905 - Bothell (0161-183-R04)

Analysis: WA DOE WTPH-D **Matrix: WATER** **Units: mg/L** **Matrix Spike/Matrix Spike Duplicate**

Extracted: 06/24/94 **Analyzed: 06/25/94** **Sample ID: 9406-280-1**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	RPD	Limits %Rec	Limits RPD
DIESEL	7.31	N/A	N/A	2.38	10.2	121	N/A	N/A	N/A	56-135	20

Quality Control Surrogate Recoveries (%)

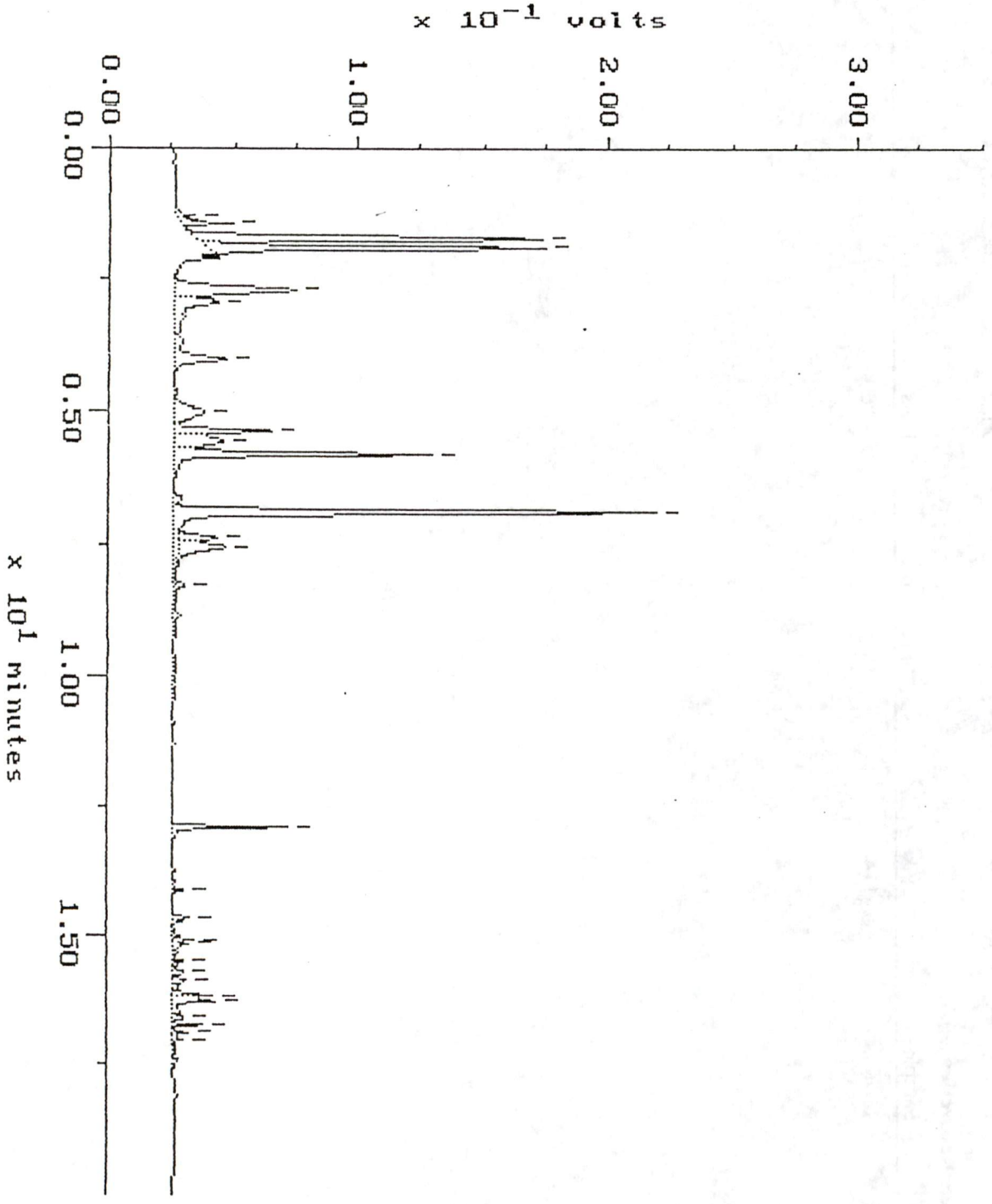
Compound	Sample	Spike	Spike Dup.	Limits
O-TERPHENYL	119	114	N/A	50-150

8

R - 16

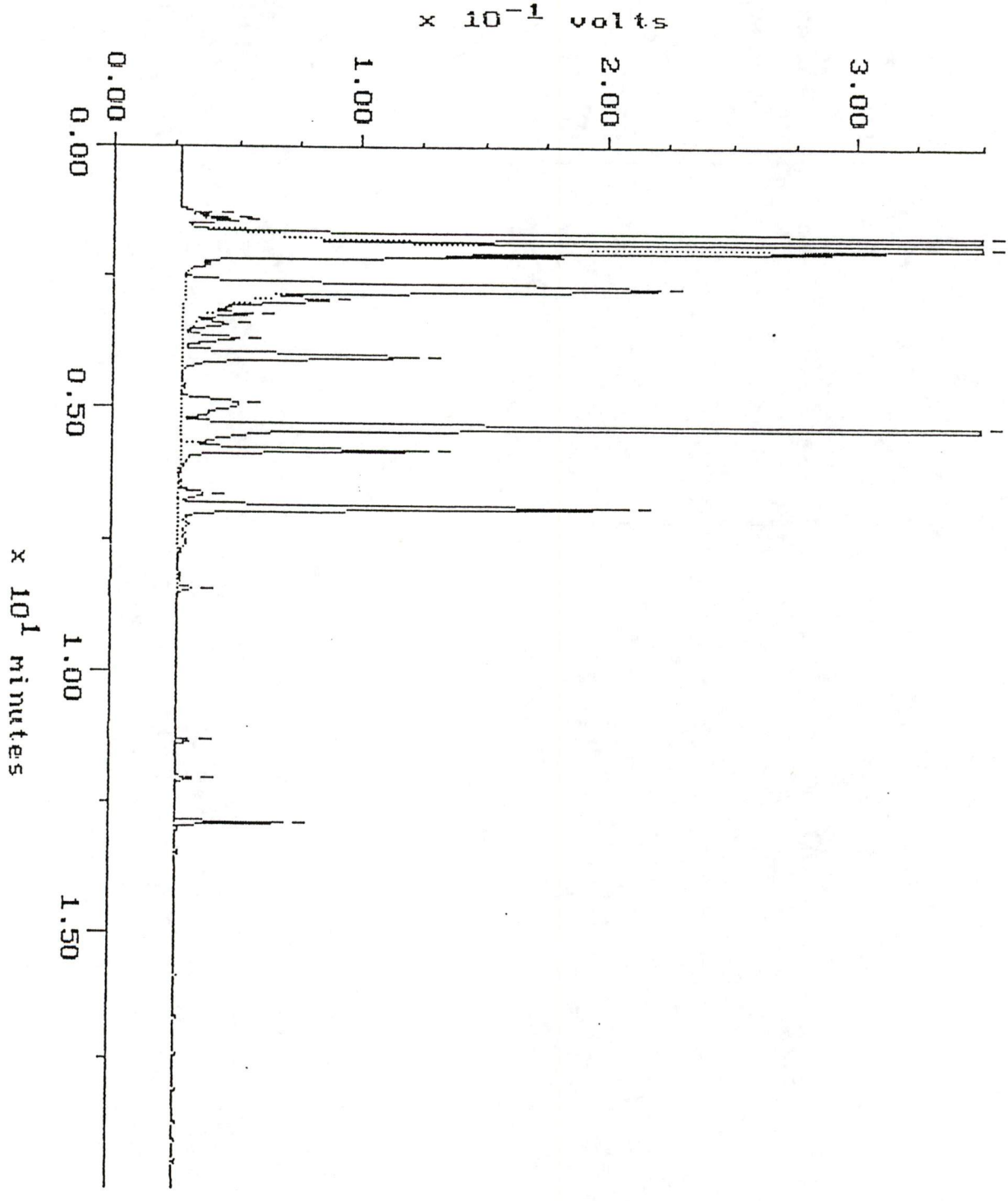
WA DOE WTPH-G

Sample: 9406-282-1 Channel: FID Filename: R6249P34
Acquired: 25-JUN-94 4:56 Method: F:\BRO2\MAXDATA\PICARD\062494PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



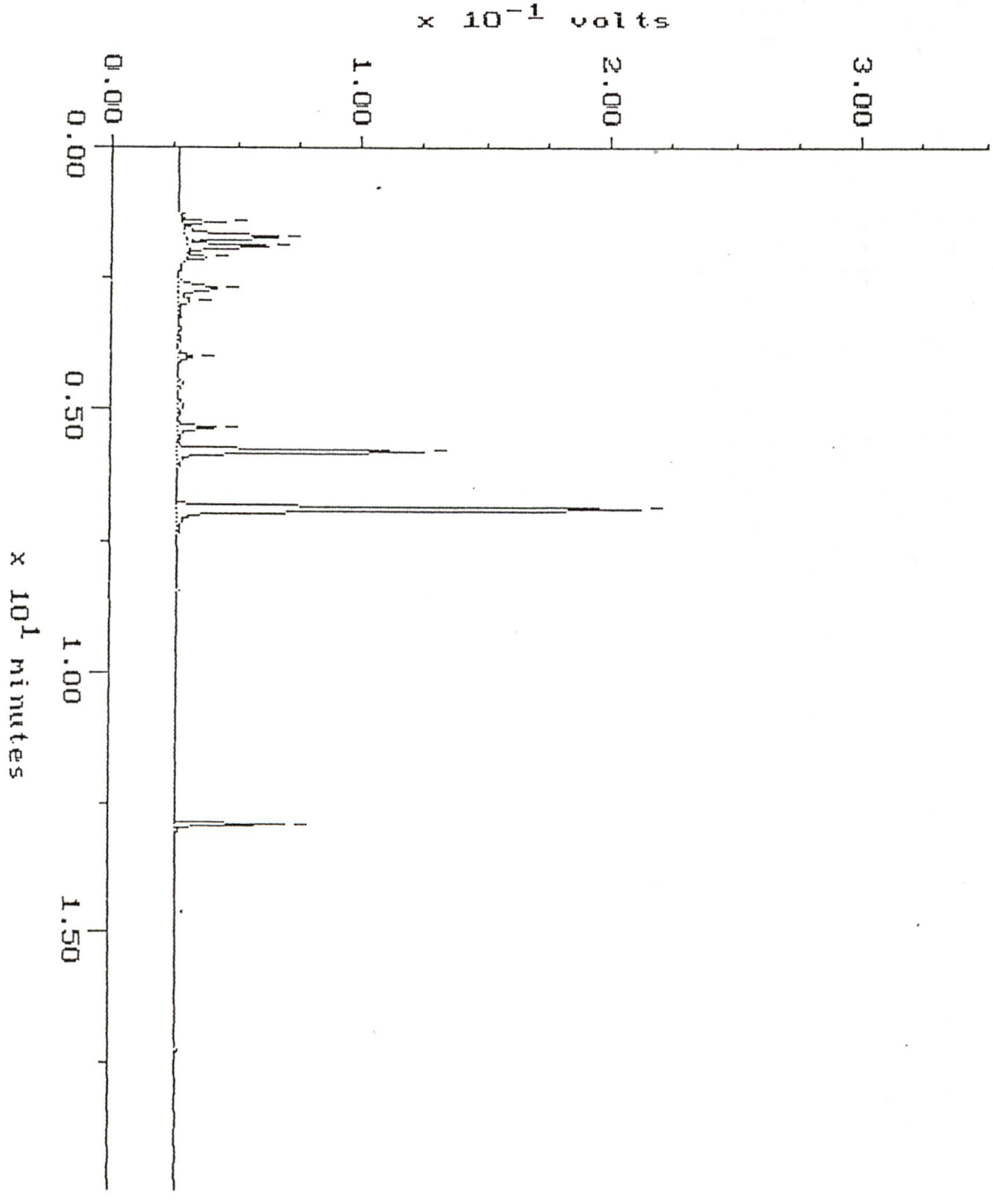
WA DOE WTPH-G

Sample: 9406-282-2 Channel: FID Filename: R6249P35
Acquired: 25-JUN-94 5:26 Method: F:\BRO2\MAXDATA\PICARD\062494PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



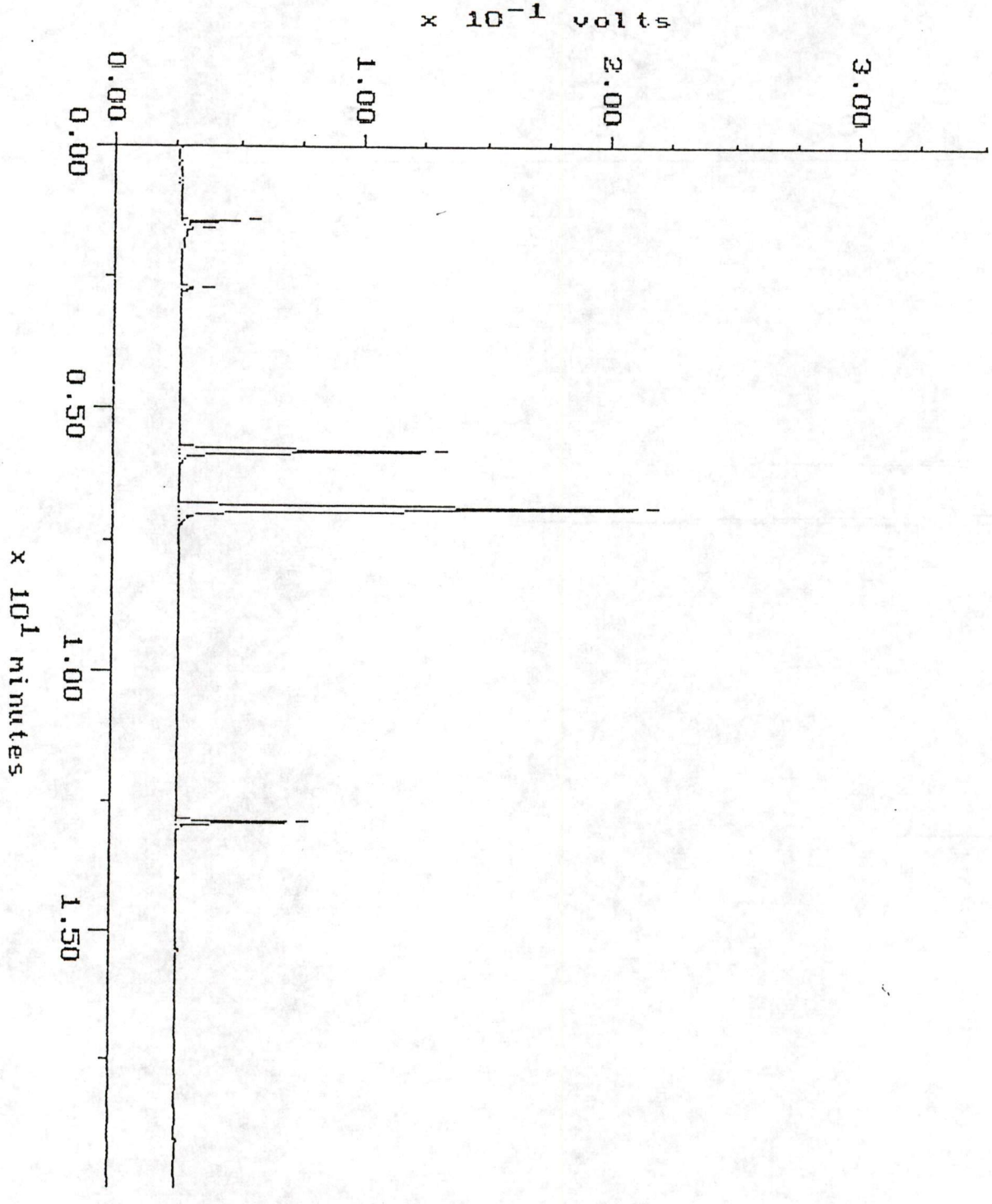
WA DOE WTPH-G

Sample: 9406-282-3 Channel: FID Filename: R6289P06
Acquired: 28-JUN-94 13:44 Method: F:\BRO2\MAXDATA\PICARD\062894PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



