Status Report and Results of Ground Water Monitoring July and October 1994 Unocal Service Station 5353 Seattle, Washington

May 17, 1995

For
Unocal CERT - Northern Region

GeoEngineers

May 17, 1995

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

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

Attention: Dr. Mark Brearley, R.G.

We are submitting two copies of our "Status Report and Results of Ground Water Monitoring" for Unocal Service Station 5353 in Seattle, Washington. This report summarizes our monitoring services provided during the removal of a heating oil UST (underground storage tank) in April 1994 and ground water monitoring activities conducted in July and October 1994. Contractual terms for our services are described in blanket contract number B1982G.

We appreciate the opportunity to be of continued service to Unocal. Please call if you have questions regarding this report.

Yours very truly,

GeoEngineers, Inc.

James A. Miller, P.E.
Principal

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RESULTS OF GROUND WATER MONITORING
JULY AND OCTOBER 1994
UNOCAL SERVICE STATION 5353
SEATTLE, WASHINGTON
FOR
UNOCAL CERT - NORTHERN REGION

INTRODUCTION

This report summarizes the results of GeoEngineers' monitoring services provided during the removal of a heating oil UST (underground storage tank) in April 1994 and ground water monitoring activities conducted at and in the vicinity of Unocal Service Station 5353 during July and October 1994. Unocal Service Station 5353 is located northeast of the intersection of Westlake Avenue North and Mercer Street in Seattle, Washington. The Unocal site is shown relative to surrounding physical features in Figure 1. The general layout of the site is shown in Figure 2. Approximately 80,000 gallons of leaded premium gasoline was released from a product line at the Unocal site in or before early 1980.

BACKGROUND

AREA HISTORY

The site is located about 500 feet south of the present shoreline of Lake Union. The original shoreline of Lake Union extended south of the present alignment of Mercer Street. In the late 1800s, the south end of Lake Union was developed predominantly with lumber mills and related facilities. The accumulated deposits of sawdust and wood waste from the sawmills and other fill materials eventually extended the shoreline of Lake Union north to its present location.

The land use in the area of the site between the late 1800s and the present included commercial, light industrial and heavy industrial, based on our historical research. Land uses on approximately 20 different properties in close proximity to the Unocal site were identified as potential sources of contamination, based on former or current facilities at those locations. These facilities include service stations, an asphalt plant and a fuel storage yard.

UNOCAL SITE HISTORY

The Unocal site was covered by Lake Union before the south shore of the lake was extended northward in the late 1800s. In 1893, the site was occupied by Brace and Hergert Mill Company. Century Brewing Company and Horluck Creameries Inc. occupied the site beginning sometime between 1917 and 1935, and extending to 1965. Unocal leased the site from 1964 to 1967 and has owned the site since 1967. The western half of the Unocal site has been occupied

by and operated as a service station since 1965. The service station facility is currently operating. The eastern half of the Unocal site has been occupied by a Denny's restaurant since 1968.

ASSESSMENT AND CLEANUP HISTORY

Unocal employees detected a gasoline leak in a product line at the Unocal site in May 1980. The leak location was in the southwestern portion of the site, near the western service island. Unocal estimated that as much as 80,000 gallons of leaded premium gasoline had been released during the 4-month period prior to detection of the leak. The USTs (underground storage tanks) and the product lines were immediately replaced.

Twenty-five monitoring wells were installed in 1980 to assess the extent of free product floating on the ground water. An extensive free product plume was encountered beneath the Unocal site, north to Valley Street, west beneath Westlake Avenue and south beneath Mercer Street.

A free product recovery system was installed at the site in June 1980. The recovery system was operated from June 1980 until October 1982. A total of approximately 41,900 gallons of gasoline was recovered during this period. A subsurface VES (vapor extraction system) was installed at the site in June 1988. The VES has operated from June 1988 to the present.

Eighteen additional monitoring wells were drilled and installed in 1991 and 1992 to assess the extent of contaminated soil and ground water in the vicinity of the Unocal site. An area of contaminated soil was encountered extending beneath the Unocal site, north to Valley Street, west beneath Westlake Avenue and south beneath Mercer Street. Contaminated ground water was encountered beneath the site and beneath Westlake Avenue, Mercer Street, Terry Avenue and possibly Valley Street.

The locations of the monitoring wells installed in 1991 and 1992, and the locations of the monitoring wells installed in 1980 are shown in Figure 3.

SUBSURFACE SOIL CONDITIONS

Our interpretation of subsurface soil conditions is based on monitoring well borings completed in the vicinity of the Unocal site and on review of city of Seattle logs of borings drilled in the vicinity. Mixed fill materials consisting of sand, sand with silt, silty sand, silty gravel, silt, and sawdust were encountered in the borings. The fill materials extend to a depth of approximately 35 feet. Little horizontal continuity was observed in the nonsawdust fill units. Fill zones consisting of sawdust and wood chips were encountered beneath and in the vicinity of the Unocal site. The sawdust and wood chip zones ranged from several feet to greater than 10 feet in thickness. Native sand with varying amounts of gravel was encountered beginning at a depth of approximately 35 feet in those borings that extended to this depth.

GROUND WATER CONDITIONS

Ground water is present at a depth of about 7 to 14 feet beneath the Unocal site. The general direction of ground water flow in the area is toward the northeast, although considerable variation in ground water flow direction occurs in localized areas.

SCOPE

The purpose of our UST removal and ground water monitoring services at the site was to evaluate subsurface soil conditions in the vicinity of the heating oil UST near the northeast corner of the service station building, and to evaluate ground water conditions beneath and in the vicinity of the site. The specific scope of our services during this reporting period is as follows.

UST REMOVAL

1. Observe and document the removal of one heating oil UST and examine the UST for evidence of corrosion or leakage.
2. Observe and document the excavation required for the UST removal.
3. Obtain soil samples from the limits of the resulting excavation for field screening of petroleum hydrocarbons. Our field screening procedures are described in Appendix A.
4. Obtain a composite sample from the resulting soil stockpile.
5. Submit selected soil samples from the limits of the UST excavation and from the stockpile for chemical analysis of diesel- and heavy oil-range hydrocarbons by Ecology Method WTPH-D extended.
6. Evaluate the field and laboratory data with regard to existing regulatory concerns.

GROUND WATER MONITORING

1. Measure the depths to ground water in selected monitoring wells during the July 14 and 15, and October 25 and 26, 1994 sampling visits, and calculate water table elevations relative to an assumed site datum. Our field procedures are described in Appendix A.
2. Obtain product or ground water samples from monitoring wells MW-32A, MW-34 through MW-37, MW-40 through MW-47, SMW-3 and SMW-4 on July 14 or 15, and October 25 or 26, 1994. Submit the samples for laboratory analysis of 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. Submit composite purge water samples for laboratory analysis of BETX by EPA Method 8020 and total oil and grease by EPA Method 413.2.

UNDERGROUND STORAGE TANK REMOVAL

Sleister (A.L. Sleister and Sons Construction Inc.) of Mukilteo, Washington, removed the heating oil UST from the site on April 6, 1994. A representative of GeoEngineers who is

registered with Ecology to perform UST site checks/site assessments was present to observe the UST removal operation and to obtain soil samples from the resulting excavation and soil stockpile.

A 550-gallon steel UST, buried about 2.5 feet beneath the ground surface, was removed. Rust and corrosion were observed on the UST surface. A 0.1-inch-diameter hole was observed near the base of the east side of the UST after it was removed. It was not evident whether the hole was present when the tank was in place, or if it resulted from the removal process.

The excavation for removal of the UST was completed to a depth of approximately 7 feet. Fill consisting of sand with varying amounts of silt, gravel and brick fragments was encountered in the excavation. Localized staining of soil surrounding the UST fill port (north end) was observed as the fill port was exposed. Ground water seepage was not encountered in the excavation, but soil became wet at a depth of 7 feet.

The presence of petroleum hydrocarbons in subsurface soil was evaluated by obtaining soil samples from the excavation for field screening. Field screening indicated potential petroleum hydrocarbon contamination in soil in the north wall of the excavation. Field screening and soil sampling methods are described in Appendix A.

Two discrete soil samples were obtained from the final limits of the excavation in areas where potential contamination was identified by field screening. One composite sample was obtained from the soil stockpile. The samples were submitted to the laboratory for chemical analysis. Chemical analytical results and corresponding field screening results are summarized in Table 1. Approximate soil sampling locations are shown in Figure 4. Laboratory reports and our review of the laboratory quality control data are presented in Appendix B.

Diesel- and heavy oil-range hydrocarbons, including heating oil, were not detected at concentrations greater than laboratory detection limits in the sample obtained from the base of the excavation, beneath the fill port. Diesel- and heavy oil-range hydrocarbons were detected at concentrations of 420 mg/kg (milligrams per kilogram) and 87 mg/kg, respectively in the sample obtained from the north wall of the excavation. Diesel-range hydrocarbons were detected at a concentration of 29 mg/kg in the composite soil stockpile sample.

Sleister backfilled the excavation with the temporarily stockpiled soil removed from the excavation and with imported backfill on April 6 and 7, 1994.

GROUND WATER AND FREE PRODUCT SAMPLING

GROUND WATER ELEVATIONS

Ground water levels were measured in the well casings of monitoring wells MW-32A, MW-34 through MW-36, MW-40 through MW-47, SMW-3 and SMW-4 on July 14 or 15 and October 25 or 26, 1994 using an electric water level indicator. Ground water depths and elevations are summarized in Table 2. The depths to water measured in the monitoring wells ranged from about 7.2 to 10.8 feet on July 14 and 15, 1994. The depths to water measured in the monitoring wells ranged from about 8.5 to 13.7 feet on October 25 and 26, 1994.

Approximately 0.25 feet of free product was measured in MW-37 on July 15, and approximately 0.17 feet on October 26, 1994. Ground water elevations and inferred ground water contours and flow direction based on the October 1994 measurements are shown in Figure 3.

GROUND WATER SAMPLING AND ANALYSIS

GeoEngineers obtained ground water samples from monitoring wells MW-32A, MW-34 through MW-36, MW-40 through MW-47, SMW-3 and SMW-4 on July 14 or 15, 1994. We also obtained a sample of ground water-free product mixture from monitoring well MW-37 on July 15, 1994. We obtained ground water samples from monitoring wells MW-32A, MW-34 through MW-37, MW-40 through MW-47, SMW-3 and SMW-4 on October 25 or 26, 1994. Monitoring well locations are shown in Figure 3. Each sample was submitted for laboratory analysis of BETX, and gasoline-, diesel- and heavy oil-range hydrocarbons. Sampling procedures are described in Appendix A. Chemical analytical results are summarized in Table 3 and Figure 5. The laboratory reports and our review of the laboratory QA/QC program are included in Appendix B.

Dissolved-phase benzene, ethylbenzene, toluene and/or xylenes were detected at concentrations exceeding the MTCA Method A ground water cleanup levels in the samples obtained from monitoring wells MW-32A, MW-34, MW-35, MW-37, MW-40, MW-42, MW-43, MW-45 and SMW-4 during the July and October 1994 sampling events. Benzene also was detected at a concentration greater than the MTCA Method A ground water cleanup level in the July 1994 sample from MW-41. The sum of dissolved-phase gasoline-, diesel- and/or heavy oil-range hydrocarbons exceeded the Method A ground water cleanup level in the samples obtained from monitoring wells MW-32A, MW-34, MW-35, MW-36, MW-37, MW-40, MW-42, MW-45, MW-46 and SMW-4 during the July and October 1994 sampling events.

DISCUSSION

Soil with diesel-range hydrocarbon concentrations exceeding the cleanup level remains in the north wall of the heating oil UST excavation. Field screening results did not indicate that leaking of oil had occurred from the small hole that was observed in the east side of the UST after it was removed.

Free product is present in MW-37, located beneath Mercer Street to the south of the site. Free product was not observed in any other wells at the site. Petroleum-related ground water contamination, primarily consisting of gasoline, is present beneath the site at concentrations exceeding the MTCA Method A cleanup levels.

Petroleum-related ground water contamination also is present at concentrations exceeding the MTCA Method A cleanup levels in the following off-site wells.

- MW-40, located upgradient of the Unocal site.
- MW-37 and MW-43, located upgradient of the Unocal site.
- MW-42 and SMW-4, located crossgradient to downgradient of the Unocal site.

- MW-36 and MW-46, located downgradient of the Unocal site.

The ground water contamination present in upgradient monitoring well MW-40, and downgradient monitoring wells MW-36 and MW-46, primarily consists of heavy oil-range hydrocarbons. The crossgradient and downgradient limits of the plume of gasoline-contaminated ground water are defined by monitoring wells MW-44, SMW-3, MW-46, MW-36 and MW-47.

LIMITATIONS

We have prepared this report for use by Unocal in their evaluation of ongoing remediation efforts at Service Station 5353. This report may be made available to potential buyers of the property and to regulatory agencies. This report is not intended for use by others and the information contained herein may not be applicable to other sites.

Our services have been completed in accordance with generally accepted practices in this area at the time the report was prepared. No warranty or other conditions, express or implied, should be understood.

We appreciate the opportunity to be of service on this project. Please call if you have any questions regarding this report.

Respectfully submitted,

GeoEngineers, Inc.

Norman L. Puri, P.E.
Environmental Engineer

James A. Miller, P.E.
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TABLE 1
SUMMARY OF SOIL ANALYTICAL RESULTS
HEATING OIL UST EXCAVATION AND SOIL STOCKPILE

Sample[1] Number	Date Sampled	Sampling Location	Depth of Sample (feet)	Field Screening Results[2]		Diesel-range[3] Hydrocarbons (mg/kg)	Heavy Oil-range[3] Hydrocarbons (mg/kg)
				Headspace Vapors (ppm)	Sheen		
HO-1-7	04/06/94	Base beneath fill port	7.0	<100	SS	<11	<46
HO-2-5	04/06/94	North wall	5.0	<100	MS	420	87
HO-3	04/06/94	Stockpile	–	<100	SS	29	<45
MTCA Method A Soil Cleanup Level						200	200

Notes:

[1]Approximate sample locations from excavation limits shown in Figure 4.

[2]Field screening methods are described in Appendix A. SS = slight sheen, MS = moderate sheen.

[3]Analyzed by Ecology Method WTPH-D extended.

ppm = parts per million

mg/kg = milligrams per kilogram

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

Monitoring Well[1]	Date Measured	Depth to Ground Water[2] (feet)	Corrected Ground Water Elevation[3] (feet)
MW-32A	12/29/93	10.73	9.97
	04/07/94	10.65	10.05
	07/14/94	10.72	9.98
	10/25/94	11.46	9.24
MW-33	12/29/93	10.82	9.93
	04/07/94	10.60	10.15
MW-34	12/29/93	11.01	10.41
	04/07/94	10.88	10.54
	07/14/94	10.78	10.64
	10/25/94	11.78	9.64
MW-35	12/29/93	10.23	9.87
	04/07/94	9.91	10.19
	07/14/94	10.13	9.97
	10/25/94	10.87	9.23
MW-36	12/30/93	9.42	8.38
	07/15/94	7.98	9.82
	10/25/94	9.32	8.48
MW-37	12/30/93	10.59[4]	10.74
	04/07/94	10.49[4]	10.59
	07/15/94	Note [5]	--
	10/26/94	Note [5]	--
MW-40	12/30/93	10.68	10.21
	04/07/94	9.35	11.54
	07/15/94	10.68	10.21
	10/26/94	11.22	9.67
MW-41	12/29/93	11.24	15.76
	07/14/94	10.81	16.19
	10/25/94	13.69	13.31
MW-42	12/30/93	9.62	10.70
	04/07/94	9.36	10.96
	07/15/94	9.26	11.06
	10/26/94	9.92	10.40
MW-43	07/14/94	10.70	10.34
	10/26/94	11.34	9.70
MW-44	07/15/94	8.35	10.38
	10/26/94	9.81	8.92

Notes appear on page 2 of 2.

TABLE 2 (Page 2 of 2)

Monitoring Well[1]	Date Measured	Depth to Ground Water[2] (feet)	Corrected Ground Water Elevation[3] (feet)
MW-45	12/29/93	8.79	9.36
	04/07/94	8.22	9.93
	07/14/94	**8.39**	**9.76**
	10/25/94	**9.10**	**9.05**
MW-46	**07/15/94**	**7.15**	**9.76**
	10/25/94	**8.51**	**8.40**
MW-47	12/30/93	9.50	10.33
	04/07/94	10.47	9.36
	07/14/94	**10.51**	**9.32**
	10/25/94	**11.02**	**8.81**
SMW-3	**07/14/94**	**10.35**	--
	10/25/94	**11.52**	--
SMW-4	**07/14/94**	**8.50**	--
	10/25/94	**9.72**	--

Notes:

[1]Approximate locations of monitoring wells are shown in Figures 1 through 3.

[2]Below monitoring well casing rim.

[3]Elevations are measured relative to the city of Seattle datum.

[4]0.40 feet and 0.08 feet of product measured in MW-37 on 12/30/93 and 04/07/94, respectively.

[5]0.25 feet and 0.17 feet of product measured in MW-37 on 07/15/94 and 10/26/94, respectively.

ppm = parts per million

'--' = not measured/not determined

Field procedures are described in Appendix A.

Bold indicates measurements obtained during this reporting period.

TABLE 3 (Page 1 of 3)
SUMMARY OF MONITORING WELL GROUND WATER AND FREE PRODUCT[1]
CHEMICAL ANALYTICAL DATA

Sample Number	Date Sampled	BETX[2] (µg/l) B	E	T	X	Gasoline-range Hydrocarbons[3] (mg/l)	Diesel-range Hydrocarbons[4] (mg/l)	Heavy Oil-range Hydrocarbons[4] (mg/l)	Product Type[5]
MW-2	10/15/93[6,7]	1,300	310	1,700	4,100	50	200	150	G MO
MW-32A	12/29/93	6,300	940	990	1,700	19	2.9	1.3	G
	04/07/94	3,900	490	150	590	11.0	2.1	1.3	
	07/14/94	**5,600**	**530**	**54**	**500**	**9.9**	**1.7**	**1.5**	
	10/25/94	**4,600**	**560**	**2,300**	**2,300**	**19**	**1.1**	**1.0**	
MW-33	12/29/93	560	250	100	1,100	7.2	1.1	<0.75	G
	04/07/94	220	80	1.5	190	3.5	1.0	1.1	
MW-34	10/07/93[8]	1,400	120	480	440	4.2	1.6	0.97	G
	12/29/93	15,000	1,500	11,000	7,000	52	2.2	<0.75	
	04/07/94	4,500	260	930	840	9.8	1.4	<0.75	
	07/14/94	**980**	**210**	**420**	**820**	**5.7**	**1.2**	**<0.75**	
	10/25/94	**6,500**	**680**	**170**	**1,000**	**13**	**4.1**	**1.9**	
MW-35	12/29/93	580	200	40	720	4.2	1.0	<0.75	G
	04/07/94	480	140	51	550	5.3	0.87	<0.75	
	07/14/94	**980**	**150**	**79**	**600**	**8.1**	**0.89**	**<0.75**	
	10/25/94	**360**	**100**	**3.6**	**82**	**2.8**	**1.3**	**1.2**	
MW-36	12/30/93	0.7	<0.5	<0.5	<0.5	<0.1	0.37	0.94	–
	07/15/94	**0.7**	**<0.5**	**<0.5**	**<0.5**	**<0.1**	**0.41**	**0.96**	
	10/25/94	**1.2**	**<0.5**	**<0.5**	**<1.0**	**<0.05**	**0.67**	**1.3**	
MW-37	10/07/93[6,7,9,10]	7,500[11]	28,000[11]	69,000[11]	170,000[11]	2,000,000[11]	82,000[11]	<94,000[11,12]	G
	01/06/94[6,9,10]	6,200[11]	27,000[11]	63,000[11]	150,000[11]	1,600,000[11]	90,000[11]	14,000[11]	
	04/07/94[6,10]	660	1,500	3,600	9,500	92.0	18	<0.75	
	07/15/94[6,10]	**18,000**	**7,700**	**44,000**	**44,000**	**330**	**1,700**	**260**	
	10/26/94[6,10]	**14,000**	**4,400**	**30,000**	**26,000**	**170**	**35**	**7.5**	
MTCA Method A Ground Water Cleanup Levels		5	30	40	20	1.0[13]			

Notes appear on page 3 of 3.

TABLE 3 (Page 2 of 3)

Sample Number	Date Sampled	BETX[2] (µg/l) B	E	T	X	Gasoline-range Hydrocarbons[3] (mg/l)	Diesel-range Hydrocarbons[4] (mg/l)	Heavy Oil-range Hydrocarbons[4] (mg/l)	Product Type[5]
MW-40	10/07/93[14]	36	2.1	1.8	5.3	0.93	1.8	1.9	aG MO
	12/30/93	34	11	1.1	7.4	1.5	5.4	4.2	
	04/07/94	29	6.9	1.1	2.6	1.2	2.2	2.0	
	07/15/94	27	1.2	0.8	1.7	1.0	2.1	2.5	
	10/26/94	20	0.77	0.53	2.0	1.2	2.9	2.6	
MW-41	12/29/93	4.6	<0.5	<0.5	<0.5	<0.1	<0.25	<0.75	–
	07/14/94	10	<0.5	<0.5	<0.5	<0.1	<0.25	<0.75	
	10/25/94	<0.5	<0.5	<0.5	<1.0	<0.05	0.50	<0.75	
MW-42	12/30/93	570	<0.5	0.5	0.7	<0.1	1.3	2.4	G MO
	04/07/94	620	<1.0	<1.0	<1.0	<0.2	0.84	1.1	
	07/15/94	490	<0.5	0.6	0.5	<0.1	0.54	0.85	
	10/26/94	530	<0.5	0.55	<1.0	0.092	1.3	2.5	
MW-43	12/30/93	82	11	0.5	100	0.34	0.32	<0.75	G
	07/14/94	31	4.6	<0.5	74	0.36	<0.25	<0.75	
	10/26/94	9.1	<0.5	<0.5	<1.0	0.16	0.58	<0.75	
MW-44	07/15/94	<0.5	<0.5	<0.5	<0.5	<0.1	<0.25	<0.75	–
	10/26/94	<0.5	<0.5	<0.5	<1.0	<0.05	0.28	<0.75	
MW-45	12/29/93	2,900	680	760	3,000	11	1.1	0.86	G
	04/07/94	2,500	580	620	2,500	16.0	0.83	<0.75	
	07/14/94	4,000	870	750	3,600	25	0.85	1.1	
	10/25/94	2,600	920	230	3,000	19	1.0	<0.75	
MW-46	07/15/94	<0.5	<0.5	<0.5	<0.5	<0.1	0.27	1.2	–
	10/25/94	<0.5	<0.5	<0.5	<1.0	<0.05	1.5	7.3	
MW-47	12/30/93	2.0	<0.5	<0.5	1.0	<0.1	0.31	<0.75	–
	04/07/94	2.5	<0.5	<0.5	<0.5	<0.1	0.30	<0.75	
	07/14/94	1.6	<0.5	<0.5	<0.5	<0.1	0.29	<0.75	
	10/25/94	1.8	<0.5	<0.5	<1.0	0.051	0.27	<0.75	
SMW-3	07/14/94	<0.5	<0.5	<0.5	<0.5	<0.1	<0.25	<0.75	–
	10/25/94	<0.5	<0.5	<0.5	<1.0	<0.05	0.32	<0.75	
MTCA Method A Ground Water Cleanup Levels		5	30	40	20	1.0[12]			

Notes appear on page 3 of 3.

TABLE 3 (Page 3 of 3)

Sample Number	Date Sampled	BETX[2] (µg/l) B	E	T	X	Gasoline-range Hydrocarbons[3] (mg/l)	Diesel-range Hydrocarbons[4] (mg/l)	Heavy Oil-range Hydrocarbons[4] (mg/l)	Product Type[5]
SMW-4	07/14/94	9,400	1,800	72	4,400	30	4.0	1.8	–
	10/25/94	8,500	1,700	64	4,500	29	5.3	1.2	
MTCA Method A Ground Water Cleanup Levels		5	30	40	20	1.0[12]			

Notes:

[1]All samples are ground water unless otherwise noted. Chemical analysis by North Creek Analytical during October 1994 (ATI prior to October 1994).

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

[3]Analyzed by Ecology Method WTPH-G.

[4]Analyzed by Ecology Method WTPH-D extended.

[5]Evaluated by inspection of chromatogram by EcoChem, as described in our "Report of Geoenvironmental Services" dated June 10, 1994. G = gasoline, aG = aged gasoline, S = Stoddard solvent, D = diesel, MO = motor oil.

[6]Sample consisted of a product-ground water mixture.

[7]Sample also was analyzed for HVOCs (halogenated volatile organic compounds) by EPA Method 8010. HVOCs were not detected.

[8]Sample also was analyzed for total and dissolved (field filtered) lead by EPA Method 7421. Total and dissolved lead were detected at concentrations of 0.067 and 0.0078 mg/l, respectively.

[9]Sample consisted of free product. Sample also was analyzed for total lead by EPA Method 7421. Total lead was detected at a concentration of 180 mg/kg.

[10]Contaminant concentrations vary widely depending on the proportion of ground water to free product in the sample. Results should be considered qualitative.

[11]Concentrations are in units of mg/kg.

[12]Laboratory detection level exceeds the MTCA Method A cleanup level.

[13]The MTCA Method A ground water cleanup level for the sum of gasoline-, diesel- and heavy oil-range hydrocarbons is 1.0 mg/l if the carbon ranges are distinctly quantified using gas chromatography methods.

[14]Sample also was analyzed for total and dissolved (field filtered) lead by EPA Method 7421. Total lead was detected at a concentration of 0.054 mg/l. Dissolved lead was not detected.

µg/l = micrograms per liter

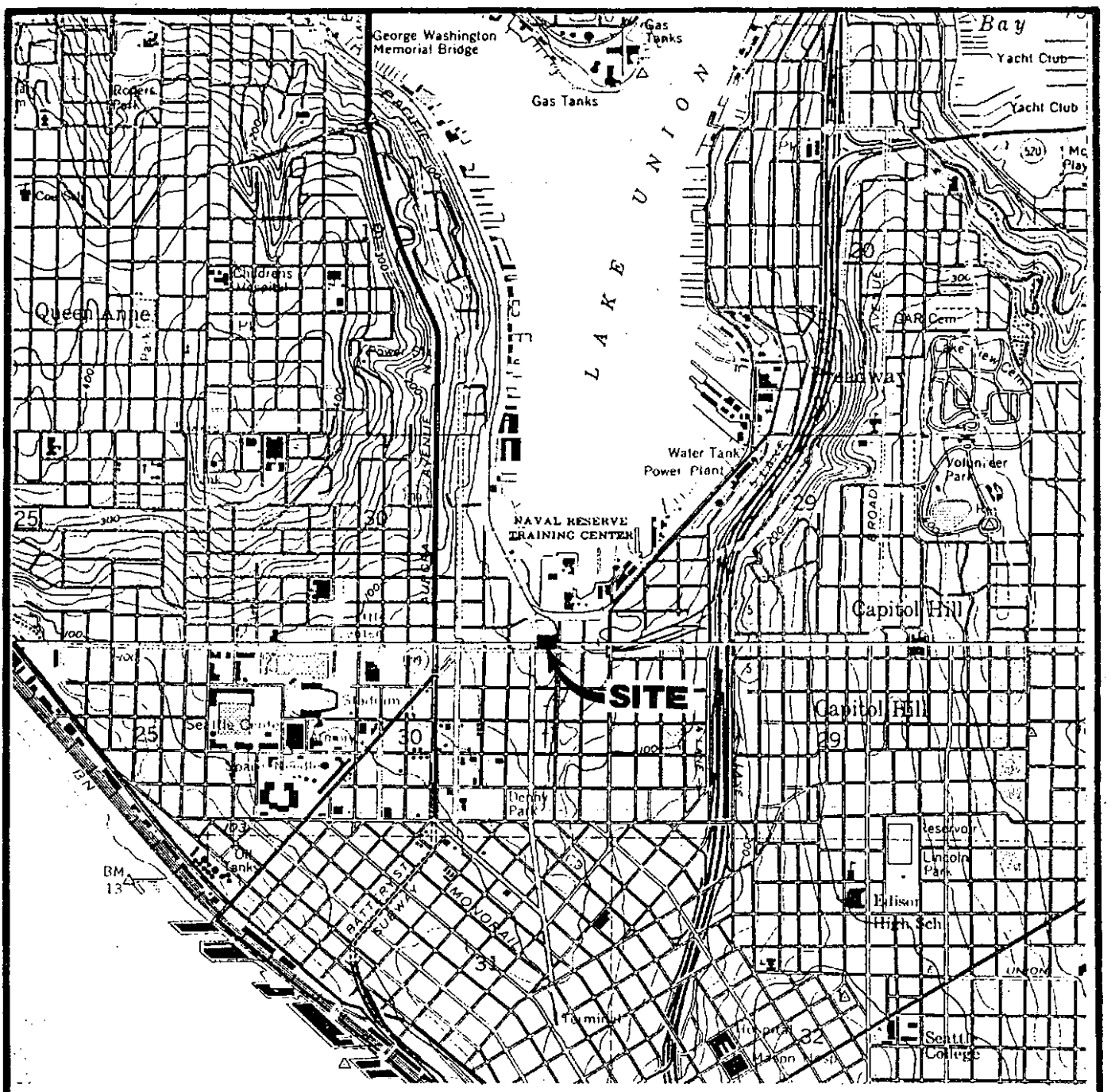
mg/l = milligrams per liter

"–" = not applicable/not determined

Bold indicates data obtained during this reporting period.

Shading indicates concentration exceeding the MTCA Method A ground water cleanup level.

Document ID: 161013G2.WK1



REFERENCE: USGS TOPOGRAPHIC QUADRANGLE MAPS "SEATTLE NORTH, WASH.," PHOTOREVISED 1968 AND "SEATTLE SOUTH, WASH.," PHOTOREVISED 1973.

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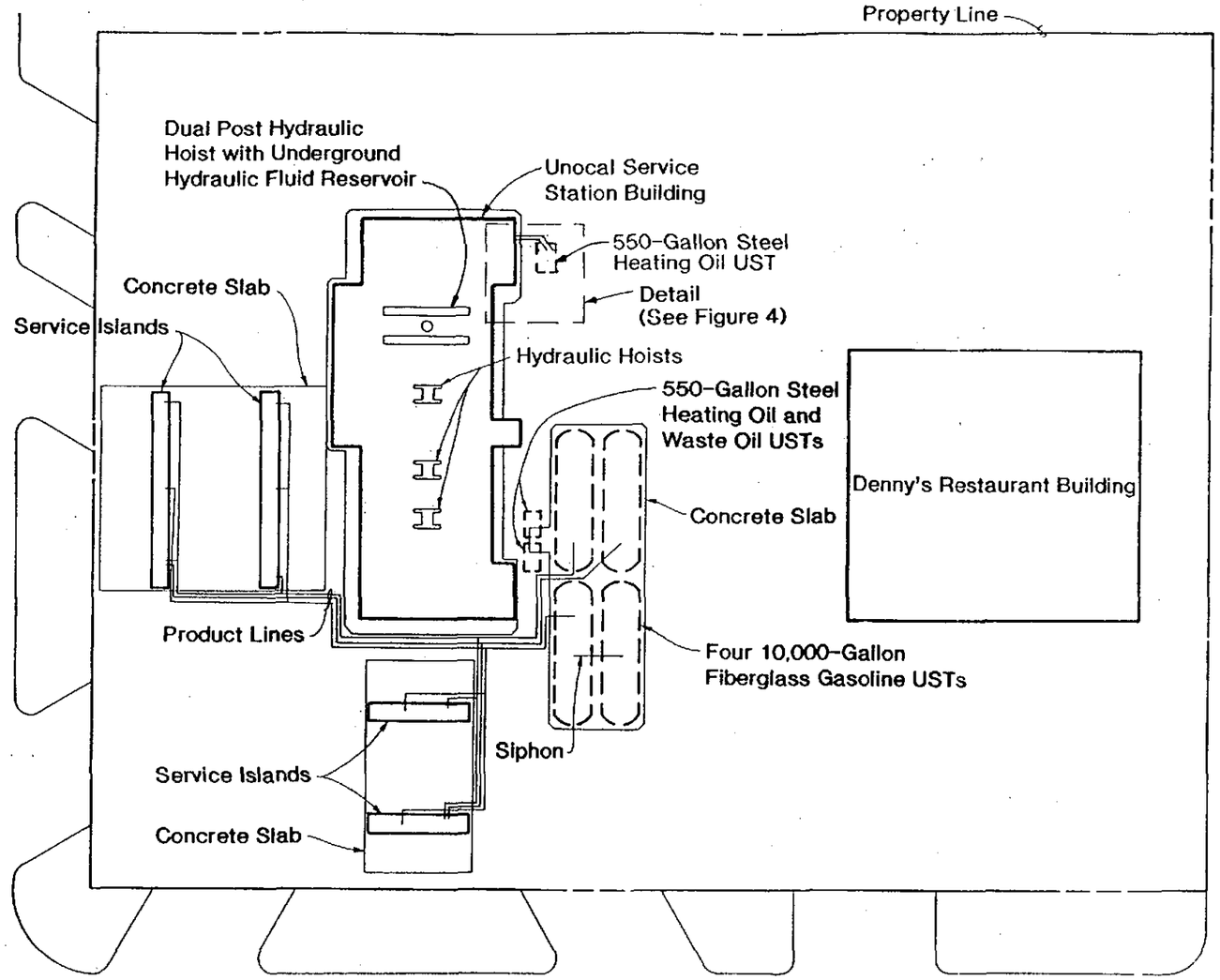
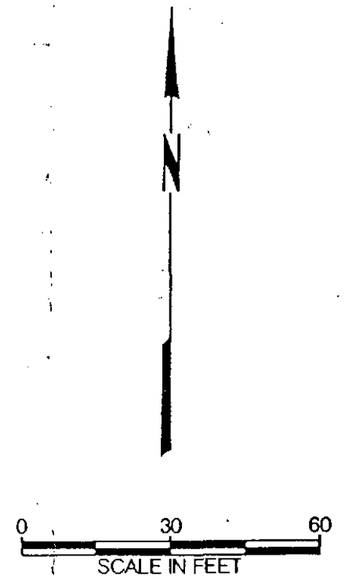
VICINITY MAP

FIGURE 1

0161-013-R04 AMA:KKT 2-13-92





EXPLANATION:

UST UNDERGROUND STORAGE TANK

REFERENCE: DRAWINGS ENTITLED "GENERAL ARRANGEMENT, SERVICE STATION 5353, WESTLAKE AVE. & MERCER ST., SEATTLE WASHINGTON," DATED 03/05/65; AND "TANK & PIPELINE REPLACEMENT PROJECT, SERVICE STATION 5353, WESTLAKE AVE. & MERCER ST., SEATTLE, WASHINGTON," DATED 06/18/80, BOTH BY UNION OIL COMPANY OF CALIFORNIA.