WA DOE WTPH-G

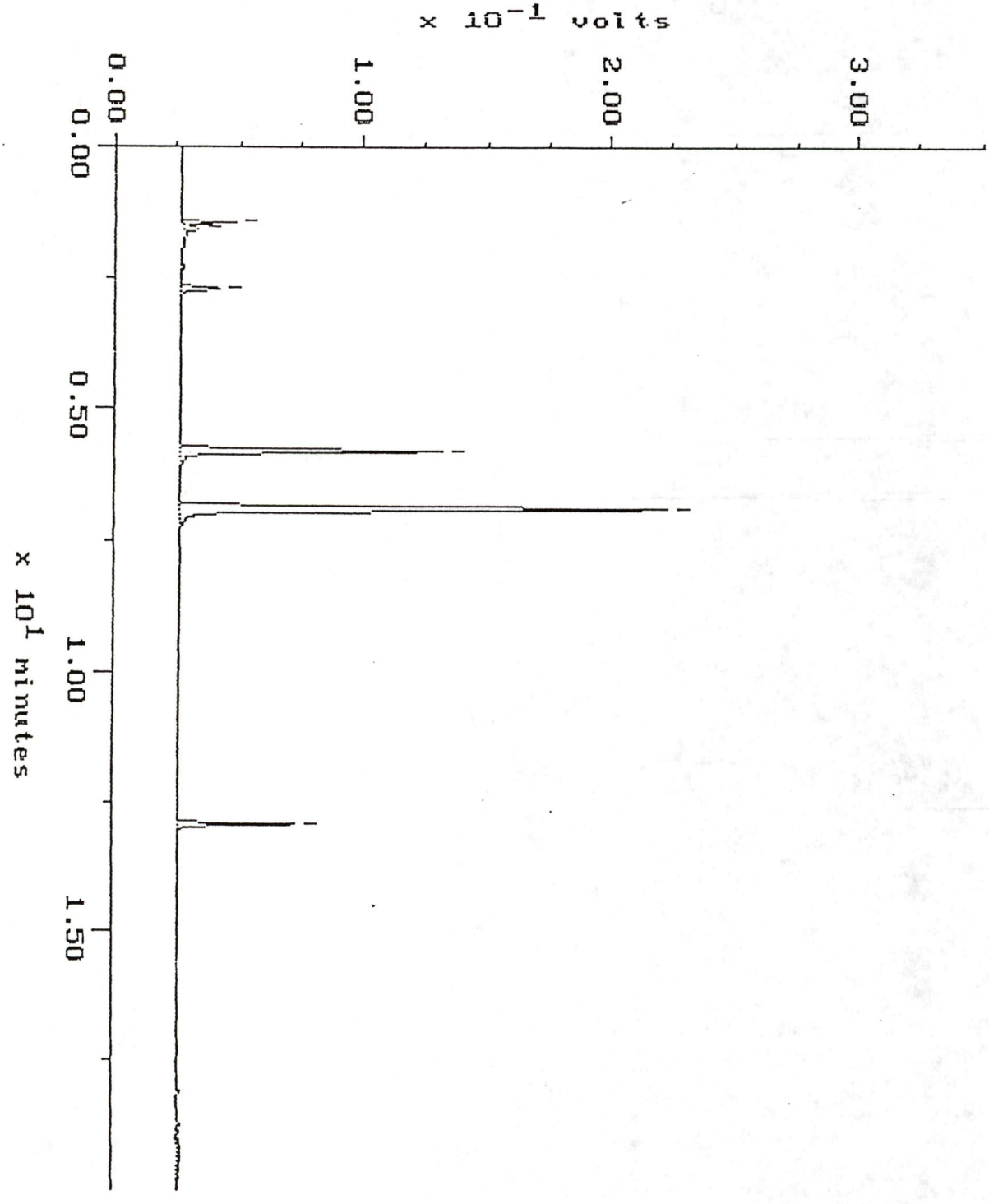
Sample: 9406-282-4 Channel: FID Filename: R6279P22
Acquired: 27-JUN-94 19:13 Method: F:\BRO2\MAXDATA\PICARD\062794PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



WA DOE WTPH-G

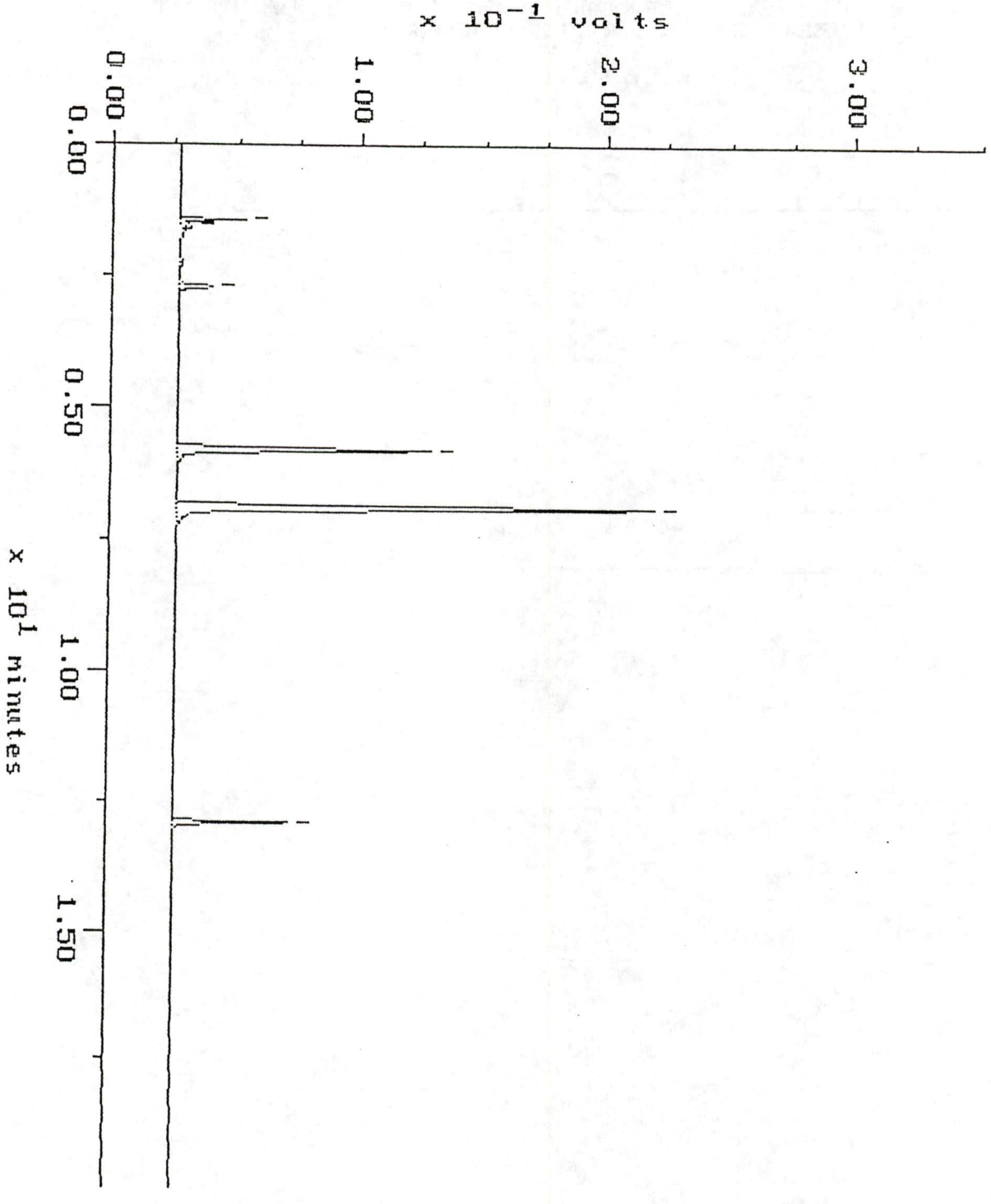
Blank

Sample: WRB 6-24 Channel: FID Filename: R6249F01
Acquired: 24-JUN-94 9:52 Method: F:\BRO2\MAXDATA\PICARD\062494PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



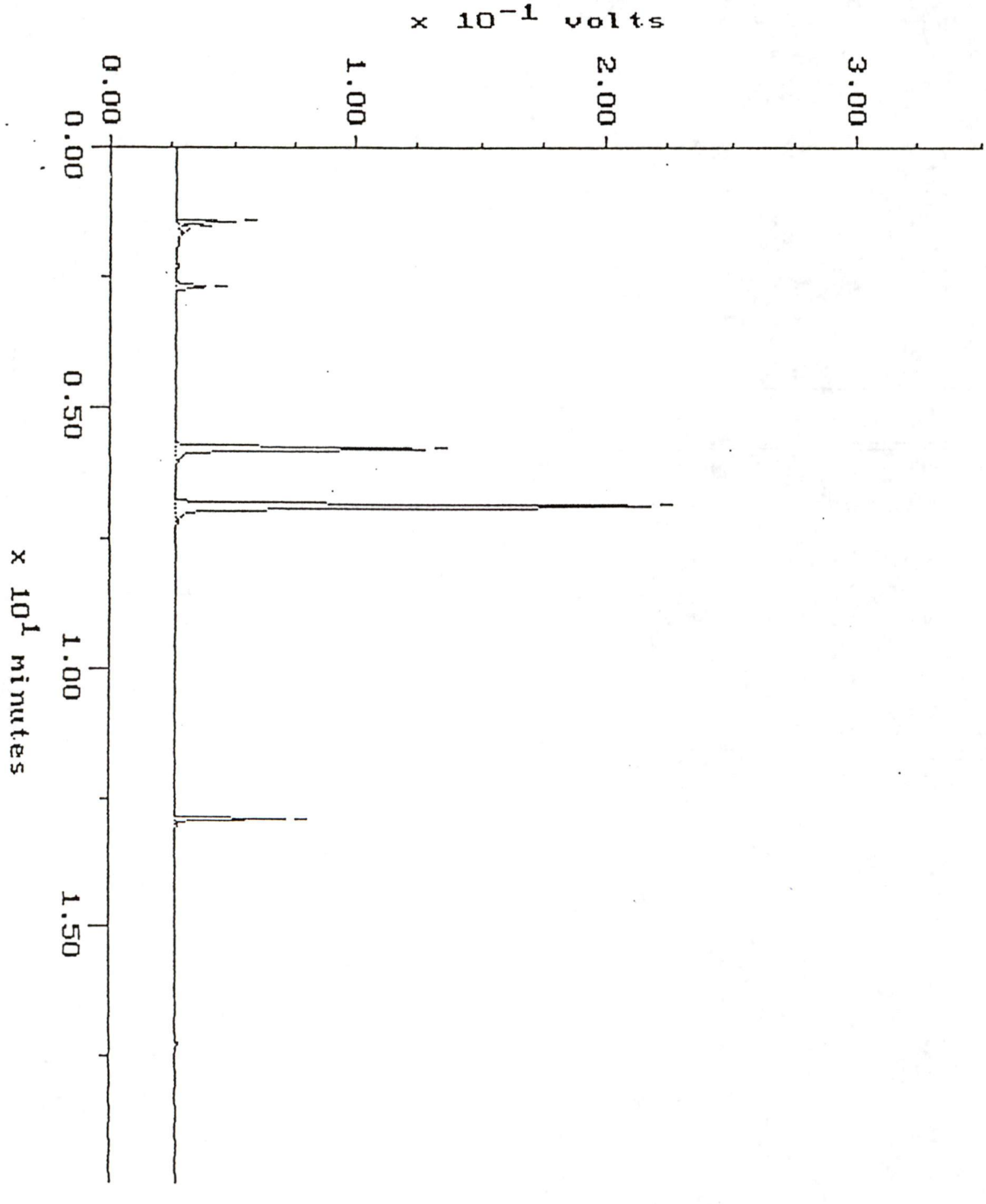
WA DOE WTPH-G Blank

Sample: WRB 6-27 Channel: FID Filename: R6279P03
Acquired: 27-JUN-94 9:12 Method: F:\BRO2\MAXDATA\PICARD\062794PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



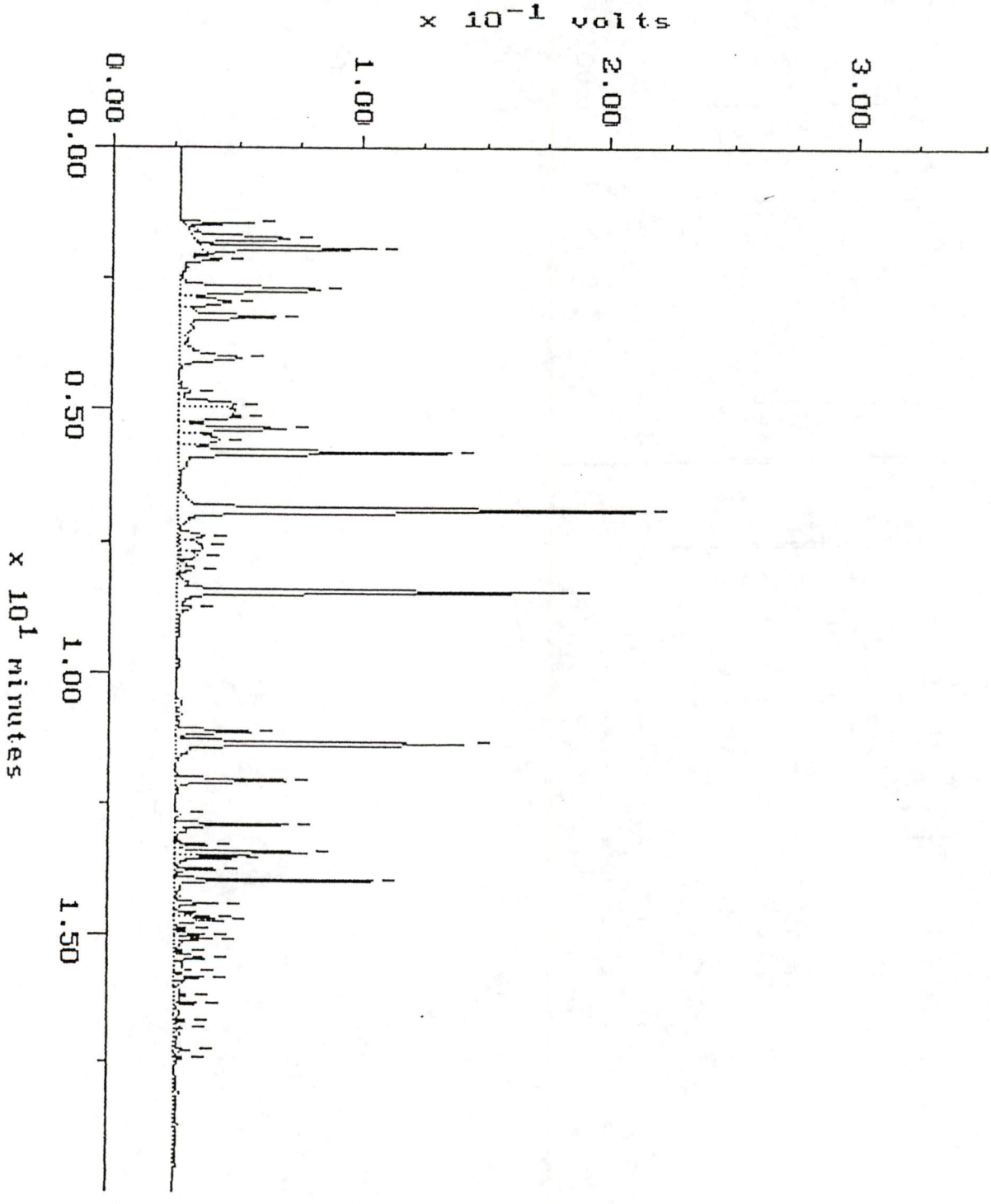
WA DOE WTPH-G Blank

Sample: WRB 6-28 Channel: FID Filename: R6289P03
Acquired: 28-JUN-94 11:28 Method: F:\BRO2\MAXDATA\PICARD\062894PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



CONTINUING CALIBRATION

Sample: STD C G Channel: FID Filename: R6239P40
Acquired: 24-JUN-94 8:31 Method: F:\BRO2\MAXDATA\PICARD\062394PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.

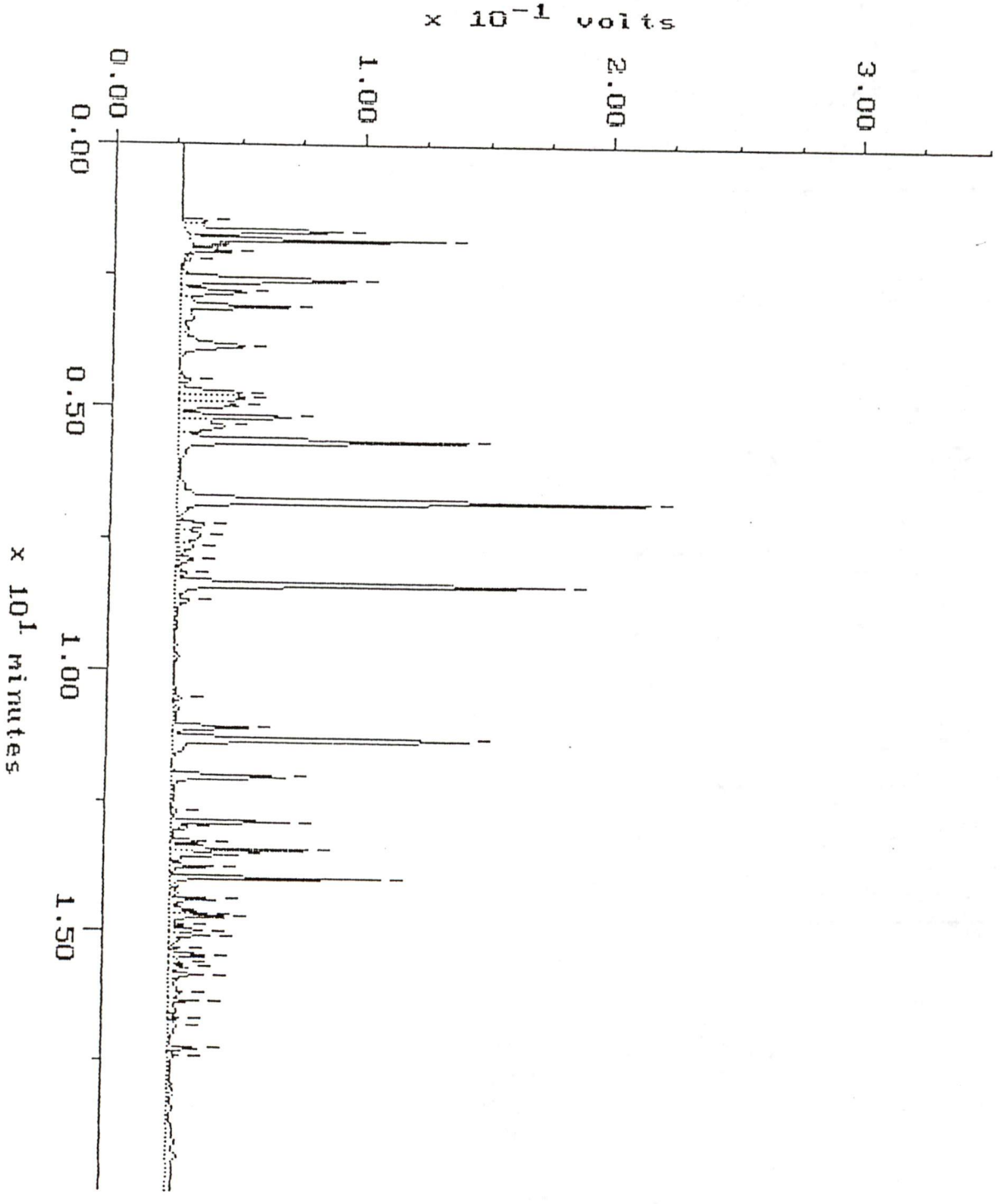


CONTINUING CALIBRATION

Sample: STD-C G
Acquired: 27-JUN-94 7:50
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.

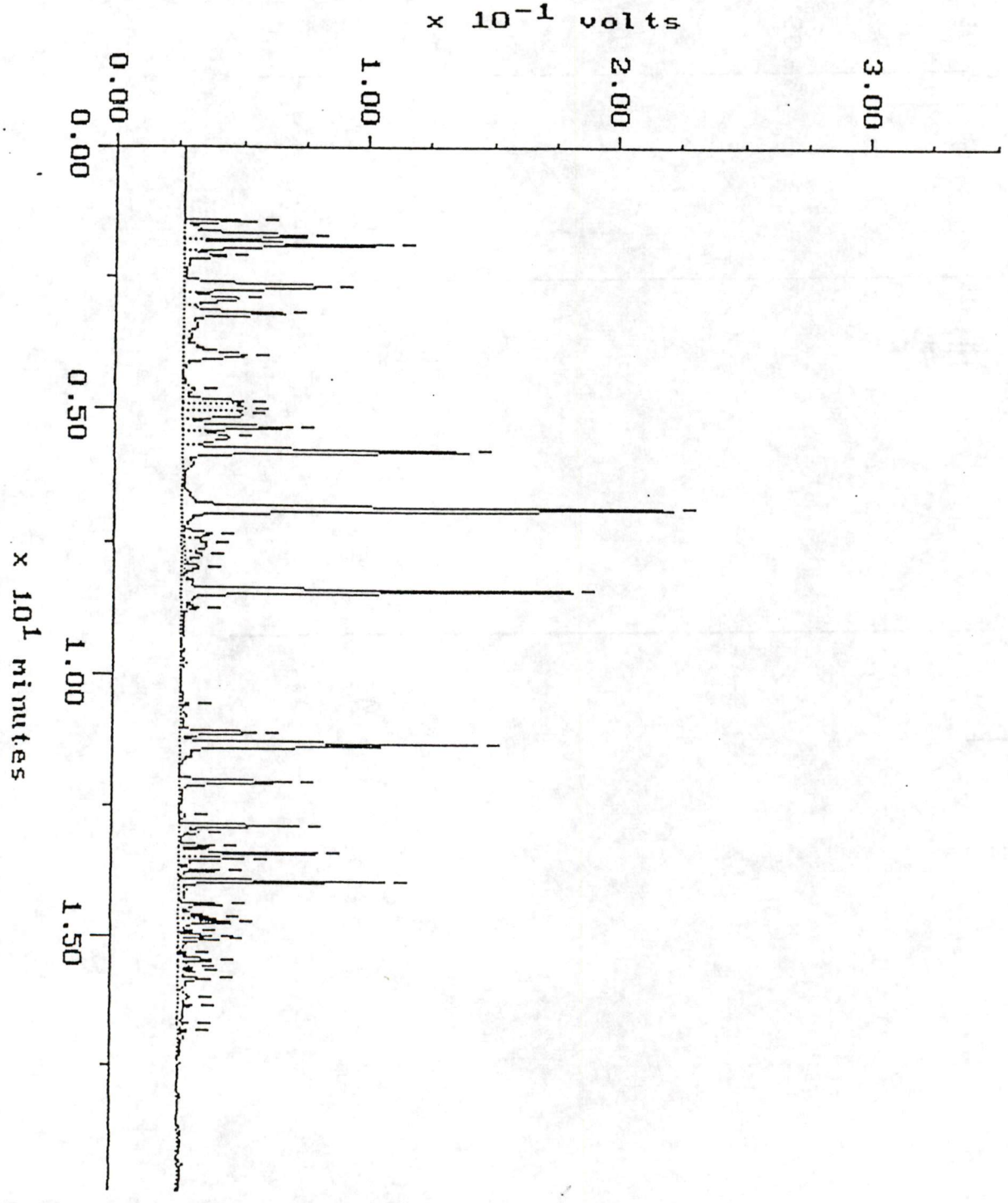
Channel: FID
Method: F:\BRO2\MAXDATA\PICARD\062794PC

Filename: R6279P01
Operator: ATI



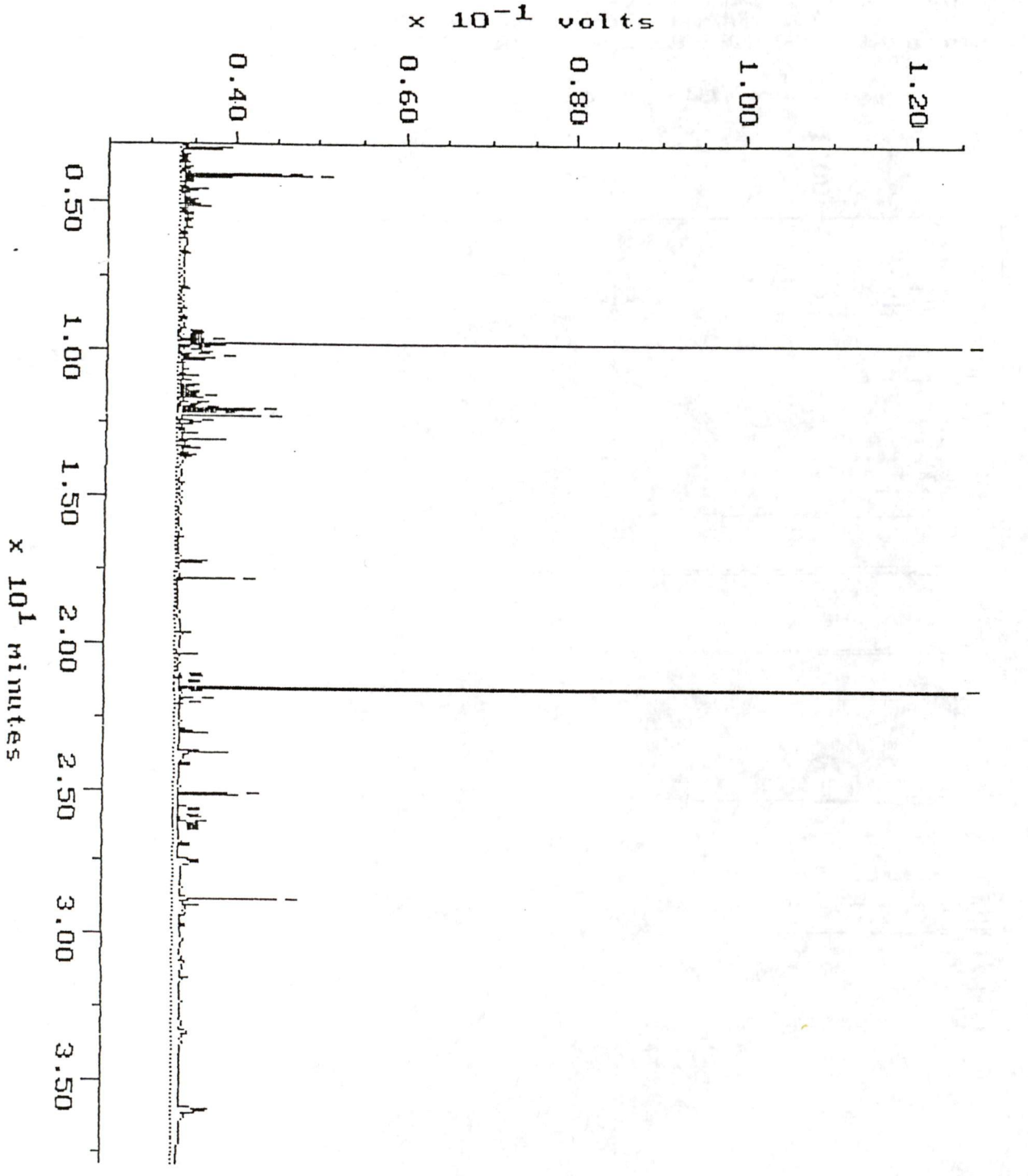
CONTINUING CALIBRATION

Sample: STD C G Channel: FID Filename: R6289P01
Acquired: 28-JUN-94 9:39 Method: F:\BRO2\MAXDATA\PICARD\062894PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



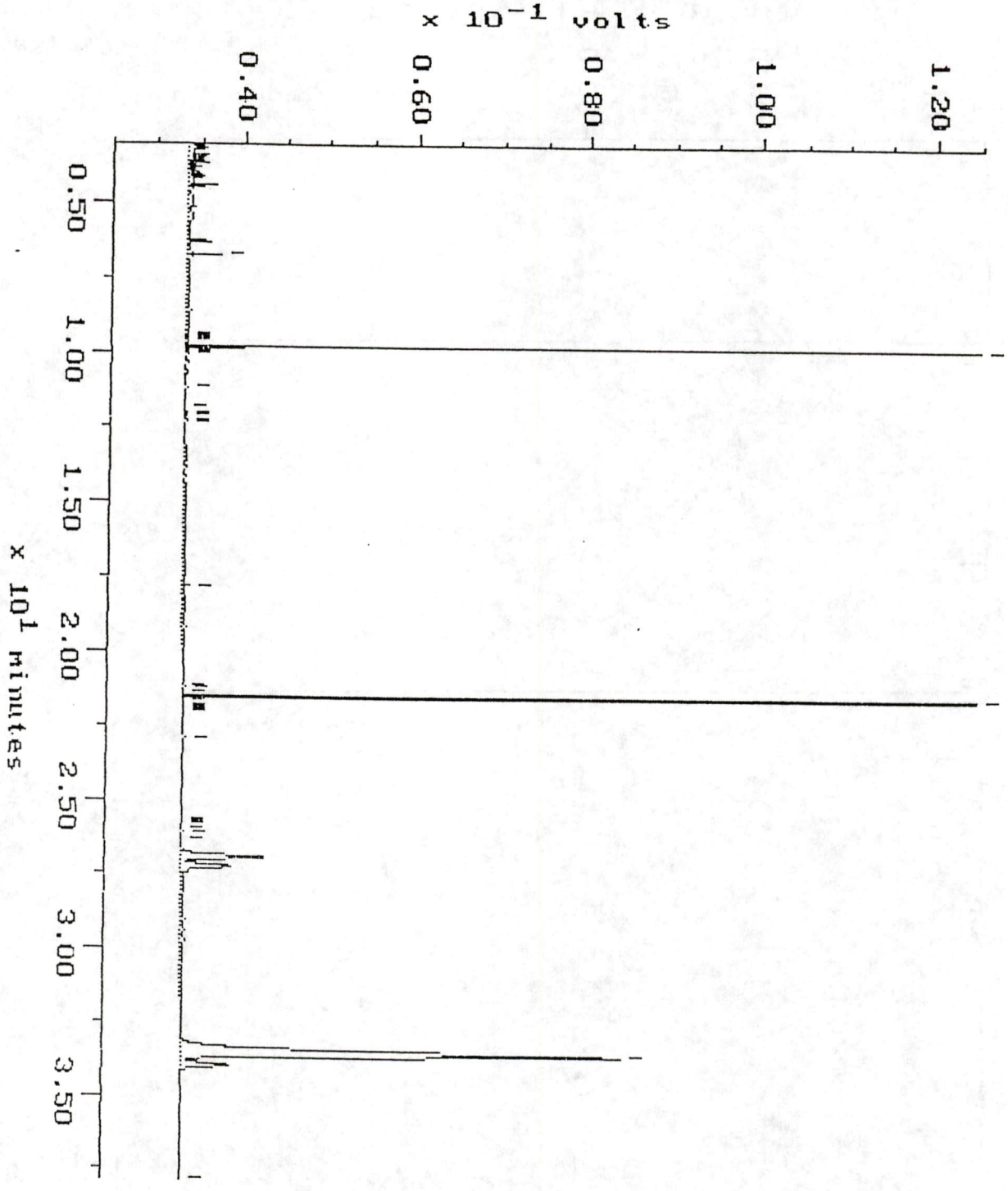
WA DOE WTPH-D

Sample: 9406-282-1 Channel: NANCY Filename: R6268N06
Acquired: 26-JUN-94 19:18 Method: F:\BRO2\MAXDATA\NANCY\FUEL0626 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