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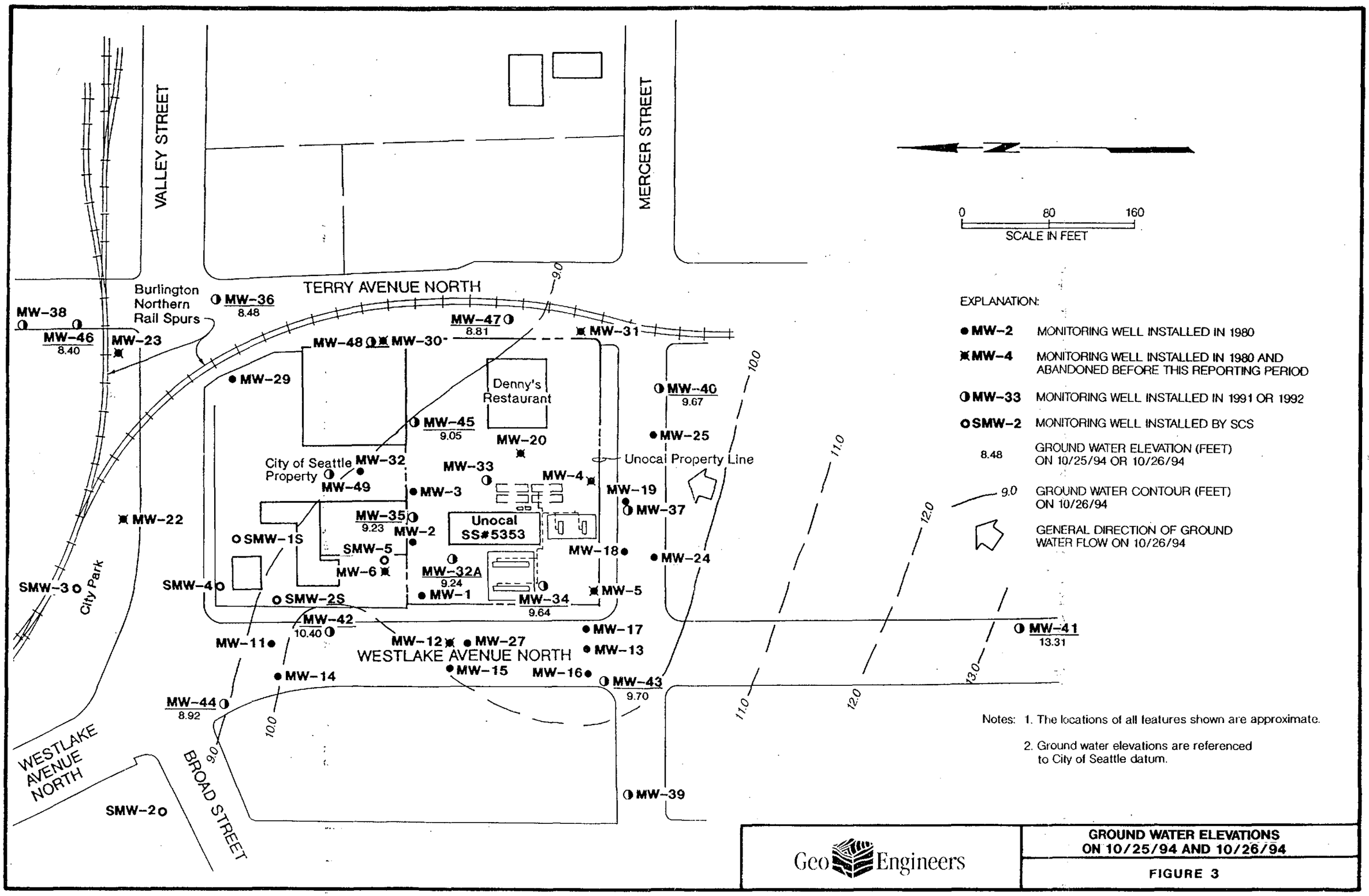
SITE PLAN

FIGURE 2

0161-013-R69 MLP:BDH 12.9.91(8)



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

2. Ground water elevations are referenced to City of Seattle datum.

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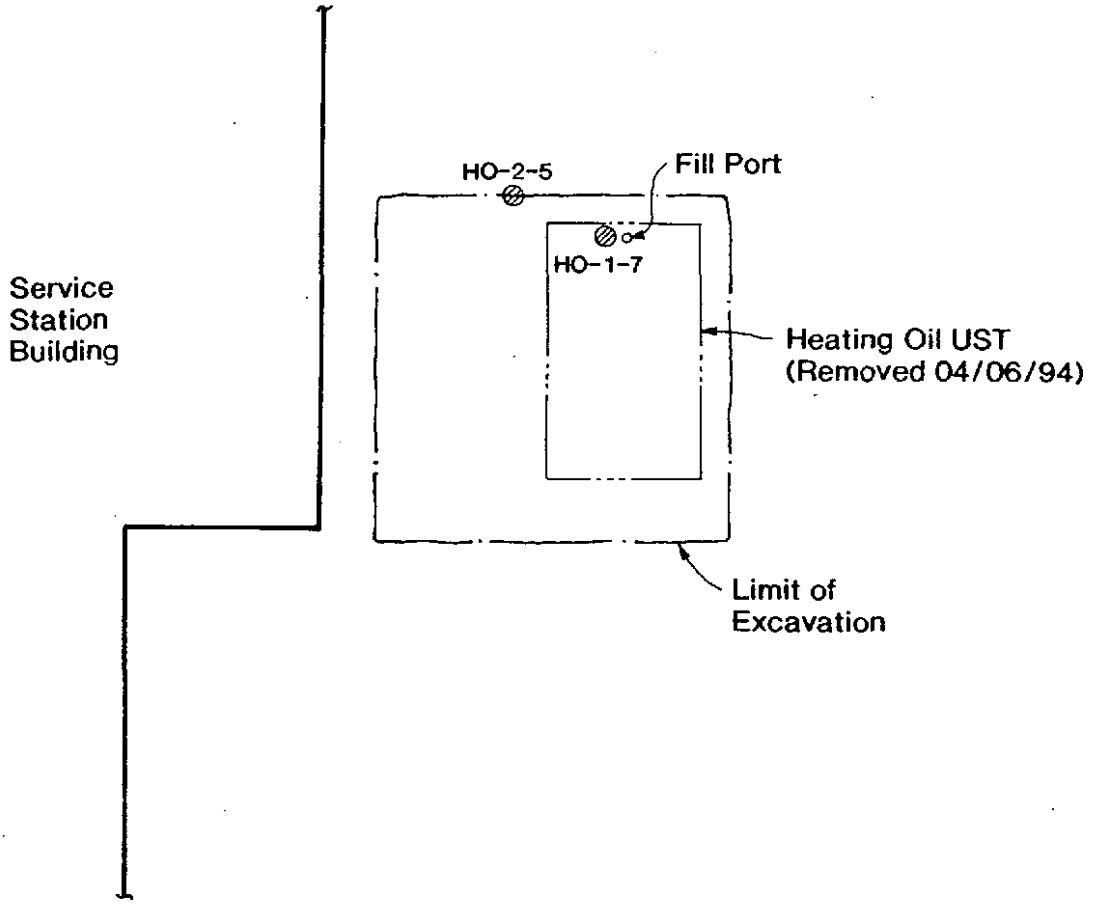
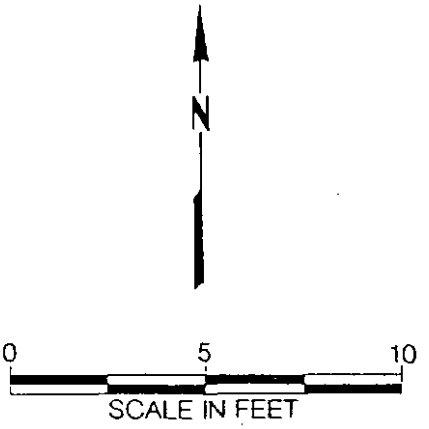
GROUND WATER ELEVATIONS ON 10/25/94 AND 10/26/94

FIGURE 3



EXPLANATION:

⊘ HO-2-5	SOIL SAMPLE
UST	UNDERGROUND STORAGE TANK



0161-013-R69 LTB:BDH 5/19/94

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DETAIL

FIGURE 4

MW-46	B	G	D	O
07/15/94	<0.5	<0.1	0.27	1.2
10/25/94	<0.5	<0.05	1.5	7.3
MTCA	5.0	1.0		

MW-45	B	G	D	O
04/07/94	2,500	16.0	0.83	<0.75
07/14/94	4,000	25	0.85	1.1
10/25/94	2,600	19	1.0	<0.75
MTCA	5.0	1.0		

MW-38	B	G	D	O
07/15/94	0.7	<0.1	0.41	0.96
10/25/94	1.2	<0.05	0.67	1.3
MTCA	5.0	1.0		

MW-47	B	G	D	O
04/07/94	2.5	<0.1	0.30	<0.75
07/14/94	1.6	<0.1	0.29	<0.75
10/25/94	1.8	0.051	0.27	<0.75
MTCA	5.0	1.0		

MW-33	B	G	D	O
04/07/94	220	3.5	1.0	1.1
MTCA	5.0	1.0		

MW-40	B	G	D	O
04/07/94	29	1.2	2.2	2.0
07/15/94	27	1.0	2.1	2.5
10/26/94	20	1.2	2.9	2.6
MTCA	5.0	1.0		

MW-2	B	G	D	O
10/15/93	1,300	50	200	150
MTCA	5.0	1.0		

MW-35	B	G	D	O
04/07/94	480	5.3	0.87	<0.75
07/14/94	980	8.1	0.89	<0.75
10/25/94	360	2.8	1.3	1.2
MTCA	5.0	1.0		

MW-32A	B	G	D	O
04/07/94	3,900	11.0	2.1	1.3
07/14/94	5,600	9.9	1.7	1.5
10/25/94	4,600	19	1.1	1.0
MTCA	5.0	1.0		

MW-37	B	G	D	O
04/07/94	660	92.0	18	<0.75
07/15/94	18,000	330	1,700	260
10/26/94	14,000	170	35	7.5
MTCA	5.0	1.0		

SMW-3	B	G	D	O
07/14/94	<0.5	<0.1	<0.25	<0.75
10/25/94	<0.5	<0.05	0.32	<0.75
MTCA	5.0	1.0		

MW-34	B	G	D	O
04/07/94	4,500	9.8	1.4	<0.75
07/14/94	980	5.7	1.2	<0.75
10/25/94	6,500	13	4.1	1.9
MTCA	5.0	1.0		

MW-41	B	G	D	O
07/14/94	10	<0.1	<0.25	<0.75
10/25/94	<0.5	<0.05	0.50	<0.75
MTCA	5.0	1.0		

SMW-4	B	G	D	O
07/14/94	9,400	30	4.0	1.8
10/25/94	8,500	29	5.3	1.2
MTCA	5.0	1.0		

MW-43	B	G	D	O
07/14/94	31	0.36	<0.25	<0.75
10/26/94	9.1	0.18	0.58	<0.75
MTCA	5.0	1.0		

MW-42	B	G	D	O
04/07/94	620	<0.2	0.84	1.1
07/15/94	490	<0.1	0.54	0.85
10/26/94	530	0.092	1.3	2.5
MTCA	5.0	1.0		

MW-44	B	G	D	O
07/15/94	<0.5	<0.1	<0.25	<0.75
10/26/94	<0.5	<0.05	0.28	<0.75
MTCA	5.0	1.0		

VALLEY STREET

MERCER STREET

TERRY AVENUE NORTH

WESTLAKE AVENUE NORTH

BROAD STREET

WESTLAKE AVENUE NORTH

MW-38 ◐

MW-48

● MW-29

MW-49 ◐

MW-32 ◐ MW-3 ●

MW-10 ●

MW-18 ●

MW-24

⊗SMW-1S

⊗ SMW-2S

⊗ SMW-5

● MW-1

MW-11 ◐

MW-27 ●

MW-17 ●

MW-13 ●

MW-14 ●

MW-15 ●

MW-16 ●

SMW-2 ⊗

MW-39 ◑

N

0 80 160

SCALE IN FEET

EXPLANATION:

MW-2 ● MONITORING WELL INSTALLED IN 1980

MW-33 ◑ MONITORING WELL INSTALLED IN 1991 OR 1992

SMW-2S ⊗ MONITORING WELL INSTALLED BY SCS

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 LEVEL

Geo Engineers

SUMMARY OF GROUND WATER ANALYTICAL DATA

FIGURE 5

NLP:BDH:DDW 0161013A.DWG 0161013R69:030995

APPENDIX A

APPENDIX A

FIELD EXPLORATIONS

SOIL SAMPLING PROCEDURES

Discrete soil samples were obtained from the heating oil UST excavation using a backhoe bucket. The soil samples retrieved with the backhoe were obtained from the central portion of the backhoe bucket using a steel trowel. A three-point composite soil sample was obtained from the soil stockpile using a steel trowel. The trowel was decontaminated before each sampling attempt with a Liquinox solution wash and a distilled water rinse.

Each soil sample obtained was separated into two portions. The first portion was field screened for petroleum hydrocarbons. The second portion was placed in a laboratory jar, filled completely to eliminate headspace, then kept cold for transport to the analytical laboratory if selected for chemical analysis. Chain-of-custody procedures were followed.

FIELD SCREENING OF SOIL SAMPLES

A GeoEngineers representative field screened soil samples obtained from the excavation. Field screening results are used as a general guideline to delineate areas of possible petroleum-related contamination. In addition, screening results are used to aid in the selection of soil samples for chemical analysis. The screening methods used include (1) visual screening, (2) water sheen screening, and (3) headspace vapor screening using a Bacharach TLV Sniffer.

Visual screening consists of inspecting the soil for stains indicative of petroleum-related contamination. Visual screening is generally more effective when contamination is related to heavy petroleum hydrocarbons such as motor oil, or when hydrocarbon concentrations are high. Water sheen screening and headspace vapor screening are more sensitive methods that have been effective in detecting contamination at concentrations less than regulatory cleanup guidelines. However, field screening results are site-specific. The effectiveness of field screening results will vary with temperature, moisture content, organic content, soil type, and type and age of contaminant. The presence or absence of a sheen or headspace vapors does not necessarily indicate the presence or absence of petroleum hydrocarbons.

Water sheen screening involves placing soil in water and observing the water surface for signs of sheen. Sheen screening may detect both volatile and nonvolatile petroleum hydrocarbons. Sheen classifications are as follows:

No Sheen (NS)	No visible sheen on water surface.
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly. Natural organic matter in the soil may produce a slight sheen.

Moderate Sheen (MS) Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on water surface.

Heavy Sheen (HS) Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen.

Headspace vapor screening involves placing a soil sample in a plastic sample bag. Air is captured in the bag, and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a Bacharach TLV Sniffer is inserted in the bag, and the TLV Sniffer measures the concentration of combustible vapors present within the sample bag headspace. Headspace vapor screening targets volatile petroleum hydrocarbon compounds. The TLV Sniffer measures combustible vapor concentrations in ppm (parts per million) and is calibrated to hexane. The TLV Sniffer is designed to quantify combustible gas concentrations in the 100 to 10,000 ppm in this application.

Field screening results are site-specific. The results may vary with temperature, moisture content, soil lithology, organic content and type of contaminant.

MONITORING WELL MEASUREMENTS AND SAMPLING

GROUND WATER ELEVATIONS

Depths to the ground water table relative to the monitoring well casing rims and thicknesses of free product, where present, were measured on the dates indicated in Table 2. The water level measurements were made using an electric water level indicator. Product thickness was measured with a transparent disposable bailer. The electric water level indicator was cleaned with a Liquinox (phosphate-free detergent) solution wash and a distilled water rinse prior to use in each well. Ground water elevations were calculated by subtracting the water table depths from the casing rim elevations.

GROUND WATER SAMPLING

Ground water samples were obtained from monitoring wells MW-32A, MW-34 through MW-36, MW-40 through MW-47, SMW-3 and SMW-4 on July 14 or 15, 1994. We obtained ground water samples from monitoring wells MW-32A, MW-34 through MW-37, MW-40 through MW-47, SMW-3 and SMW-4 on October 25 or 26, 1994. The samples were obtained with a new disposable bailer and clean bailing rope after at least three well volumes of water were removed from each well casing. The samples were transferred in the field to laboratory-prepared sample containers and were kept cold during transport to the testing laboratory. Chain-of-custody procedures were followed during transport of the samples to the testing laboratory. The laboratory data sheets and chain-of-custody records are provided in Appendix B.

PRODUCT SAMPLING

We obtained a sample of ground water-product mixture from monitoring well MW-37 on July 15, 1994. The ground water-product sample was obtained with a new disposable bailer and clean bailing rope from the well casing. This sample was a "grab" sample, as the well was not purged prior to sampling. The product-water sample was transferred in the field to laboratory-prepared sample containers. Chain-of-custody procedures were followed in transporting the samples to the testing laboratory. The laboratory data sheets and chain-of-custody records are provided in Appendix B.

APPENDIX B

APPENDIX 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 appendix. 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: "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

Based on our data quality review, it is our opinion that the analytical data are of acceptable quality for their intended use except for the following:

EPA Method 8020:	BETX results for sample MW-40 (October 1994) should be considered estimated because of surrogate recovery exceptions.
WTPH-G:	Gasoline-range hydrocarbon results for sample MW-40 (October 1994) should be considered estimated because of surrogate recovery exceptions.
WTPH-D:	Diesel- and extended diesel-range hydrocarbon results for samples MW-37 and MW-41 (July 1994) should be considered estimated because of surrogate recovery exceptions.

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

ATI I.D. # 9404-058

April 20, 1994

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

Attention : Norm Puri

Project Number : 0161-013-R69

Project Name : Unocal #5353 - Seattle

Dear Mr. Puri:

On April 7, 1994, Analytical Technologies, Inc. (ATI), received three 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 the fuels analyses. If you have any questions, please call.

Sincerely,

Elaine M. Walker

Elaine M. Walker
Project Manager

EMW/hal/ff

Enclosure

Analytical Technologies, Inc.

ATI I.D. # 9404-058

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-013-R69
PROJECT NAME : UNOCAL #5353 - SEATTLE

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9404-058-1	HO-1-7	04/06/94	SOIL
9404-058-2	HO-2-5	04/06/94	SOIL
9404-058-3	HO-3	04/06/94	SOIL

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	3

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. # 9404-058

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-013-R69
PROJECT NAME : UNOCAL #5353 - SEATTLE

ANALYSIS	TECHNIQUE	REFERENCE	LAB
TOTAL PETROLEUM HYDROCARBONS	GC/FID	WA DOE WTPH-D	R
MOISTURE	GRAVIMETRIC	CLP SOW ILM01.0	R

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

Analytical Technologies, Inc.

ATI I.D. # 9404-058

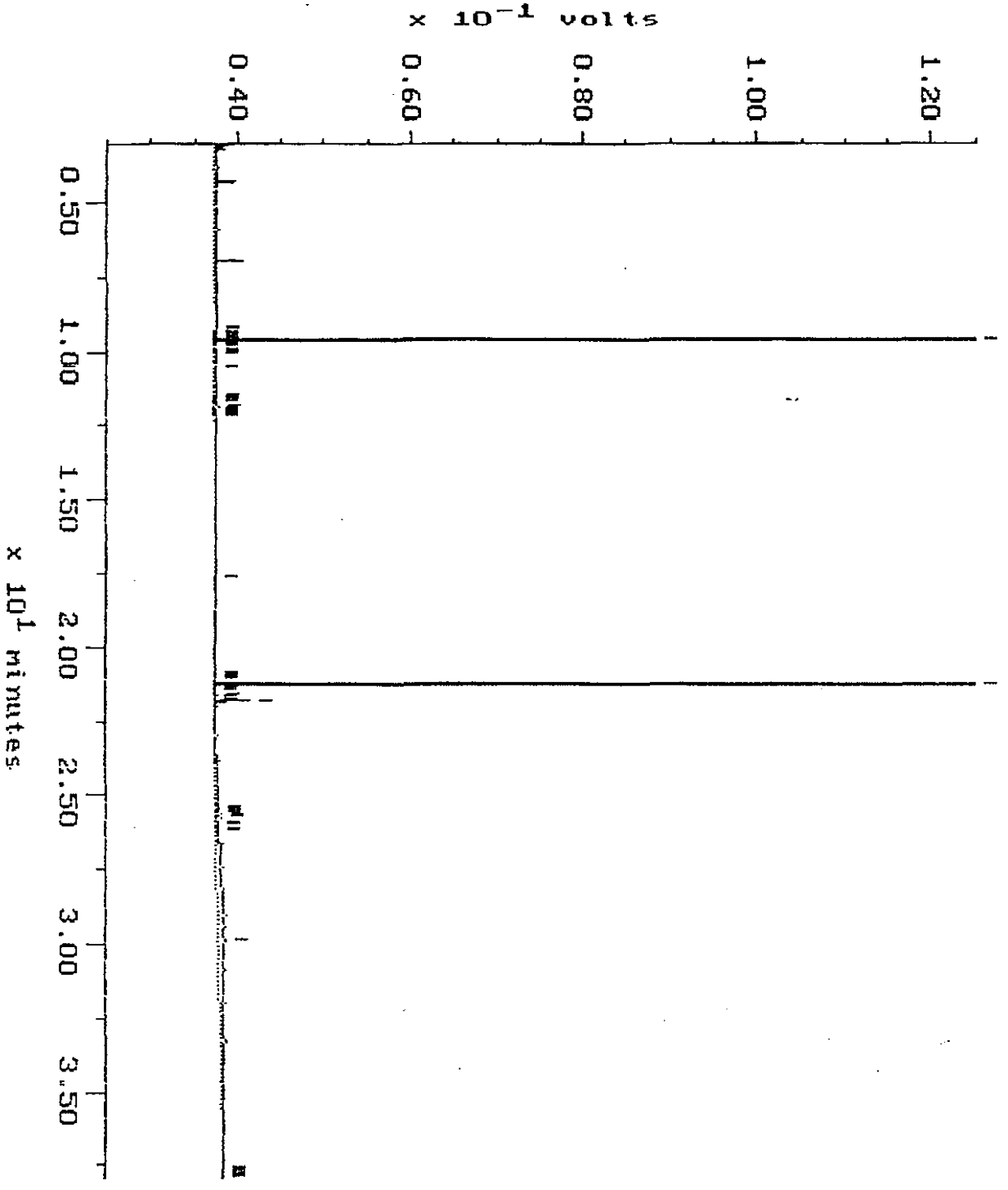
GENERAL CHEMISTRY ANALYSIS

CLIENT : GEOENGINEERS, INC. MATRIX : SOIL
PROJECT # : 0161-013-R69
PROJECT NAME : UNOCAL #5353 - SEATTLE

PARAMETER	DATE ANALYZED
MOISTURE	04/14/94

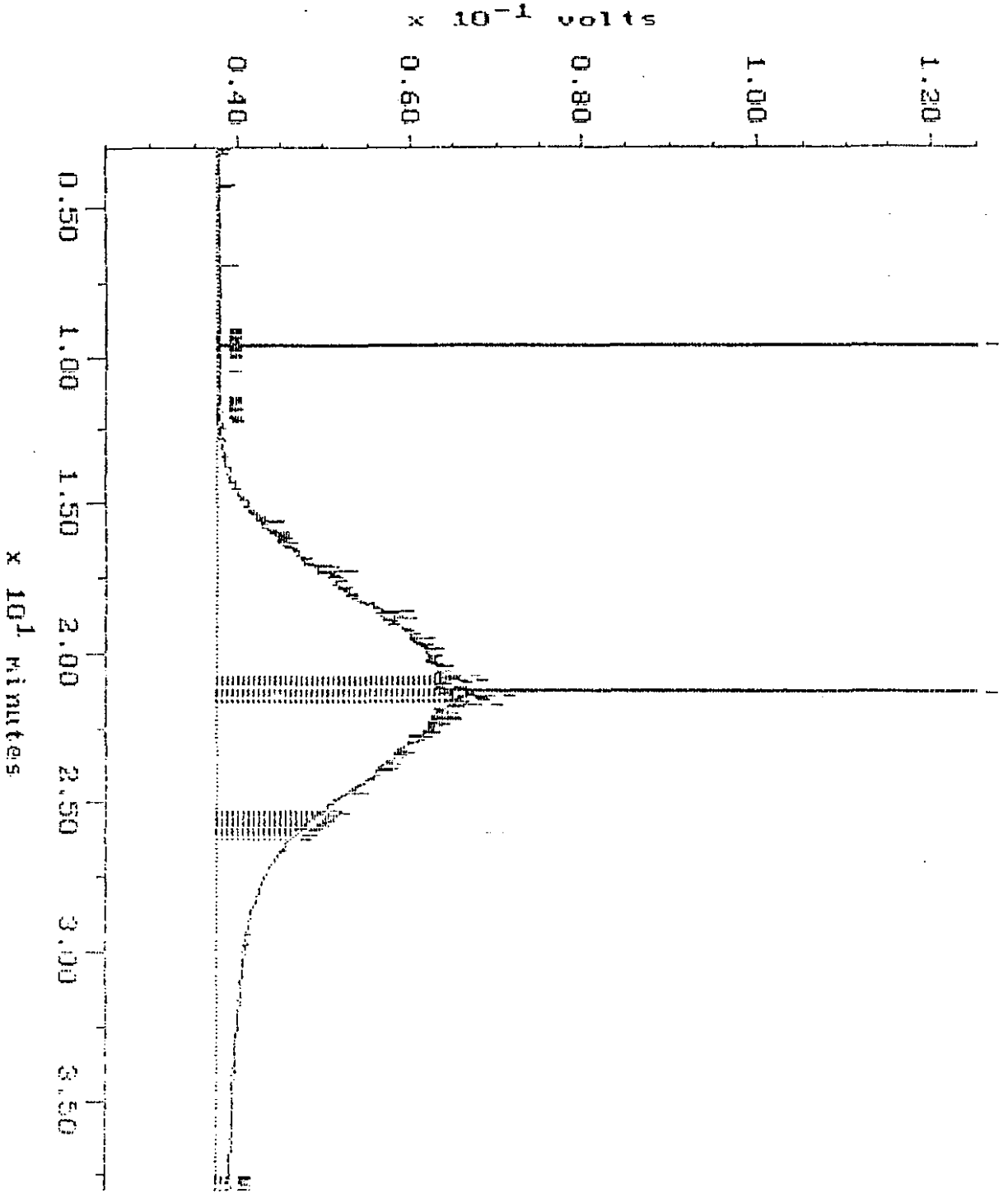
WA DOE WTPH-D

Sample: 9404-058-1 Channel: DEMITRI Filename: R4128D01
Acquired: 12-APR-94 17:00 Method: F:\BRO2\MAXDATA\SERGE-D\FUEL0412 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



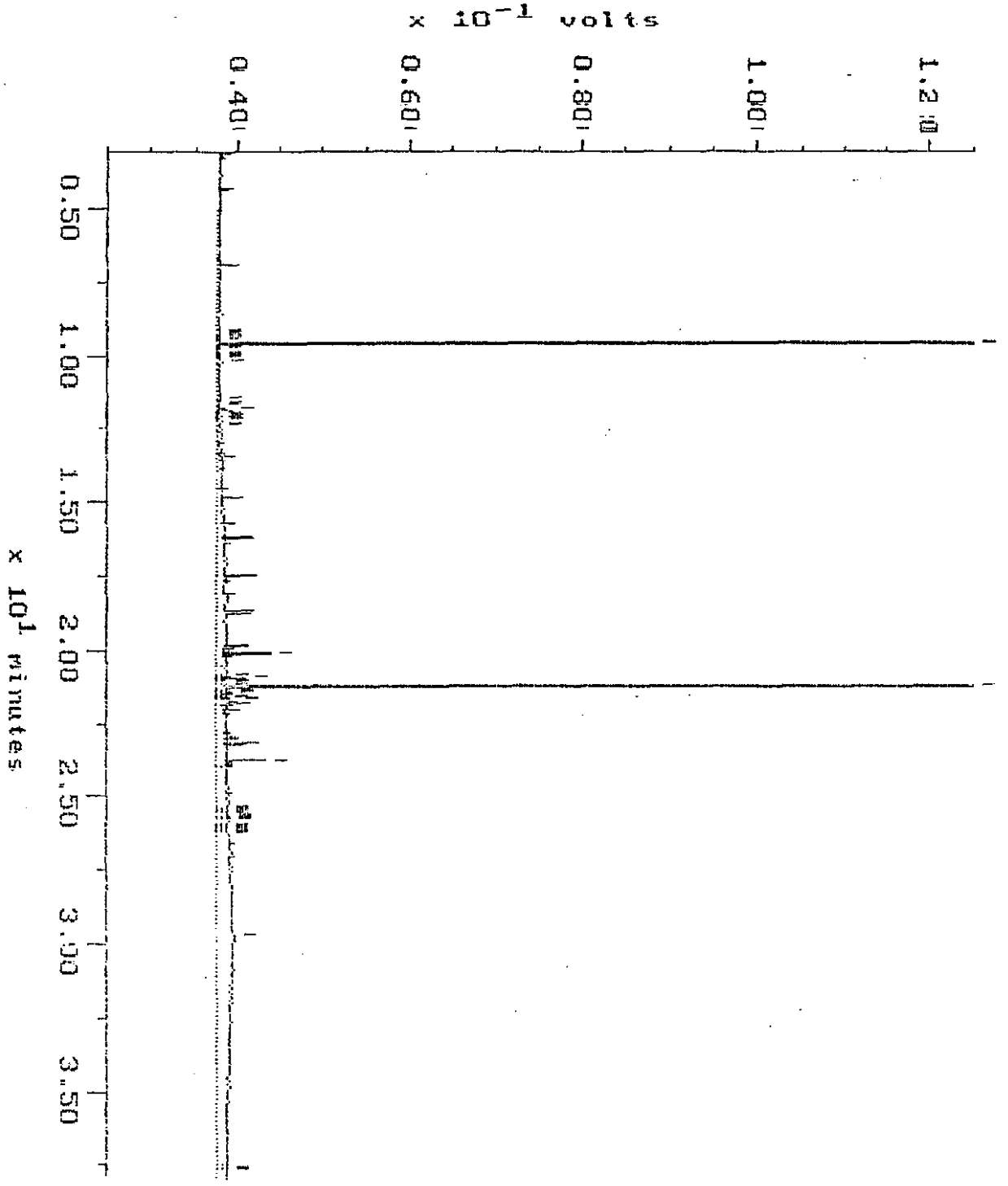
WA DOE WTPH-D

Sample: 9404-056-E Channel: DEMITRI Filename: R4116D05
Acquired: 11-APR-94 21:25 Method: F:\BRD2\MAXDATA\SERIES-D\FUEL041 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY

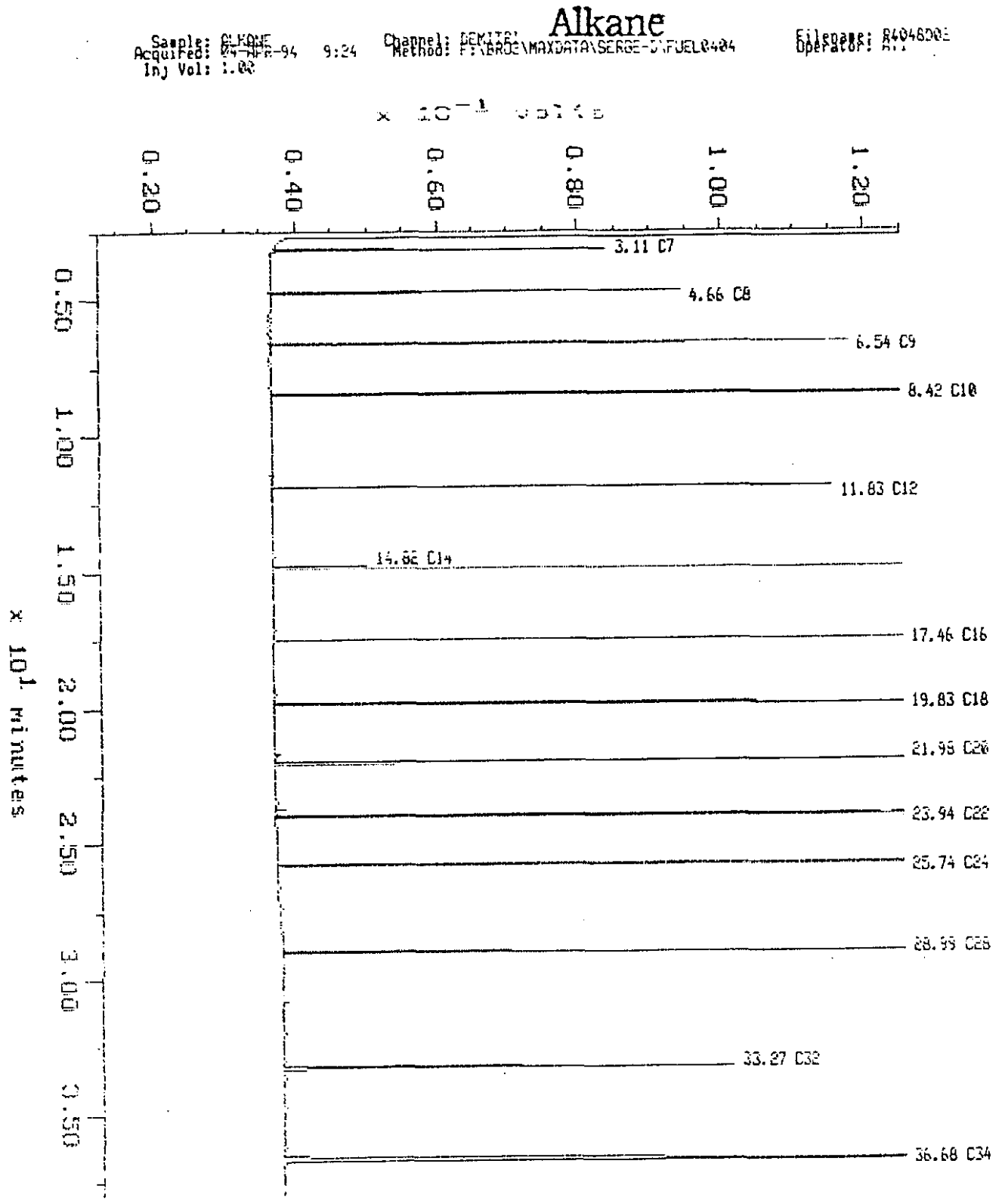


WA DOE WTPH-D

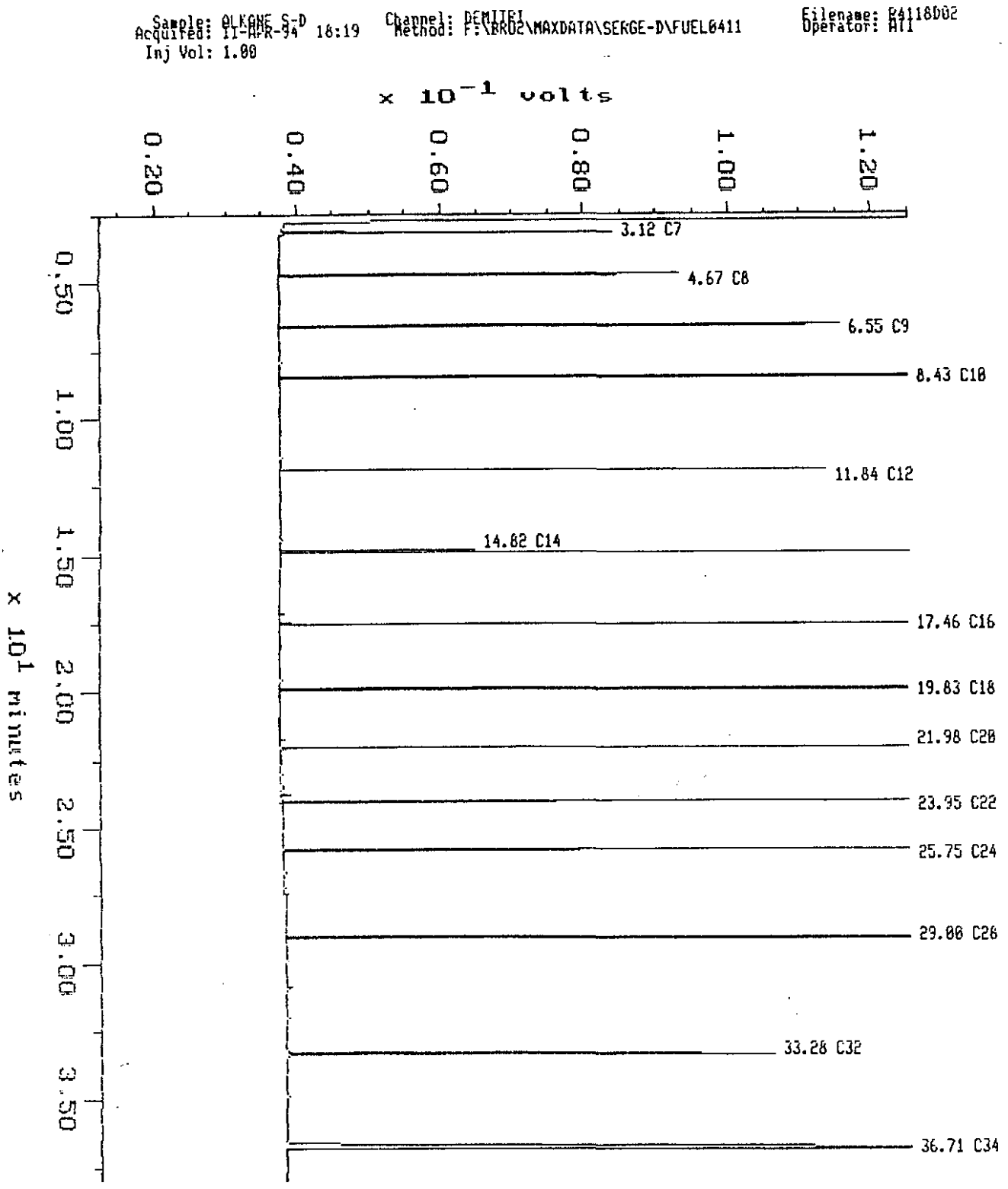
Sample: 9404-058-3 Channel: DEMITRI Filename: R4118D07
Acquired: 11-APR-94 22:11 Method: F:\BRO2\MAXDATA\SERGE-D\FUEL0411 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



Alkane


Sample: C1KONE
Acquired: 24-APR-94 9:24
Inj Vol: 1.00
Channel: DEMITRI
Method: F:\BRUCE\MAXDATA\SERGE-D\FUEL0404
Filename: R4048003
Operator: RTI
x 10⁻¹ volts
0.20
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
3.11 C7
4.66 C8
6.54 C9
8.42 C10
11.83 C12
14.86 C14
17.46 C16
19.83 C18
21.95 C20
23.94 C22
25.74 C24
28.99 C28
33.27 C32
36.68 C34

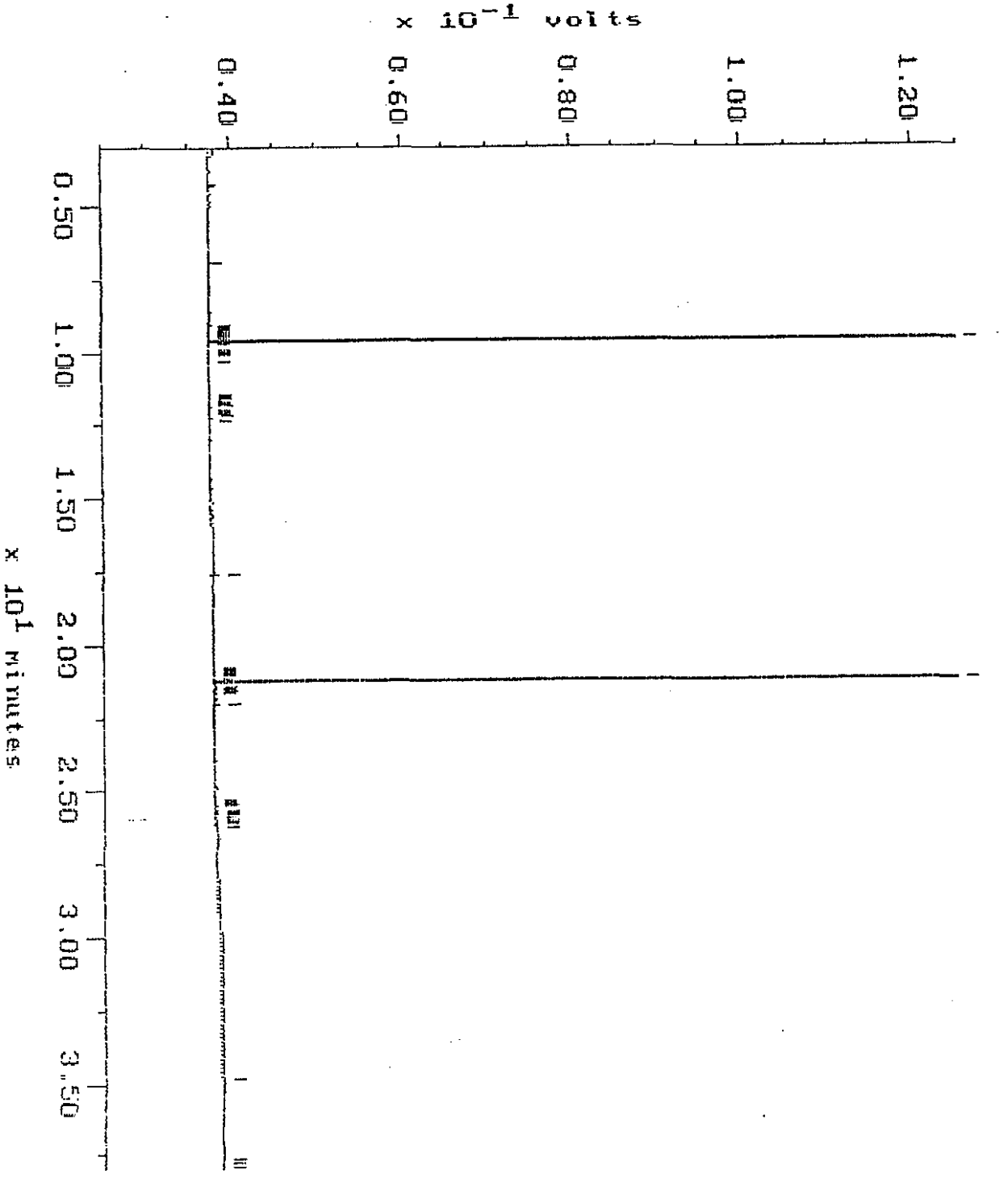
Alkane


Sample: ALKANE S-D
Acquired: 11-APR-94 18:19
Inj Vol: 1.00
Channel: DEMITEI
Method: F:\BRD2\MAXDATA\SERGE-D\FUEL0411
Filename: R4118D02
Operator: ATI
x 10⁻¹ volts
0.20
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
3.12 C7
4.67 C8
6.55 C9
8.43 C10
11.84 C12
14.82 C14
17.46 C16
19.83 C18
21.98 C20
23.95 C22
25.75 C24
29.00 C26
33.28 C32
36.71 C34