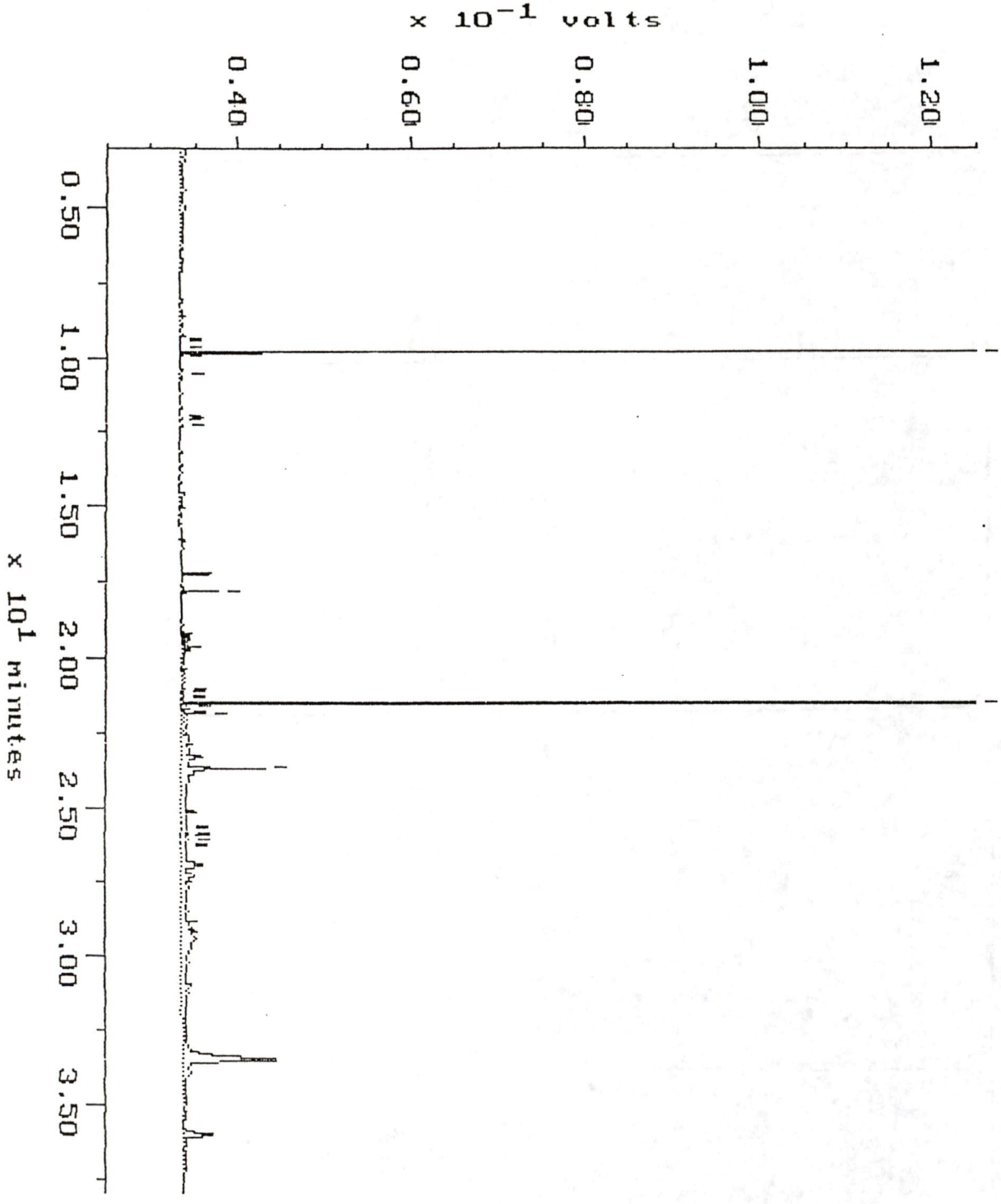
WA DOE WTPH-D

Sample: 9406-282-2 Channel: NANCY Filename: R6268N87
Acquired: 26-JUN-94 20:06 Method: F:\BRO2\MAXDATA\NANCY\FUEL0626 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



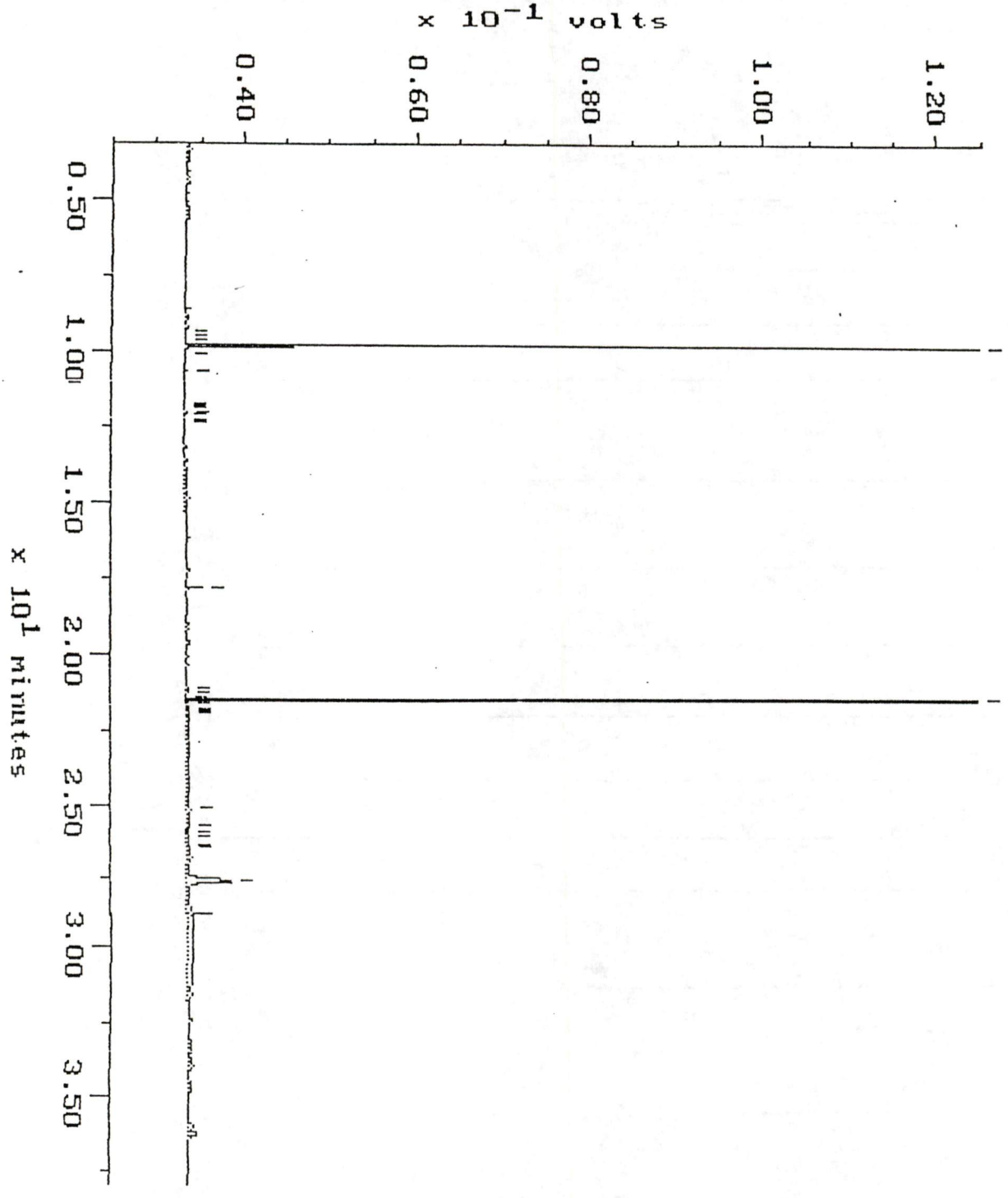
WA DOE WTPH-D

Sample: 9406-282-3 Channel: NANCY Filename: R6258N24
Acquired: 26-JUN-94 6:56 Method: F:\BRO2\MAXDATA\NANCY\FUEL0625 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE

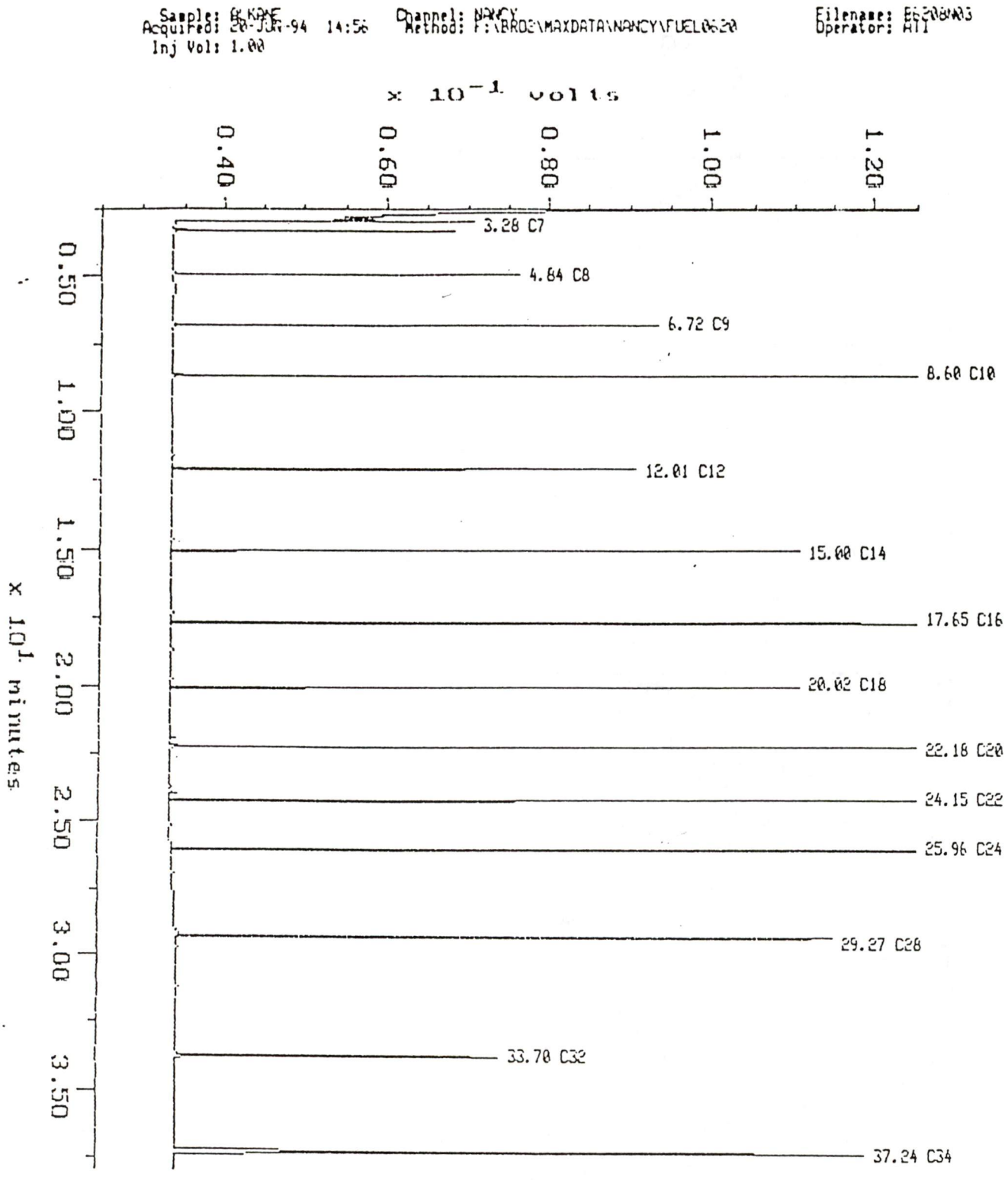


WA DOE WTPH-D

Sample: 9406-282-4 Channel: NANCY Filename: R6258N23
Acquired: 26-JUN-94 6:08 Method: F:\BRO2\MAXDATA\NANCY\FUEL0625 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE

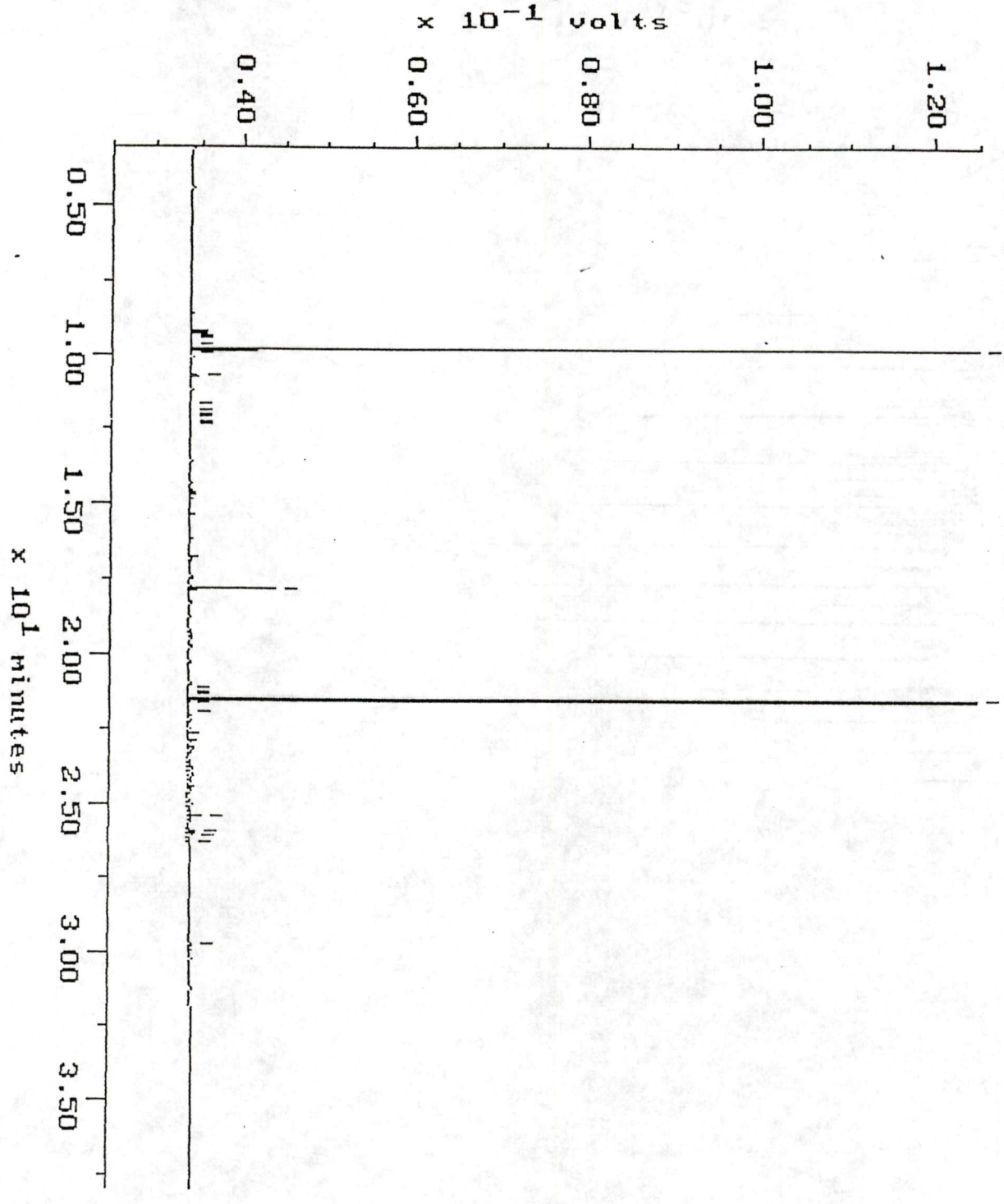


Alkane


Sample: C6 KANE
Acquired: 20-JUN-94 14:56
Inj Vol: 1.00
Channel: NANCY
Method: F:\BRDS\MAXDATA\NANCY\FUEL0620
Filename: E620WA03
Operator: ATI
x 10⁻¹ Volts
0.40
0.60
0.80
1.00
1.20
0.50
1.00
1.50
2.00
2.50
3.00
3.50
x 10¹ minutes
3.28 C7
4.84 C8
6.72 C9
8.60 C10
12.01 C12
15.00 C14
17.65 C16
20.02 C18
22.18 C20
24.15 C22
25.96 C24
29.27 C28
33.70 C32
37.24 C34