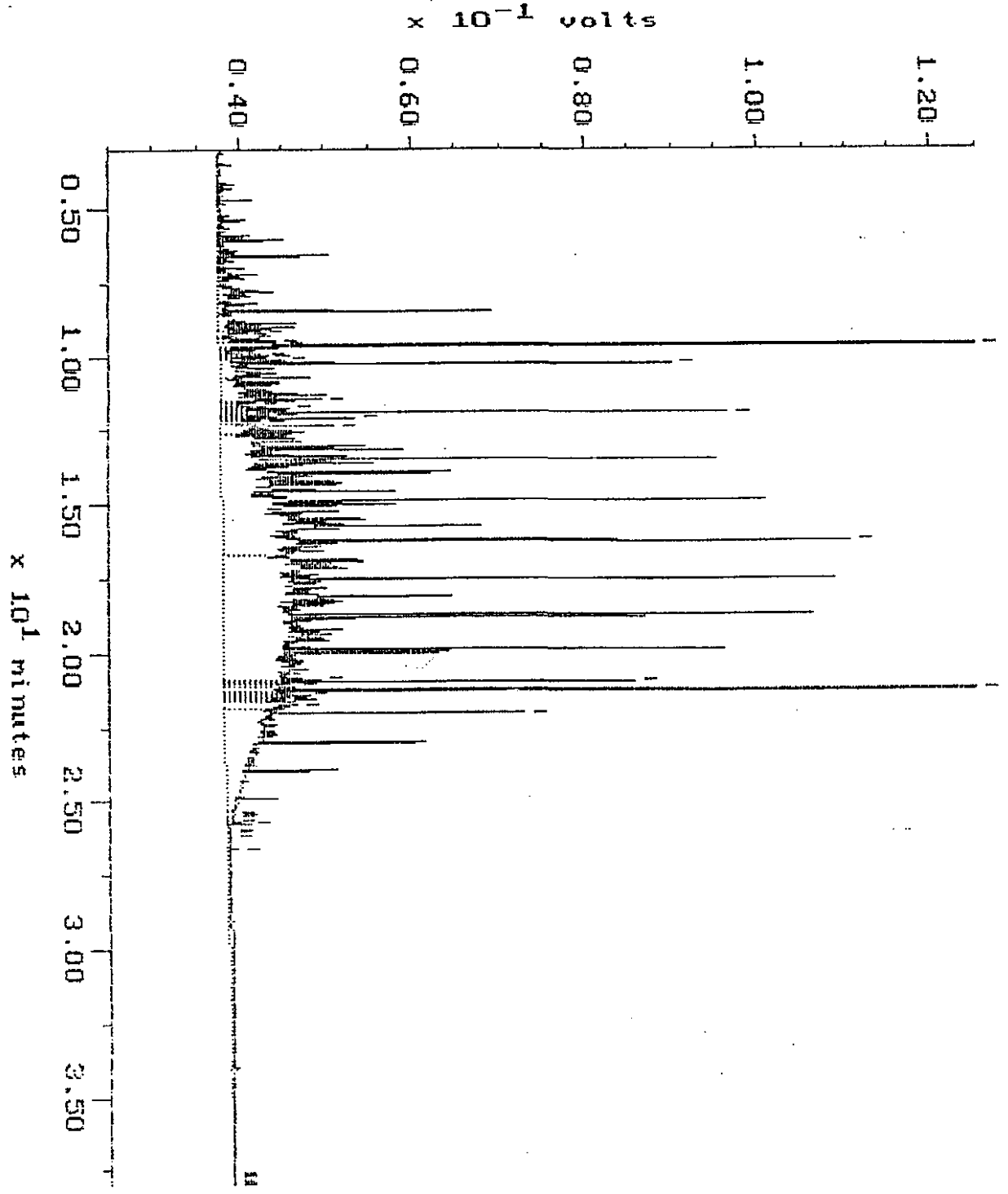
WA DOE WTPH-D

Blank

Sample: SRB 04-07 Channel: DEMITRI Filename: R4108D05
Acquired: 10-APR-94 20:51 Method: F:\BRO2\MAXDATA\SERGE-D\FUEL0410 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY

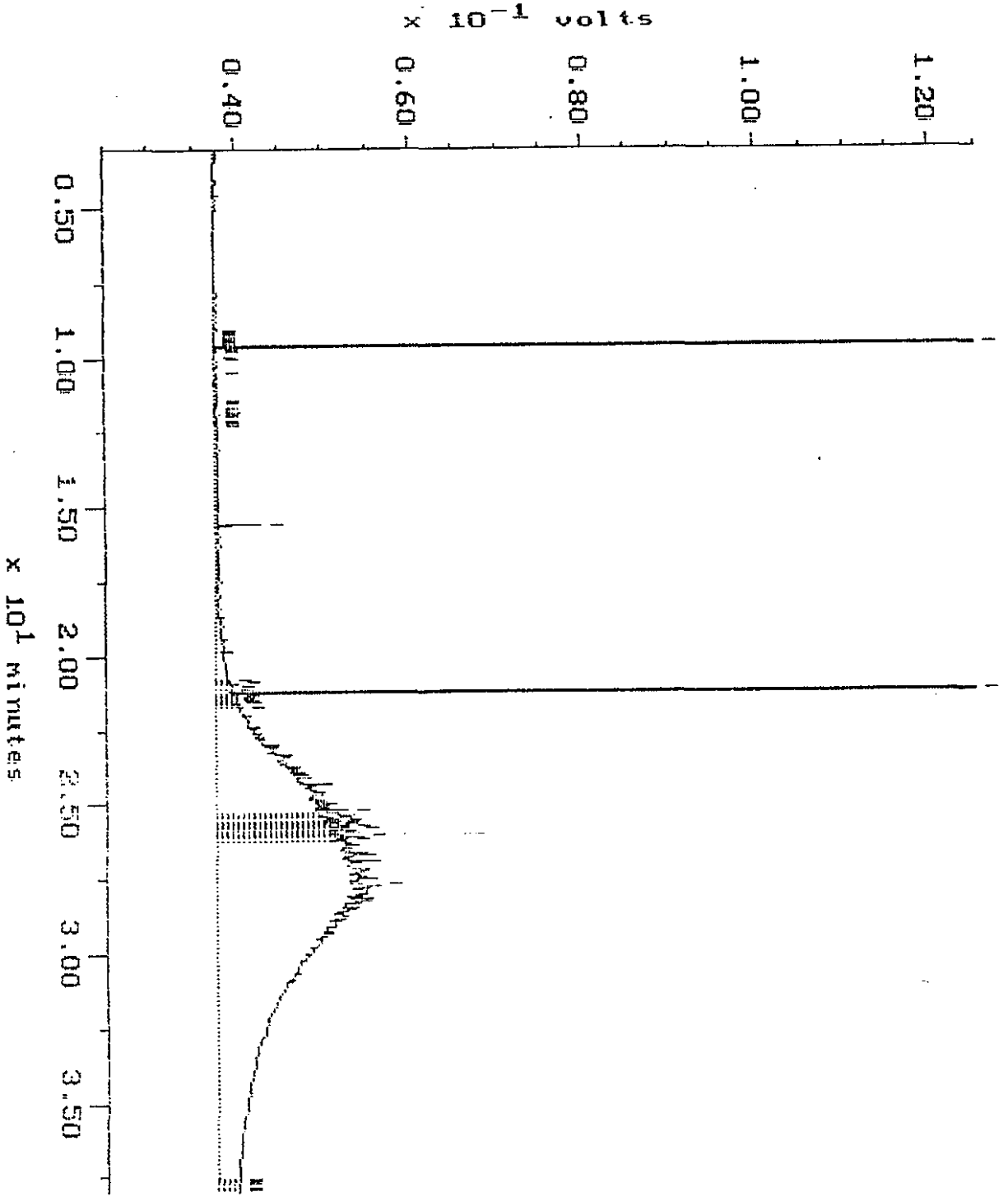


Sample: D 500 Channel: DEMITRI Filename: R4108D02
Acquired: 10-APR-94 18:33 Method: F:\BRGE\MAXDATA\SERGE-D\FUEL0410 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



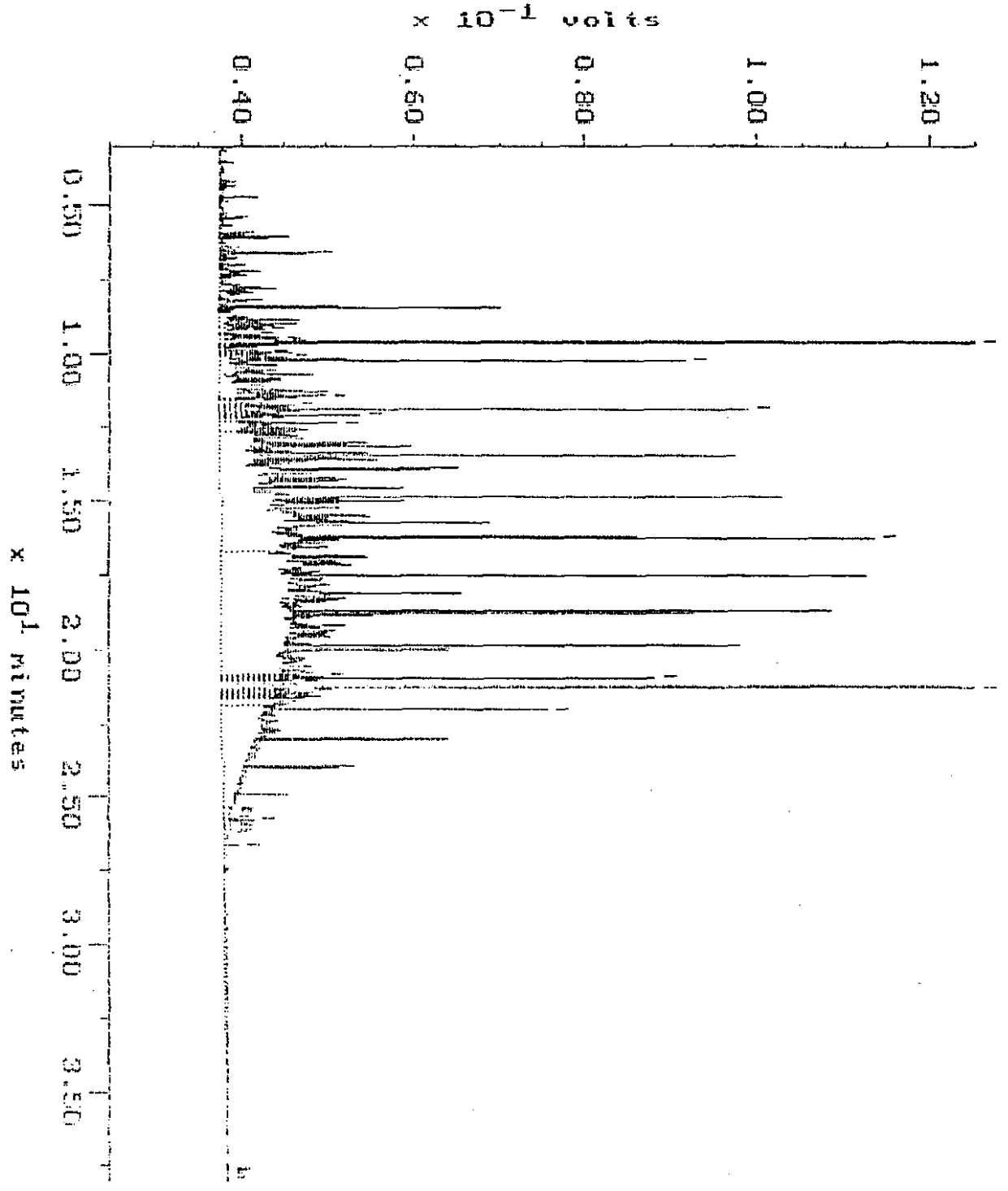
Continuing Calibration

Sample: MD 500 Channel: DEMITRI Filename: R4108D03
Acquired: 10-APR-94 19:19 Method: F:\BRO2\MAXDATA\SERGE-D\FUEL0410 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



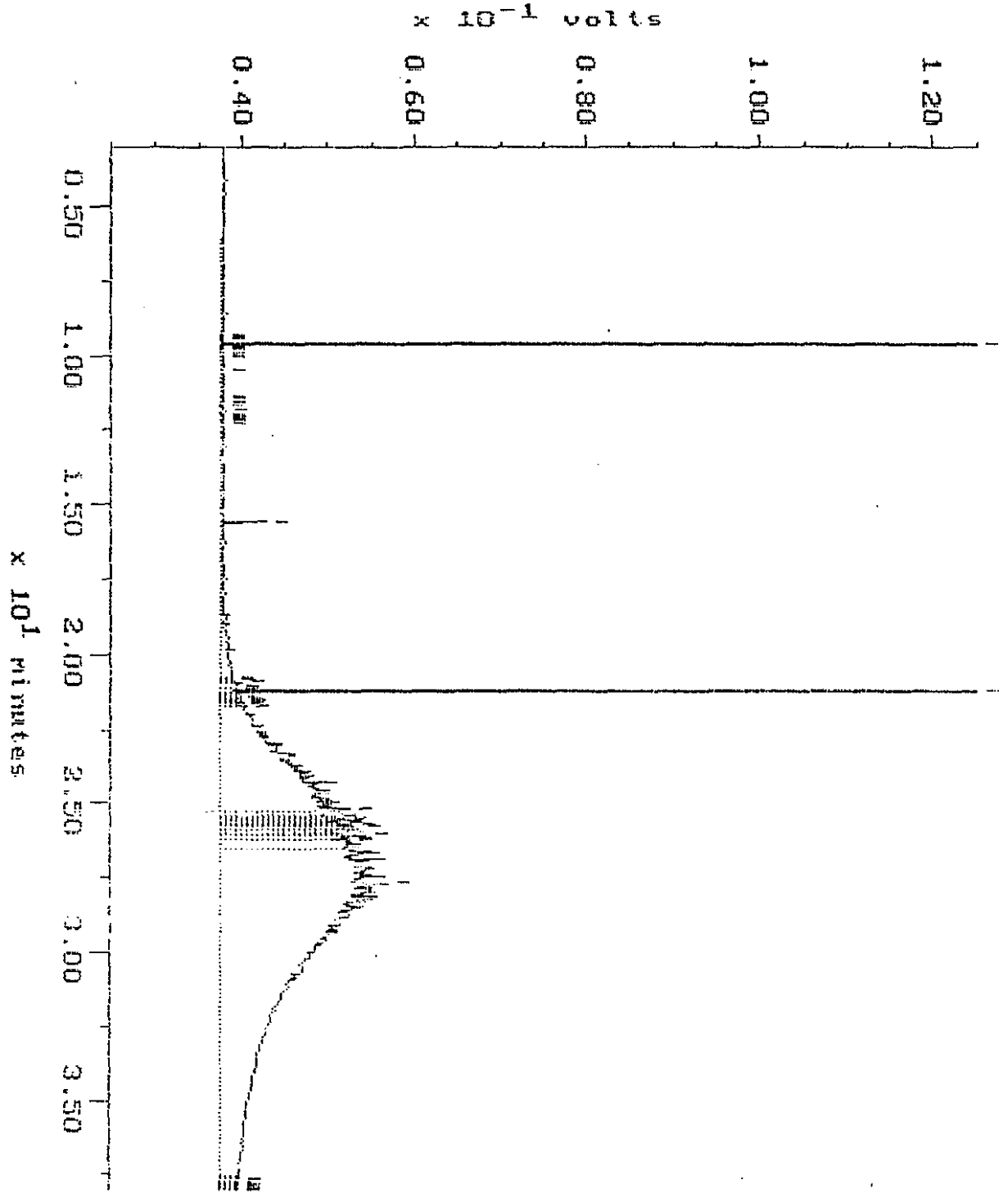
Continuing Calibration

Sample: D 500 Channel: [illegible] Filename: R411S004
Acquired: 11-APR-94 19:52 Method: F:\SERGE\MAXDATA\SERGE-D\FUEL0411 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



Continuing Calibration

Sample: MD 500 Channel: DEMITRI Filename: R4118D05
Acquired: 11-APR-94 20:39 Method: F:\BRO2\MAXDATA\SERGE-D\FUEL0411 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



Analytical Technologies, Inc.
OREGON / WASHINGTON

Page 1 of 1

YES
NO

Fax copy of Lab Report and COC to UNOCAL Contact:

Chain-of-Custody-Record#:

UNOCAL under contract with ATI RENTON: FAX: (206) 363-1742

Consultant Project Number: 0161-013-R69
Consultant Name: GeoEngineers
Address: 8410 154th Ave NE Redmond
Project Contact: Norm Puri
(Phone): 861-6000
Samples Collected by (Name): Lisa Bona
Signature: Lisa J Bona

UNOCAL Contact (Name): Dr. Mark Brearley
(Phone): 640-7610
UNOCAL Facility #: SS 5353
Site Specific Release Number:
TASK #:
Unocal, West Lake & Mercer

QC Data:
- UNOCAL Summary Report
- Expanded QC Report

9404.058

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 Extended State: OR WA	TPH-418.1M State: OR WA	EPA 418.1	Fuel Fingerprint EPA 8015M	Purgeable Halocarbons (8010)	Purgeable Aromatics (8020)	PCBs Only (8080M)	PCB / Pesticides (8080)	HPLC PAHs (8310)	Lead Total / Dissolved	TCLP Metals (8)	Purgeable Organics (8240) GC/MS	Extractable Organics (8270) GC/MS	RUSH Y/N *	Remarks
HO-1-7	-1	1	Soil	4/6/94	1350					X													N	
HO-2-5	-2	1	↓	↓	1400					X													↓	
HO-3	-3	1	↓	↓	1340					X													↓	

Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Orgainzation	Date/Time
Lisa J Bona	GEI	4/6/94 1630		GET	4/7/94 1700
Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Orgainzation	Date/Time
	GET	4/6/94 0830			
Relinquished By (Signature)	Organization	Date/Time	Received By Laboratory		Date/Time
			ATIWA		4/7/94 11:21

* 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: Norman L. Puri Signature: Company: GET Date: 4/21/94

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

ATI I.D. # 407128

July 29, 1994

GeoEngineers

AUG 0 1 1994

Routing KLP

File

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

Attention : Norm Puri

Project Number : 0161-013-R62

Project Name : Unocal #5353 - Seattle

Dear Mr. Puri:

On July 15, 1994, Analytical Technologies, Inc. (ATI), received 16 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/elf

Enclosure

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

Analytical Technologies, Inc.

ATI I.D. # 407128

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-013-R62
PROJECT NAME : UNOCAL #5353 - SEATTLE

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
407128-1	SMW-4	07/14/94	WATER
407128-2	SMW-3	07/14/94	WATER
407128-3	MW-45	07/14/94	WATER
407128-4	MW-47	07/14/94	WATER
407128-5	MW-41	07/14/94	WATER
407128-6	MW-43	07/14/94	WATER
407128-7	MW-42	07/15/94	WATER
407128-8	MW-44	07/15/94	WATER
407128-9	MW-36	07/15/94	WATER
407128-10	MW-35	07/14/94	WATER
407128-11	MW-32A	07/14/94	WATER
407128-12	MW-34	07/14/94	WATER
407128-13	MW-46	07/15/94	WATER
407128-14	MW-37	07/15/94	WATER
407128-15	MW-40	07/15/94	WATER
407128-16	PW-1	07/15/94	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	16

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. # 407128

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-013-R62
PROJECT NAME : UNOCAL #5353 - SEATTLE

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. # 407128

CASE NARRATIVE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-013-R62
PROJECT NAME : UNOCAL #5353 - SEATTLE

CASE NARRATIVE: TOTAL PETROLEUM HYDROCARBONS - DIESEL ANALYSIS

Fifteen (15) water samples were received by ATI on July 15, 1994, for WA DOE WTPH-D extended analysis. These samples were analyzed in accordance with Washington state methodology.

The surrogate recovery for sample 407128-14 (MW-37) was out of limits due to sample dilution. The surrogate recovery for sample 407128-5 (MW-41) was out of limits. This sample was reextracted on July 25, 1994, outside of ATI's recognized holding time. Both sets of data are being reported. The relative percent difference (RPD) for the quality control (QC) sample and its duplicate associated with the 407128-5 (MW-4) reextract was out of limits.

Analytical Technologies, Inc.

ATI I.D. # 407128

OIL & GREASE
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE EXTRACTED	: 07/15/94
PROJECT #	: 0161-013-R62	DATE ANALYZED	: 07/18/94
PROJECT NAME	: UNOCAL #5353 - SEATTLE	UNITS	: mg/L
EPA METHOD	: 413.2	SAMPLE MATRIX	: WATER

ATI I.D. #	CLIENT I.D.	OIL & GREASE
407128-16	PW-1	3.5
METHOD BLANK	-	<1

Analytical Technologies, Inc.

ATI I.D. # 407128

OIL & GREASE
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: BLANK
PROJECT #	: 0161-013-R62	DATE EXTRACTED	: 07/15/94
PROJECT NAME	: UNOCAL #5353 - SEATTLE	DATE ANALYZED	: 07/18/94
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	<1.00	N/A	N/A	10.0	10.4	104	N/A	N/A	N/A

$$\% \text{ Recovery} = \frac{(\text{Spiked Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Dup. Spike Result})|}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D. # 407128

OIL & GREASE
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-013-R62
PROJECT NAME : UNOCAL #5353 - SEATTLE
EPA METHOD : 413.2
SAMPLE MATRIX : WATER

SAMPLE I.D. # : 407122-2
DATE EXTRACTED : 07/15/94
DATE ANALYZED : 07/18/94
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	<1.00	NC	N/A	N/A	N/A	N/A	N/A	N/A

NC = Not calculable.

$$\% \text{ Recovery} = \frac{(\text{Spiked Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Dup. Spike Result})|}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D. # 407128

OIL & GREASE
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: 407087-1
PROJECT #	: 0161-013-R62	DATE EXTRACTED	: 07/15/94
PROJECT NAME	: UNOCAL #5353 - SEATTLE	DATE ANALYZED	: 07/18/94
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	15.0	N/A	N/A	10.0	21.9	69	N/A	N/A	N/A

$$\% \text{ Recovery} = \frac{(\text{Spiked Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Dup. Spike Result})|}{\text{Average Result}} \times 100$$

Analytical Summary Report

Client: GeoEngineers, Inc. **Project: Unocal #5353 - Seattle (0161-013-R62)**

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	SMW-4		SMW-3	MW-45	
	Date Sampled:	N/A	N/A	N/A	07/14/94		07/14/94	07/14/94	
	Date Extracted:	N/A	N/A	N/A	N/A		N/A	N/A	
	Date Analyzed:	07/15/94	07/18/94	07/19/94	07/16/94		07/16/94	07/16/94	
Benzene		<0.5	<0.5	<0.5	9400	D7	<0.5	4000	D6
Ethylbenzene		<0.5	<0.5	<0.5	1800	D6	<0.5	870	D6
Toluene		<0.5	<0.5	<0.5	72	D6	<0.5	750	D4
Total Xylenes		<0.5	<0.5	<0.5	4400	D6	<0.5	3600	D6
Gasoline (Toluene to Dodecane)		<100	<100	<100	30000	D6	<100	25000	D4
Surrogate Recoveries (%)									
Bromofluorobenzene		98	99	98	96	D6	95	96	D4
Trifluorotoluene		99	98	99	95	D6	96	96	D4

	ATI Sample #:	4	5	6	7		8	9
	Client ID:	MW-47	MW-41	MW-43	MW-42		MW-44	MW-36
	Date Sampled:	07/14/94	07/14/94	07/14/94	07/15/94		07/15/94	07/15/94
	Date Extracted:	N/A	N/A	N/A	N/A		N/A	N/A
	Date Analyzed:	07/18/94	07/16/94	07/16/94	07/16/94		07/16/94	07/18/94
Benzene		1.6	10	31	490	D5	<0.5	0.7
Ethylbenzene		<0.5	<0.5	4.6	<0.5		<0.5	<0.5
Toluene		<0.5	<0.5	<0.5	0.6		<0.5	<0.5
Total Xylenes		<0.5	<0.5	74	0.5		<0.5	<0.5
Gasoline (Toluene to Dodecane)		<100	<100	360	<100		<100	<100
Surrogate Recoveries (%)								
Bromofluorobenzene		97	97	98	93		98	99
Trifluorotoluene		93	97	100	99		94	91

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

D4 Value from a ten fold diluted analysis.
D5 Value from a 20 fold diluted analysis.
D6 Value from a 50 fold diluted analysis.
D7 Value from a 100 fold diluted analysis.

Analytical Summary Report

Client: GeoEngineers, Inc. **Project: Unocal #5353 - Seattle (0161-013-R62)**

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

	ATI Sample #:	10		11		12		13	14		15
	Client ID:	MW-35		MW-32A		MW-34		MW-46	MW-37		MW-40
	Date Sampled:	07/14/94		07/14/94		07/14/94		07/15/94	07/15/94		07/15/94
	Date Extracted:	N/A		N/A		N/A		N/A	N/A		N/A
	Date Analyzed:	07/19/94		07/18/94		07/19/94		07/18/94	07/19/94		07/19/94
Benzene		980	D6	5600	D7	980	D5	<0.5	18000	D9	27
Ethylbenzene		150	D6	530	D7	210	D5	<0.5	7700	D9	1.2
Toluene		79	D6	54	D3	420	D5	<0.5	44000	D9	0.8
Total Xylenes		600	D6	500	D3	820	D5	<0.5	44000	D9	1.7
Gasoline (Toluene to Dodecane)		8100	D6	9900	D3	5700	D5	<100	330000	D9	1000
Surrogate Recoveries (%)											
Bromofluorobenzene		97	D6	91	D3	100	D5	94	99	D9	100
Trifluorotoluene		92	D6	97	D3	104	D5	94	93	D9	93

	ATI Sample #:	16	
	Client ID:	PW-1	
	Date Sampled:	07/15/94	
	Date Extracted:	N/A	
	Date Analyzed:	07/19/94	
Benzene		1000	D6
Ethylbenzene		120	D6
Toluene		280	D6
Total Xylenes		510	D6
Gasoline (Toluene to Dodecane)		-	
Surrogate Recoveries (%)			
Bromofluorobenzene		99	D6
Trifluorotoluene		-	

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

D3 Value from a five fold diluted analysis.
D5 Value from a 20 fold diluted analysis.
D6 Value from a 50 fold diluted analysis.
D7 Value from a 100 fold diluted analysis.
D9 Value from a 500 fold diluted analysis.

Analytical Technologies, Inc. ATI Reference: 407128

Quality Control Summary Report

Client: GeoEngineers, Inc. **Project: Unocal #5353 - Seattle (0161-013-R62)**

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

Extracted: N/A **Analyzed: 07/15/94** **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
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	19.7	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	991	99	N/A	N/A	N/A	78-116	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
BROMOFLUOROBENZENE	98	97	N/A	76-120
TRIFLUOROTOLUENE	99	100	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: 07/18/94** **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
BENZENE	<0.500	N/A	N/A	20.0	19.7	99	20.8	104	5	89-110	10
TOLUENE	<0.500	N/A	N/A	20.0	19.8	99	19.9	100	1	89-113	10
TOTAL XYLENES	<0.500	N/A	N/A	40.0	39.2	98	39.4	99	1	89-111	10
GASOLINE	<100	N/A	N/A	1000	926	93	930	93	0	78-116	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
BROMOFLUOROBENZENE	99	98	98	76-120
TRIFLUOROTOLUENE	98	96	98	50-150

Analytical Technologies, Inc. ATI Reference: 407128

Quality Control Summary Report

Client: GeoEngineers, Inc. **Project: Unocal #5353 - Seattle (0161-013-R62)**

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

Extracted: N/A **Analyzed: 07/19/94** **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
BENZENE	<0.500	N/A	N/A	20.0	20.0	100	20.2	101	1	89-110	10
TOLUENE	<0.500	N/A	N/A	20.0	20.3	102	20.1	101	1	89-113	10
TOTAL XYLENES	<0.500	N/A	N/A	40.0	40.1	100	39.8	100	1	89-111	10
GASOLINE	<100	N/A	N/A	1000	934	93	913	91	2	78-116	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
BROMOFLUOROBENZENE	98	99	99	76-120
TRIFLUOROTOLUENE	99	99	97	50-150

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

Extracted: N/A **Analyzed: 07/16/94** **Sample ID: 407128-2**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	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	96	97	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: 07/15/94** **Sample ID: 407124-1**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	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	19.1	96	19.7	99	3	87-114	10
TOTAL XYLENES	<0.500	N/A	N/A	40.0	37.8	95	39.2	98	4	85-113	10
GASOLINE	<100	<100	NC	1000	899	90	920	92	2	80-113	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
BROMOFLUOROBENZENE	97	95	99	76-120
TRIFLUOROTOLUENE	95	97	97	50-150

Analytical Technologies, Inc. ATI Reference: 407128

Analytical Summary Report

Client: GeoEngineers, Inc. **Project: Unocal #5353 - Seattle (0161-013-R62)**

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

ATI Sample #:	0	0	1	2	3	4
Client ID:	Method Blank	Method Blank	SMW-4	SMW-3	MW-45	MW-47
Date Sampled:	N/A	N/A	07/14/94	07/14/94	07/14/94	07/14/94
Date Extracted:	07/19/94	07/25/94	07/19/94	07/19/94	07/19/94	07/19/94
Date Analyzed:	07/21/94	07/26/94	07/22/94	07/22/94	07/22/94	07/21/94
Diesel (C12-C24)	<0.25	<0.25	4.0	<0.25	0.85	0.29
Motor Oil (C24-C34)	<0.75	<0.75	1.8	<0.75	1.1	<0.75
Surrogate Recoveries (%)						
O-Terphenyl	91	100	71	98	57	85

ATI Sample #:	5	5RE	6	7	8	9
Client ID:	MW-41	MW-41	MW-43	MW-42	MW-44	MW-36
Date Sampled:	07/14/94	07/14/94	07/14/94	07/15/94	07/15/94	07/15/94
Date Extracted:	07/19/94	07/25/94*	07/19/94	07/19/94	07/19/94	07/19/94
Date Analyzed:	07/22/94	07/26/94	07/22/94	07/22/94	07/22/94	07/21/94
Diesel (C12-C24)	<0.25	<0.25	<0.25	0.54	<0.25	0.41
Motor Oil (C24-C34)	<0.75	<0.75	<0.75	0.85	<0.75	0.96
Surrogate Recoveries (%)						
O-Terphenyl	45 H	55	87	53	75	97

Surrogate Limits: (O-T:50-150)
H Out of limits.
RE = Reextracted and reanalyzed.
* Reextracted past the recommended hold time.

Analytical Summary Report

Client: GeoEngineers, Inc. **Project: Unocal #5353 - Seattle (0161-013-R62)**

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

ATI Sample #:	10	11	12	13	14		15
Client ID:	MW-35	MW-32A	MW-34	MW-46	MW-37		MW-40
Date Sampled:	07/14/94	07/14/94	07/14/94	07/15/94	07/15/94		07/15/94
Date Extracted:	07/19/94	07/19/94	07/19/94	07/19/94	07/19/94		07/19/94
Date Analyzed:	07/22/94	07/22/94	07/23/94	07/21/94	07/22/94		07/22/94
Diesel (C12-C24)	0.89	1.7	1.2	0.27	1700	D0	2.1
Motor Oil (C24-C34)	<0.75	1.5	<0.75	1.2	260	D4	2.5
Surrogate Recoveries (%)							
O-Terphenyl	91	77	87	92	I	D0	84

Surrogate Limits: (O-T:50-150)
D0 Value from a 200 fold diluted analysis.
D4 Value from a ten fold diluted analysis.
I = Surrogate out of limits due to sample dilution.

AnalyticalTechnologies,Inc. ATI Reference: 407128

Quality Control Summary Report

Client: GeoEngineers, Inc.

Project: Unocal #5353 - Seattle (0161-013-R62)

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

Extracted: 07/19/94 **Analyzed: 07/21/94** **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	2.16	86	N/A	N/A	N/A	70-114	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
O-TERPHENYL	91	87	N/A	50-150

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

Extracted: 07/25/94 **Analyzed: 07/26/94** **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	2.06	82	2.48	99	19	70-114	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
O-TERPHENYL	100	87	107	50-150

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

Extracted: 07/19/94 **Analyzed: 07/21/94** **Sample ID: 407128-9**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	RPD	Limits %Rec	Limits RPD
DIESEL	0.408	0.367	11	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	97	92	N/A	50-150

Quality Control Summary Report

Client: GeoEngineers, Inc. **Project: Unocal #5353 - Seattle (0161-013-R62)**

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

Extracted: 07/19/94 **Analyzed: 07/21/94** **Sample ID: 407128-13**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	RPD	Limits %Rec	Limits RPD
DIESEL	0.269	0.298	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	92	96	N/A	50-150

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

Extracted: 07/25/94 **Analyzed: 07/26/94** **Sample ID: 407187-1**

Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	RPD	Limits %Rec	Limits RPD
DIESEL	4.39	3.32	28H	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	112	100	N/A	50-150

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

Extracted: 07/19/94 **Analyzed: 07/21/94** **Sample ID: 407128-4**

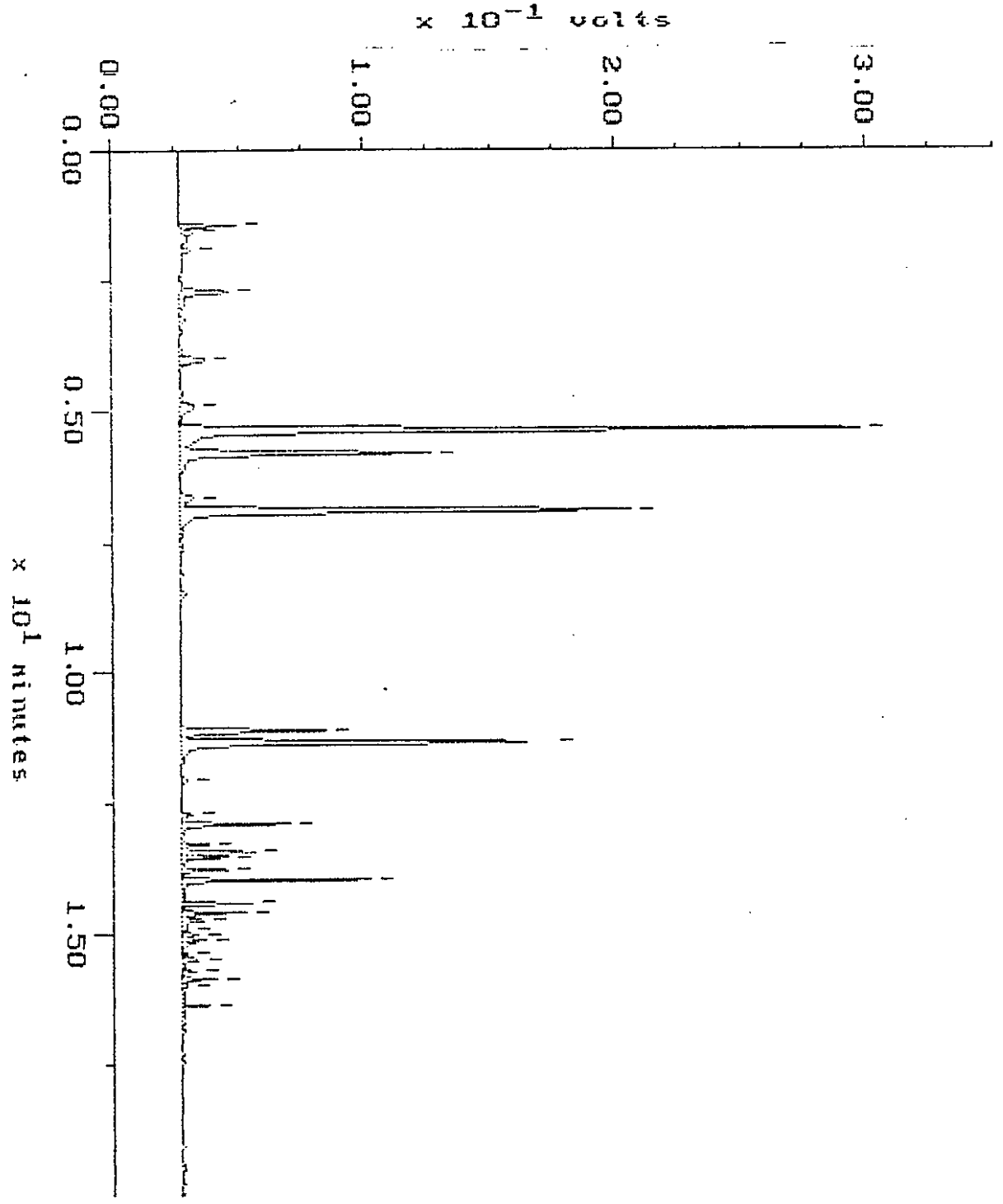
Compound	Sample Result	Duplicate Result	RPD	Spike Added	Spike Result	Spike %Rec	Spike Dup. Result	Spike Dup. %Rec	RPD	Limits %Rec	Limits RPD
DIESEL	0.288	N/A	N/A	2.38	2.54	95	N/A	N/A	N/A	56-135	20

Quality Control Surrogate Recoveries (%)

Compound	Sample	Spike	Spike Dup.	Limits
O-TERPHENYL	85	93	N/A	50-150

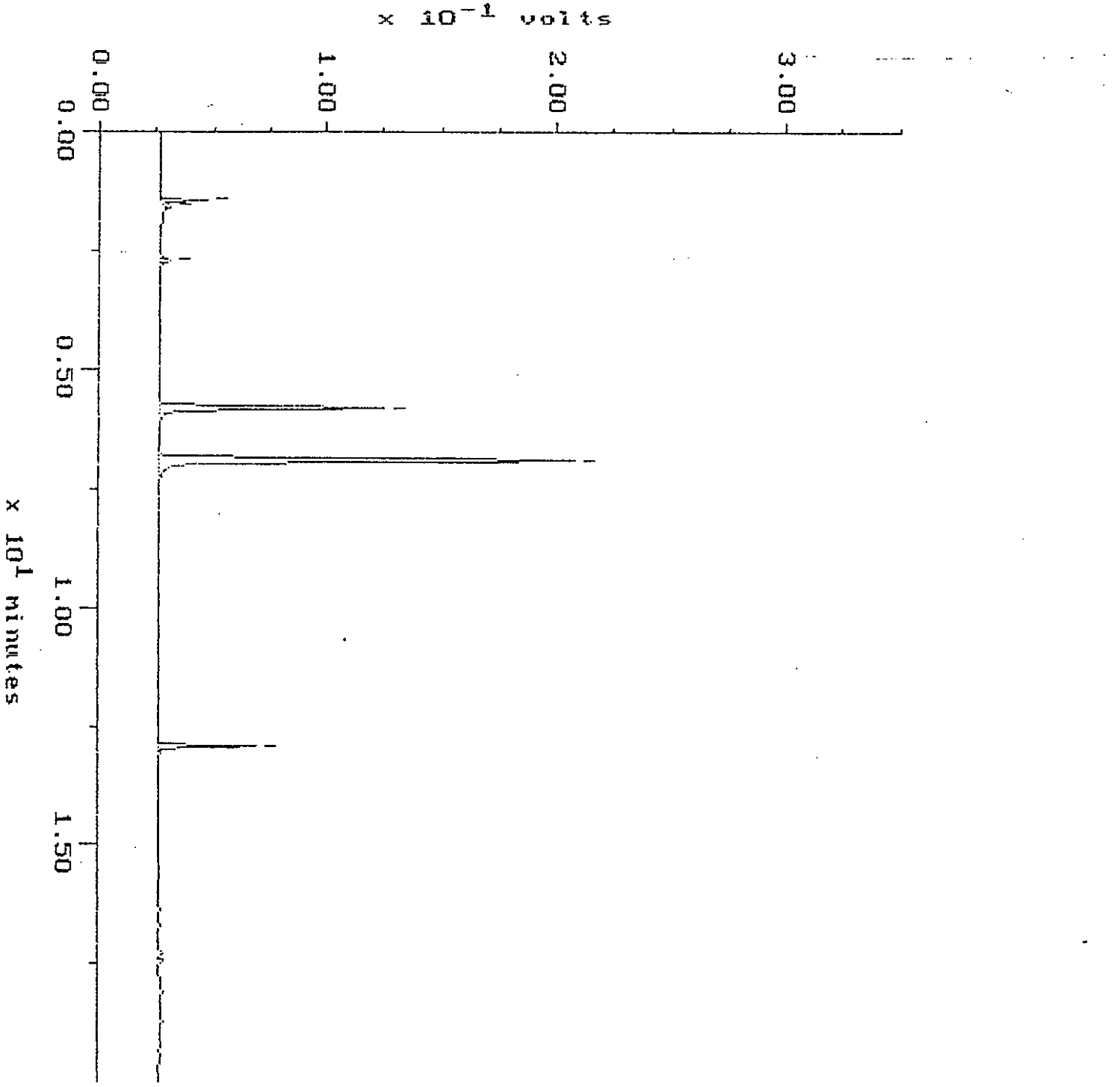
H Out of limits.