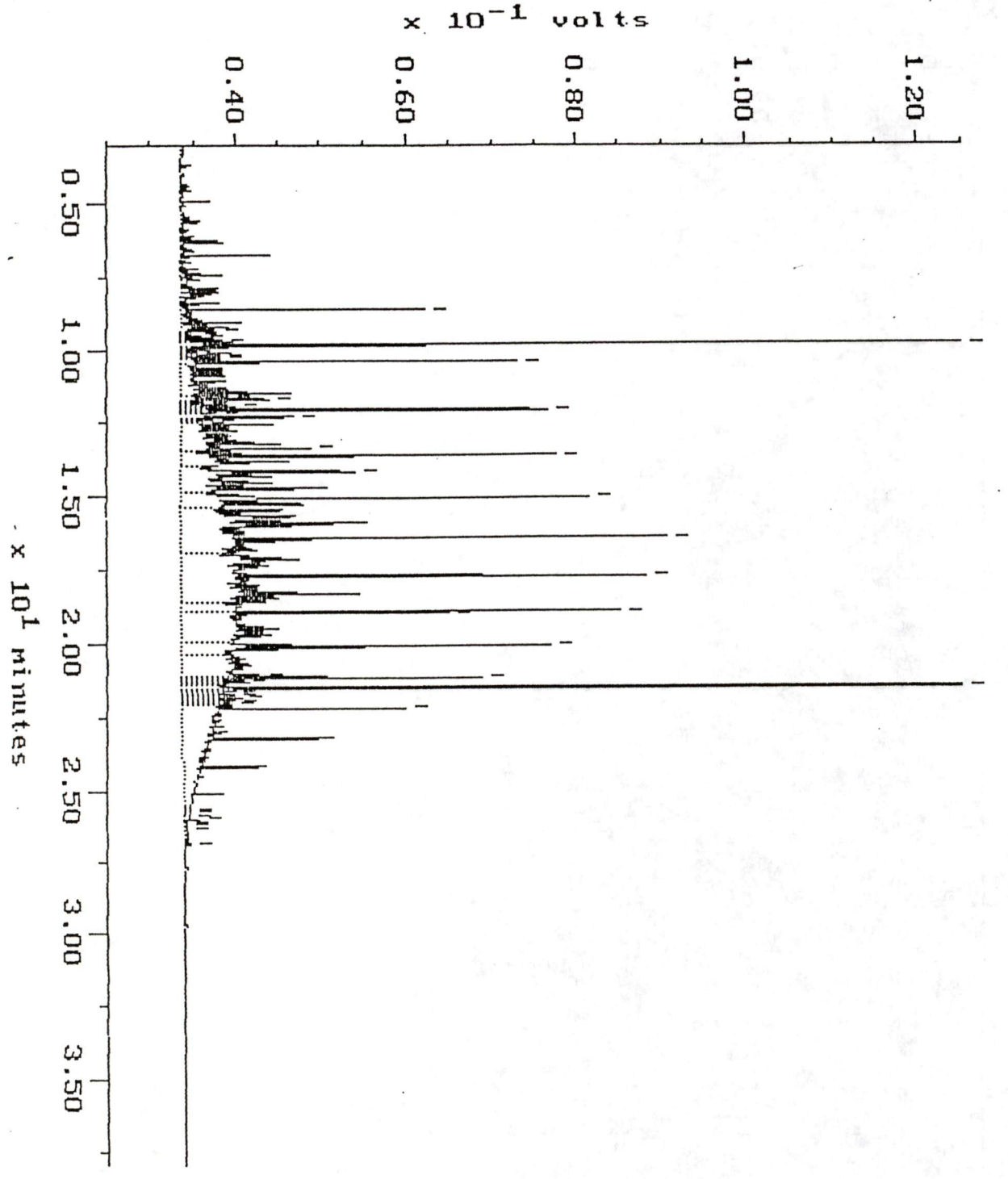
Blank

Sample: WRB 6-24 Channel: NANCY Filename: R6248N12
Acquired: 25-JUN-94 6:38 Method: F:\BRO2\MAXDATA\NANCY\FUEL0624 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



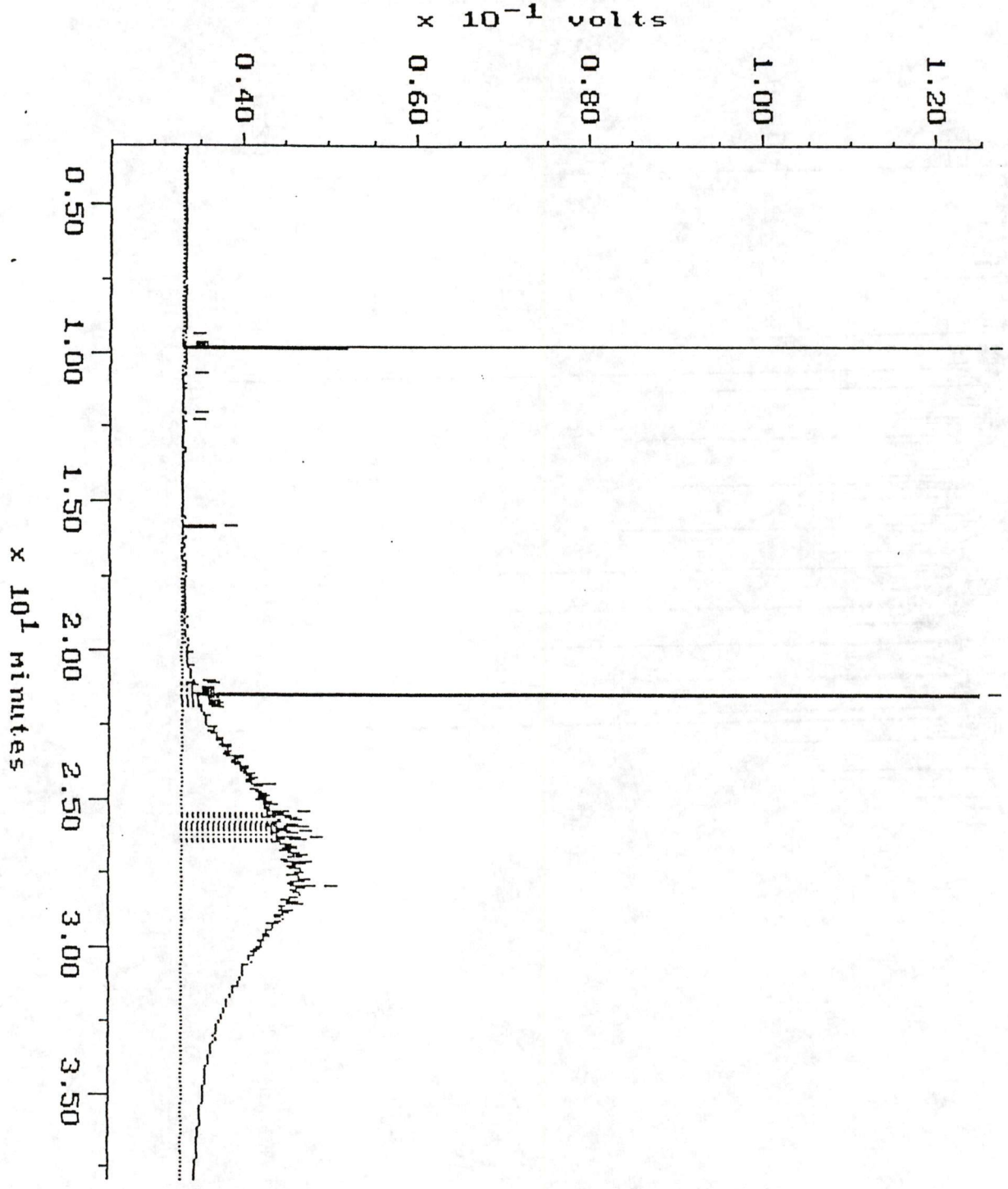
CONTINUING CALIBRATION

Sample: D 500 Channel: NANCY Filename: R6248N02
Acquired: 24-JUN-94 22:26 Method: F:\BRO2\MAXDATA\NANCY\FUEL0624 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



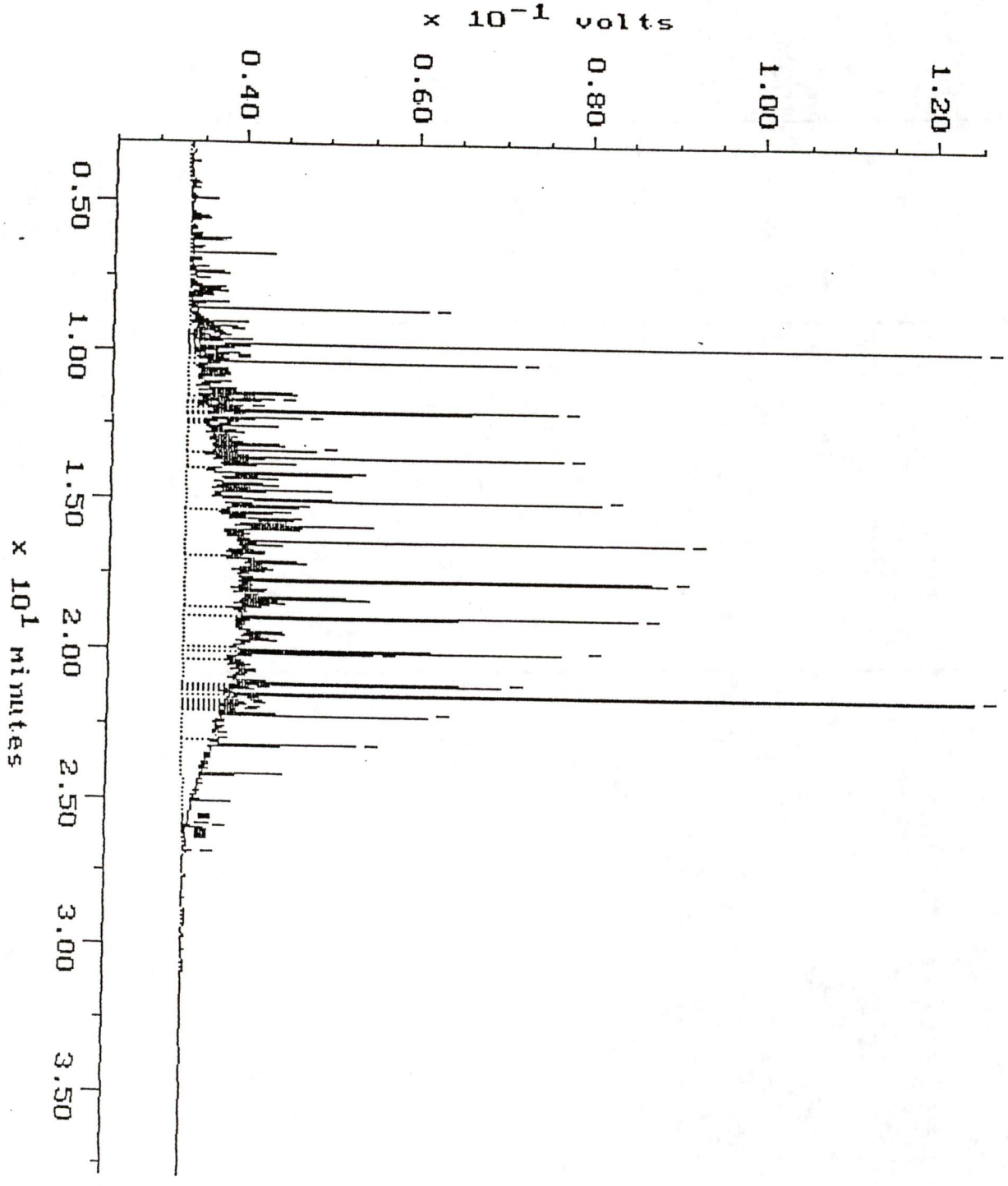
CONTINUING CALIBRATION

Sample: MO 500 Channel: NANCY Filename: R6248N03
Acquired: 24-JUN-94 23:14 Method: F:\BRO2\MAXDATA\NANCY\FUEL0624 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



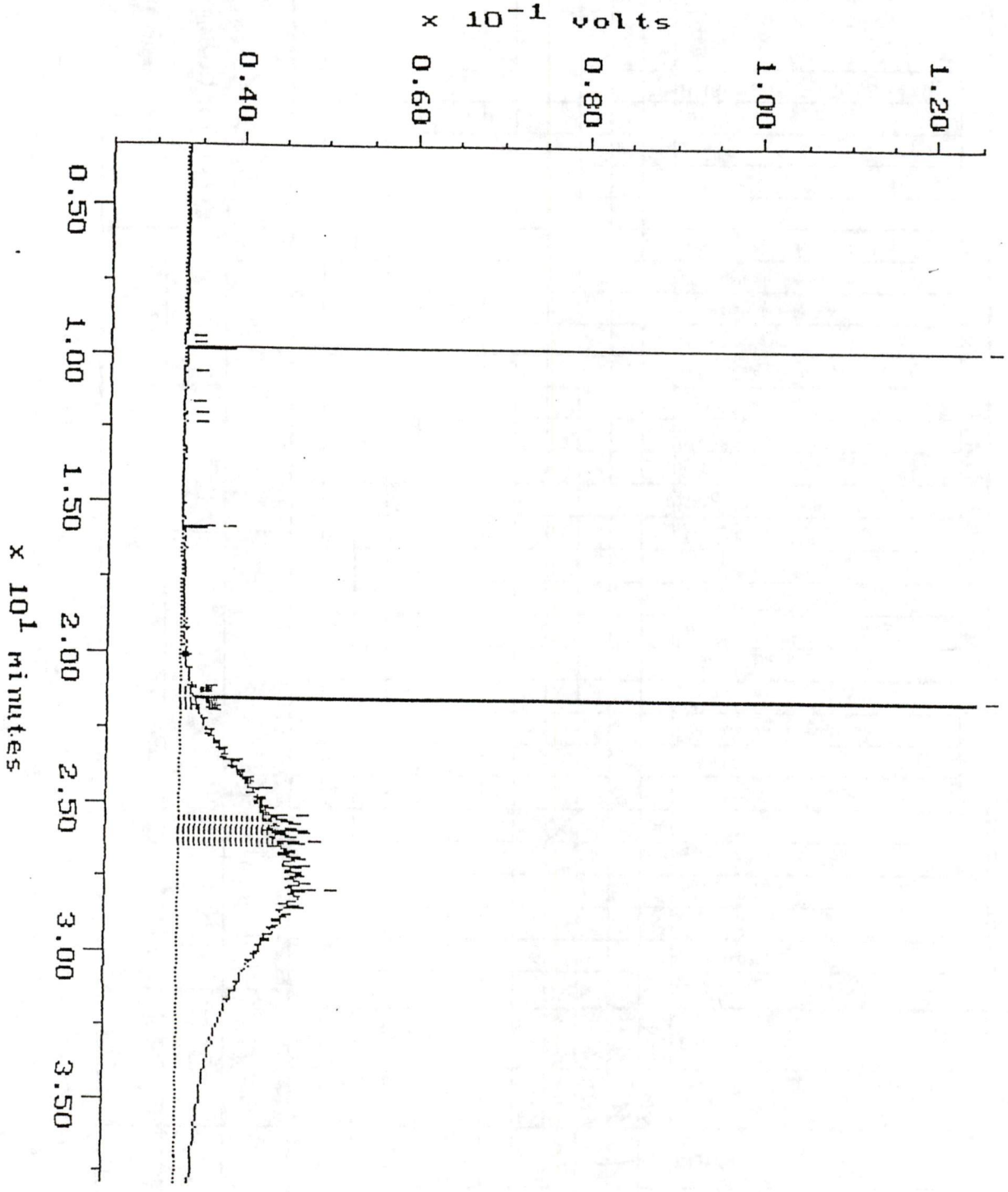
CONTINUING CALIBRATION

Sample: D 500 Channel: NANCY Filename: W6268N02
Acquired: 26-JUN-94 16:06 Method: F:\BRO2\MAXDATA\NANCY\FUEL0626 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



CONTINUING CALIBRATION

Sample: MO 500 Channel: NANCY Filename: R6268N03
Acquired: 26-JUN-94 16:54 Method: F:\BRO2\MAXDATA\NANCY\FUEL0626 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



Fax copy of Lab Report and COC to UNOCAL Contact: ☐ NO

Chain-of-Custody-Record#:

UNOCAL under contract with **ATI** Portland FAX: (503) 620-0393

Project Number 0161-183-R04 TASK #:
Consultant Name GeoEngineers, Inc
Address 8410 - 154th Ave NE Redmond, WA
Project Contact Lisa Bona
(Phone) 861-6000 FAX: 861-6050
Samples Collected by (Name) Amy Kilgore / Shelby Cheek
Signature

UNOCAL Contact (Name) Leigh Carlson
(Phone)
UNOCAL Facility # SS 5905
UNOCAL Address 18015 Bothell WAY NE
UNOCAL City, State ZIP Bothell, WA
Site Specific Release Number VLC741

Analyses To Be Performed

Sample Number	Lab Sample ID	# of Containers	Matrix	Date	Time	BETX / TPH-G Combo State: OR WA	BETX (8020)	TPH-HCID State: OR WA	TPH-G State: OR WA	TPH-D State: OR WA	TPH-D Extended State: OR WA	TPH-418.1M State: OR WA	EPA 418.1	EPA 413.2 Oil & Grease	Fuel Fingerprint EPA 8015M	Lead Total / Dissolved	Purgable Halocarbons (8010)	Purgeable Aromatics (8020)	Purgeable Organics (8240) GC/MS	Extractable Organics (8270) GC/MS	PCB / Pesticides (8080)	PCBs Only (8080M)	HPLC PAHs (8310)	TCLP 8240	TCLP 8270	TCLP Metals (8)	ICP Metals (individual)	GF/AA Metals (individual)	Priority Pollutant Metals (13)					RUSH 1, 2, 3, 5 Day *	Remarks
MW-5	1	4	W	6/21	16:00	X					X																							Normal TAT
MW-9	2	4		6/22	10:43	X					X																							
MW-10	3	4		6/21	16:45	X					X																							
MW-11	4	4	↓	6/21	15:30	X					X																							
Drum-6-23-94	5	5	W	6/23	10:30		X							X																				↓

940-282

Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Orgainzation	Date/Time
	GEI	6/23/94 12:00		ATI	6/23/94 1440
Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Orgainzation	Date/Time
Relinquished By (Signature)	Organization	Date/Time	Received By Laboratory		Date/Time

QC Data:
☐ UNOCAL Summary Report
☒ Expanded QC Report

* Please Schedule Rush TATs with ATI Project Manager

To be completed upon receipt of report:
1) Were the analyses requested on the Chain of Custody reported: _____ Yes _____ No. If no, what analyses are still needed? _____
2) Was the report issued within the requested turnaround time: _____ Yes _____ No. If no, what was the turnaround time? _____

Approved by: _____ Signature: _____ Company: _____ Date: _____

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-9508 (206) 481-9200 • FAX 485-2992
East 11115 Montgomery, Suite B • Spokane, WA 99206-4776 (509) 924-9200 • FAX 924-9290
9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

GeoEngineers

OCT 18 1994

Routing LJB

File

Dear Consultant:

Enclosed please find your UNOCAL project and chain of custody. To help better serve you and UNOCAL, Inc., we would appreciate your cooperation in taking a few moments to fill in the "Final Report Approval" section of the Chain of Custody (bottom right hand corner) and faxing it back to North Creek Analytical, at (206) 485-2992 Attention: Bethany White. This allows us to proceed with invoicing to UNOCAL.

We appreciate your assistance in helping us with this request.

NORTH CREEK ANALYTICAL, Inc.

Administrative Department

NORTH CREEK ANALYTICAL

18939 120th Avenue N.E., Suite 101 • Bothell, WA 98011-9508 (206) 481-9200 • FAX 485-2992
East 11115 Montgomery, Suite B • Spokane, WA 99206-4776 (509) 924-9200 • FAX 924-9290
9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

GeoEngineers, Inc.	Client Project ID:	UNOCAL #5905, #0161-183-R04	Sampled:	Sep 30, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 3, 1994
Redmond, WA 98052	Analysis Method:	WTPH-G	Analyzed:	Oct 7, 1994
Attention: Lisa Bona	First Sample #:	410-0115	Reported:	Oct 12, 1994

TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

Sample Number	Sample Description	Sample Result µg/L (ppb)	Surrogate Recovery %
410-0115	MW-5	170	105
410-0116	MW-9	N.D.	107
410-0117	MW-10	N.D.	103
410-0118	MW-11	N.D.	103
BLK100794	Method Blank	N.D.	115

GeoEngineers
OCT 18 1994
Routing LJB
File

Reporting Limit:	**50**

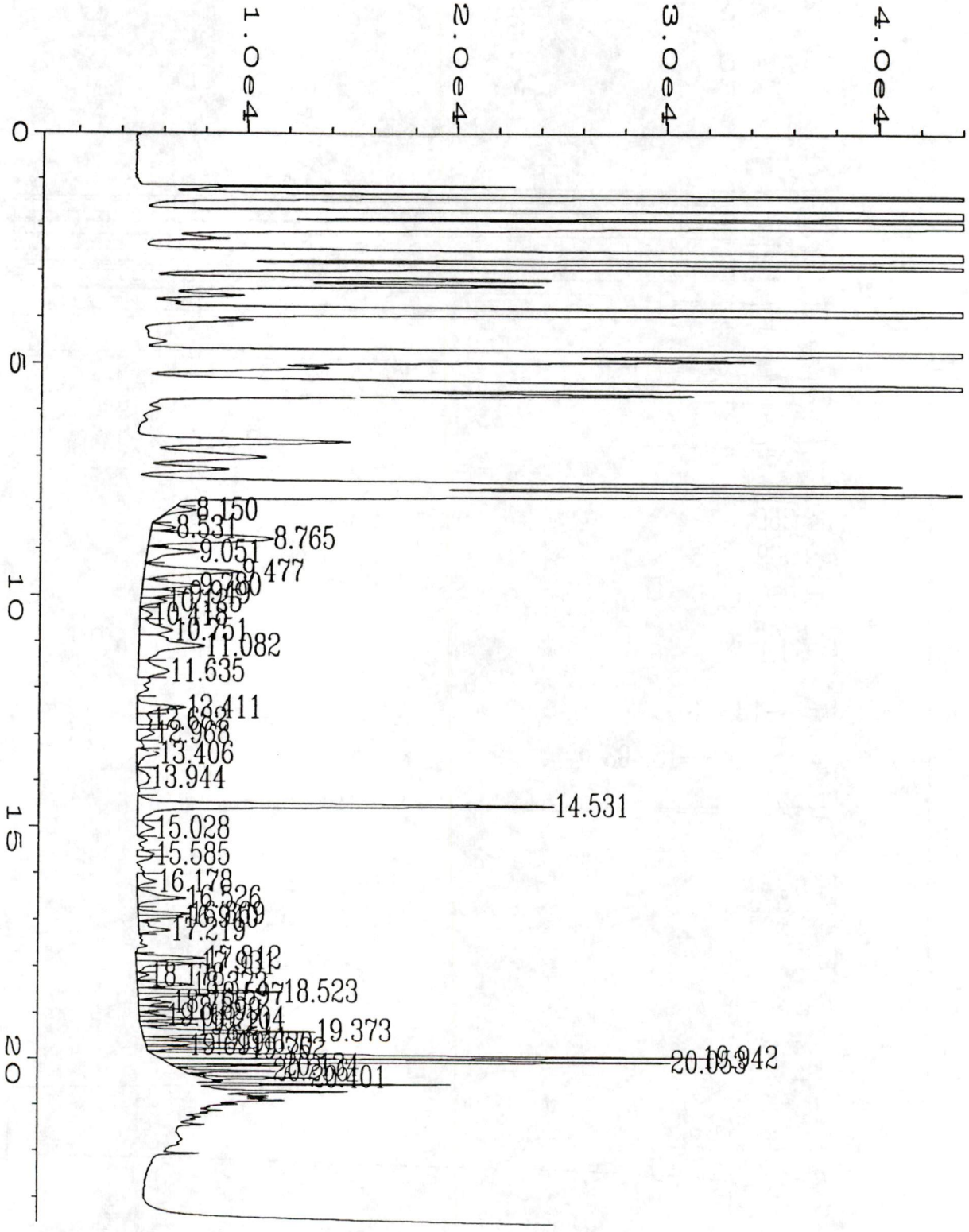
4-Bromofluorobenzene surrogate recovery control limits are 50 - 150 %.
Volatile Total Petroleum Hydrocarbons are quantitated as Gasoline Range Organics (toluene - dodecane).
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Laura Dutton

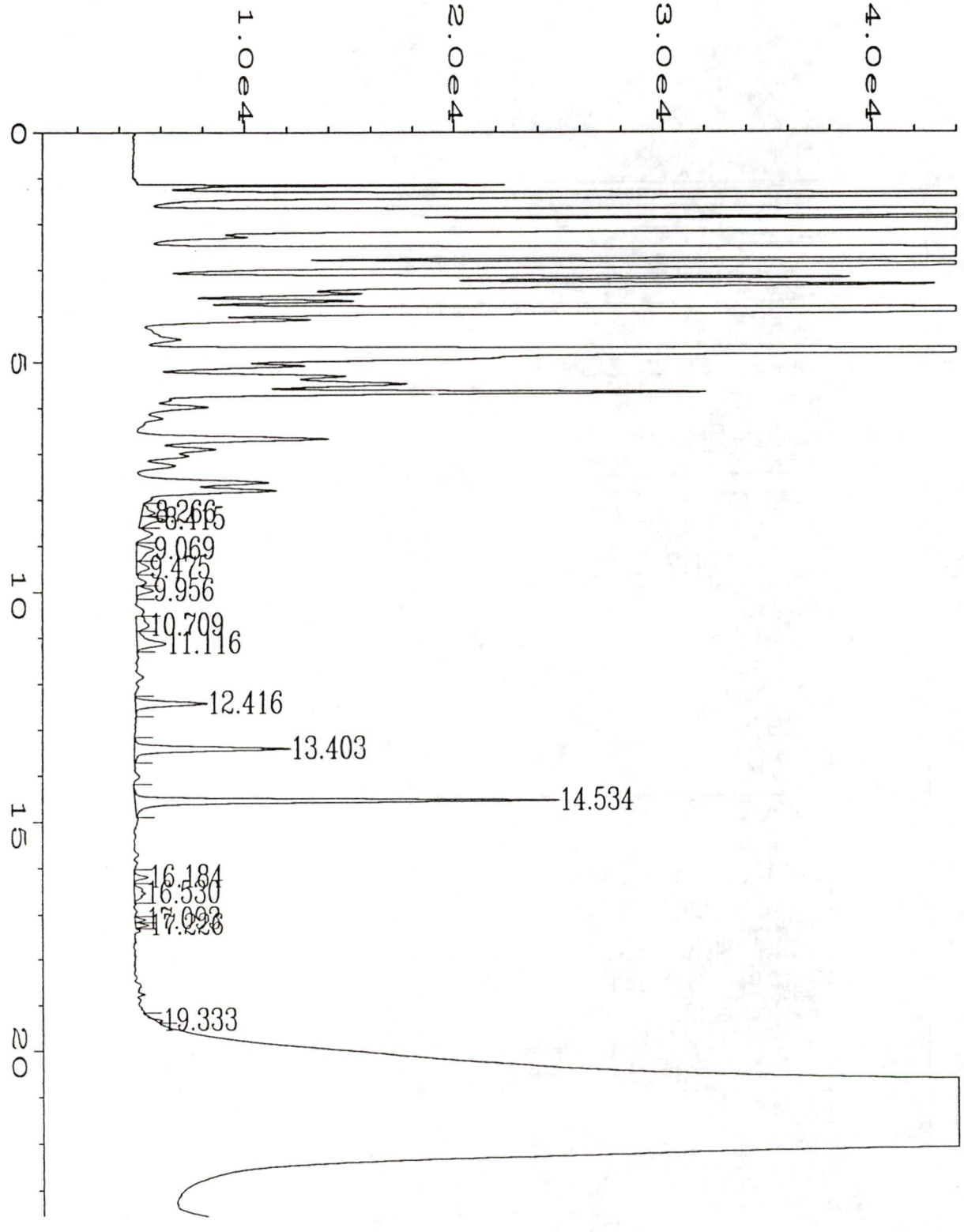
Laura Dutton
Project Manager

4100115.GEO <1>



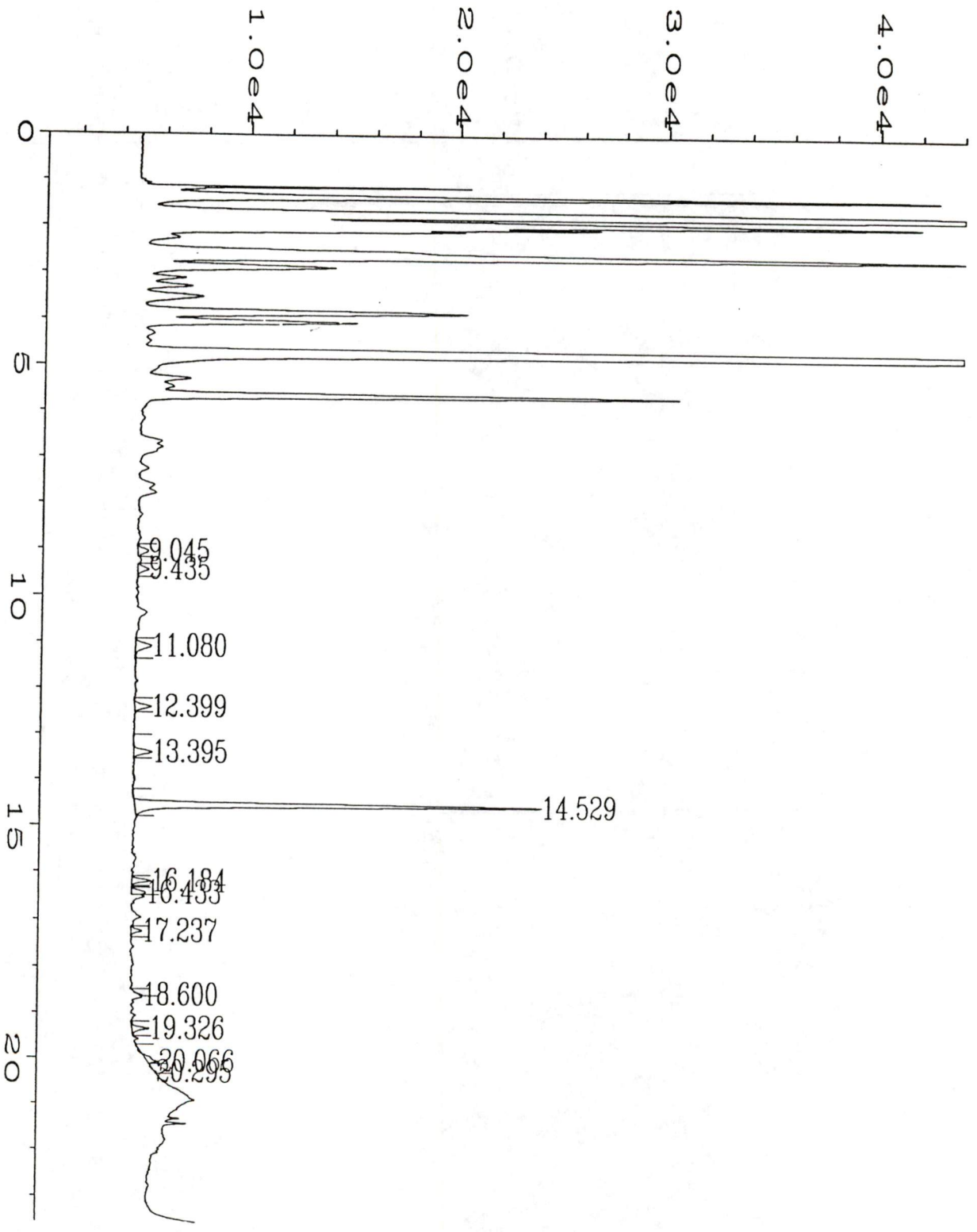
Data File Name : C:\HPCHEM\2\DATA\100794\012F0301.D
Operator :
Instrument : GC #6
Sample Name : 4100115
Run Time Bar Code:
Acquired on : 07 Oct 94 02:31 PM
Report Created on: 07 Oct 94 02:55 PM
Sample Info : 5 ml