Sample: 407128-1 DIL Channel: FID Filename: R7159P30
Acquired: 16-JUL-94 2:38 Method: F:\BRO2\MAXDATA\PICARD\071594PC Operator: ATI
Dilution: 1 : 50.000
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



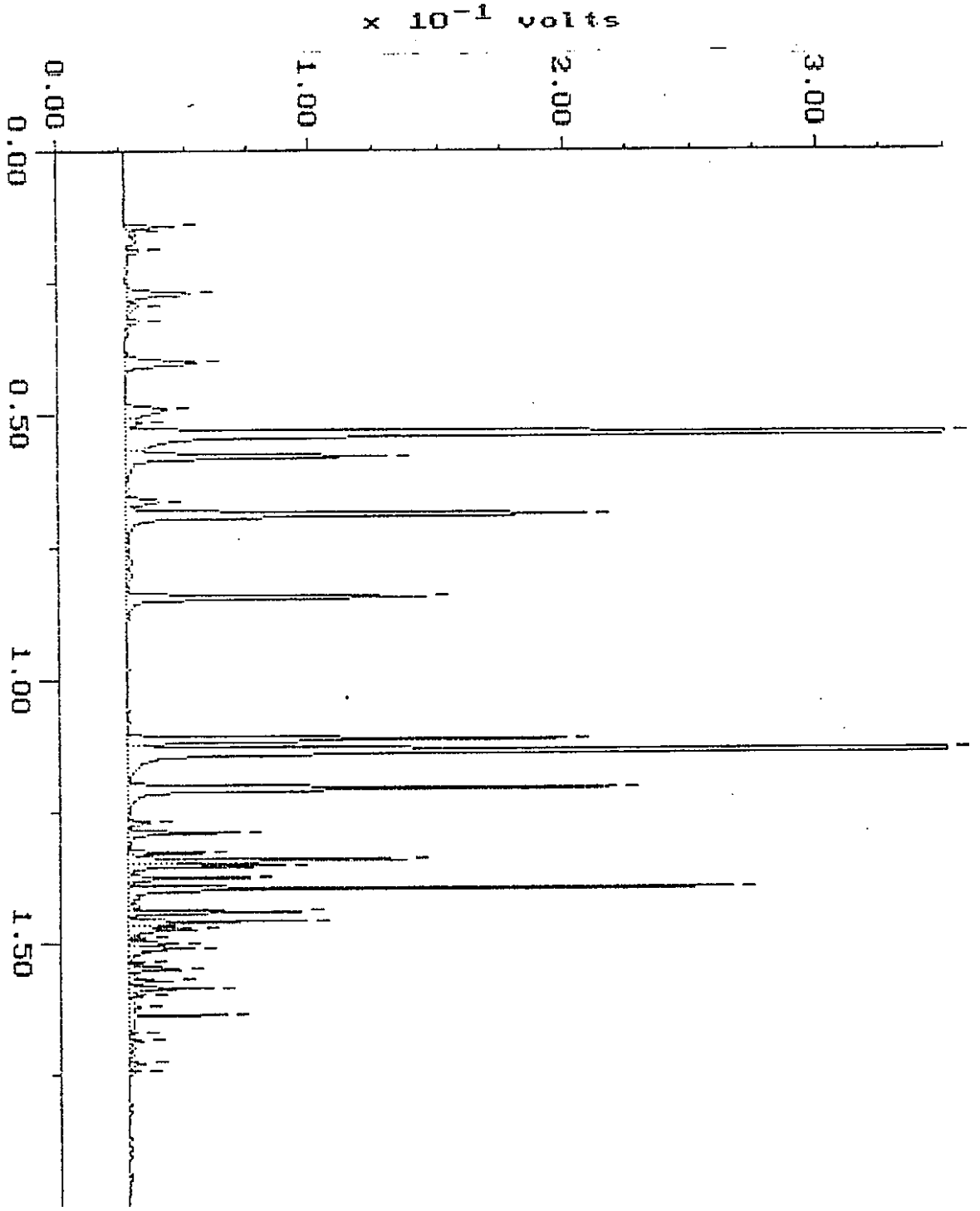
WADE WIPH-G

Sample: 407128-2 Channel: FID Filename: R7159P31
Acquired: 16-JUL-94 3:09 Method: F:\BRO2\MAXDATA\PICARD\071594PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



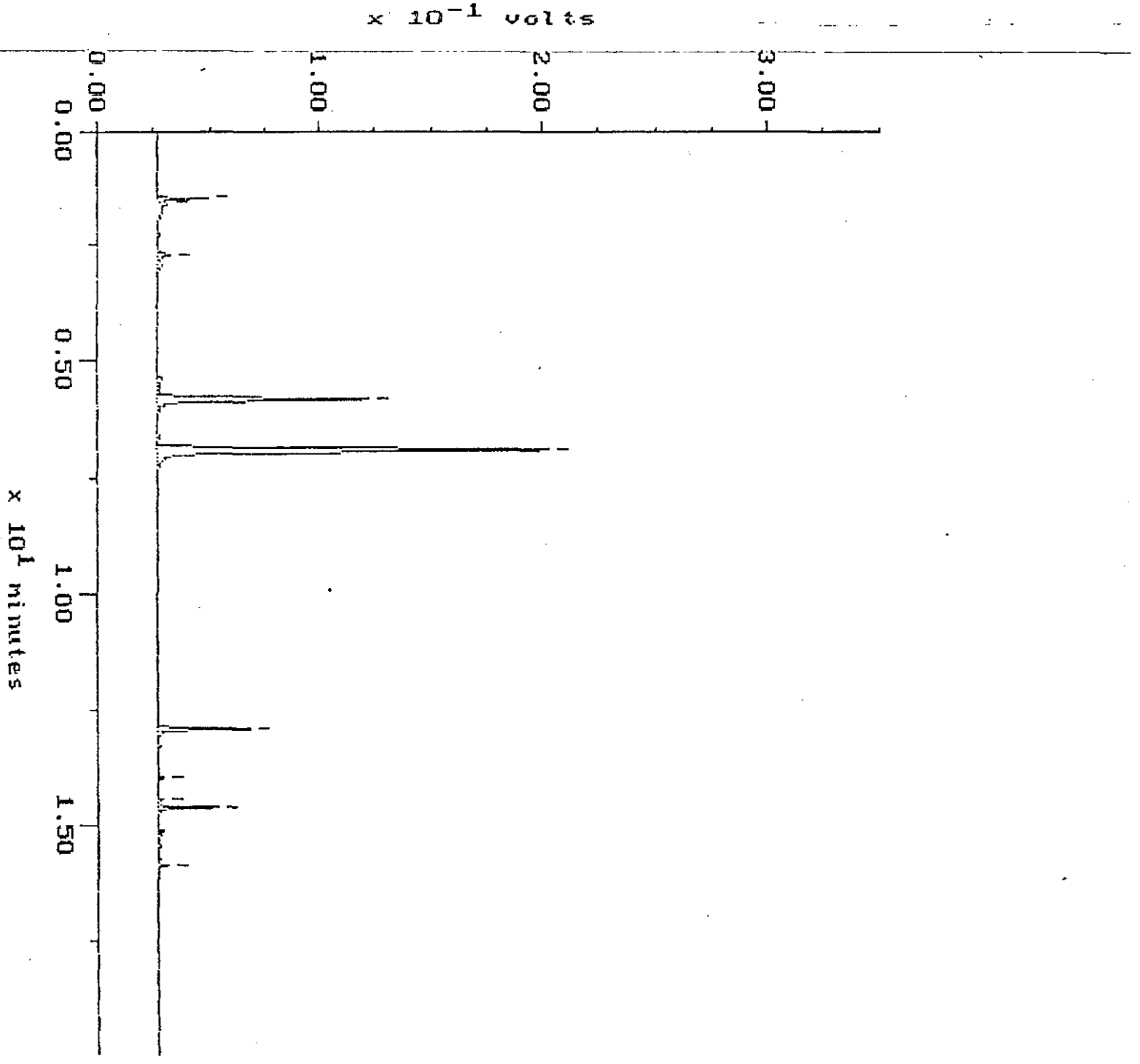
WA DOE WTPH-G

Sample: 407128-3 DIL Channel: FID Filename: R7159P33
Acquired: 16-JUL-94 4:09 Method: F:\BRD2\MAXDATA\PICARD\071594PC Operator: ATI
Dilution: 1 : 10.000
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



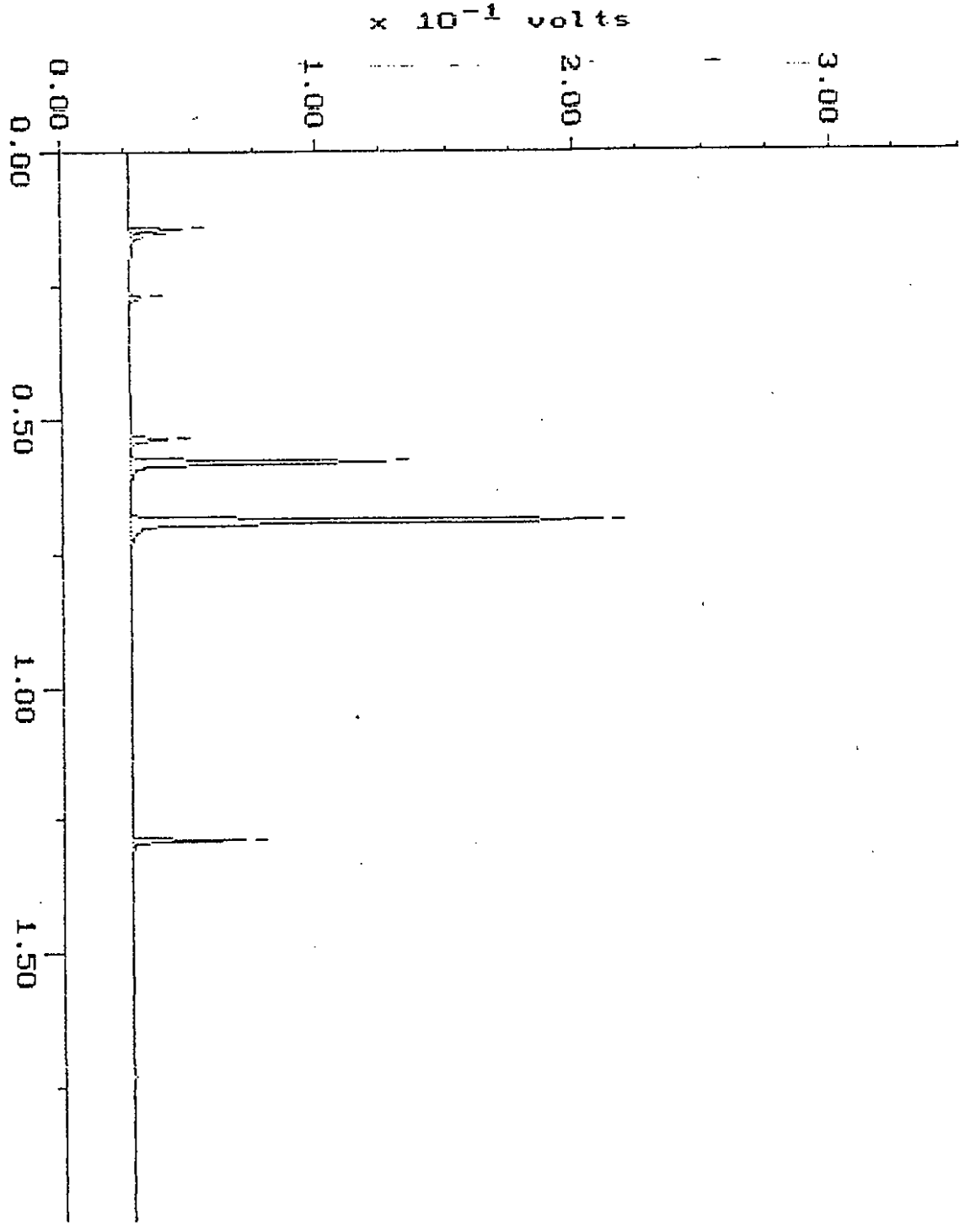
VELCO WIPE-G

Sample: 407128-4 Channel: FID Filename: R7189P18
Acquired: 18-JUL-94 17:17 Method: F:\BRD2\MAXDATA\PICARD\071894PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



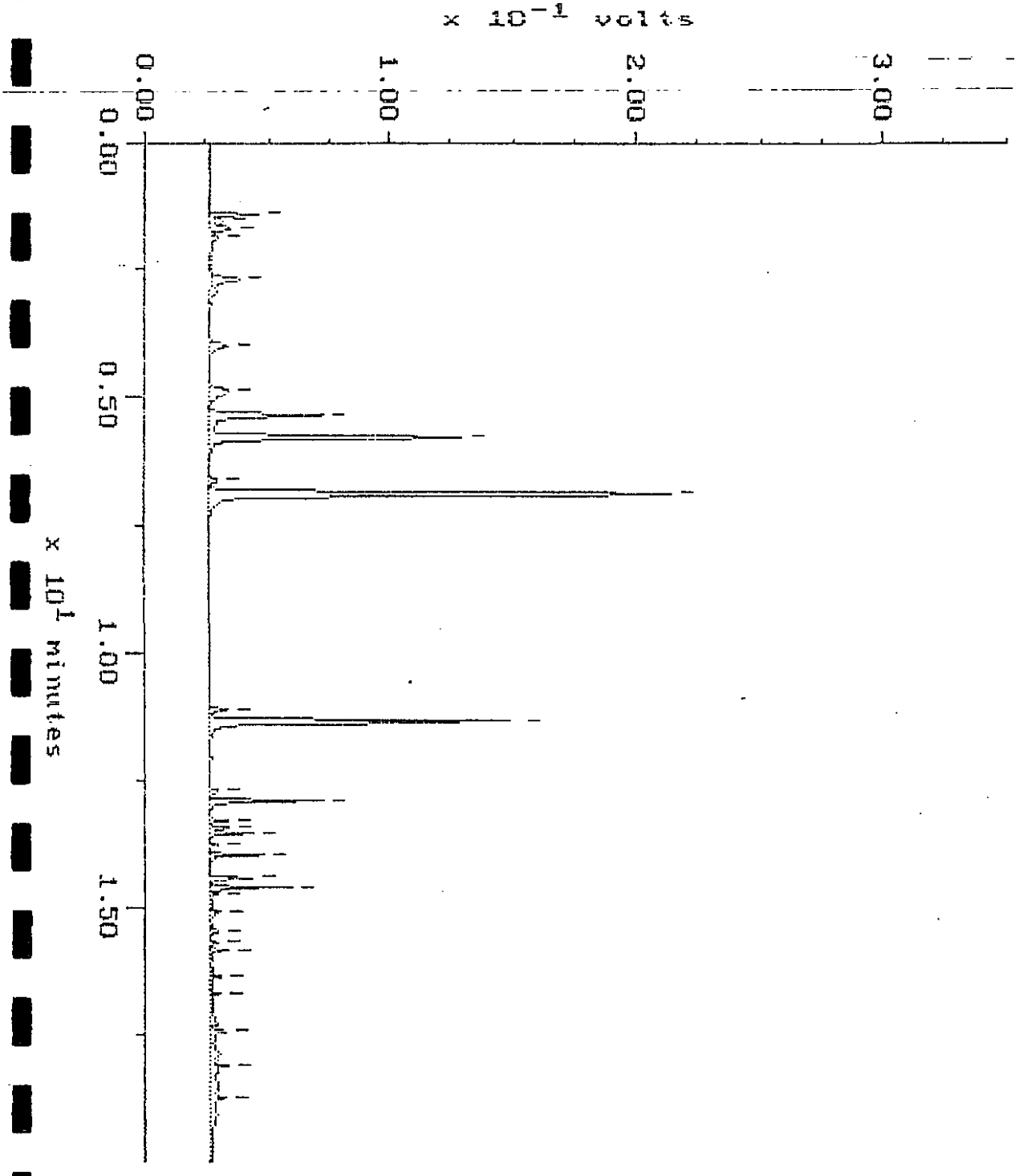
WA DOE WTPH-G

Sample: 407128-5 Channel: FID Filename: R7159P35
Acquired: 16-JUL-94 5:10 Method: F:\BRD2\MAXDATA\PICARD\071594PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



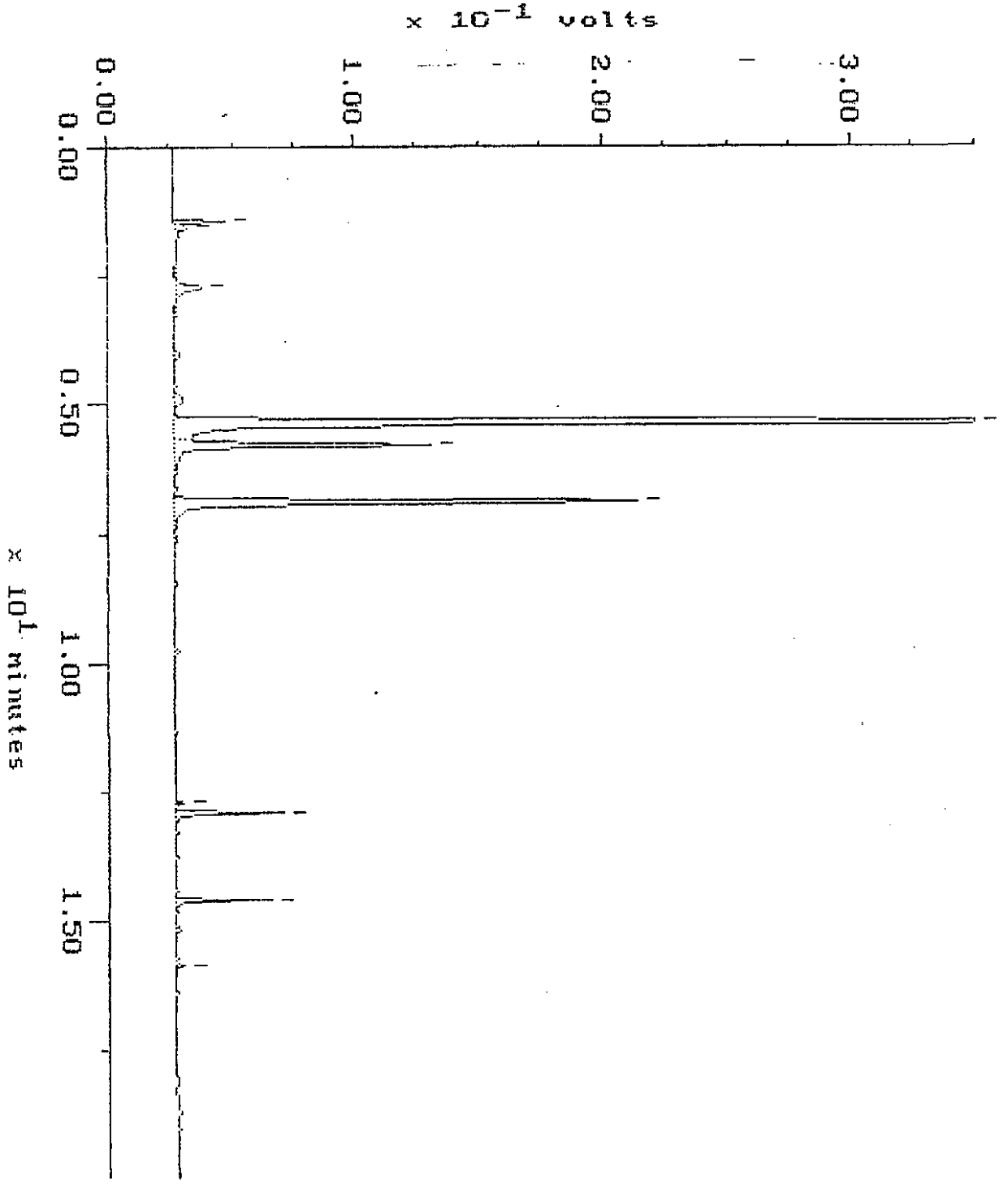
WA DOE WTPH-G

Sample: 407128-6 Channel: FID Filename: R7159P36
Acquired: 16-JUL-94 5:40 Method: F:\BRO2\MAXDATA\PICARD\071594PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



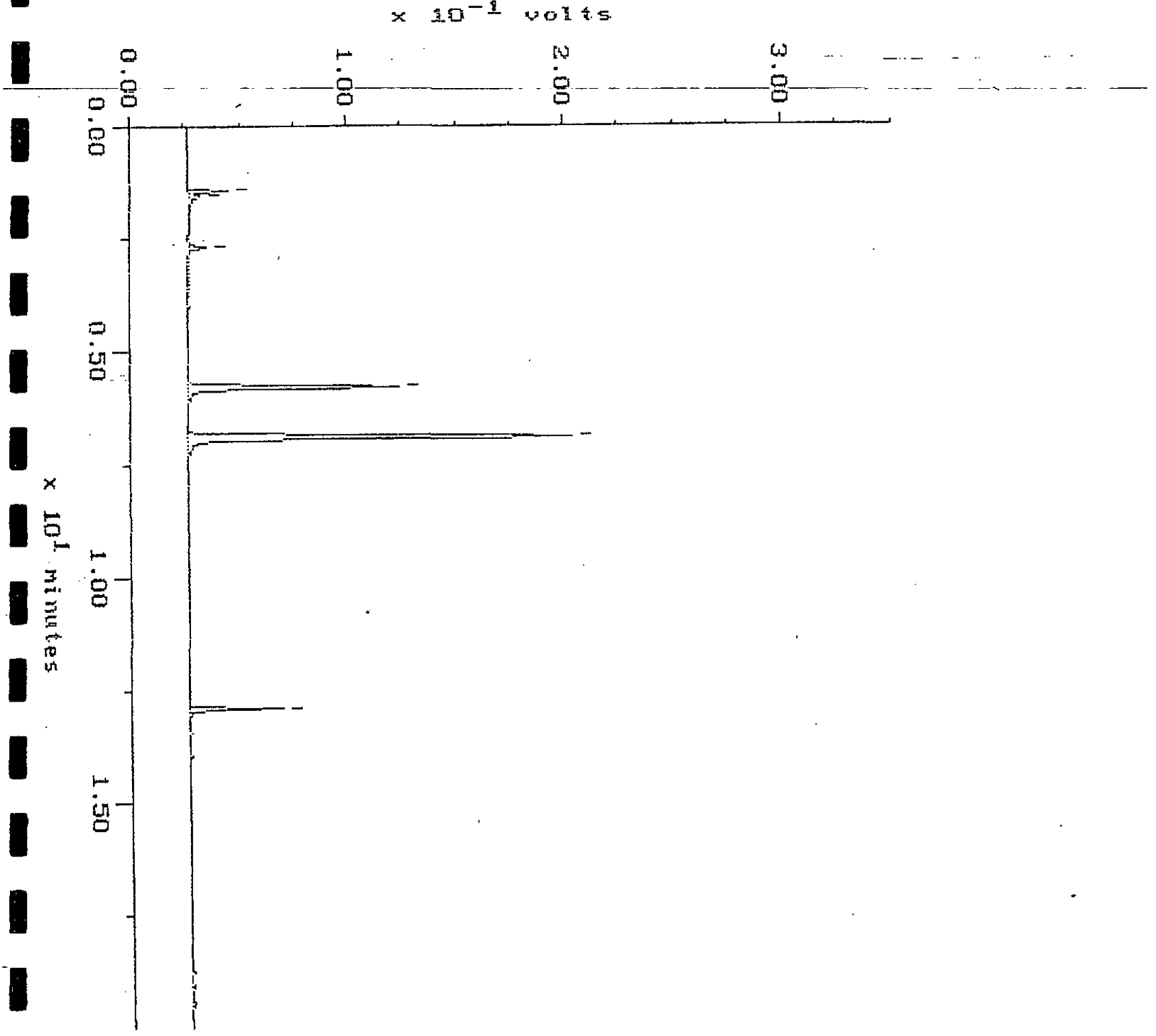
WA DOE WTPH-G

Sample: 407128-7 Channel: FID Filename: R7159P37
Acquired: 16-JUL-94 6:10 Method: F:\BRO2\MAXDATA\PICARD\071594PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



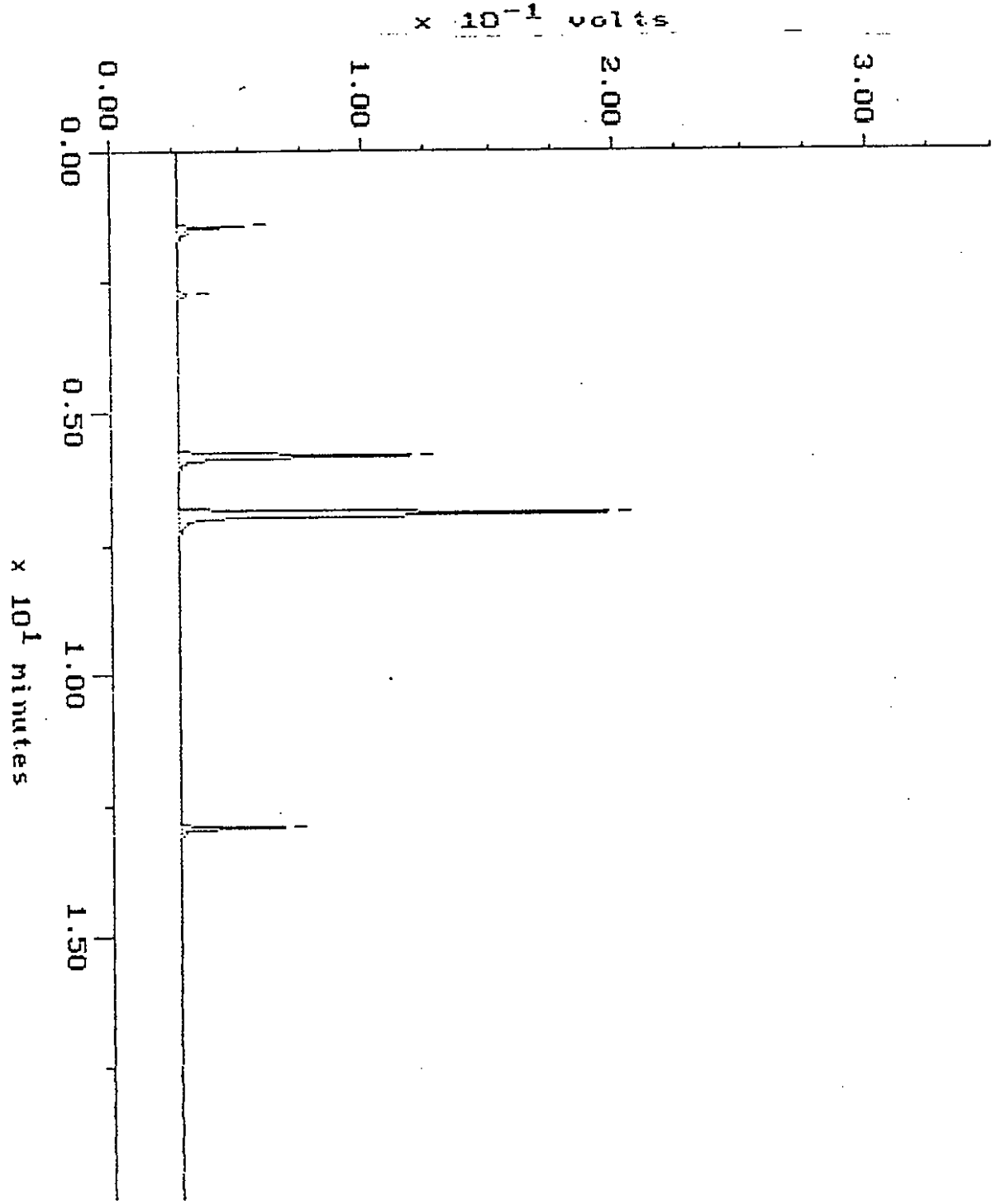
WA DOE WTPH-G

Sample: 407128-8 Channel: FID Filename: R7159P38
Acquired: 16-JUL-94 6:40 Method: F:\BRO2\MAXDATA\PICARD\071594FC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



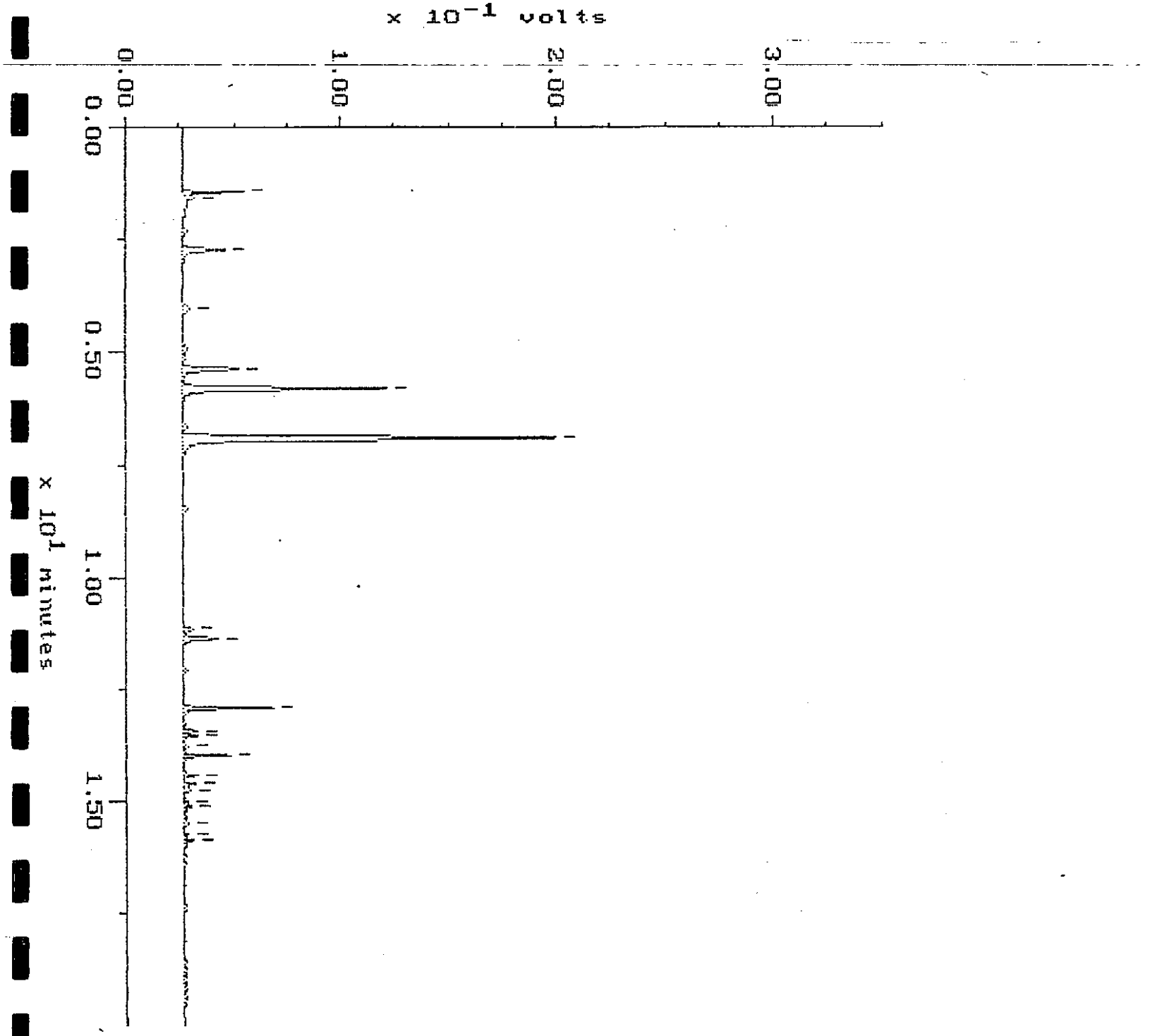
WADOE WTPH-G

Sample: 407128-9 Channel: FID Filename: R7189P20
Acquired: 18-JUL-94 18:18 Method: F:\BRO2\MAXDATA\PICARD\071894PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