Page Number : 1
Vial Number : 12
Injection Number : 1
Sequence Line : 3
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



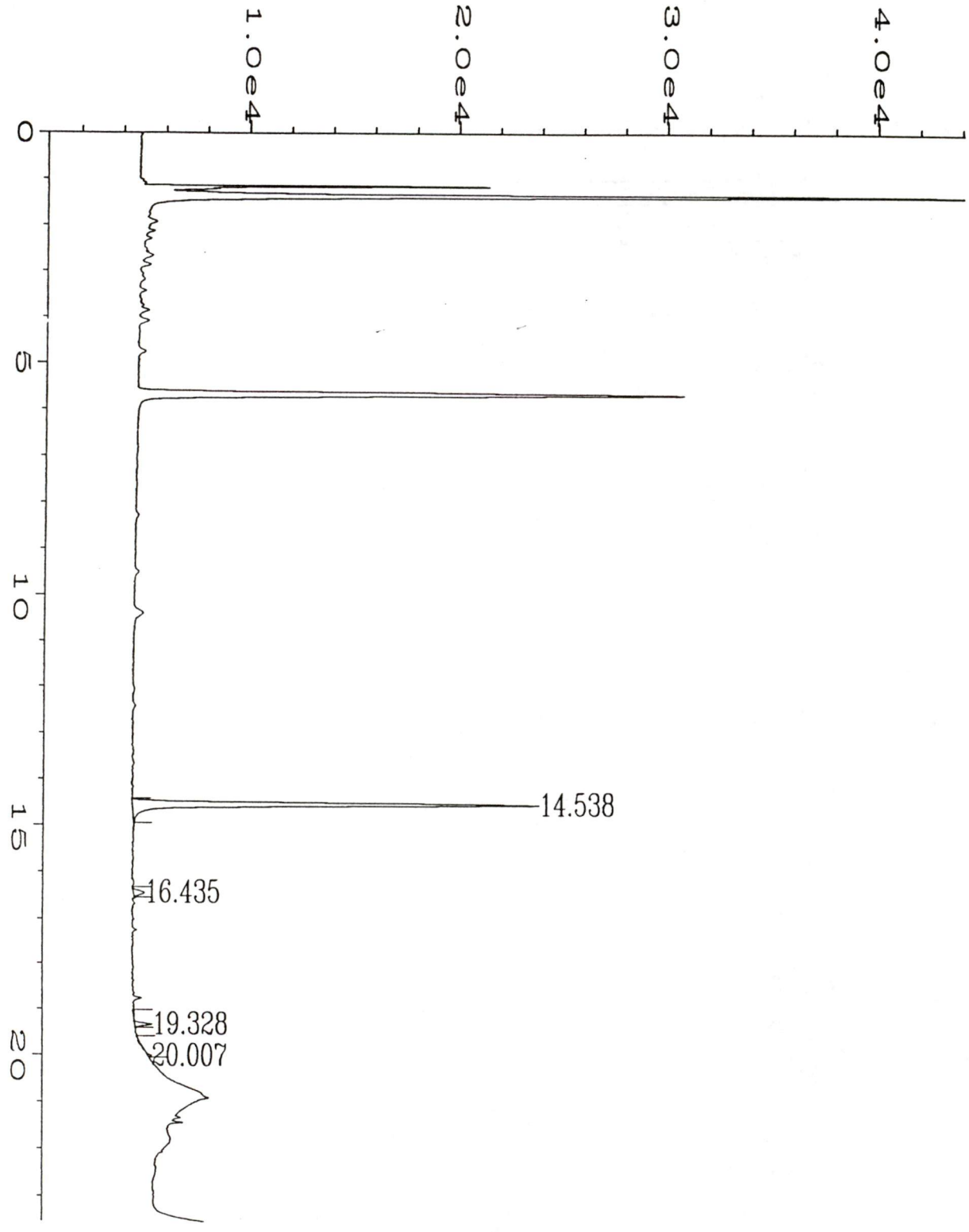
Data File Name : C:\HPCHEM\2\DATA\100794\013F0301.D
Operator :
Instrument : GC #6
Sample Name : 4100116
Run Time Bar Code:
Acquired on : 07 Oct 94 03:06 PM
Report Created on: 07 Oct 94 03:30 PM
Sample Info : 5 ml

Page Number : 1
Vial Number : 13
Injection Number : 1
Sequence Line : 3
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



ta File Name : C:\HPCHEM\2\DATA\100794\014F0301.D
)perator :
strument : GC #6
mple Name : 4100117
un Time Bar Code:
cquired on : 07 Oct 94 03:36 PM
port Created on: 07 Oct 94 04:00 PM
mple Info : 5 ml

Page Number : 1
Vial Number : 14
Injection Number : 1
Sequence Line : 3
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



ata File Name : C:\HPCHEM\2\DATA\100794\015F0301.D
perator :
nstrument : GC #6
ample Name : 4100118
un Time Bar Code:
cquired on : 07 Oct 94 04:06 PM
eport Created on: 07 Oct 94 04:30 PM
ample Info : 5 ml

Page Number : 1
Vial Number : 15
Injection Number : 1
Sequence Line : 3
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH

NORTH CREEK ANALYTICAL

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GeoEngineers, Inc.
8410 154th Avenue N.E.
Redmond, WA 98052
Attention: Lisa Bona

Client Project ID: UNOCAL #5905, #0161-183-R04
Sample Matrix: Water
Analysis Method: WTPH-G
Units: µg/L (ppb)

Analyst: R. Lister, F. Shino
Analyzed: Oct 7, 1994
Reported: Oct 12, 1994

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

Gasoline

Spike Conc. Added:	100
Spike Result:	96
% Recovery:	96
Upper Control Limit %:	114
Lower Control Limit %:	55

PRECISION ASSESSMENT
Sample Duplicate

Gasoline Range Organics

Sample Number:	410-0076
Original Result:	N.D.
Duplicate Result:	N.D.
Relative % Difference	Relative Percent Difference values are not reported at sample concentration levels less than 10 times the Detection Limit.
Maximum RPD:	38

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Laura Dutton

Laura Dutton
Project Manager

% Recovery: $\frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$

Relative % Difference: $\frac{\text{Original Result - Duplicate Result}}{(\text{Original Result + Duplicate Result}) / 2} \times 100$

4100115.GEO <2>

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GeoEngineers, Inc.	Client Project ID:	UNOCAL #5905, #0161-183-R04	Sampled:	Sep 30, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 3, 1994
Redmond, WA 98052	Analysis Method:	EPA 8020	Analyzed:	Oct 7, 1994
Attention: Lisa Bona	First Sample #:	410-0115	Reported:	Oct 12, 1994

BTEX DISTINCTION

Sample Number	Sample Description	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)	Surrogate Recovery %
410-0115	MW-5	29	N.D.	N.D.	N.D.	107
410-0116	MW-9	52	N.D.	N.D.	4.9	107
410-0117	MW-10	88	N.D.	N.D.	N.D.	107
410-0118	MW-11	N.D.	N.D.	N.D.	N.D.	107
BLK100794	Method Blank	N.D.	N.D.	N.D.	N.D.	108
Reporting Limits:		**0.50**	**0.50**	**0.50**	**1.0**	

4-Bromofluorobenzene surrogate recovery control limits are 55 - 144 %.
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Laura Dutton

Laura Dutton
Project Manager

4100115.GEO <3>

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GeoEngineers, Inc.
8410 154th Avenue N.E.
Redmond, WA 98052
Attention: Lisa Bona

Client Project ID: UNOCAL #5905, #0161-183-R04
Sample Matrix: Water
Analysis Method: EPA 8020
Units: µg/L (ppb)
QC Sample #: 410-0076

Analyst: R. Lister, F. Shino
Analyzed: Oct 7, 1994
Reported: Oct 12, 1994

MATRIX SPIKE QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Sample Result:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10.0	10.0	10.0	30.0
Spike Result:	10.1	11.1	11.8	36.6
Spike % Recovery:	101%	111%	118%	122%
Spike Dup. Result:	10.3	11.3	12.0	37.1
Spike Duplicate % Recovery:	103%	113%	120%	124%
Upper Control Limit %:	138	121	126	130
Lower Control Limit %:	57	78	83	77
Relative % Difference:	2.0%	1.8%	1.7%	1.4%
Maximum RPD:	9.0	9.0	13	20

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Laura Dutton
Project Manager

% Recovery:	$\frac{\text{Spike Result - Sample Result}}{\text{Spike Conc. Added}}$	x 100
Relative % Difference:	$\frac{\text{Spike Result - Spike Dup. Result}}{\text{(Spike Result + Spike Dup. Result) / 2}}$	x 100

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GeoEngineers, Inc.	Client Project ID:	UNOCAL #5905, #0161-183-R04	Sampled:	Sep 30, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 3, 1994
Redmond, WA 98052	Analysis Method:	WTPH-D Extended	Extracted:	Oct 7, 1994
Attention: Lisa Bona	First Sample #:	410-0115	Analyzed:	Oct 11, 1994
			Reported:	Oct 12, 1994

TOTAL PETROLEUM HYDROCARBONS - DIESEL RANGE EXTENDED

Sample Number	Sample Description	Diesel Result mg/L (ppm)	Heavy Oil Result mg/L (ppm)	Surrogate Recovery %
410-0115	MW-5	N.D.	N.D.	83
410-0116	MW-9	N.D.	N.D.	70
410-0117	MW-10	N.D.	N.D.	71
410-0118	MW-11	N.D.	N.D.	64
BLK100794	Method Blank	N.D.	N.D.	76

Reporting Limit:	**0.25**	**0.75**

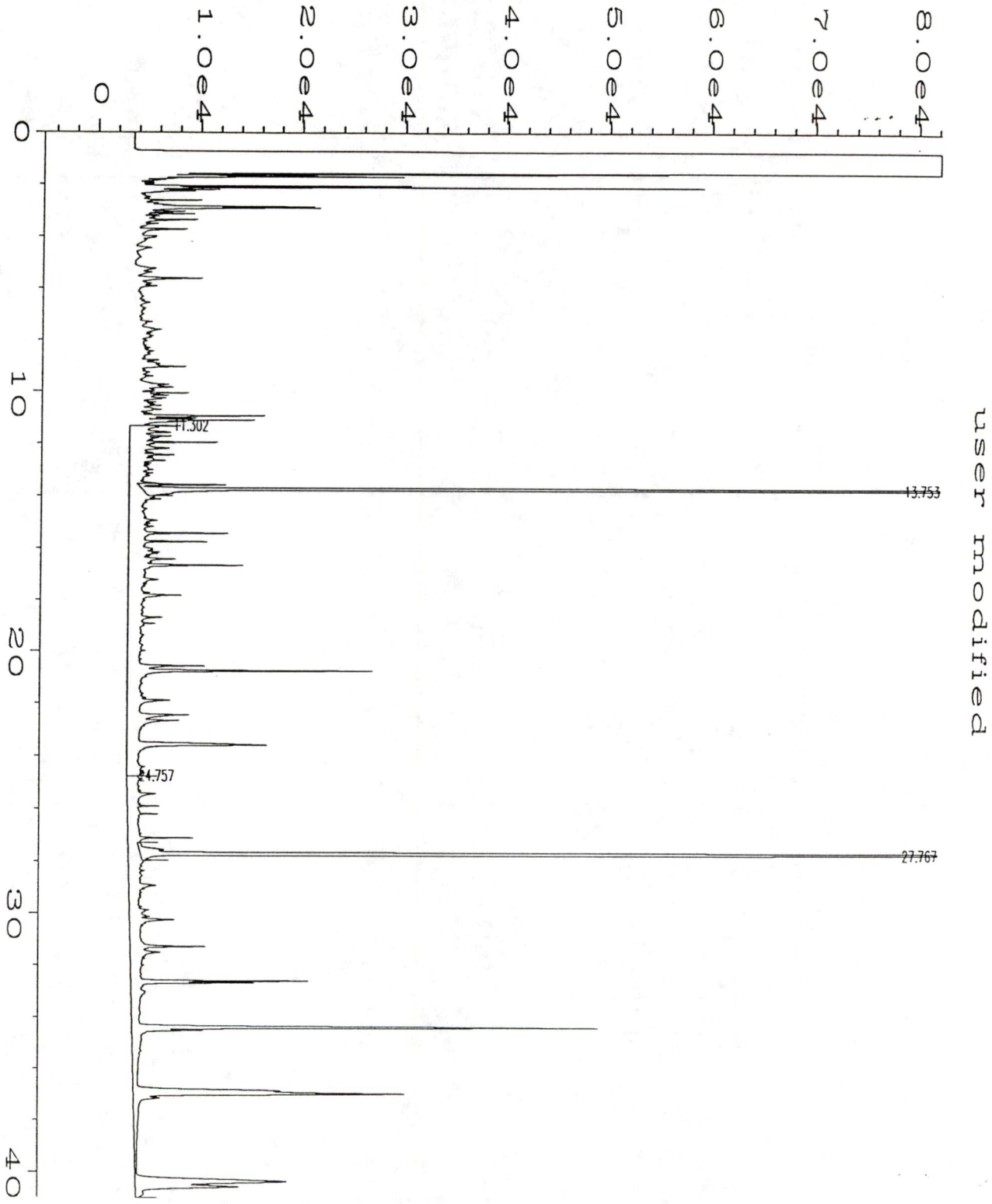
2-Fluorobiphenyl surrogate recovery control limits are 50 - 150%.
Extractable Hydrocarbons are quantitated as Diesel Range Organics (C12 - C24) and Heavy Oil Range Organics (>C24).
Analytes reported as N.D. were not detected above the stated Reporting Limit.

NORTH CREEK ANALYTICAL Inc.