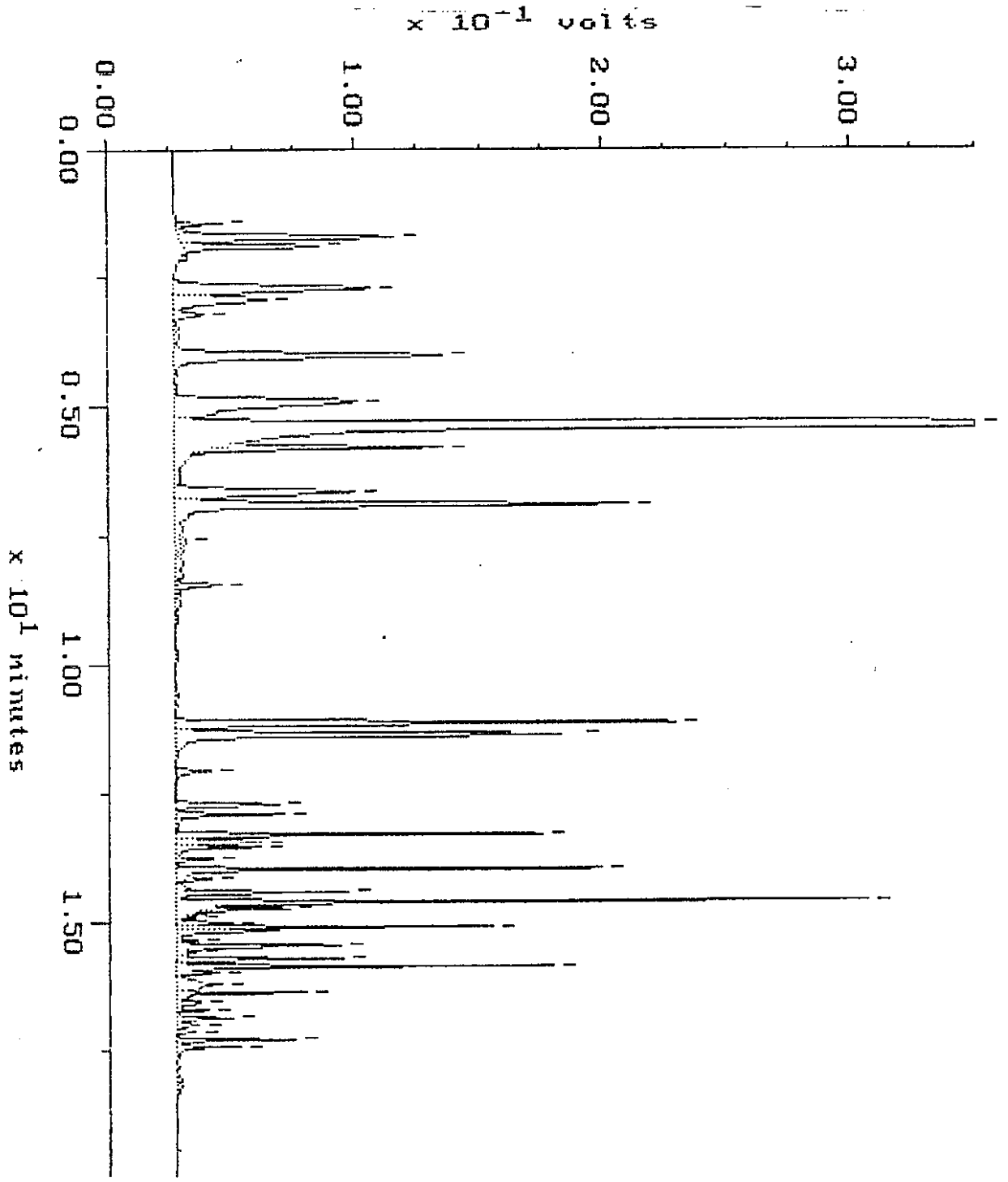
WA [illegible] WTPH-G

Sample: 407128-10 DIL Channel: FID Filename: R7199P09
Acquired: 19-JUL-94 14:08 Method: F:\BRD2\MAXDATA\PICARD\071994PC Operator: ATI
Dilution: 1 : 50.000
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



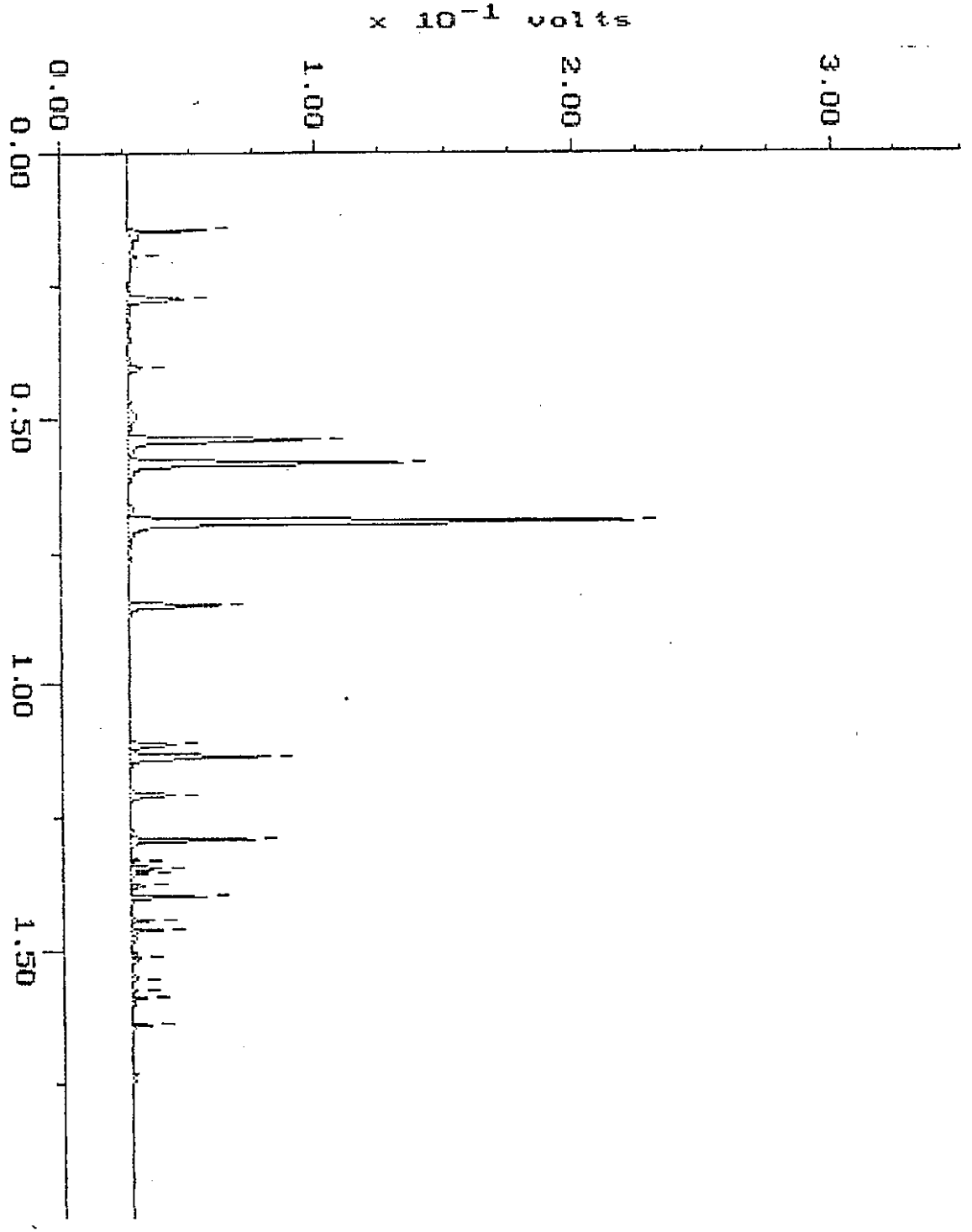
WA DOE WTPH-G

Sample: 407128-11 DIL Channel: FID Filename: R7189P27
Acquired: 18-JUL-94 21:53 Method: F:\BRO2\MAXDATA\PICARD\071894PC Operator: ATI
Dilution: 1 : 5.000
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



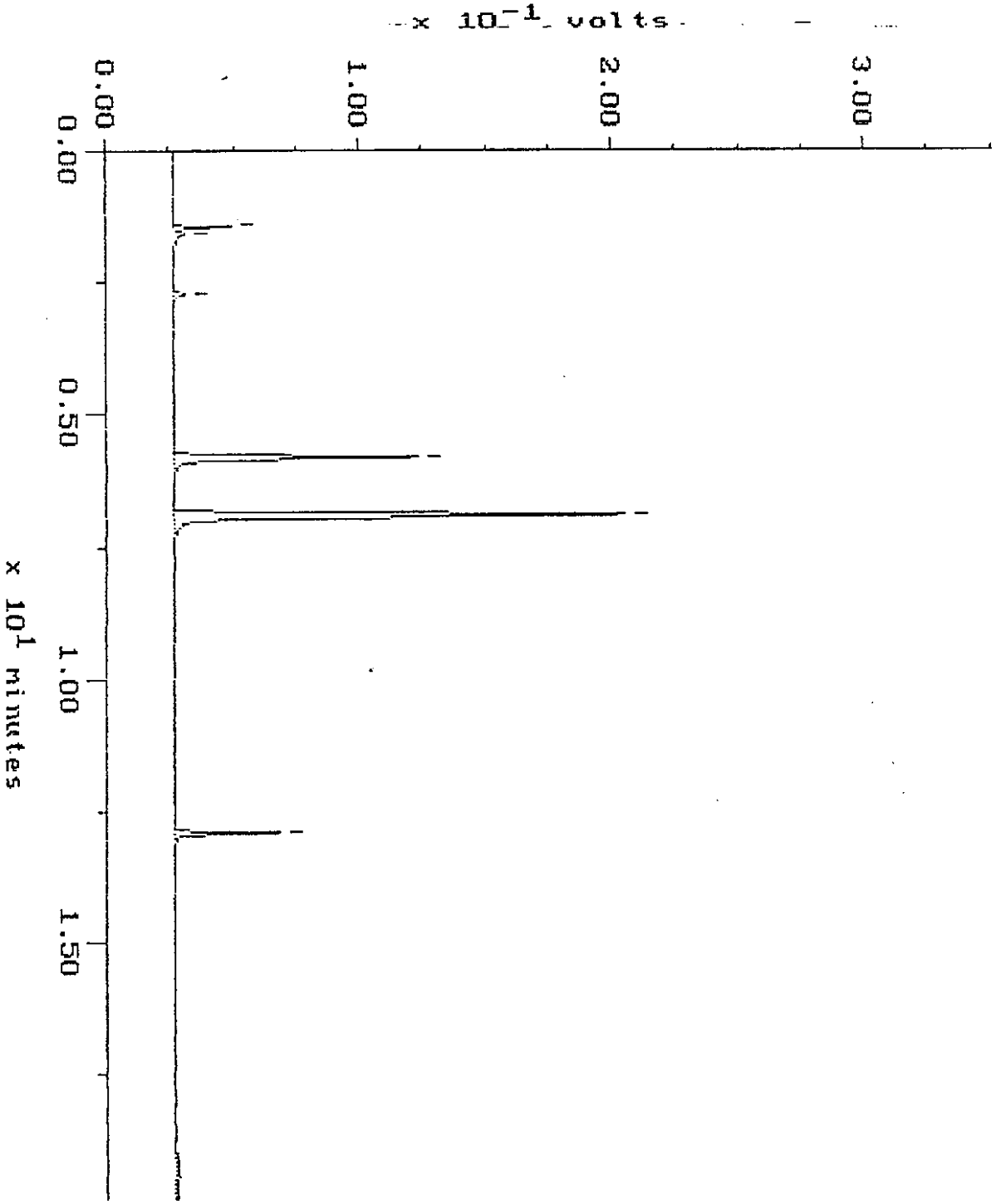
WA DOE WTPH-G

Sample: 407128-12 DIL Channel: FID Filename: R7199P11
Acquired: 19-JUL-94 15:10 Method: F:\BRO2\MAXDATA\PICARD\071994PC Operator: ATI
Dilution: 1 : 20.000
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



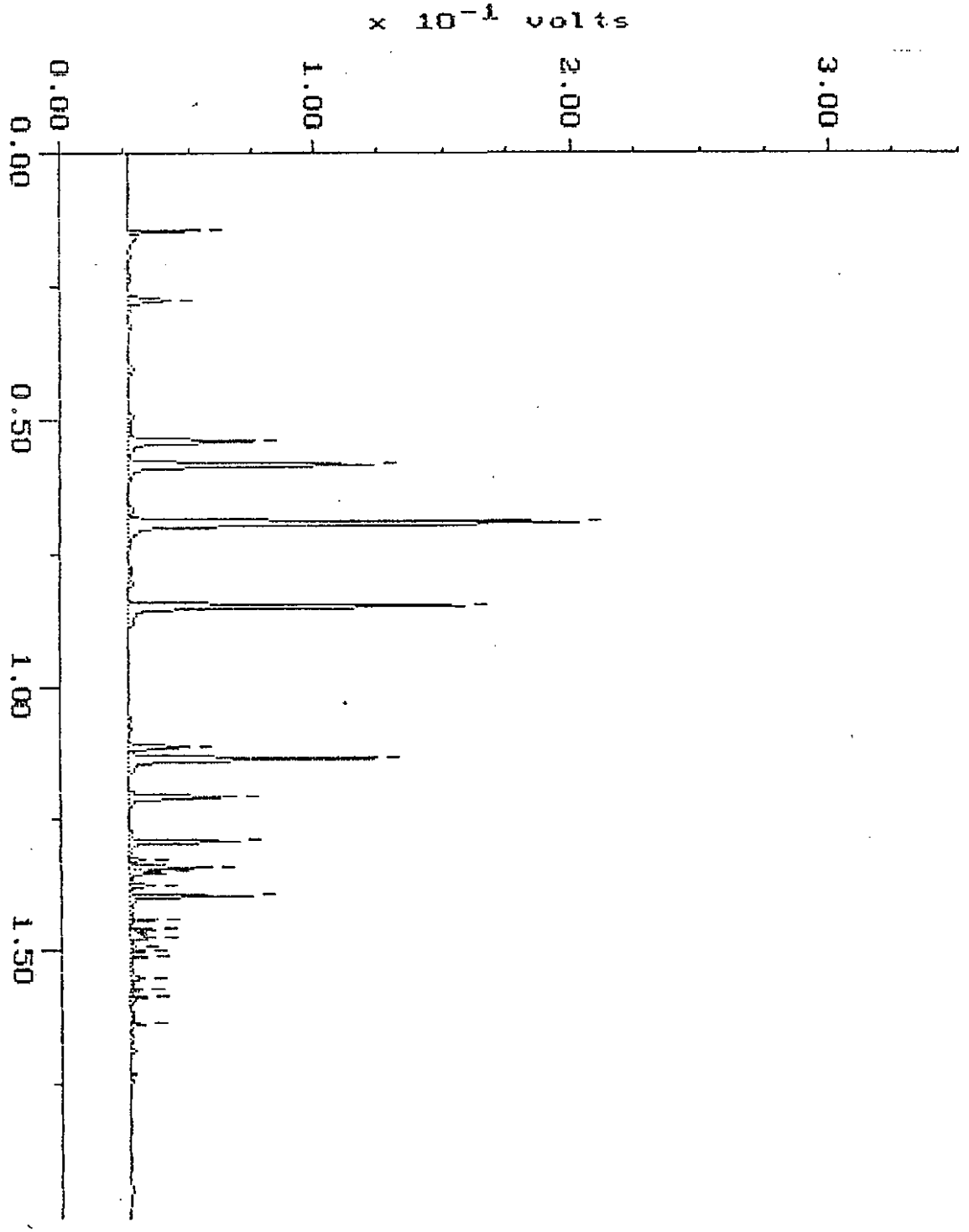
WA DOE WTPH-G

Sample: 407128-13 Channel: FID Filename: R7189P24
Acquired: 16-JUL-94 20:21 Method: F:\BRO2\MAXDATA\PICARD\071894PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



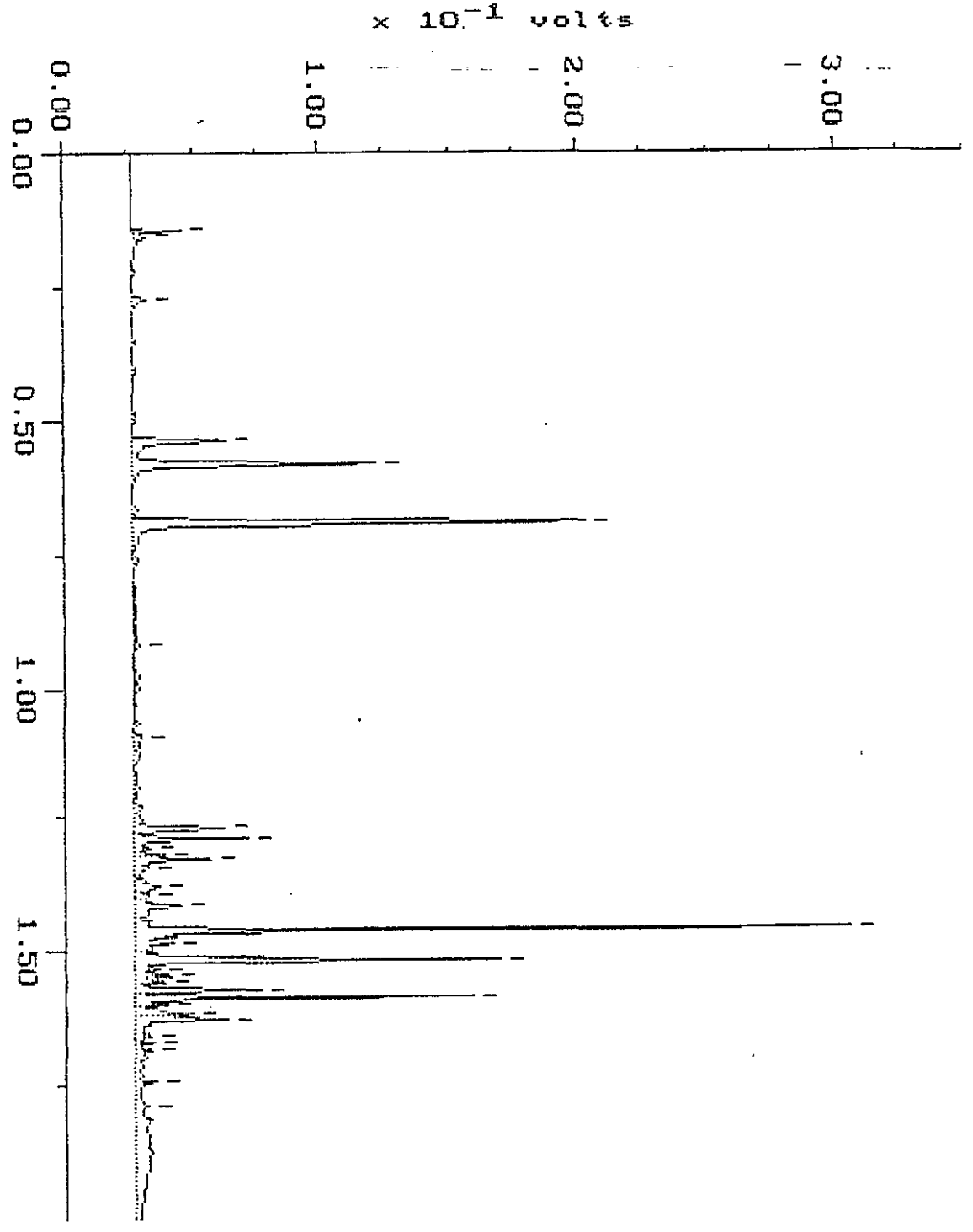
WA DOE WTPH-G

Sample: 407128-14 DIL Channel: FID Filename: R7199P16
Acquired: 19-JUL-94 17:46 Method: F:\BRO2\MAXDATA\PICARD\071994PC Operator: ATI
Dilution: 1 : 500.000
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



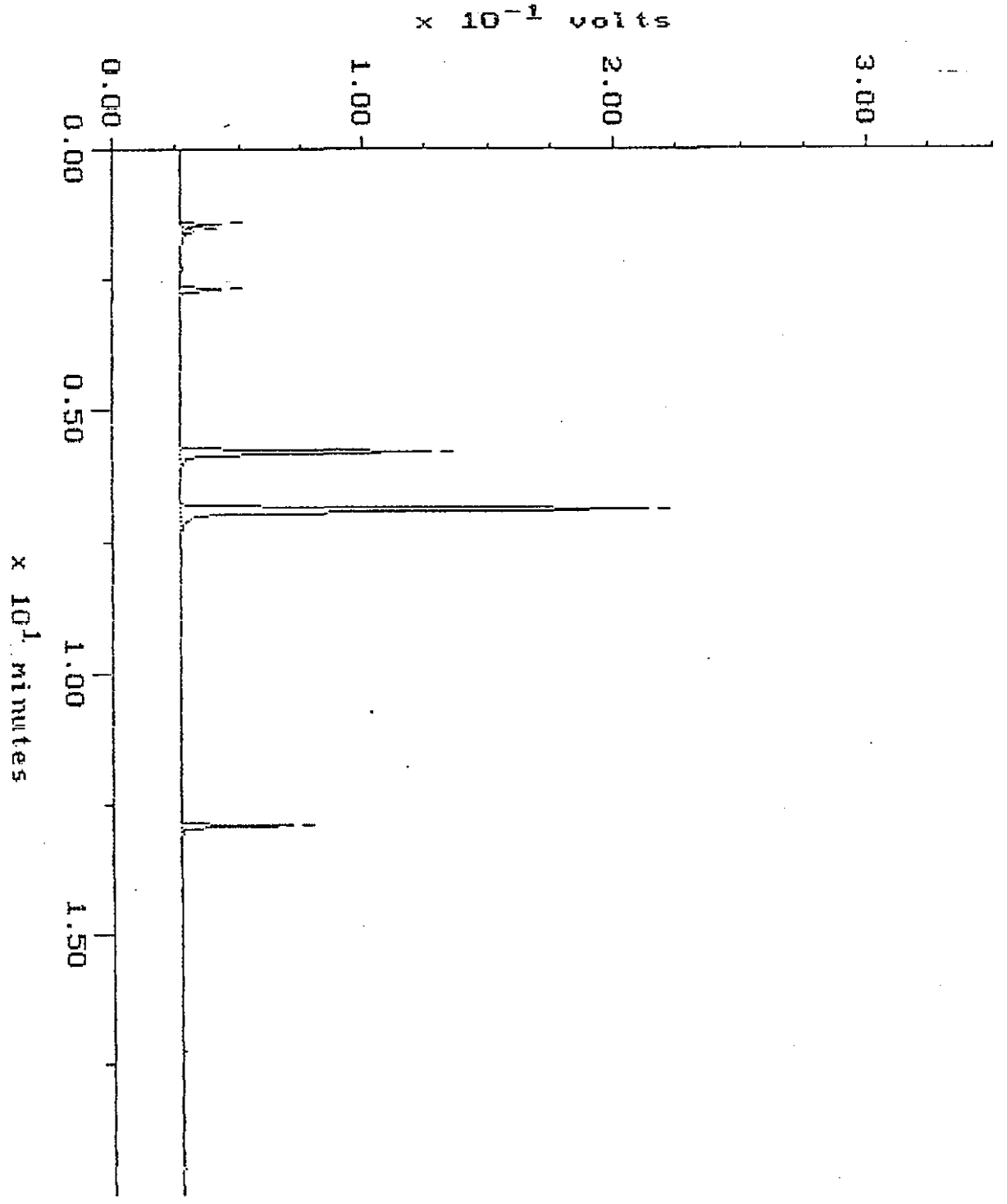
WA DOE WTPH-G

Sample: 407128-15 Channel: FID Filename: R7199P07
Acquired: 19-JUL-94 13:06 Method: F:\BR02\MAXDATA\PICARD\071994PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



WA DOE WTPH-G Blank

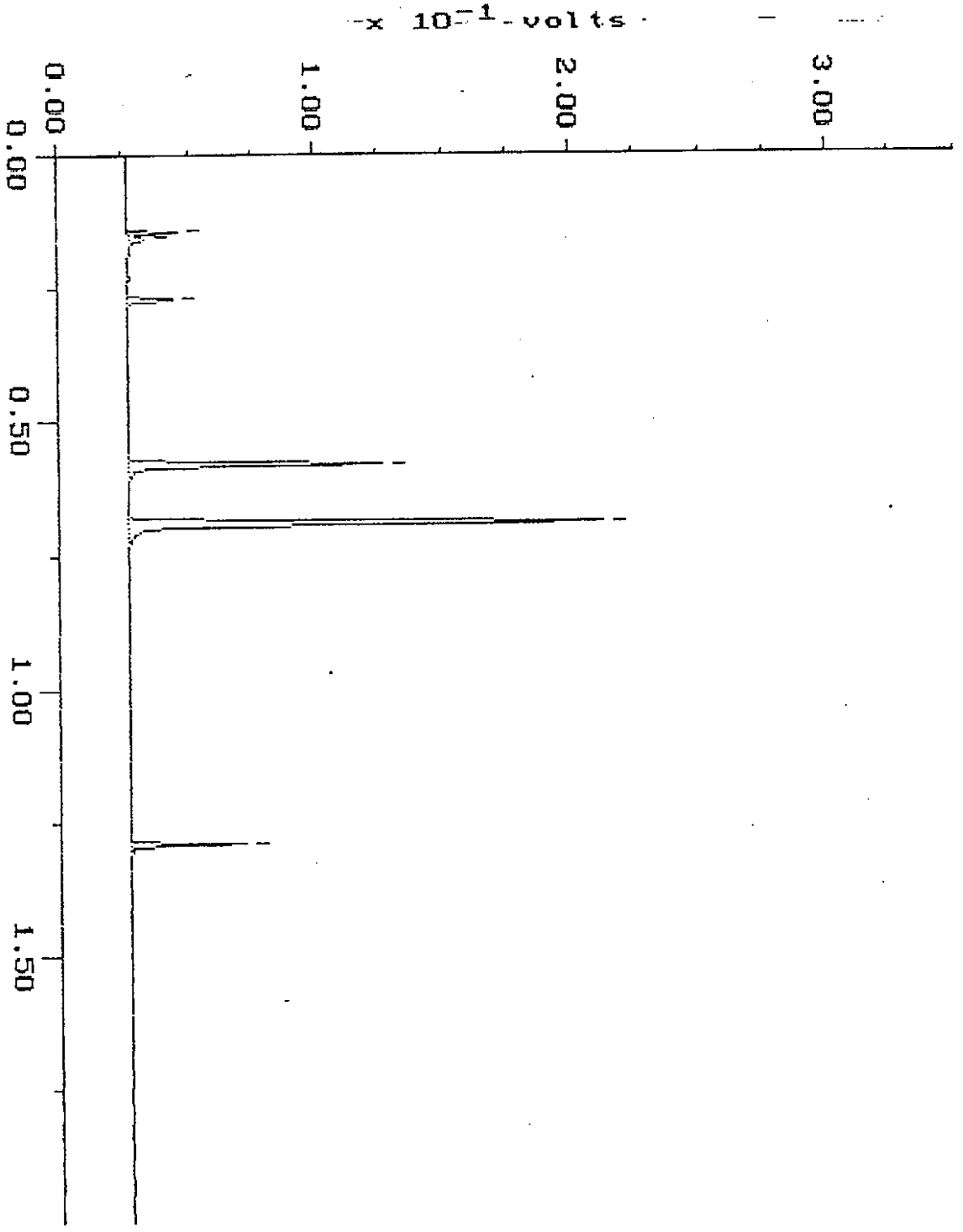
Sample: WRB 7-15 Channel: FID Filename: R7159P03
Acquired: 15-JUL-94 9:58 Method: F:\BRD2\MAXDATA\PICARD\071594PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



WA DOE WTPH-G

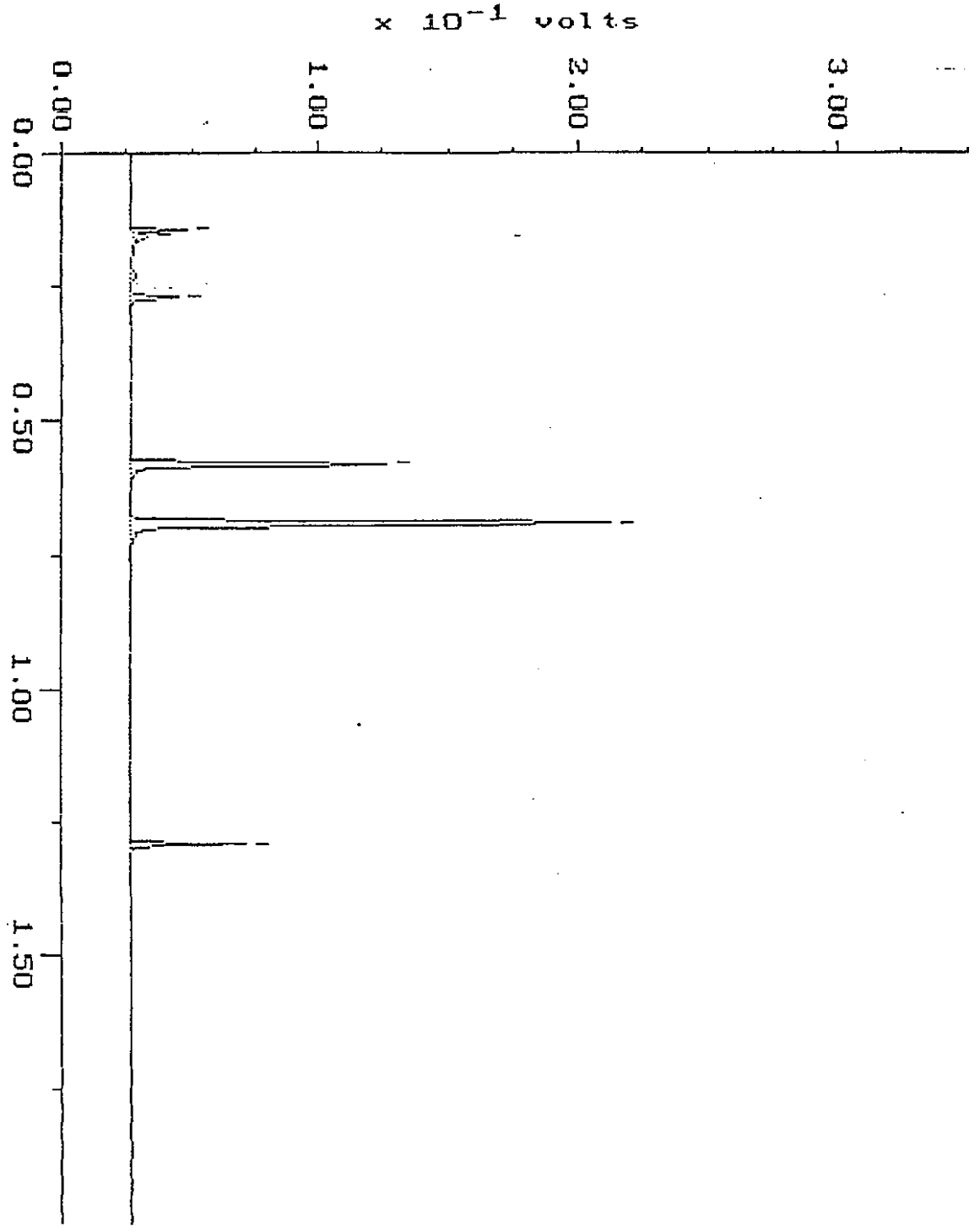
Blank

Sample: WRB 7-18 Channel: FID Filename: R7189P03
Acquired: 18-JUL-94 9:05 Method: F:\BRD2\MAXDATA\PICARD\071894PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



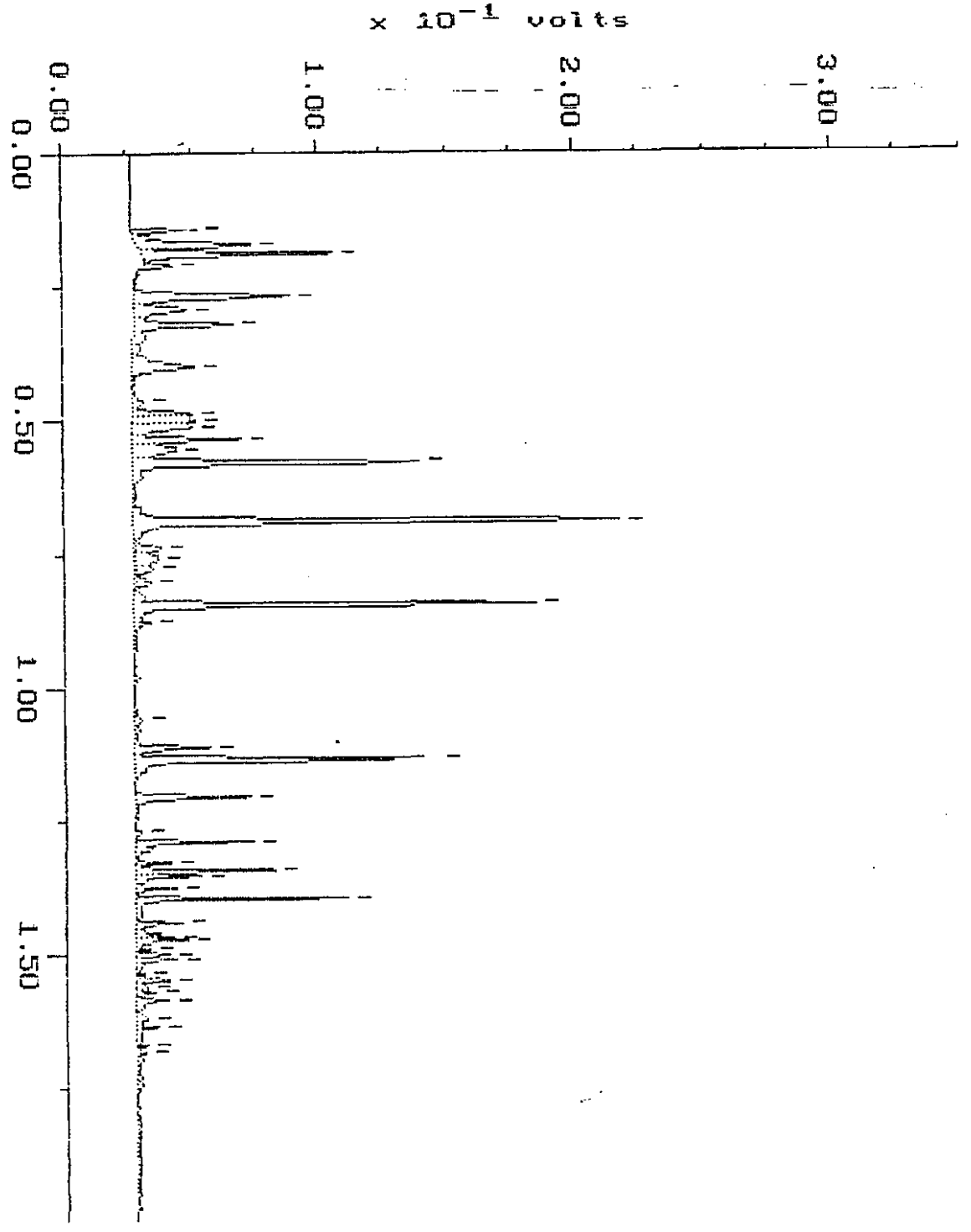
WA DOE WTPH-G Blank

Sample: WRB 7-19 Channel: FID Filename: R7199P03
Acquired: 19-JUL-94 10:31 Method: F:\BRO2\MAXDATA\PICARD\071994PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



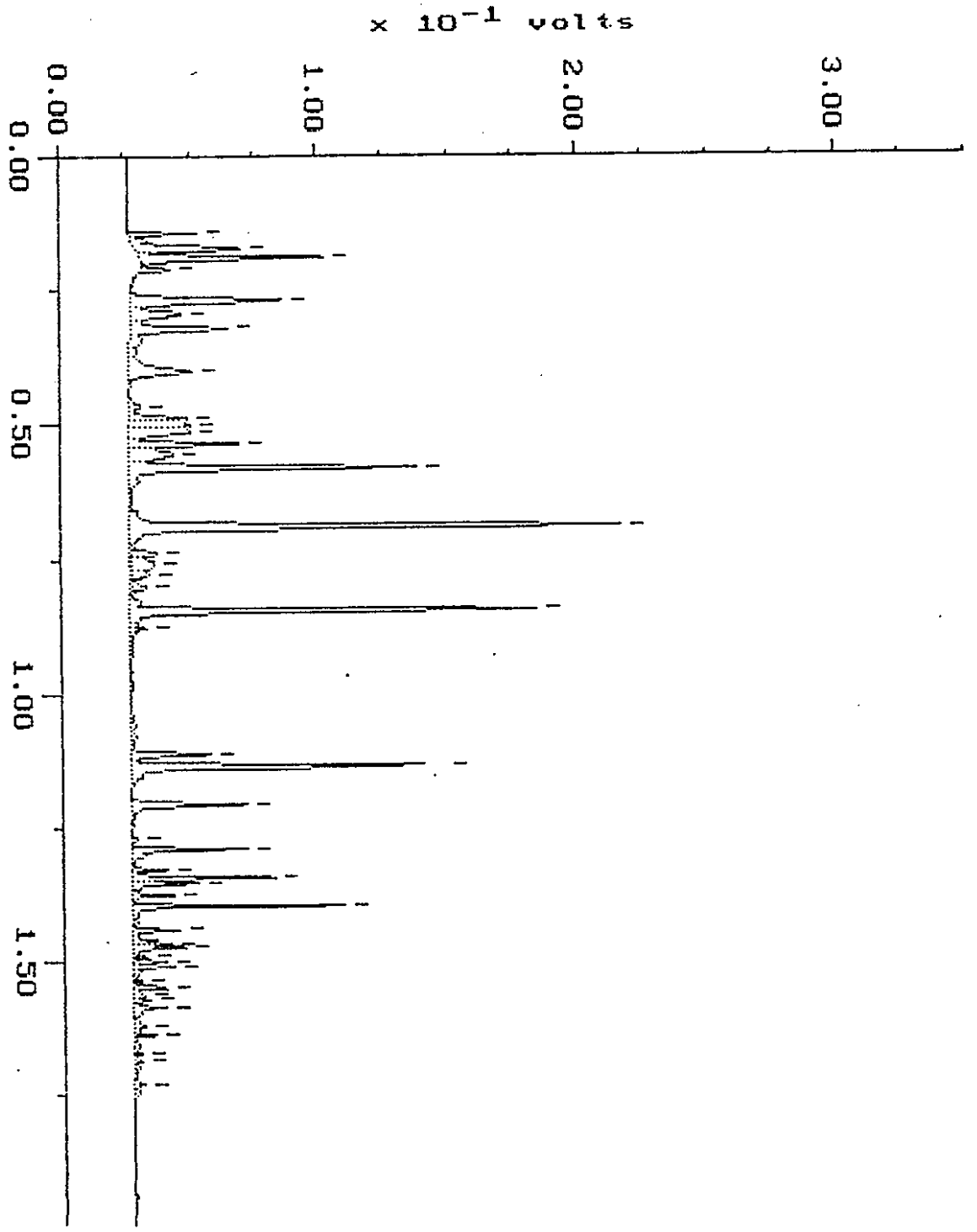
CONTINUING CALIBRATION

Sample: STD-C G Channel: FID Filename: R7159P01
Acquired: 15-JUL-94 8:26 Method: F:\BRO2\MAXDATA\PICARD\071594PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