Laura Dutton

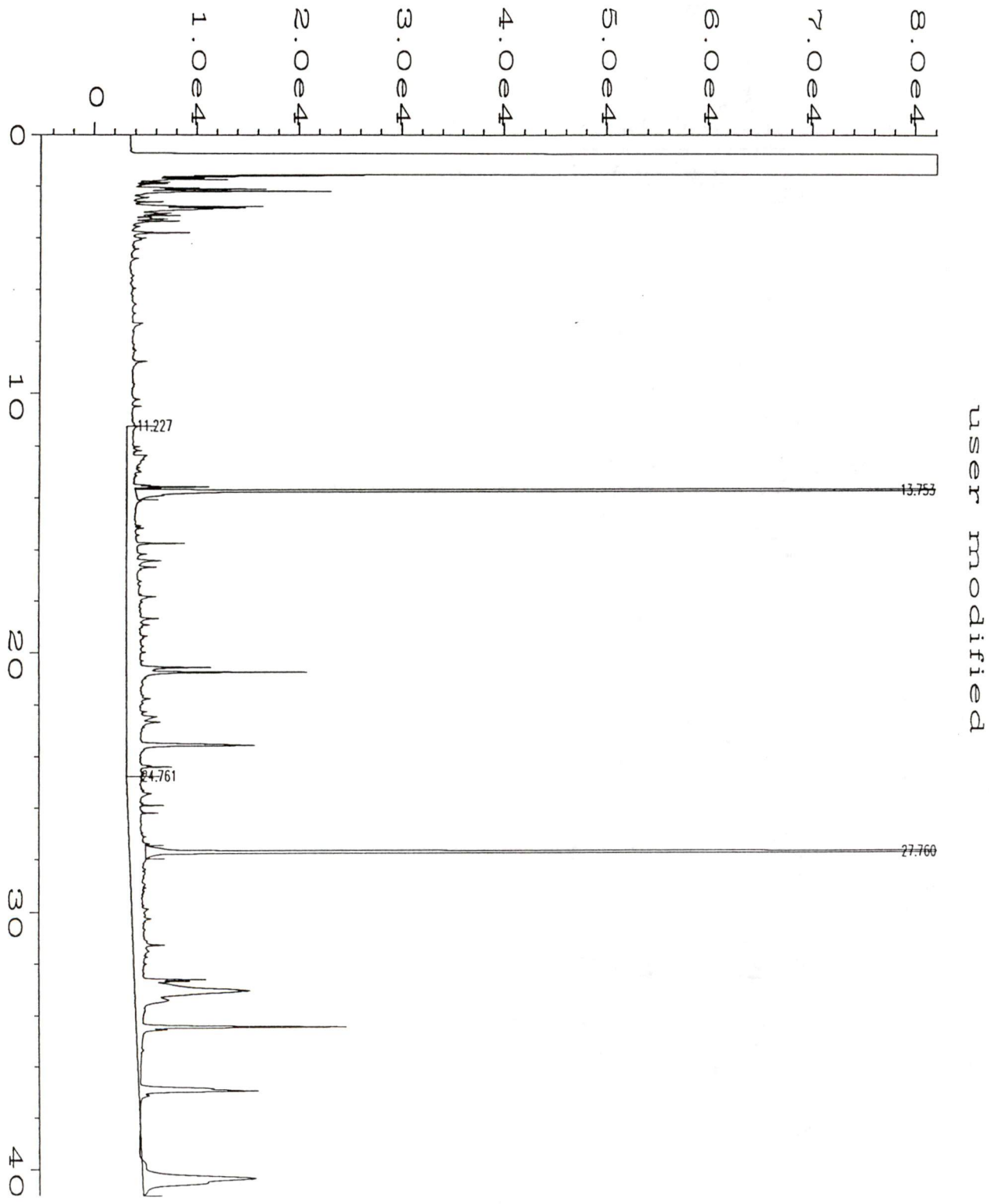
Laura Dutton
Project Manager

4100115.GEO <5>



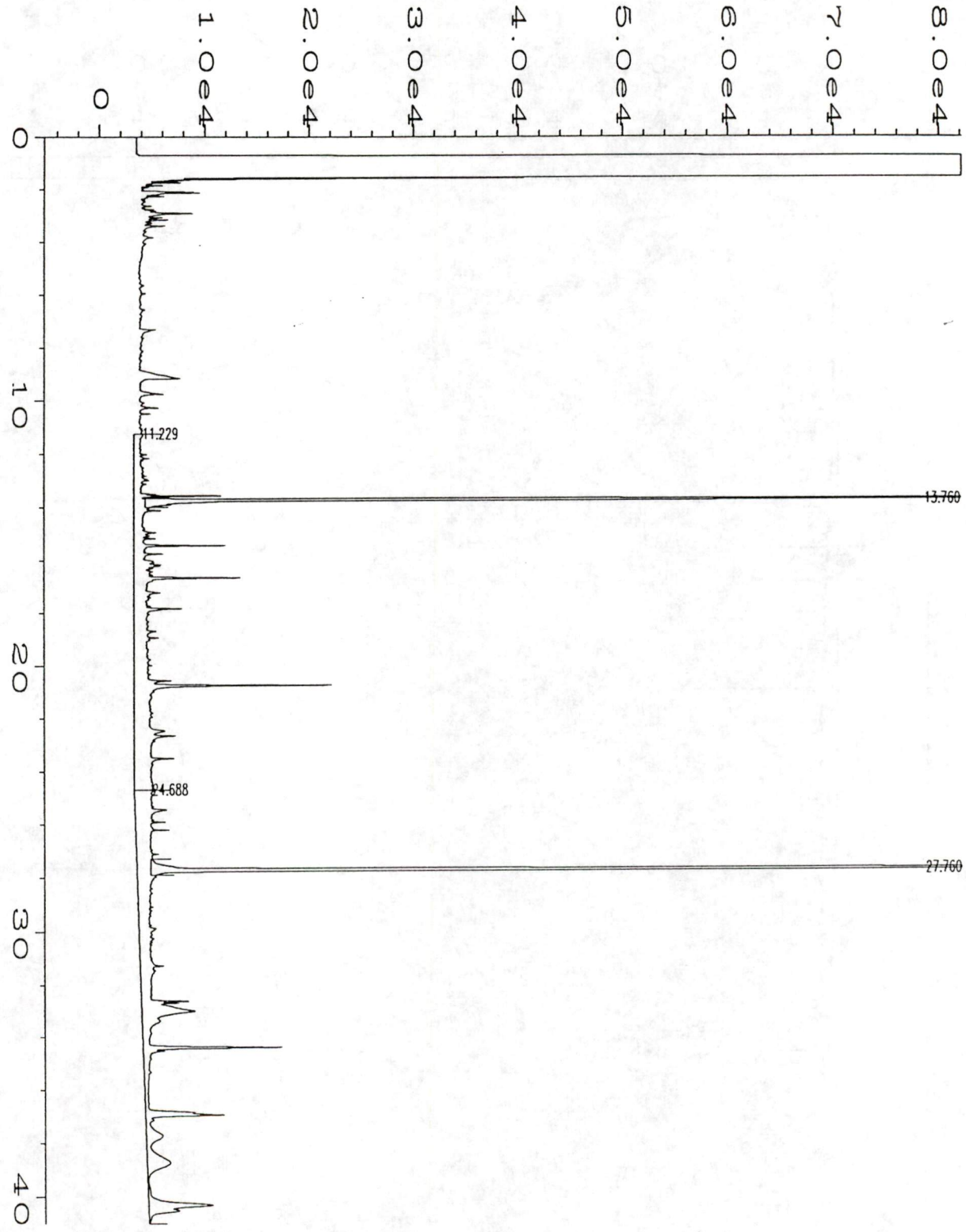
Data File Name : C:\HPCHEM\1\DATA\OCT10\061R1501.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-0115 W
Run Time Bar Code:
Acquired on : 11 Oct 94 08:11 PM
Report Created on: 12 Oct 94 09:59 AM

Page Number : 1
Vial Number : 61
Injection Number : 1
Sequence Line : 15
Instrument Method: TPH1F.MTH
Analysis Method : TPH1F.MTH



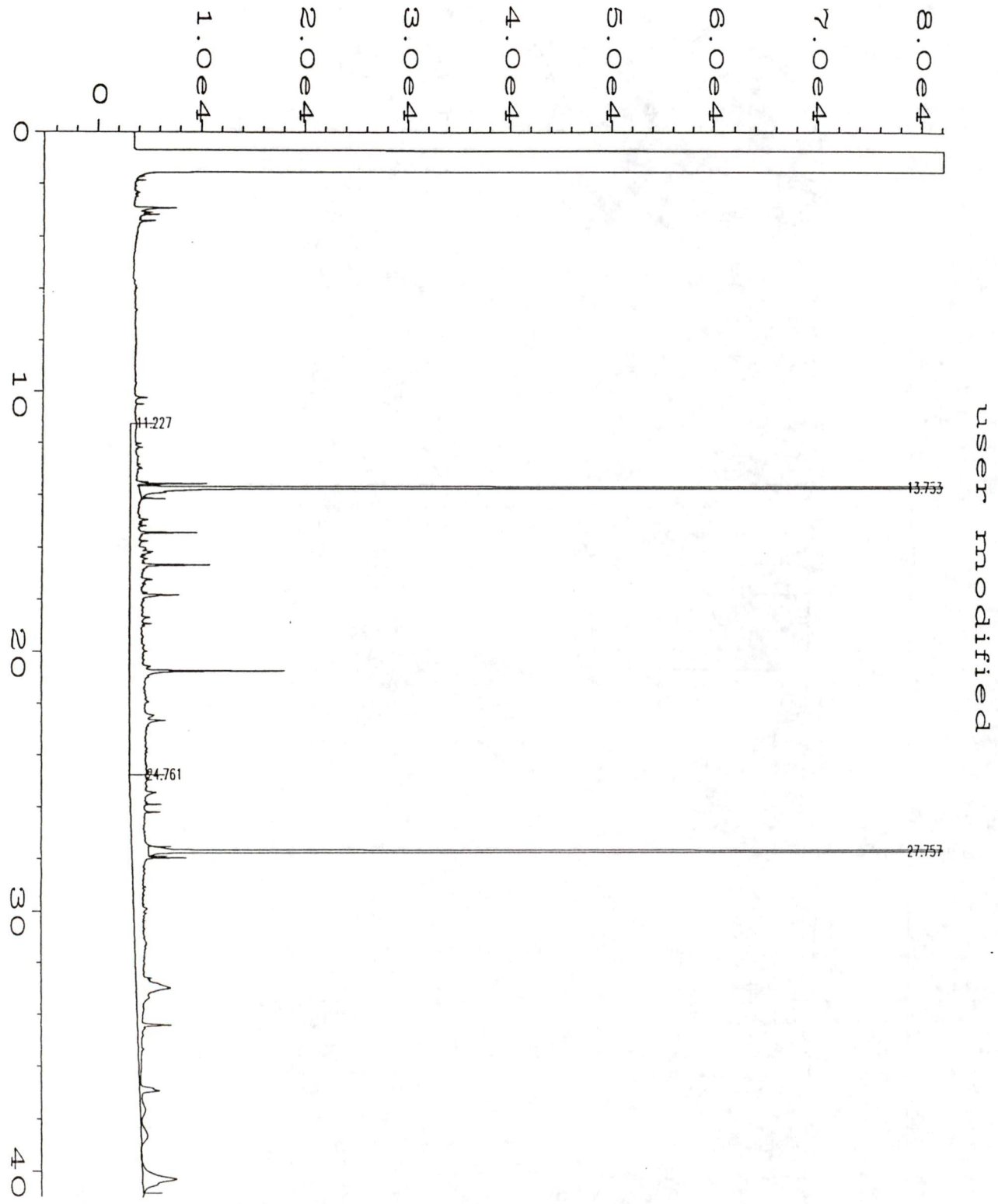
Data File Name : C:\HPCHEM\1\DATA\OCT10\062R1501.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-0116 W
Run Time Bar Code:
Acquired on : 11 Oct 94 09:05 PM
Report Created on: 12 Oct 94 10:01 AM

Page Number : 1
Vial Number : 62
Injection Number : 1
Sequence Line : 15
Instrument Method: TPH1F.MTH
Analysis Method : TPH1F.MTH



Data File Name : C:\HPCHEM\1\DATA\OCT10\063R1501.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-0117 W
Run Time Bar Code:
Acquired on : 11 Oct 94 09:59 PM
Report Created on: 12 Oct 94 10:03 AM

Page Number : 1
Vial Number : 63
Injection Number : 1
Sequence Line : 15
Instrument Method: TPH1F.MTH
Analysis Method : TPH1F.MTH



Data File Name : C:\HPCHEM\1\DATA\OCT10\064R1501.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-0118 W
Run Time Bar Code:
Acquired on : 11 Oct 94 10:53 PM
Report Created on: 12 Oct 94 10:06 AM

Page Number : 1
Vial Number : 64
Injection Number : 1
Sequence Line : 15
Instrument Method: TPH1F.MTH
Analysis Method : TPH1F.MTH

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GeoEngineers, Inc.
8410 154th Avenue N.E.
Redmond, WA 98052
Attention: Lisa Bona

Client Project ID: UNOCAL #5905, #0161-183-R04
Sample Matrix: Water
Analysis Method: WTPH-D
Units: mg/L (ppm)

Analyst: D. Anderson

Extracted: Oct 7, 1994
Analyzed: Oct 11, 1994
Reported: Oct 12, 1994

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

Diesel

Spike Conc. Added:	2.1
Spike Result:	1.4
% Recovery:	67, Q-1
Upper Control Limit %:	126
Lower Control Limit %:	71

PRECISION ASSESSMENT
Sample Duplicate

Diesel Range Organics

Sample Number:	409-1862
Original Result:	N.D.
Duplicate Result:	N.D.
Relative % Difference	Relative Percent Difference values are not reported at sample concentration levels less than 10 times the Detection Limit.
Maximum RPD:	39

Q-1 = The Percent Recovery for this QC sample is outside of the NCA established control limits.

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Laura Dutton
aura Dutton
roject Manager

% Recovery: $\frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$

Relative % Difference: $\frac{\text{Original Result - Duplicate Result}}{(\text{Original Result + Duplicate Result}) / 2} \times 100$

4100115.GEO <6>

CREEK ANALYTICAL
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15055 S.W. Sequoia Parkway, Suite 110, Portland, OR 97224-7155 (503) 624-9800 FAX 684-3782

UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: SS # 5905
Site Address: 18015 BOTHELL WAY NE
City, State, ZIP: BOTHELL, WA
Site Release Number:
Unocal Manager:

CONSULTANT INFORMATION

Firm: GEOENGINEERS Project Number: 0161-183-R04
Address: 8410 154TH AVE NE
REDMOND WA 98052
Phone: 861 6000 Fax: 861 6050
Task Order Number:
Project Manager: LISA BONA
Sample Collection by: SCOTT TKATCH, DAVE COOK

Chain of Custody Record #:

Quality Assurance Data Level: [A] [B]
A: Standard Summary
B: Standard + Chromatograms

Laboratory Turnaround Days: [10] [5] [3] [2] [1]

O Oregon O Washington Hydrocarbon Methods

	SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CON-TAINERS	TPH-HCID	TPH-Gas	BTEX (EPA 8020 Mod.)	TPH-Gas + BTEX	TPH-Diesel	TPH-Diesel Extended	TPH-418.1	Halogen. Volatiles (EPA 8010)	Aromatic Volatiles (EPA 8020)	Pesticides/PCBs or PCBs Only	GC/MS Volatiles (EPA 8240/8260)	GC/MS SemiVols. (EPA 8270)	PAHs by HPLC (EPA 8310)	Lead: Total or Dissolved	TCLP Metals (8)	NCA SAMPLE NUMBER
1.	MW-5	9/30/94	WATER	3				X		X										410015
2.	MW-9	〃	〃	3				X		X										0116
3.	MW-10	〃	〃	3				X		X										0117
4.	MW-11	〃	〃	3				X		X										0118
5.																				
6.																				
7.																				
8.																				
9.																				
10.																				

B - 53

	Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1.	David Cook	GEI	10/3/94	930 Dana Hey	NCA	10/3/94 1300
2.						
3.						

Final Report Approval
Were all requested results provided? [yes] [no] Define
Were results within requested turnaround? [yes] [no] "No" on back
Final Approval Signature:
Firm: Date:

Page 1 of 1
Comments:

Rev. 11.1.94
Distribution: White - Laboratory Yellow - Consultant Pink - Unocal