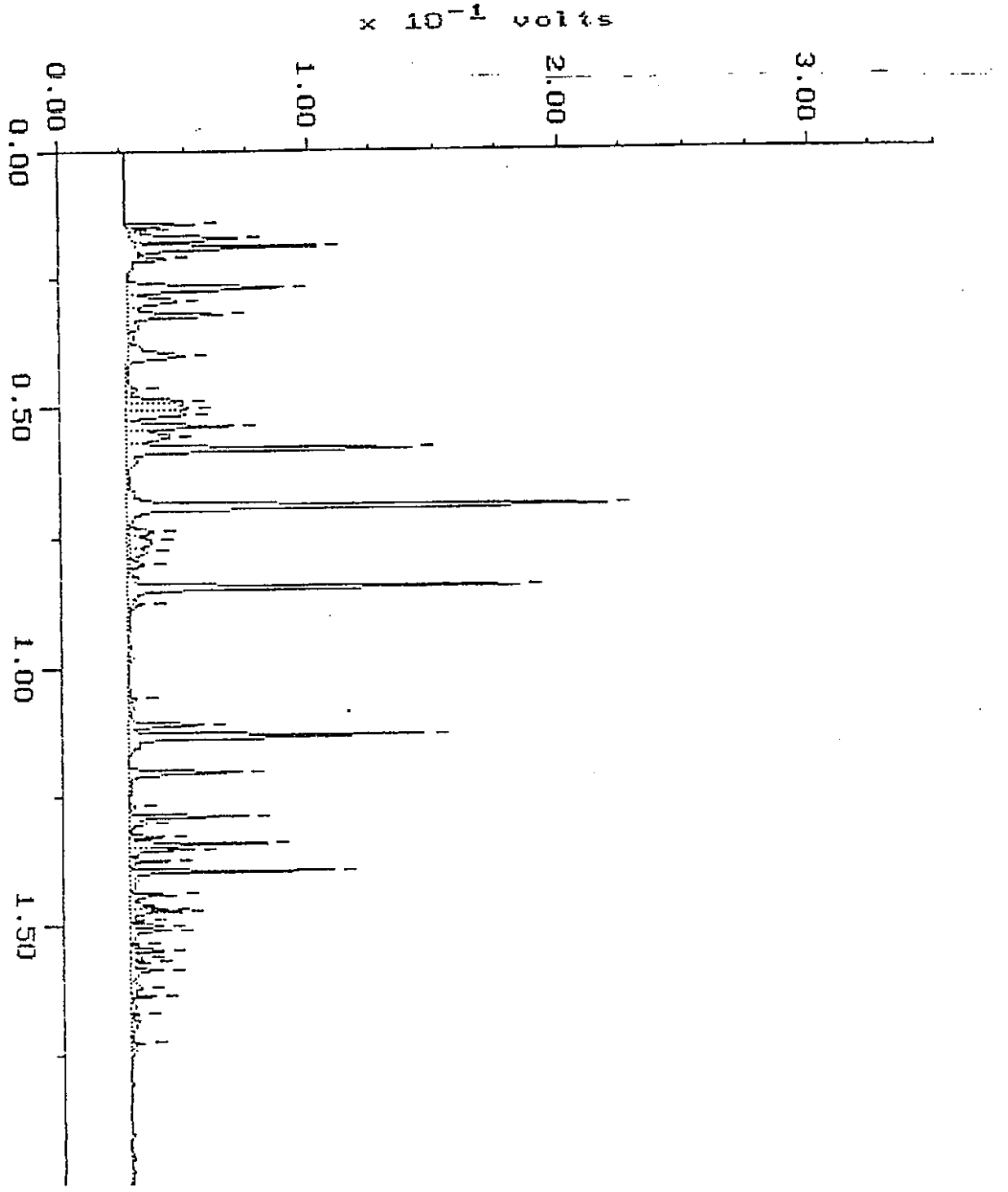
CONTINUING CALIBRATION

Sample: STD-C G Channel: FID Filename: R7189P01
Acquired: 18-JUL-94 7:41 Method: F:\BRO2\MAXDATA\PICARD\071894PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



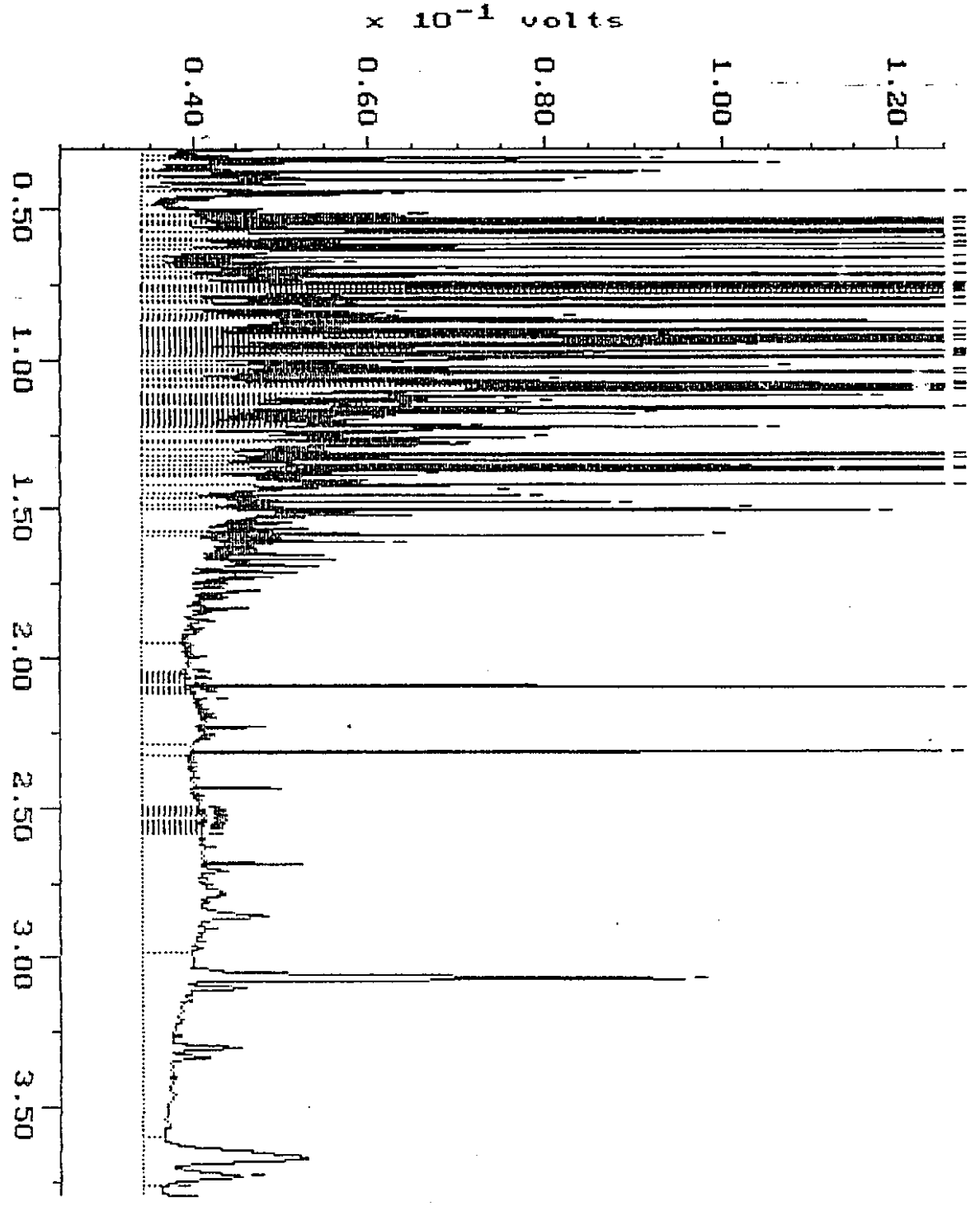
CONTINUING CALIBRATION

Sample: STD-C G Channel: FID Filename: R7199P01
Acquired: 19-JUL-94 8:46 Method: F:\BRO2\MAXDATA\PICARD\071994PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



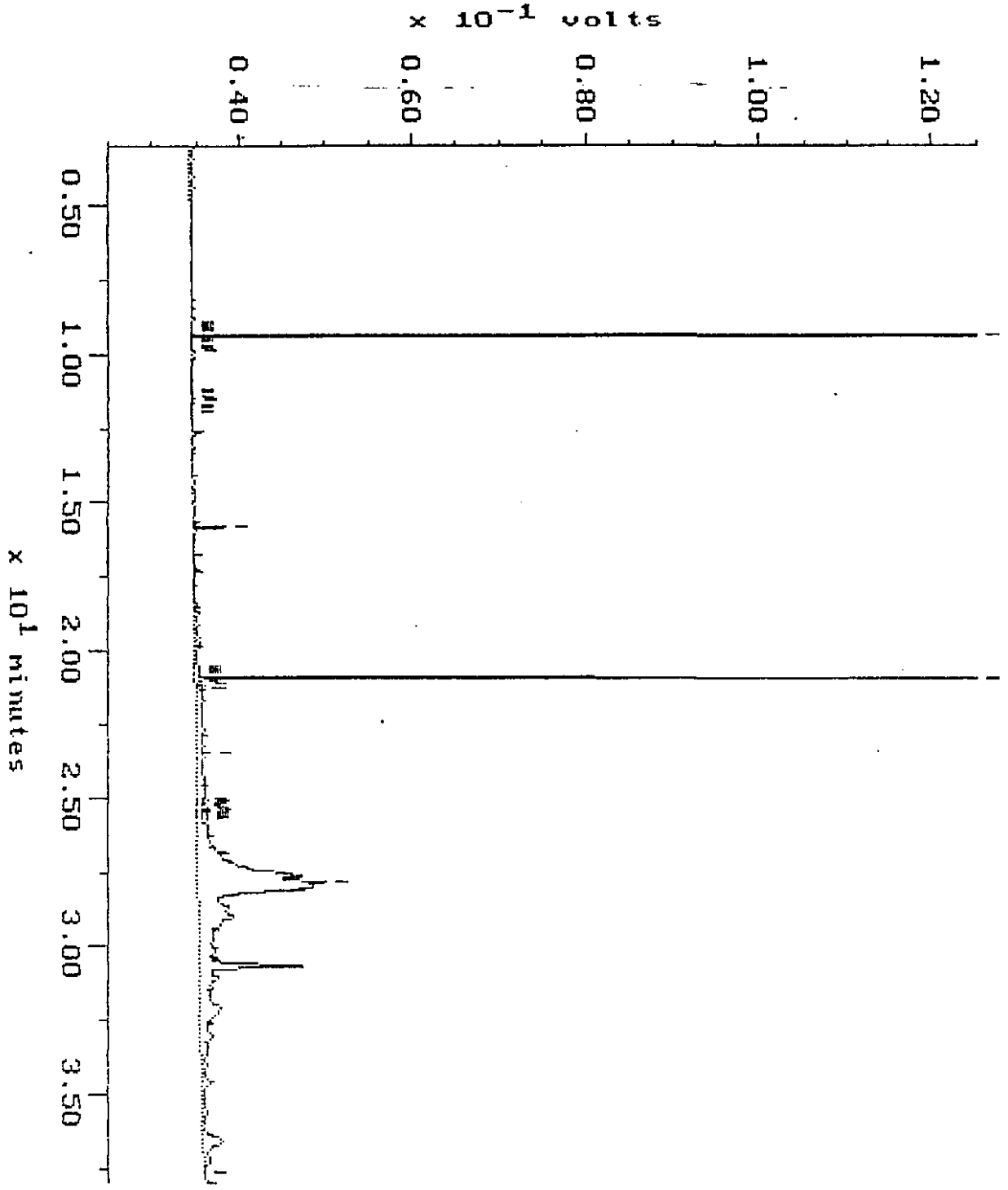
WA DOE WTPH-D

Sample: 407128-1 Channel: FRED Filename: R7218F15
Acquired: 22-JUL-94 1:41 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



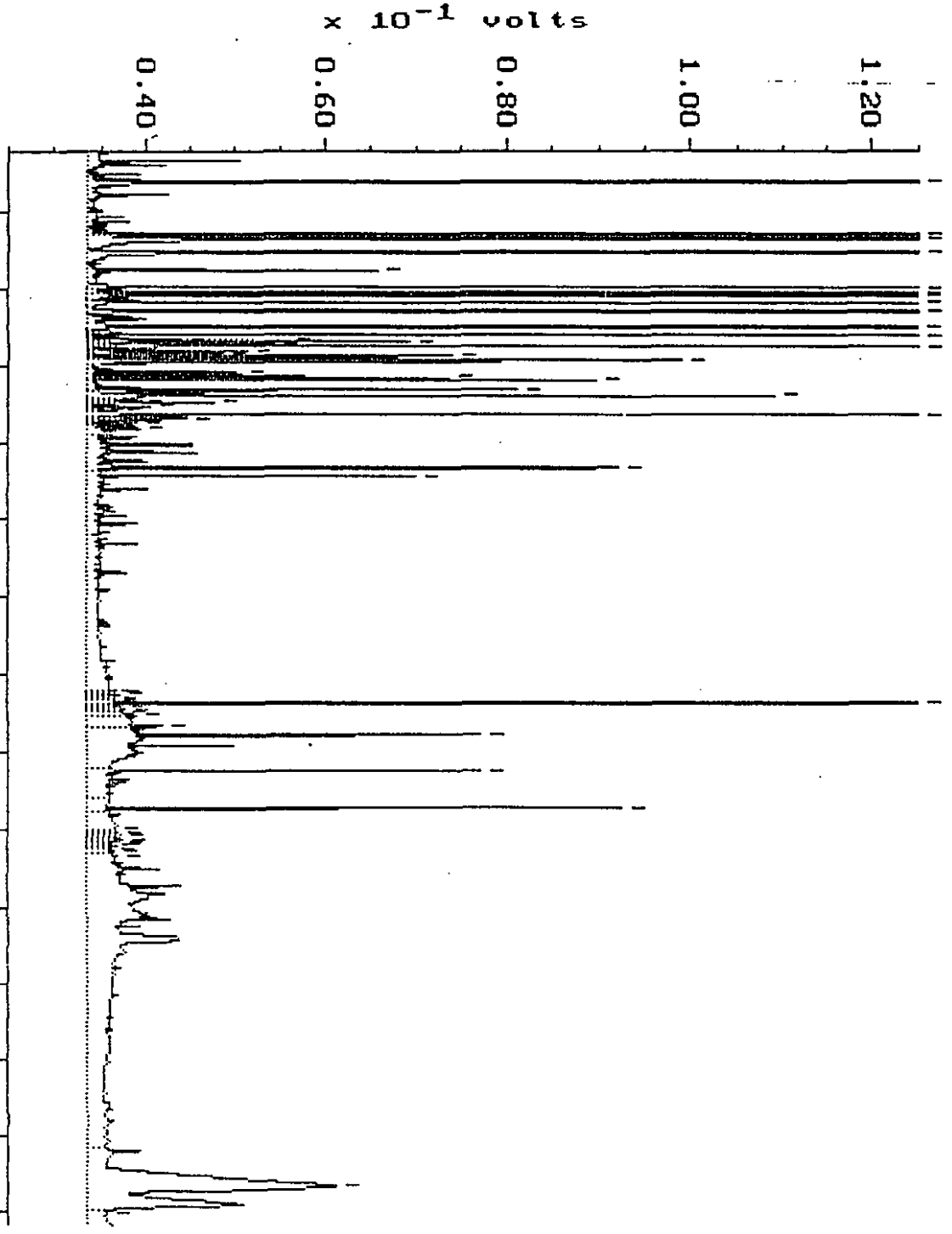
WA DOE WTPH-D

Sample: 407128-2 Channel: FRED Filename: R7218F17
Acquired: 22-JUL-94 3:18 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



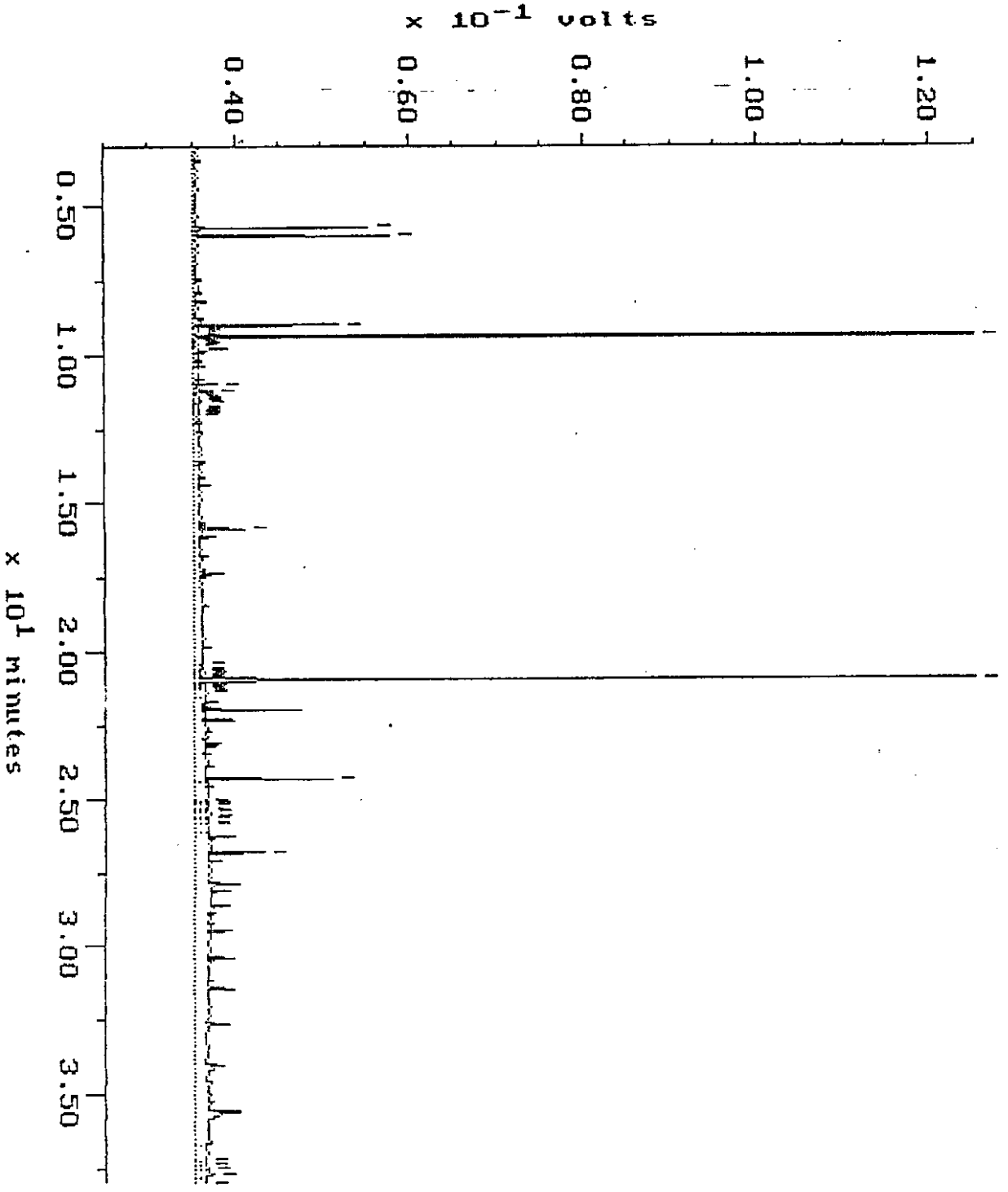
WA DOE WTPH-D

Sample: 407128-3 Channel: FRED Filename: R7218F31
Acquired: 22-JUL-94 14:48 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



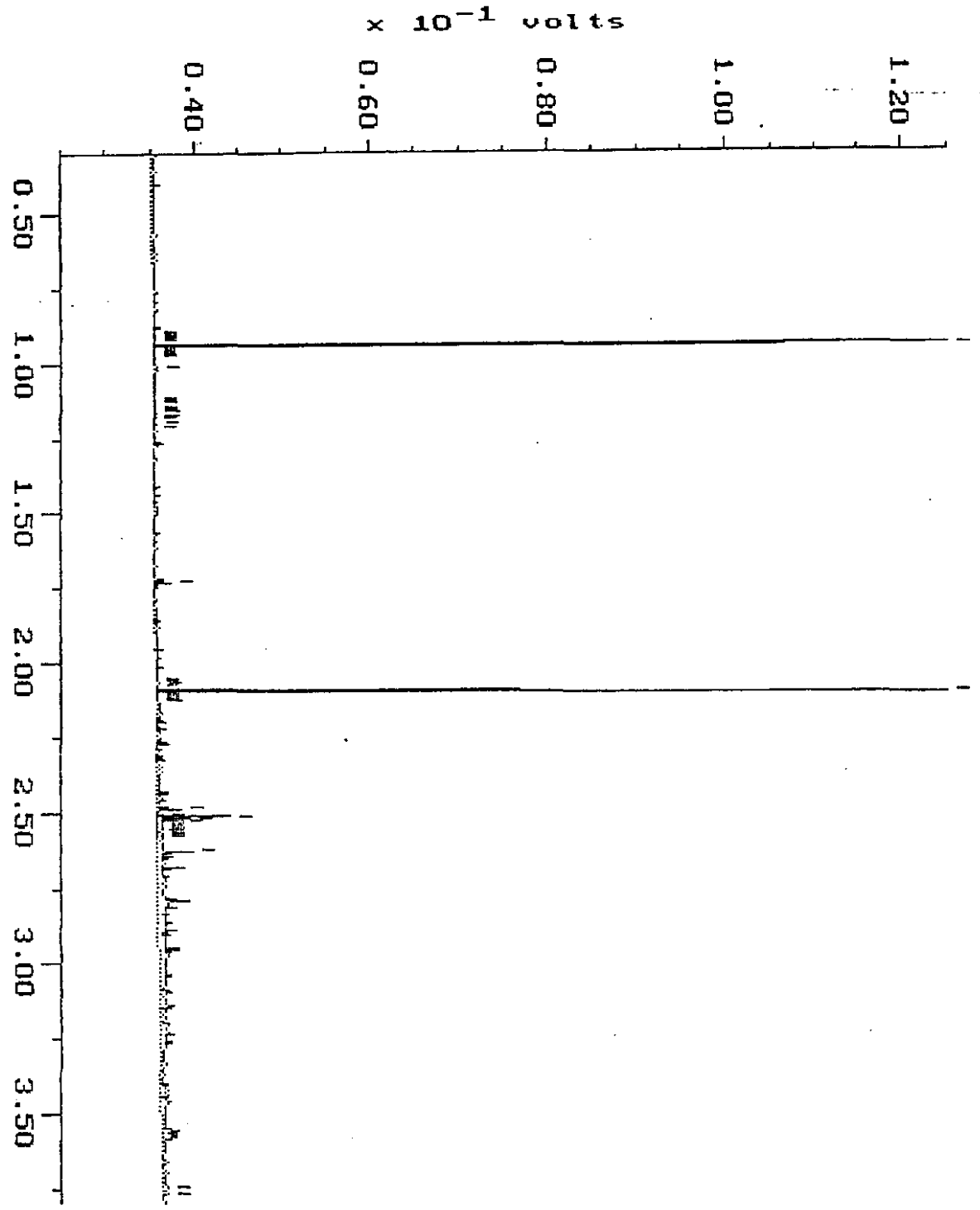
WA DOE WTPH-D

Sample: 407128-4 Channel: FRED Filename: R7198F31
Acquired: 21-JUL-94 5:09 Method: F:\BRO2\MAXDATA\FRED\FUEL0719 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



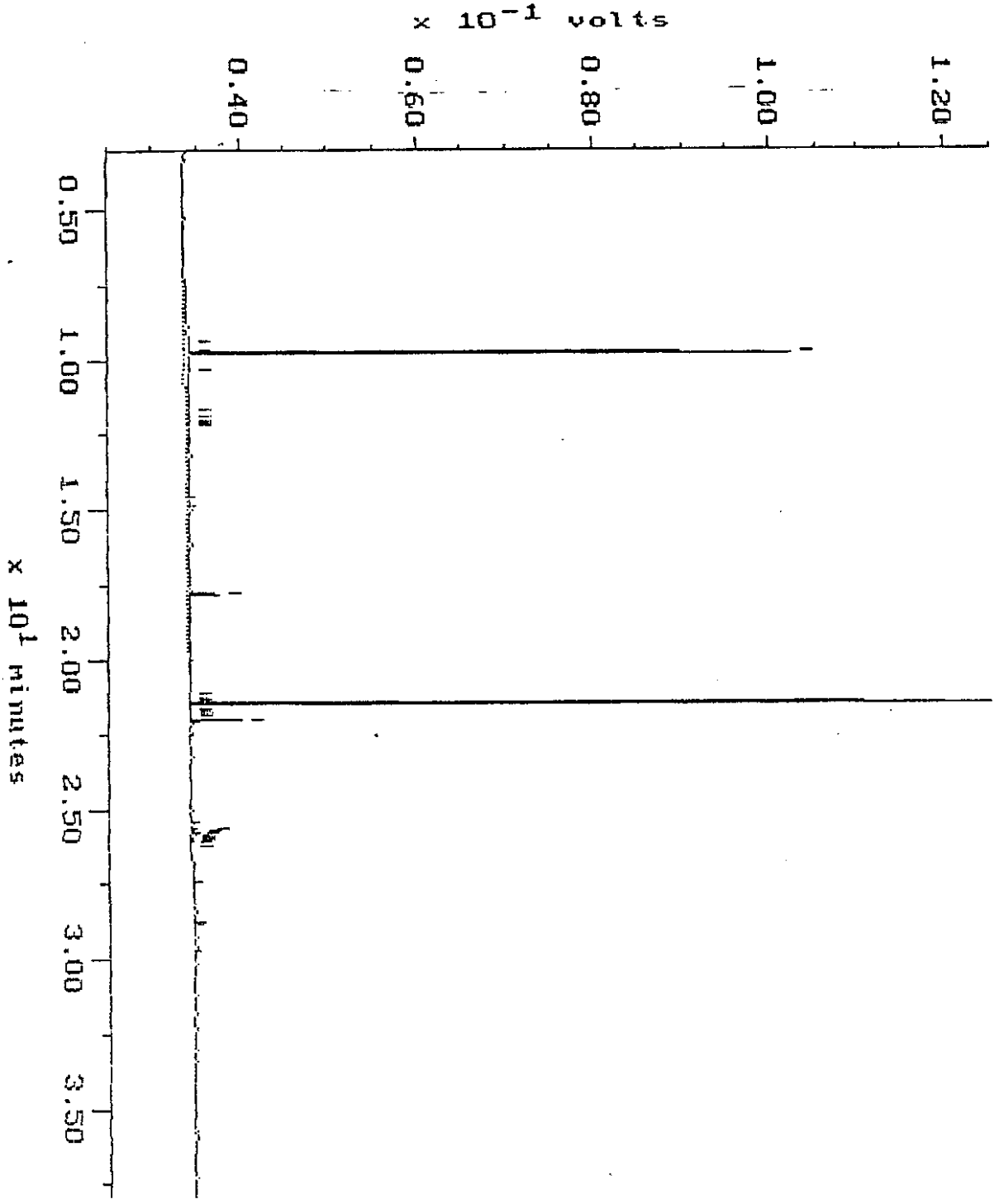
WA DOE WTPH-D

Sample: 407128-5 Channel: FRED Filename: R7218F24
Acquired: 22-JUL-94 8:58 Method: F:\BRD2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



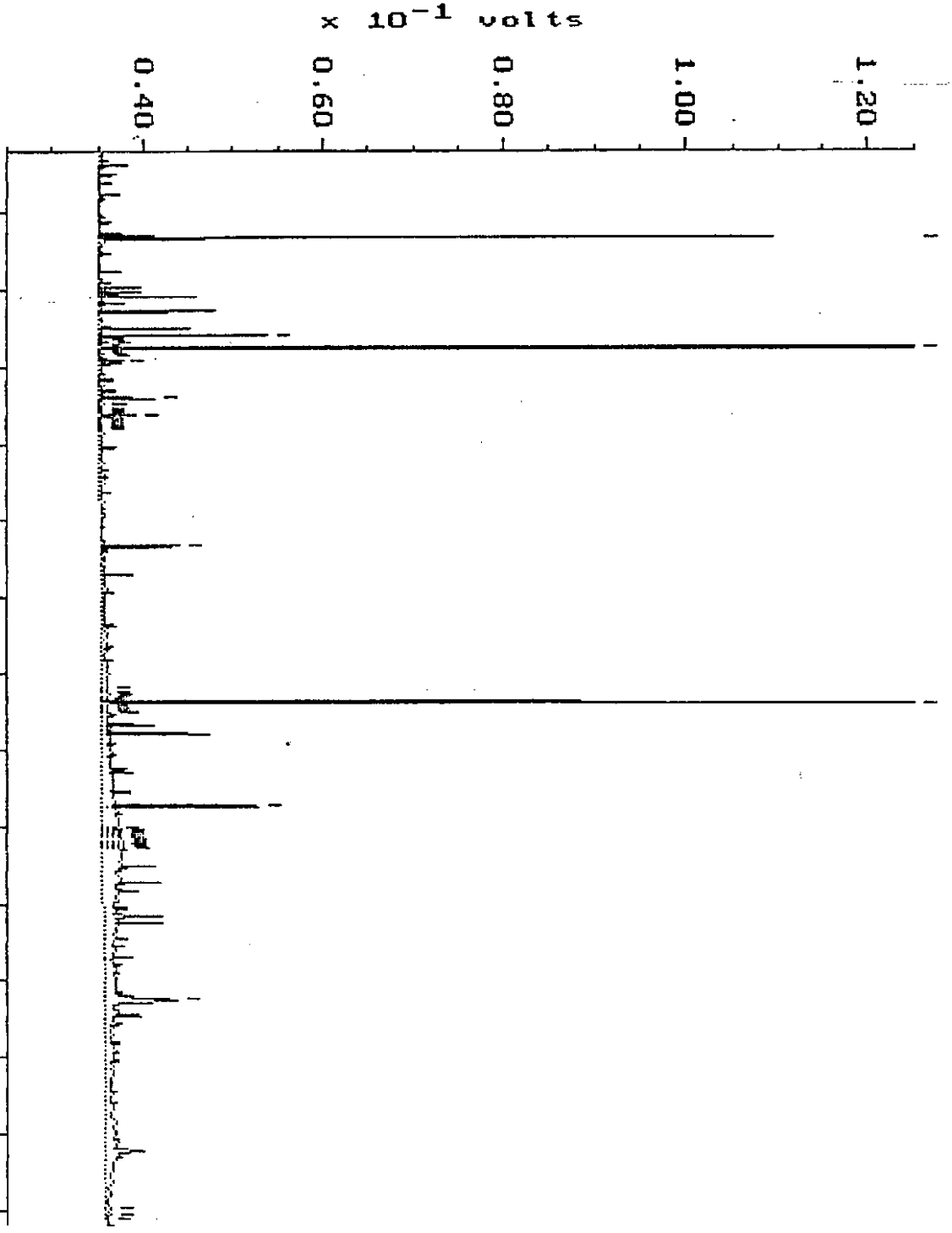
WA DOE WTPH-D

Sample: 407128-5 RE Channel: NANCY Filename: R7258N30
Acquired: 26-JUL-94 15:08 Method: F:\BR02\MAXDATA\NANCY\FUEL0725 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE

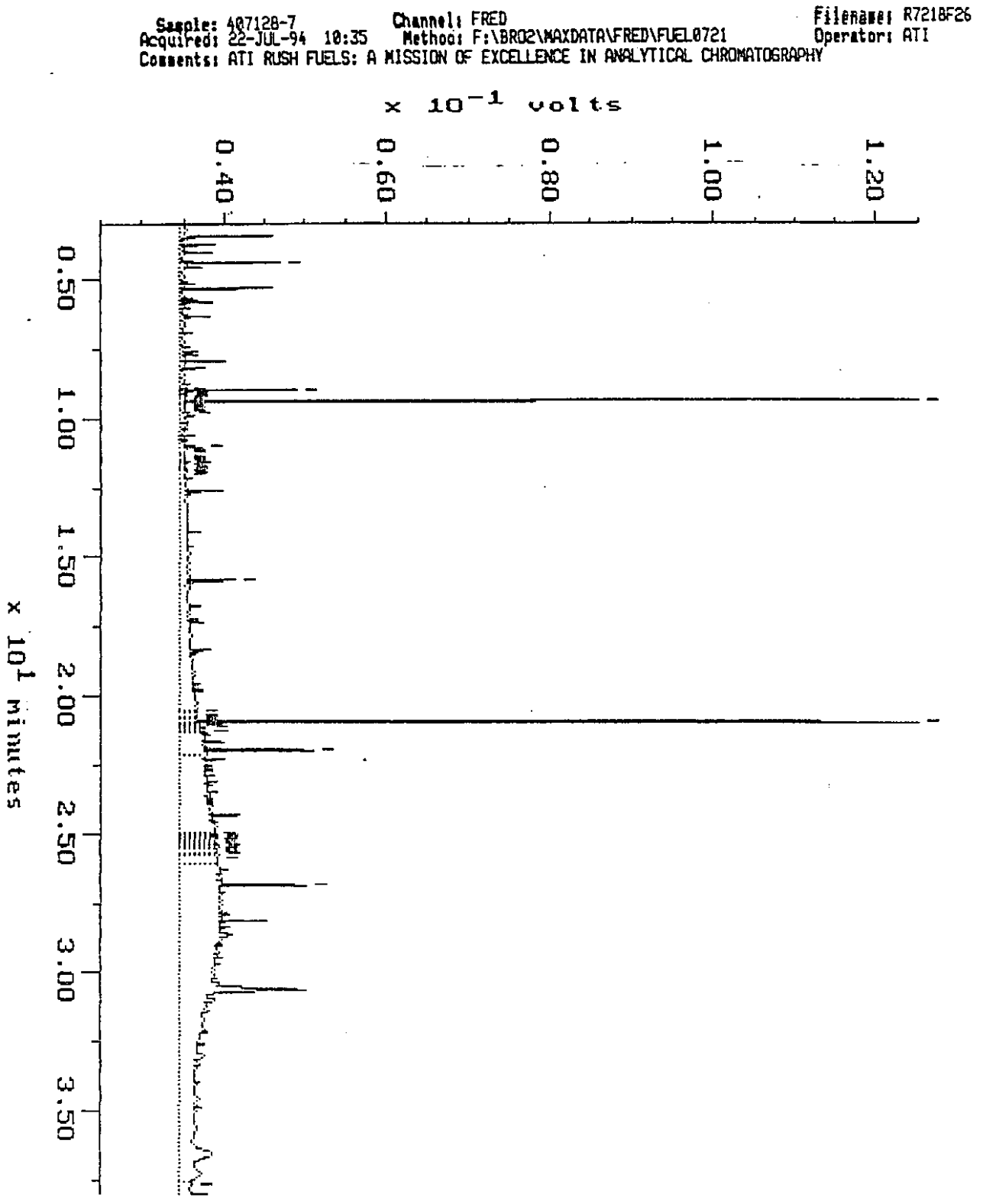


WA DOE WTPH-D

Sample: A07128-6 Channel: FRED Filename: R7218F25
Acquired: 22-JUL-94 9:47 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY

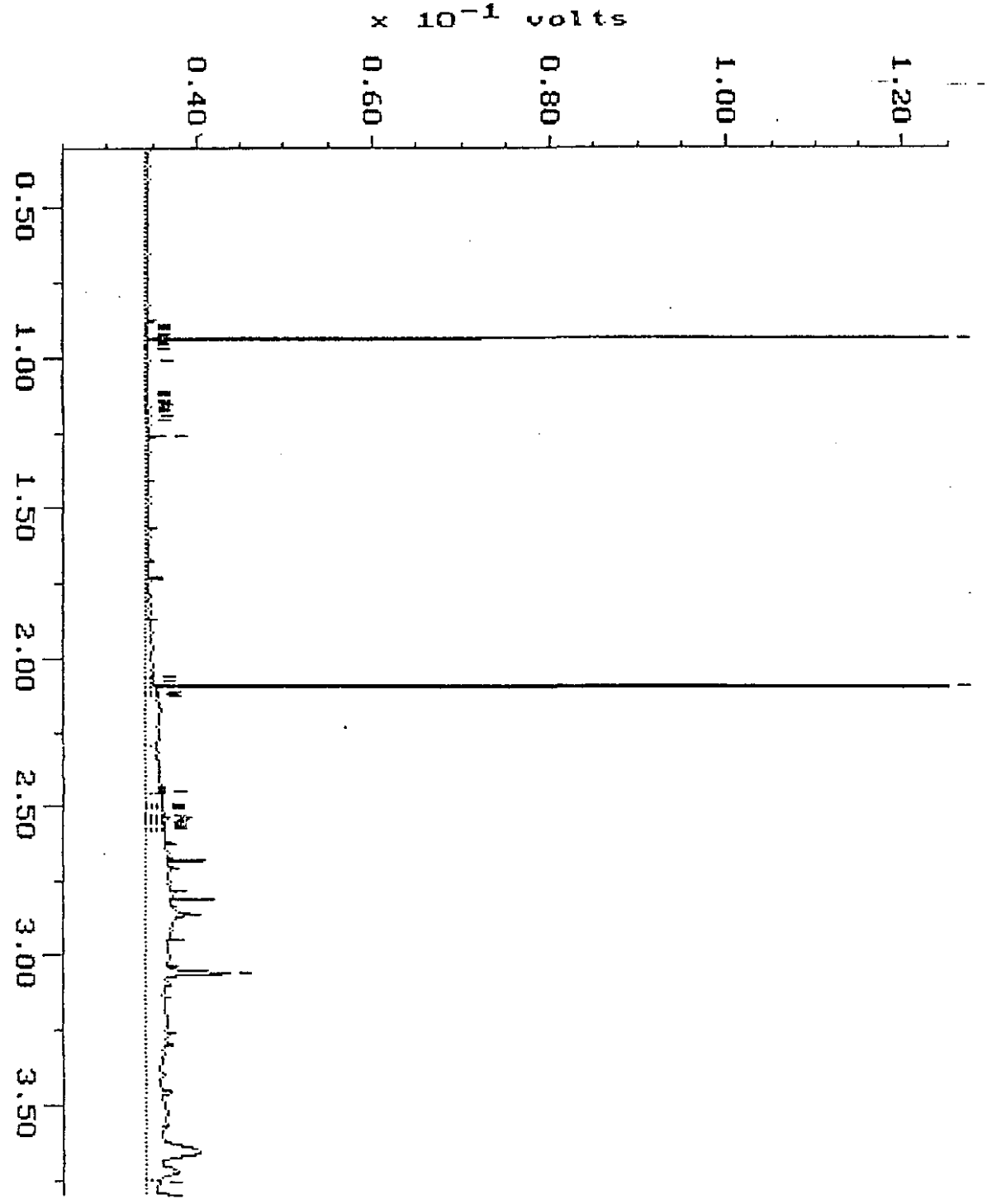


WA DOE WTPH-D


Sample: 407128-7
Channel: FRED
Filename: R7218F26
Acquired: 22-JUL-94 10:35
Method: F:\BRD2\MAXDATA\FRED\FUEL0721
Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY
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

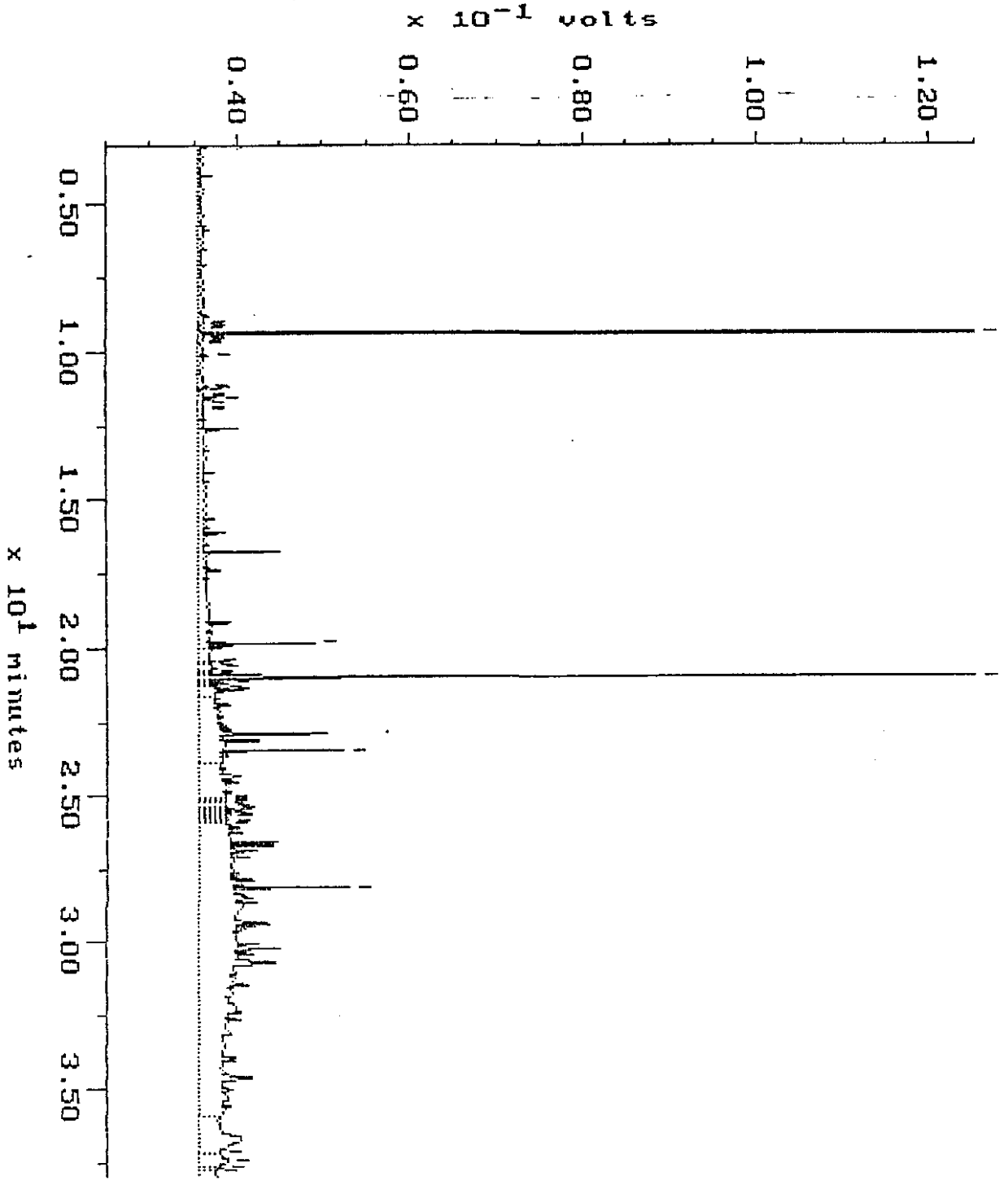
WA DOE WTPH-D

Sample: 407128-8 Channel: FRED Filename: R7218F27
Acquired: 22-JUL-94 11:25 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



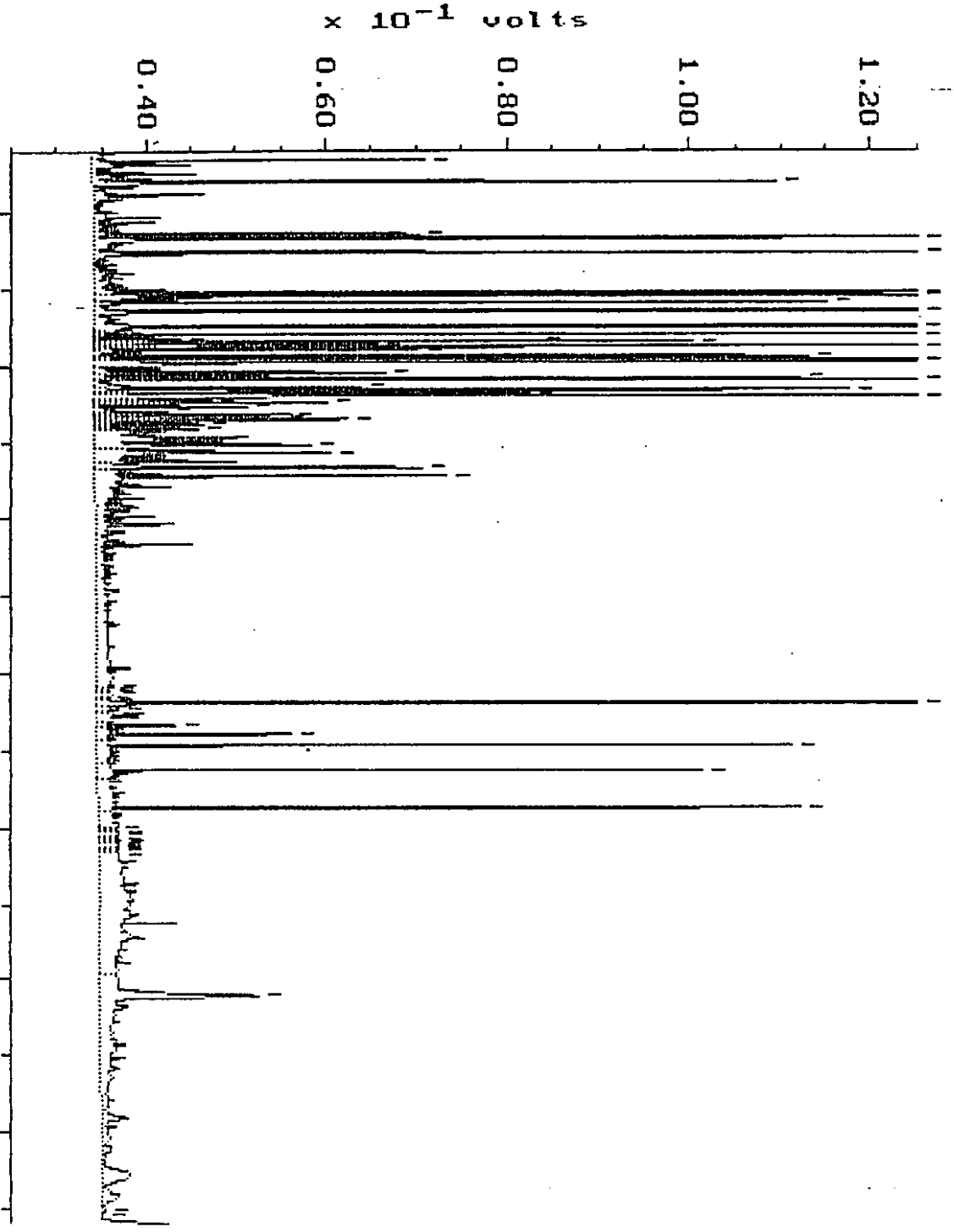
WA DOE WTPH-D

Sample: 407128-9 Channel: FRED Filename: R7198F33
Acquired: 21-JUL-94 6:46 Method: F:\BRO2\MAXDATA\FRED\FUEL0719 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



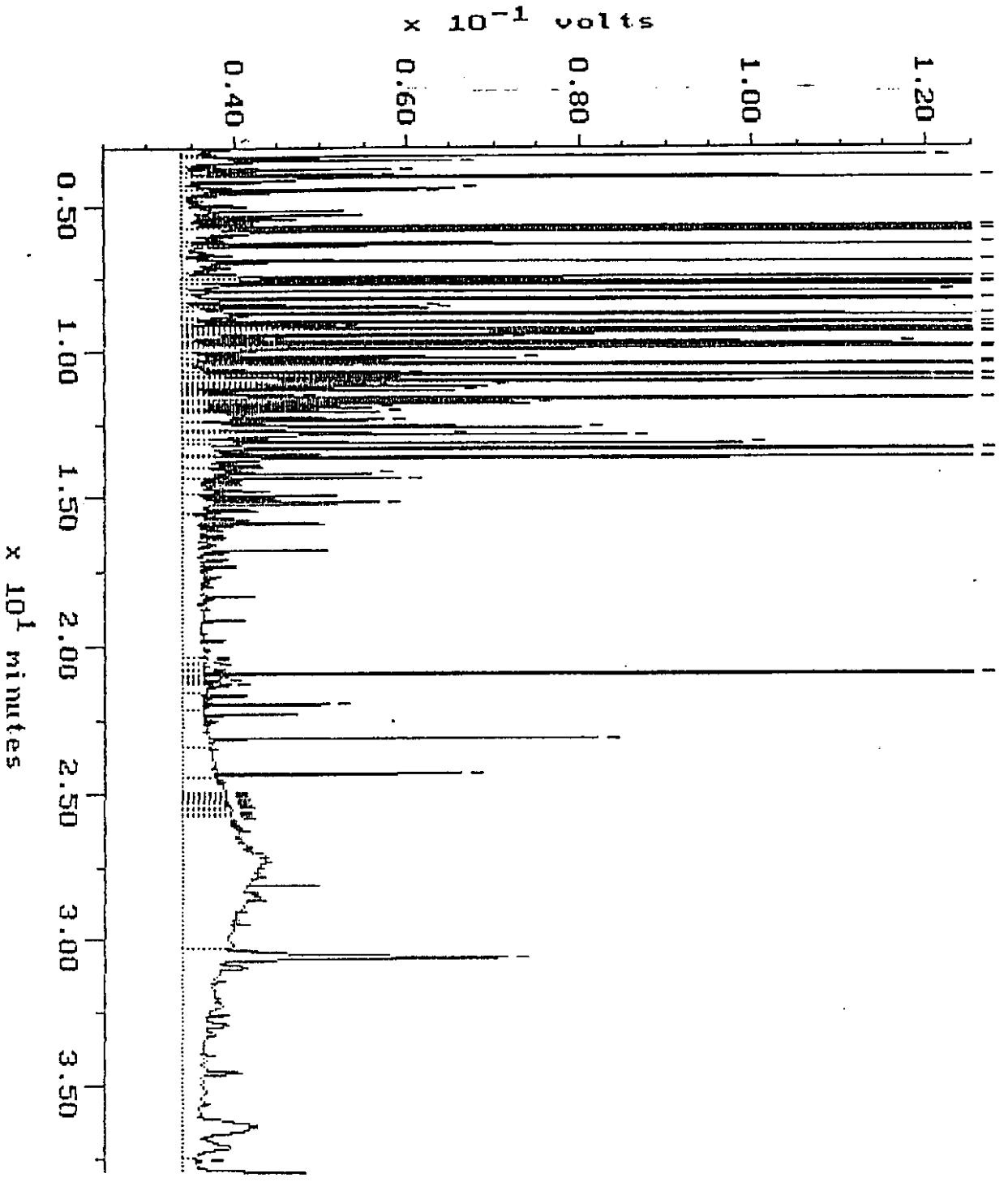
WA DOE WTPH-D

Sample: 407128-10 Channel: FRED Filename: R7218F28
Acquired: 22-JUL-94 12:14 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



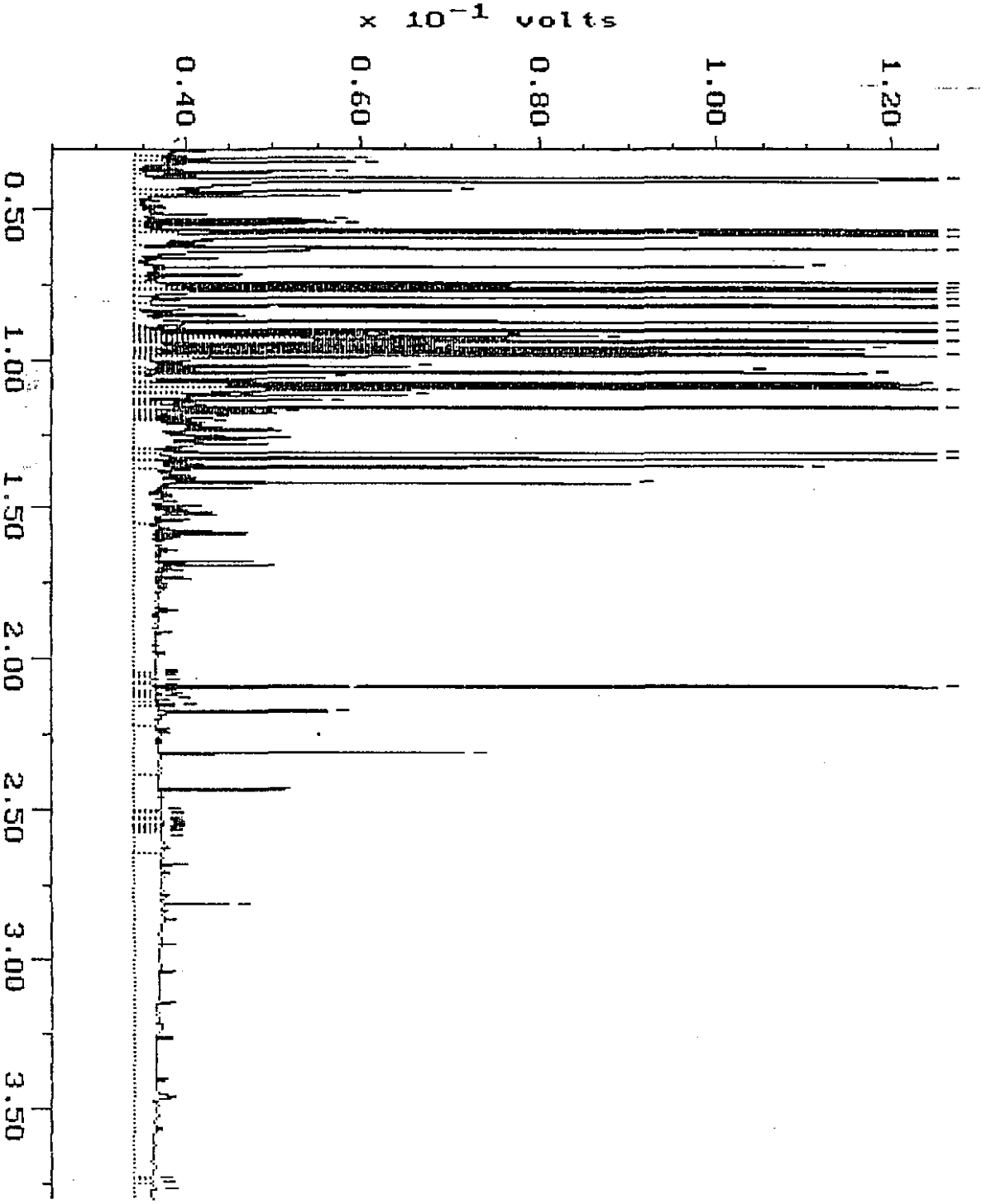
WA DOE WTPH-D

Sample: 407128-11 Channel: FRED Filename: R7218F29
Acquired: 22-JUL-94 13:05 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



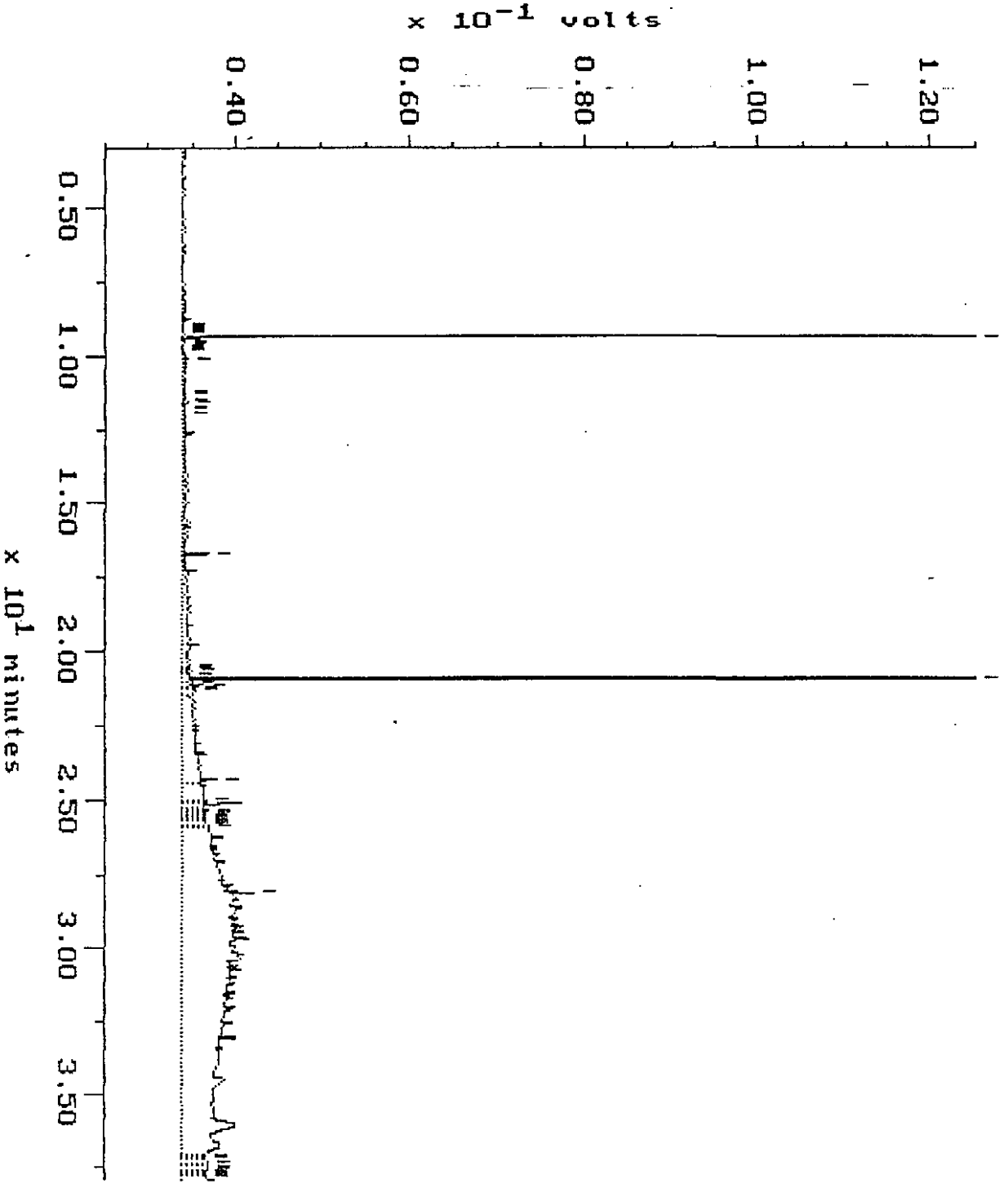
WA DOE WTPH-D

Sample: 407128-12 Channel: FRED Filename: R7228F04
Acquired: 23-JUL-94 0:51 Method: F:\BRO2\MAXDATA\FRED\FUEL0722 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



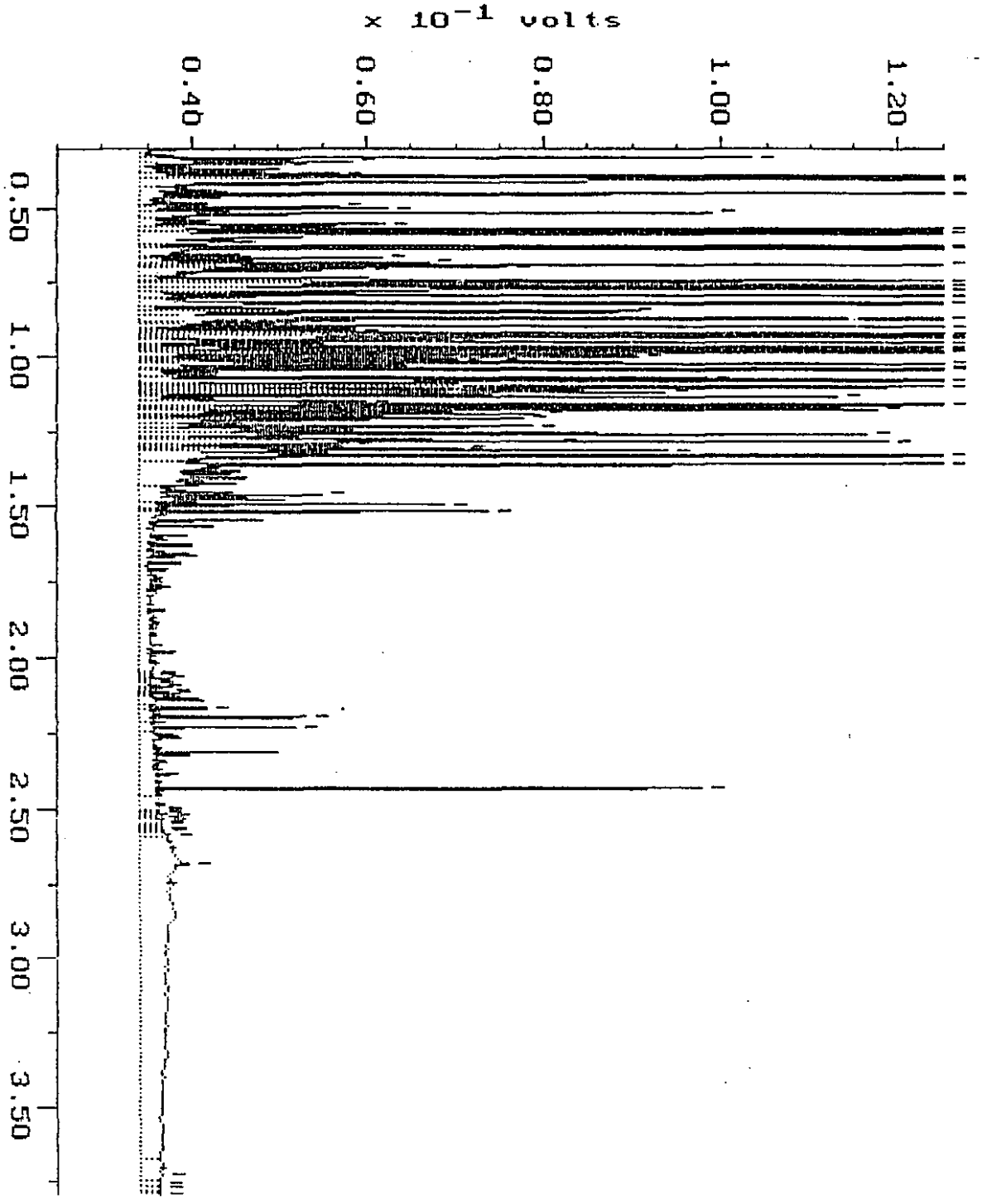
WA DOE WTPH-D

Sample: 407128-13 Channel: FRED Filename: R7218F04
Acquired: 21-JUL-94 16:38 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



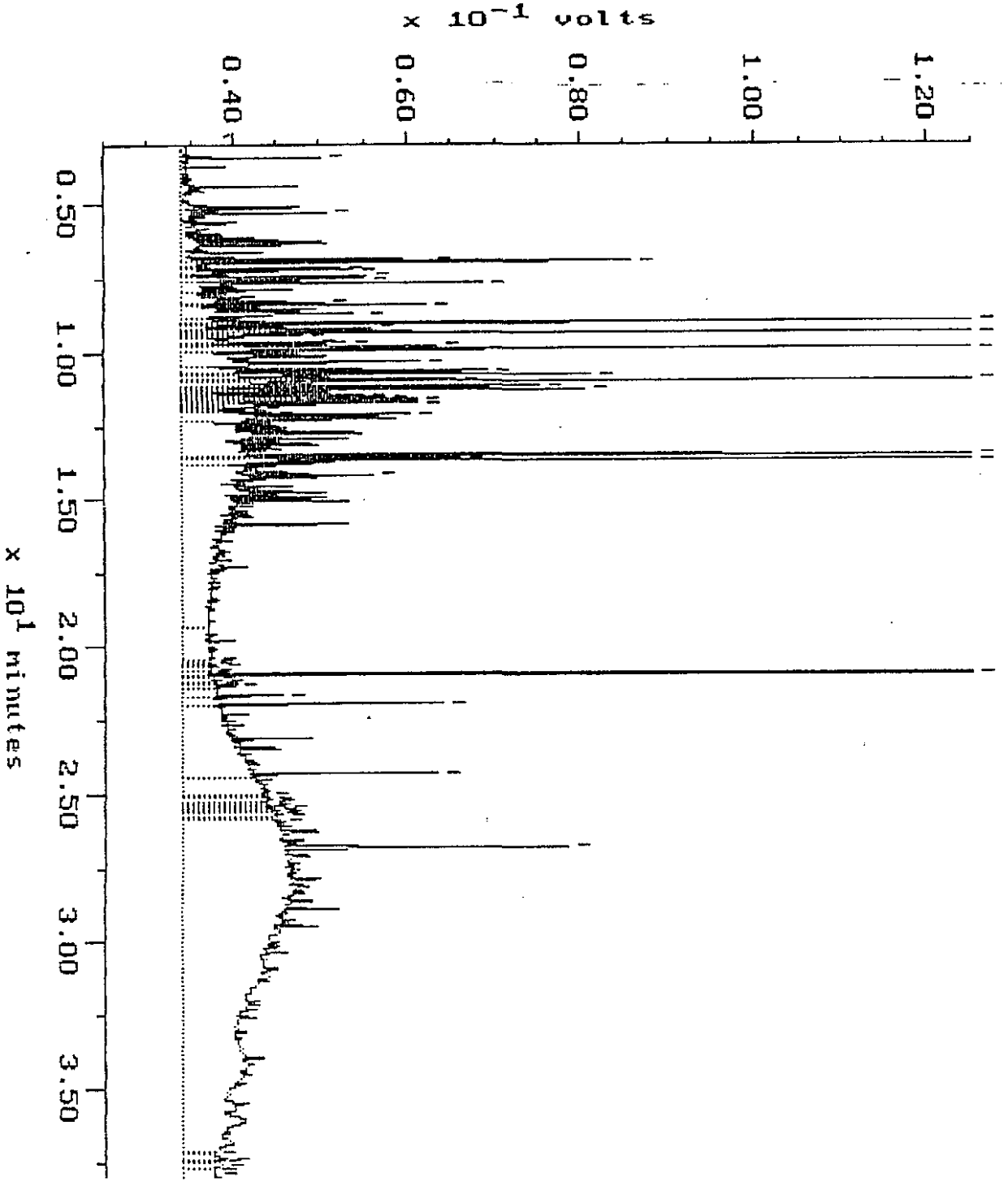
WA DOE WTPH-D

Sample: 407128-14 DIL Channel: FRED Filename: R7228F02
Acquired: 22-JUL-94 23:13 Method: F:\BRO2\MAXDATA\FRED\FUEL0722 Operator: ATI
Dilution: 1 : 200.000
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY

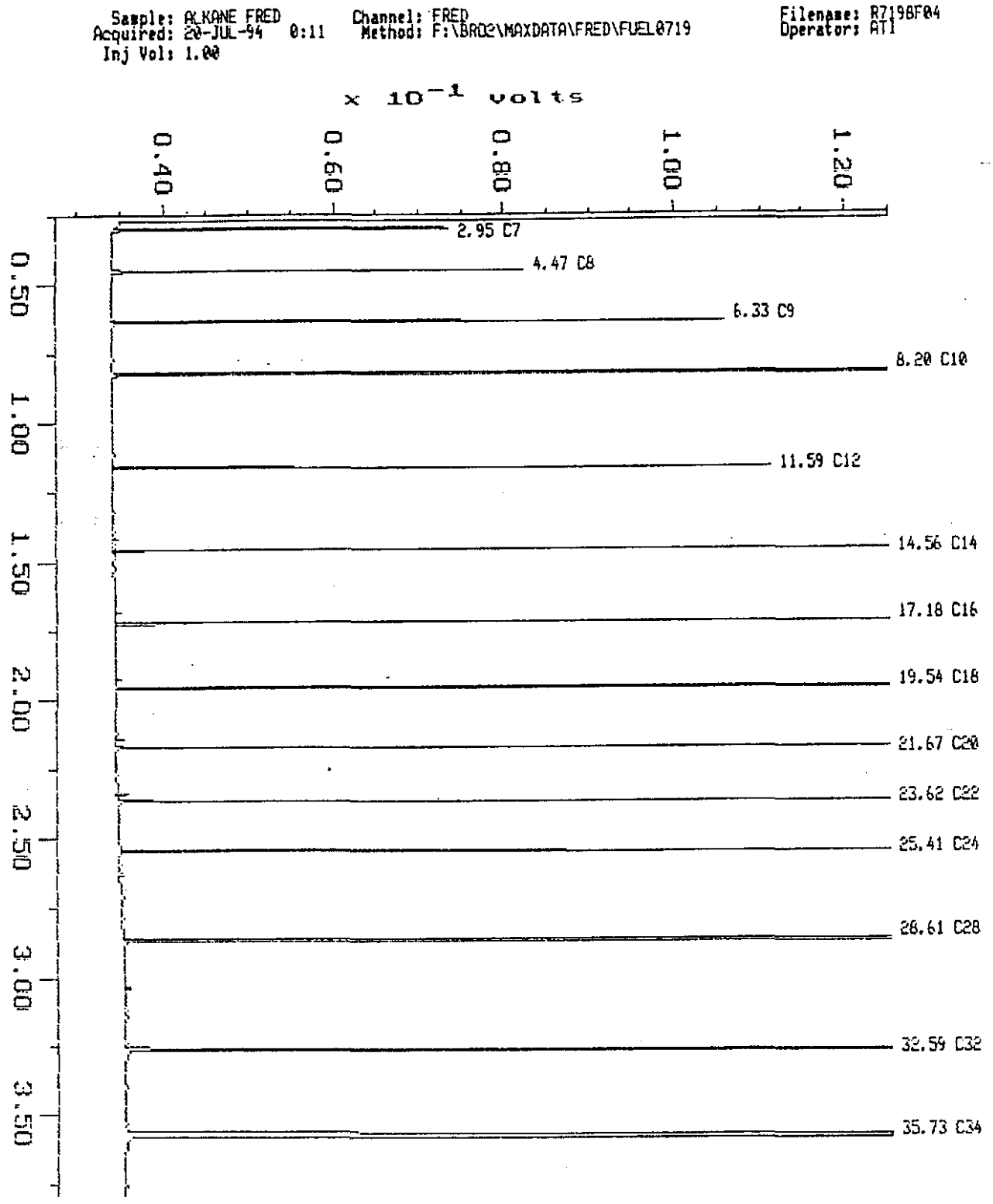


WA DOE WTPH-D

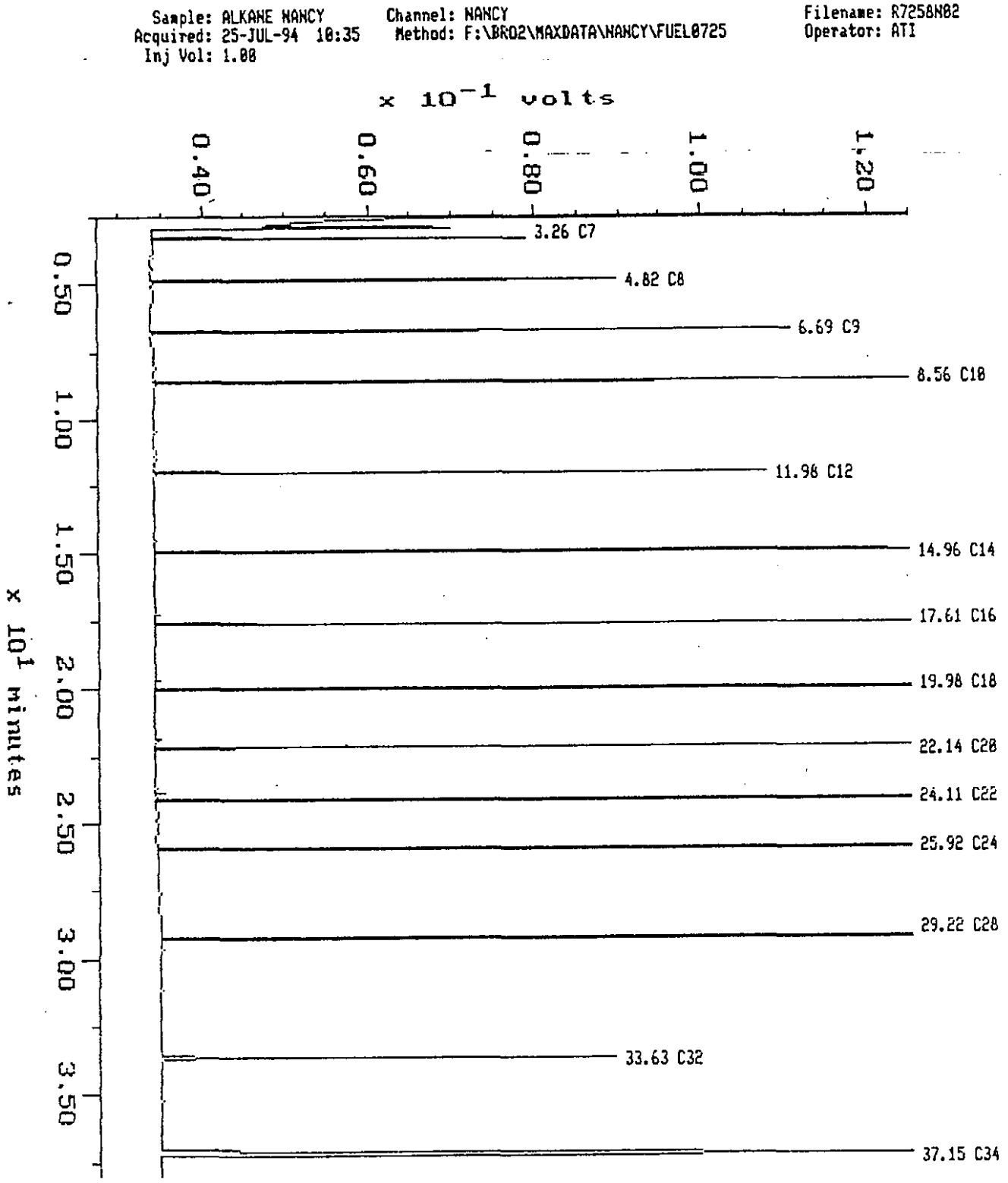
Sample: 407128-15 Channel: FRED Filename: R7218F37
Acquired: 22-JUL-94 19:54 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



Alkane

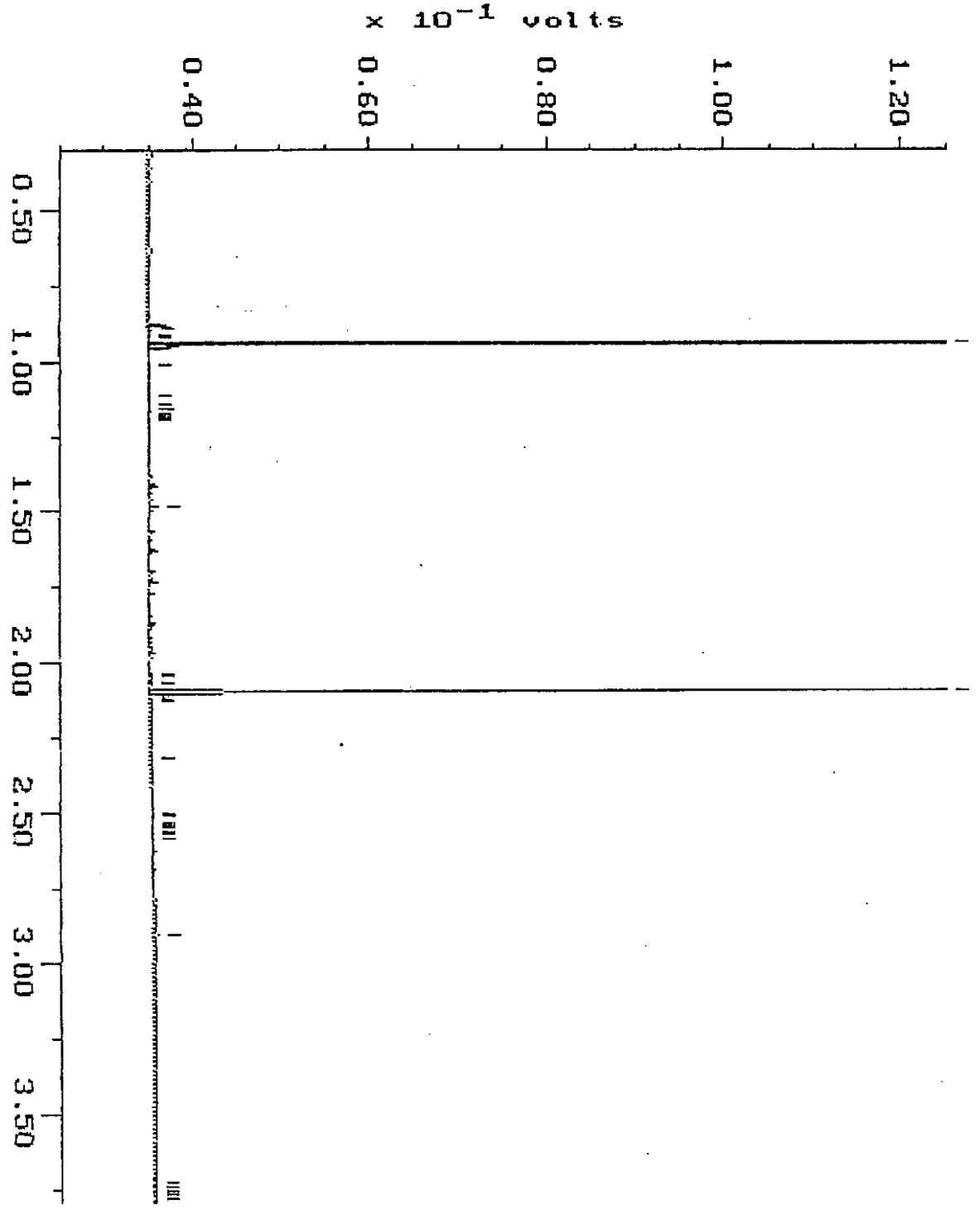

Sample: ALKANE FRED
Acquired: 20-JUL-94 0:11
Inj Vol: 1.00
Channel: FRED
Method: F:\BRO2\MAXDATA\FRED\FUEL0719
Filename: R7198F04
Operator: ATI
x 10⁻¹ volts
0.40
0.60
0.80
1.00
1.20
2.95 C7
4.47 C8
6.33 C9
8.20 C10
11.59 C12
14.56 C14
17.18 C16
19.54 C18
21.67 C20
23.62 C22
25.41 C24
28.61 C28
32.59 C32
35.73 C34
0.50
1.00
1.50
2.00
2.50
3.00
3.50
x 10¹ minutes

Alkane


Sample: ALKANE NANCY
Acquired: 25-JUL-94 10:35
Inj Vol: 1.00
Channel: NANCY
Method: F:\BRD2\MAXDATA\NANCY\FUEL0725
Filename: R7258N02
Operator: ATI
x 10⁻¹ volts
0.40
0.60
0.80
1.00
1.20
3.26 C7
4.82 C8
6.69 C9
8.56 C10
11.98 C12
14.96 C14
17.61 C16
19.98 C18
22.14 C20
24.11 C22
25.92 C24
29.22 C28
33.63 C32
37.15 C34
x 10¹ minutes
0.50
1.00
1.50
2.00
2.50
3.00
3.50

WA DOE WTPH-D Blank

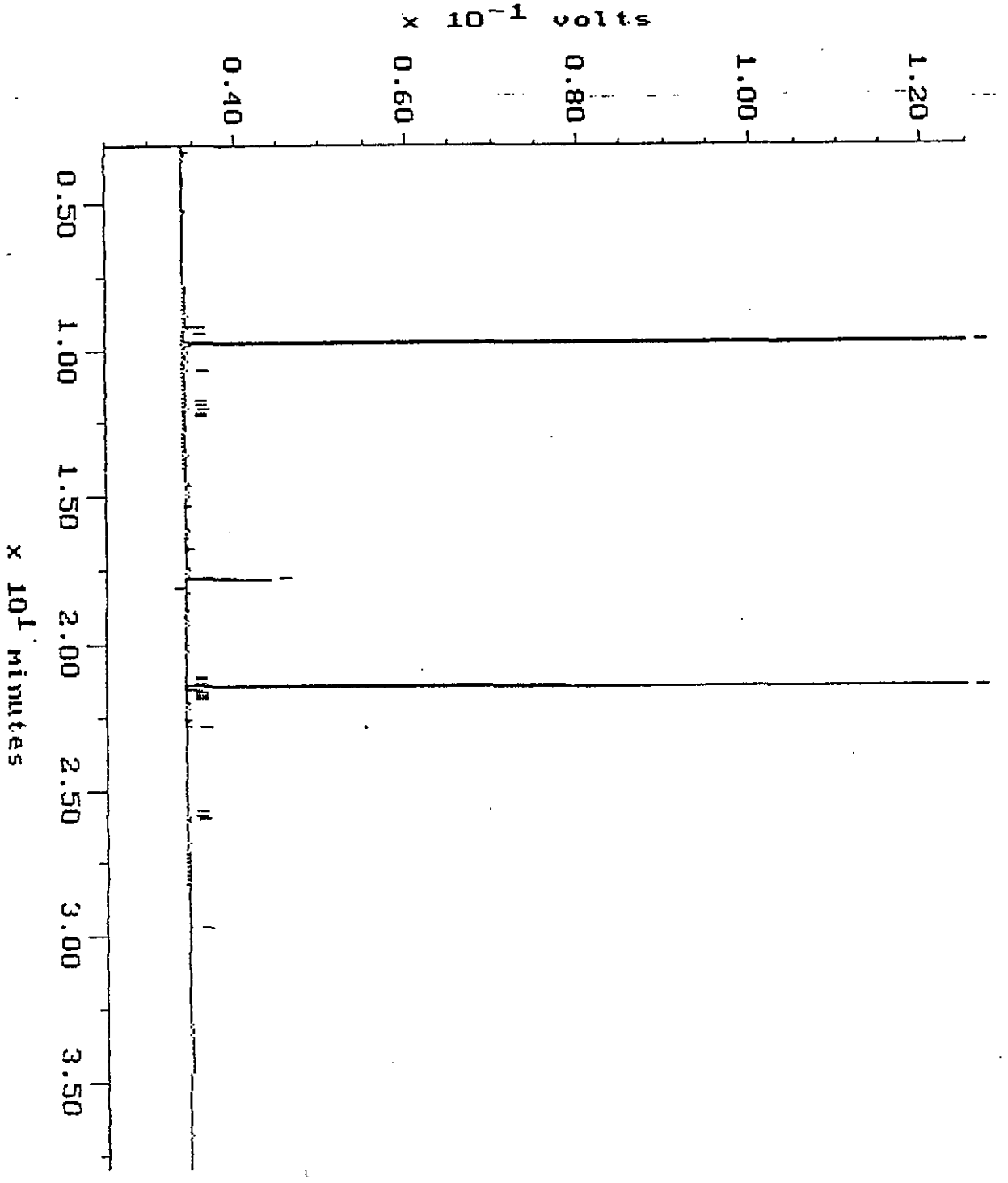
Sample: WRB 7-19 Channel: FRED Filename: R7198F29
Acquired: 21-JUL-94 3:32 Method: F:\BRO2\MAXDATA\FRED\FUEL0719 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



WA DOE WTPH-D

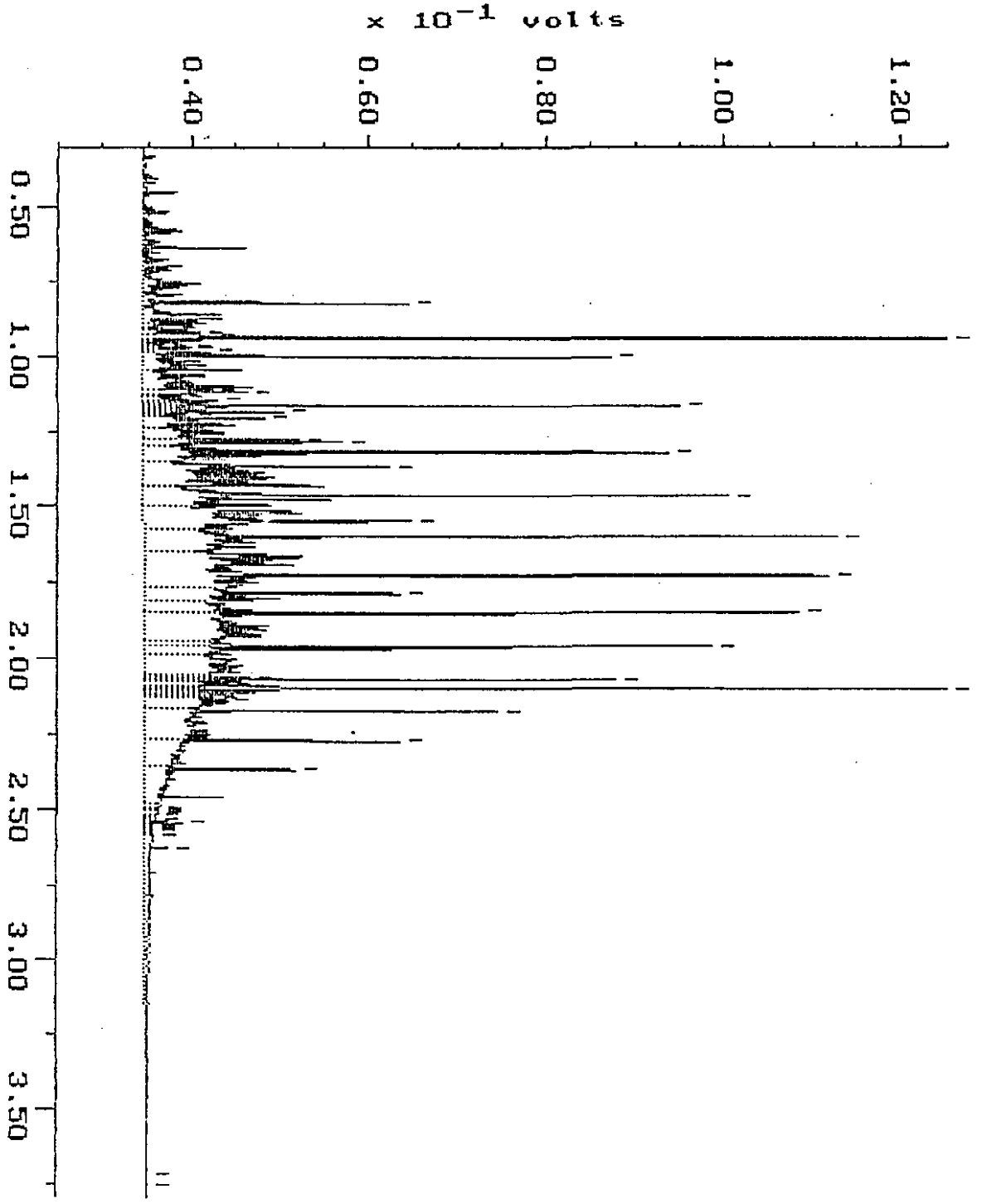
Blank

Sample: WRB 7-25 Channel: NANCY Filename: R7258N17
Acquired: 26-JUL-94 2:09 Method: F:\BRO2\MAXDATA\NANCY\FUEL0725 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



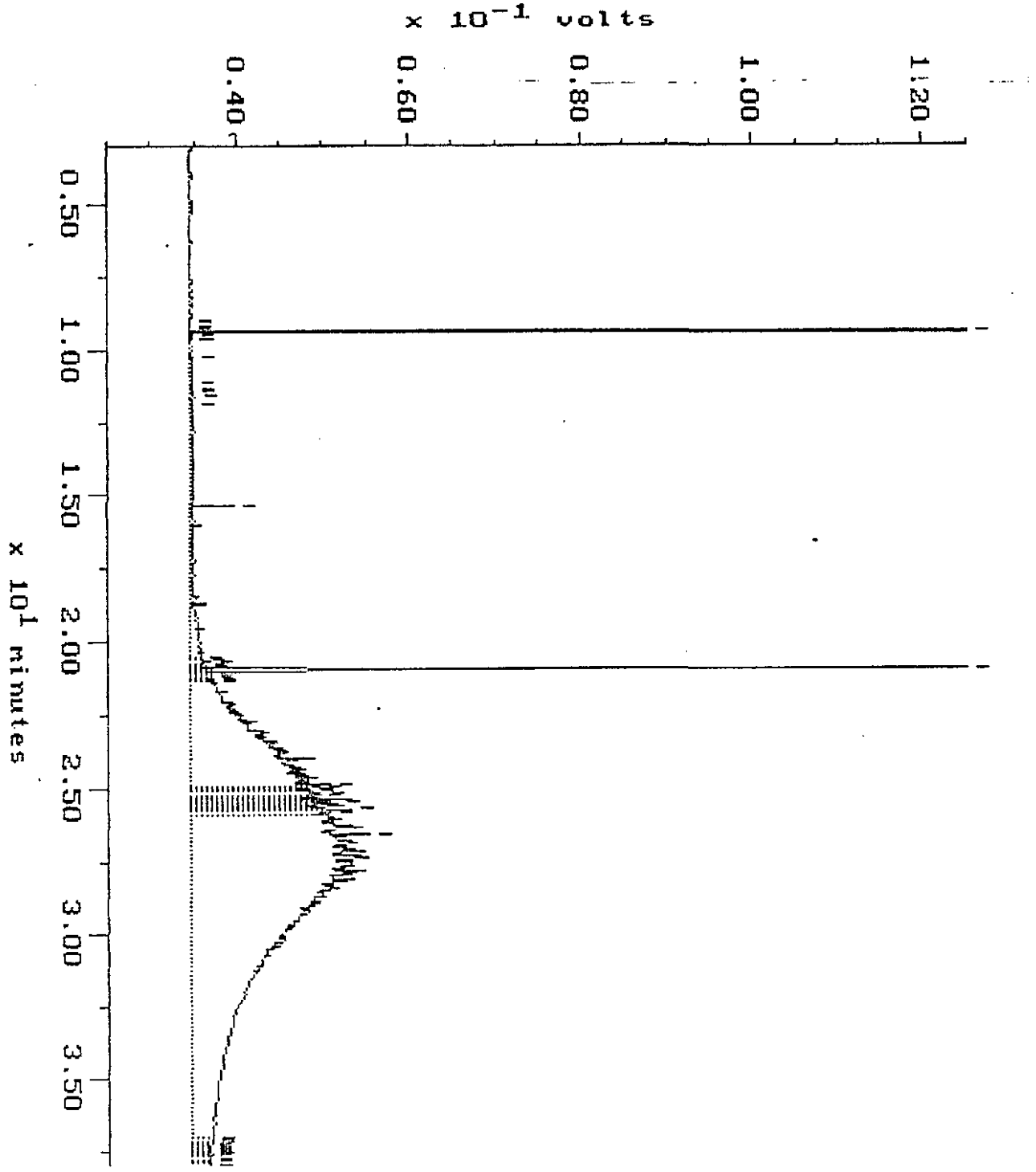
CONTINUING CALIBRATION

Sample: D 500 Channel: FRED Filename: R7198F26
Acquired: 21-JUL-94 1:07 Method: F:\BRD2\MAXDATA\FRED\FUEL0719 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



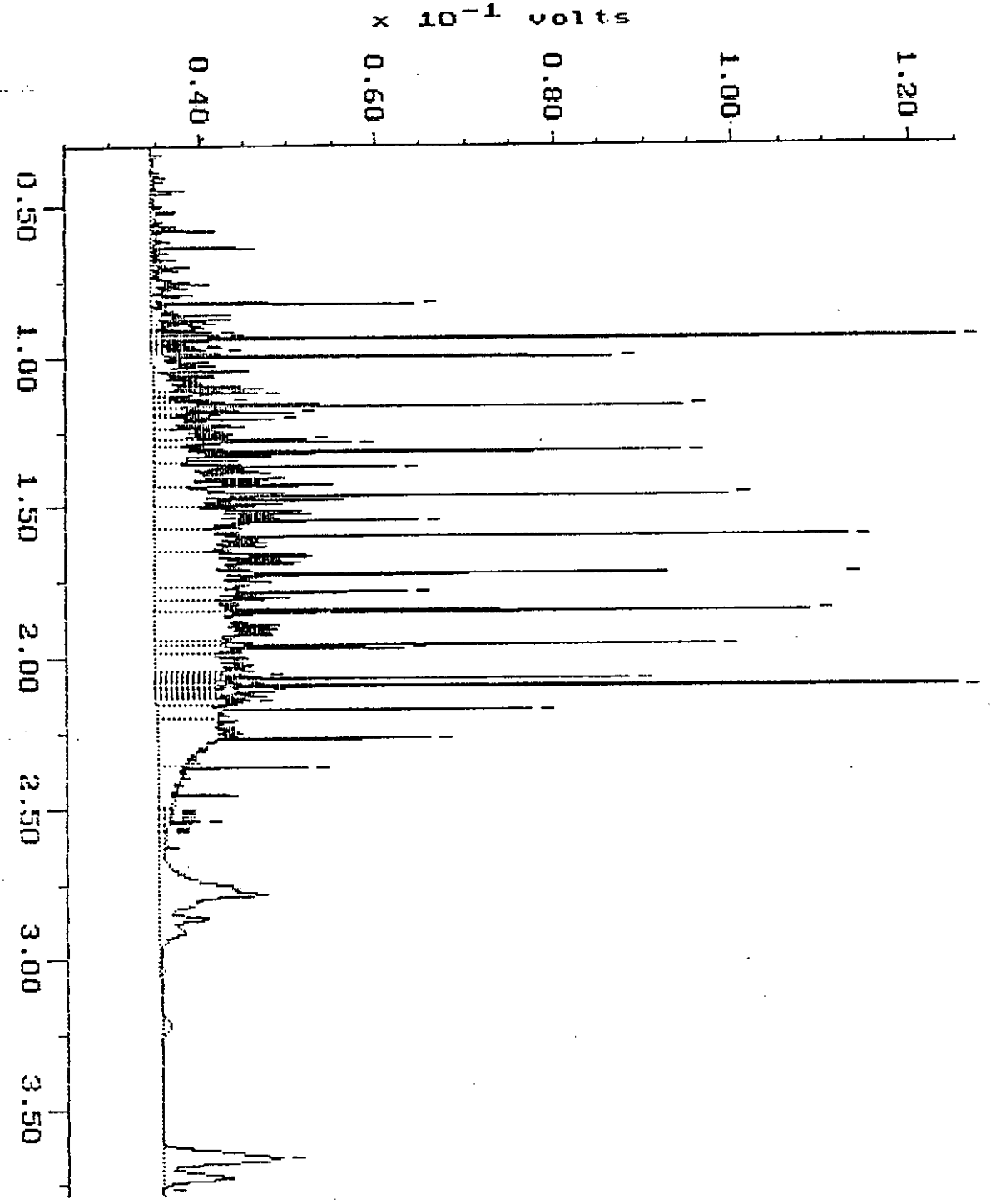
CONTINUING CALIBRATION

Sample: MO 500 Channel: FRED Filename: R7198F27
Acquired: 21-JUL-94 1:55 Method: F:\BRO2\MAXDATA\FRED\FUEL0719 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



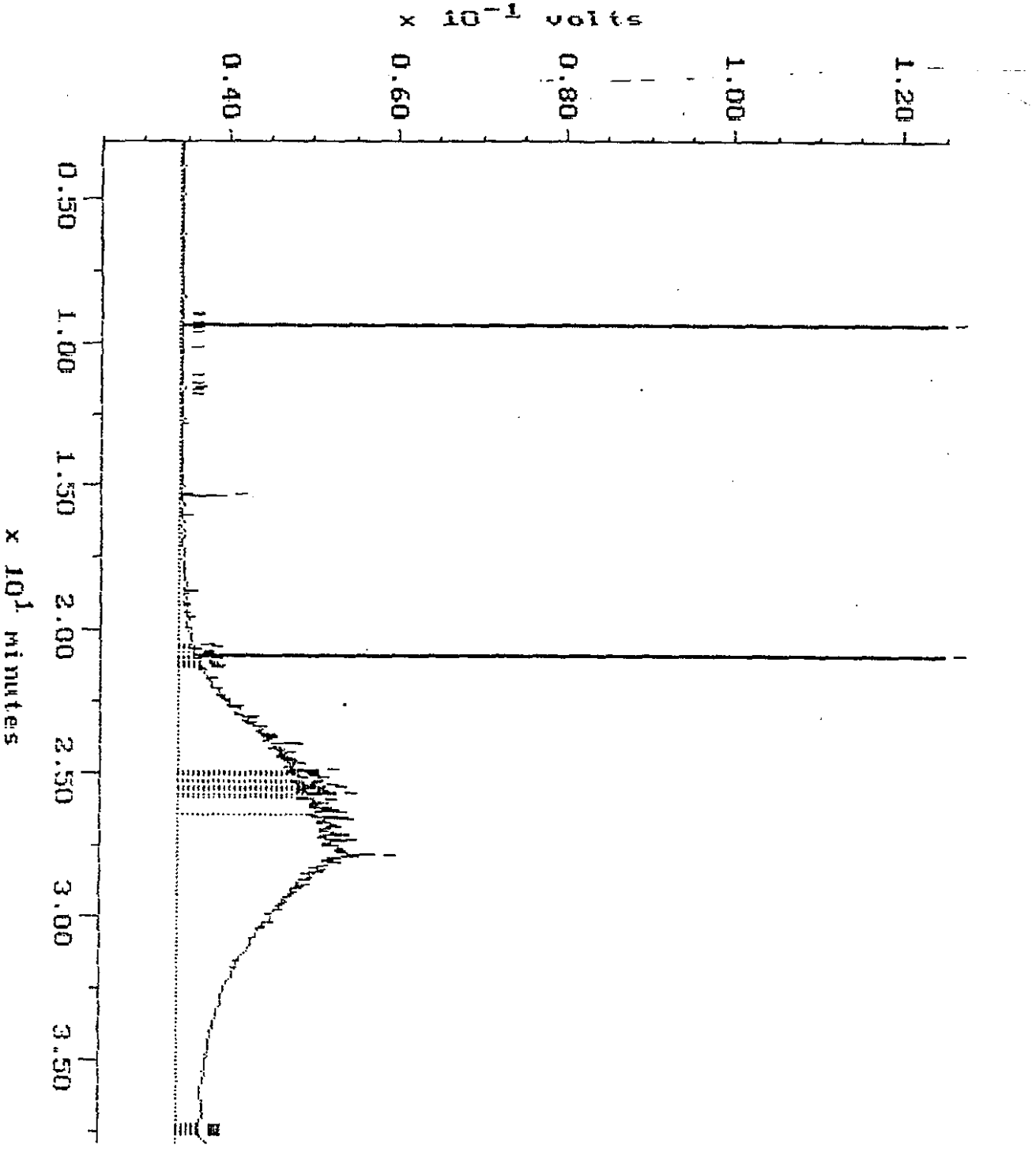
CONTINUING CALIBRATION

Sample: D 500 Channel: FRED Filename: R7198F37
Acquired: 21-JUL-94 9:59 Method: F:\BRD2\MAXDATA\FRED\FUEL0719 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



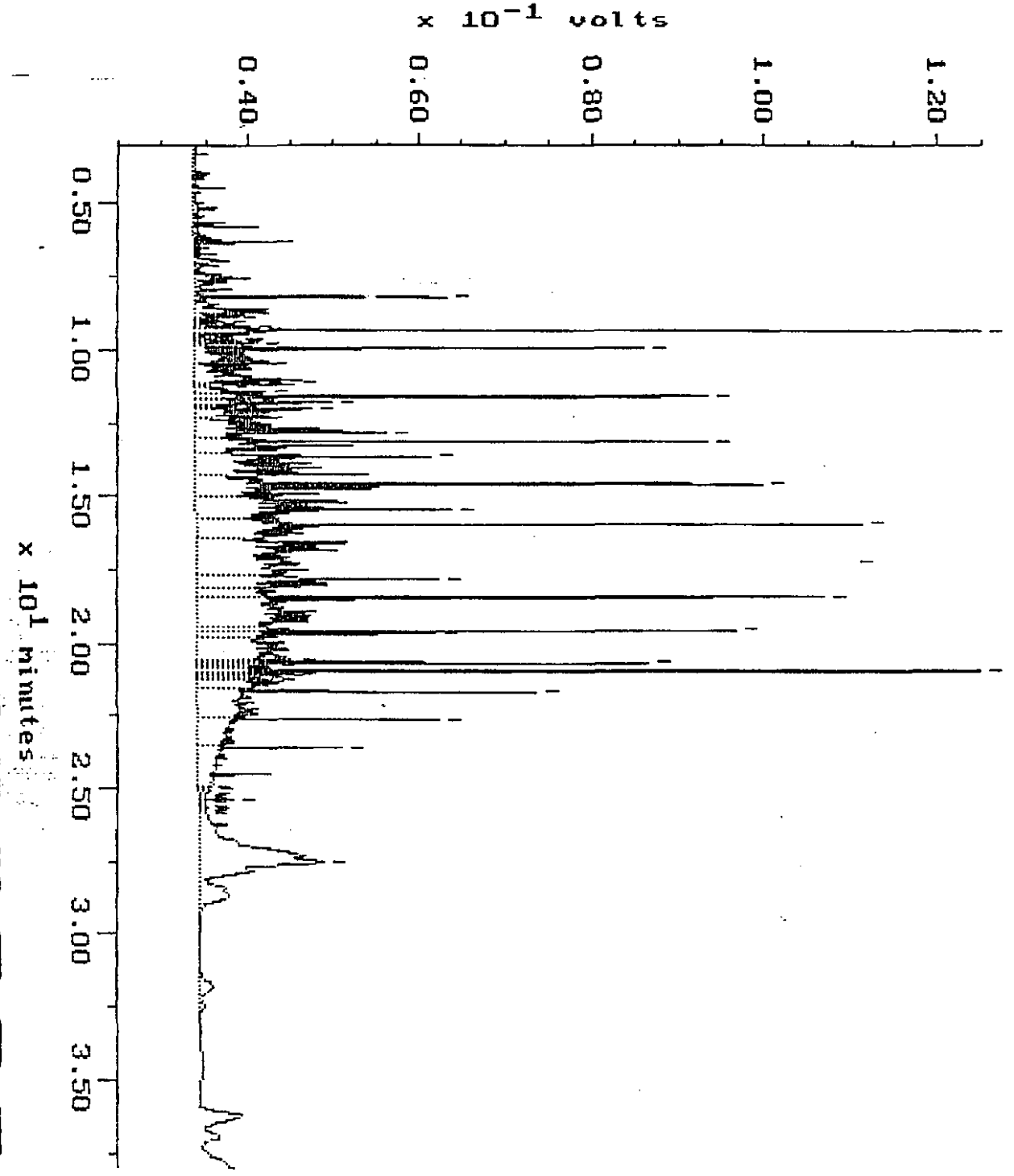
CONTINUING CALIBRATION

Sample: MO 500 Channel: FRED Filename: R7198F38
Acquired: 21-JUL-94 10:47 Method: F:\BRO2\MAXDATA\FRED\FUEL0719 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



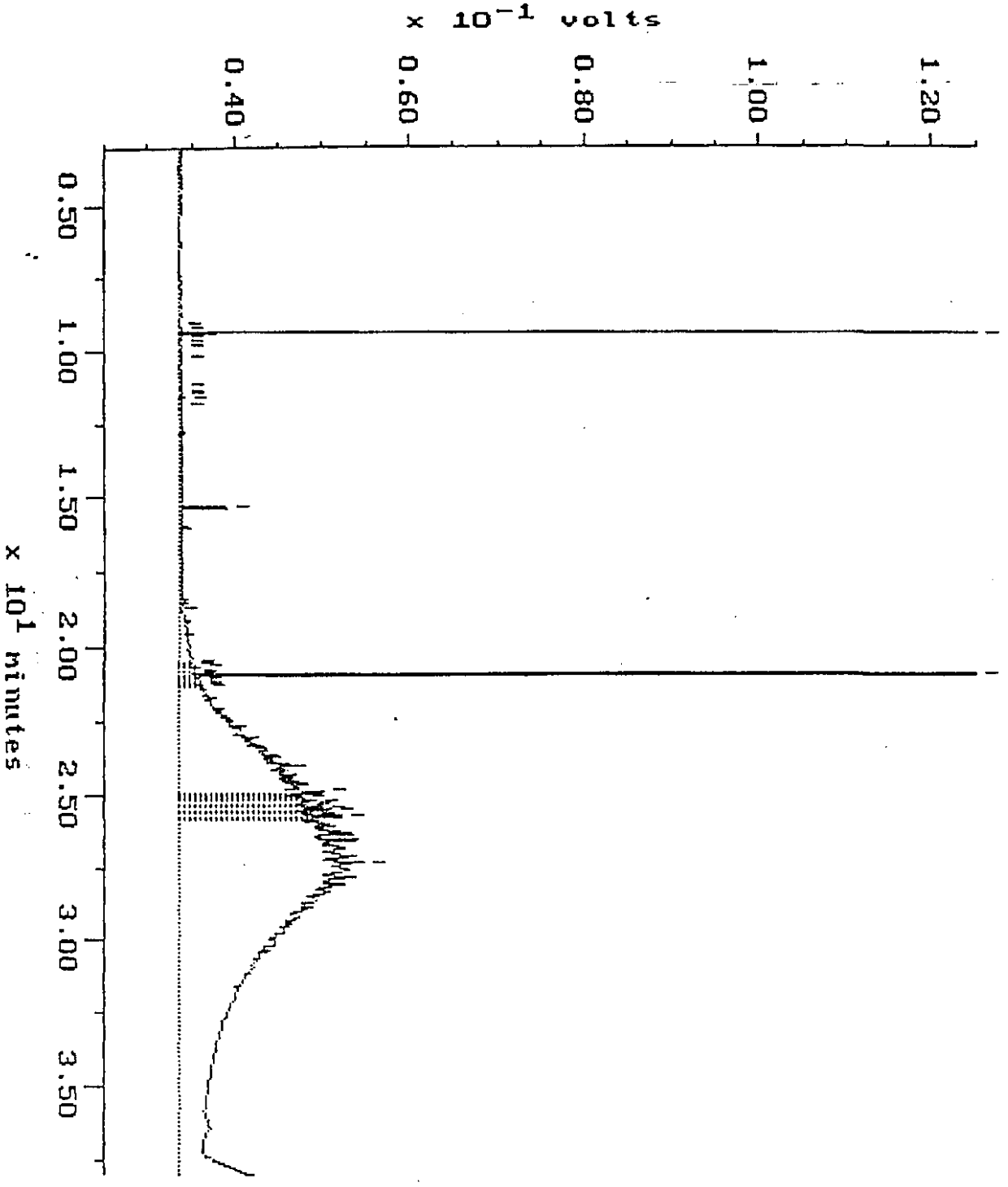
CONTINUING CALIBRATION

Sample: D 500 Channel: FRED Filename: R7218F33
Acquired: 22-JUL-94 16:32 Method: F:\BRO2\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



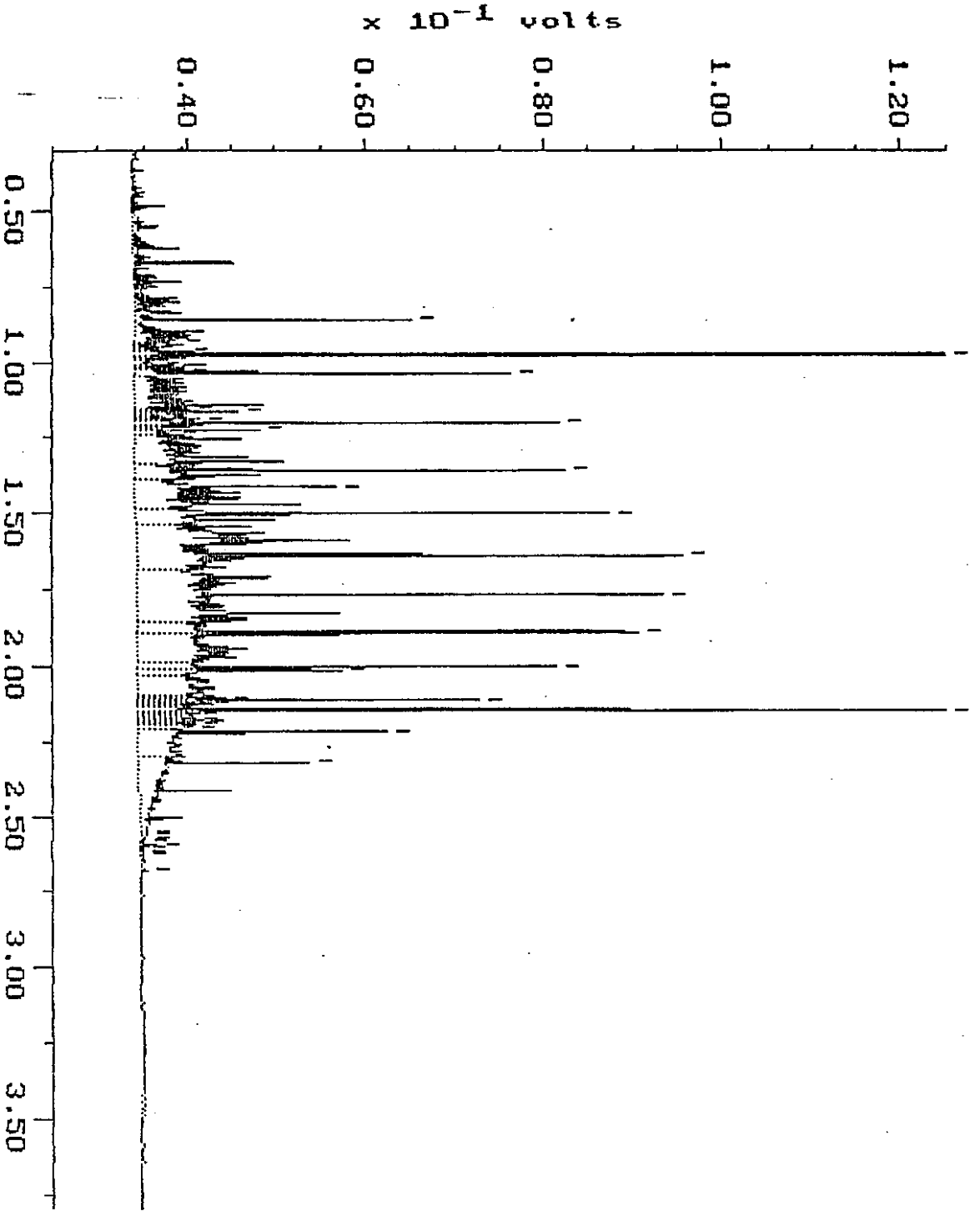
CONTINUING CALIBRATION

Sample: MO 500 Channel: FRED Filename: R7218F34
Acquired: 22-JUL-94 17:24 Method: F:\BR02\MAXDATA\FRED\FUEL0721 Operator: ATI
Comments: ATI RUSH FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY



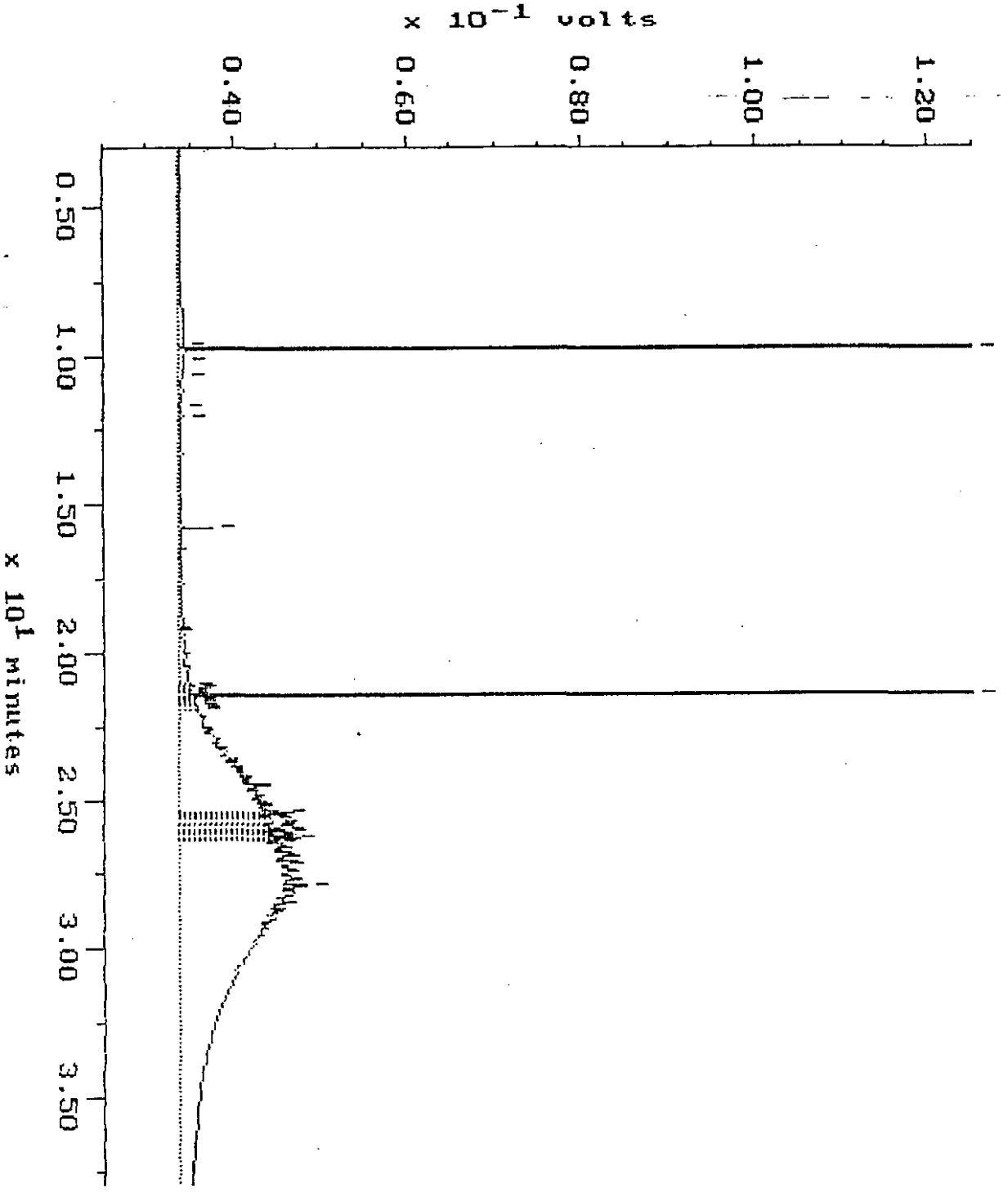
CONTINUING CALIBRATION

Sample: D 500 Channel: NANCY Filename: R7250N08
Acquired: 25-JUL-94 18:52 Method: F:\BRO2\MAXDATA\NANCY\FUEL0725 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



CONTINUING CALIBRATION

Sample: MO 500 Channel: NANCY Filename: R7258N05
Acquired: 25-JUL-94 13:07 Method: F:\BR02\MAXDATA\NANCY\FUEL0725 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



Fax copy of Lab Report and COC to UNOCAL Contact: [X] NO

Chain-of-Custody-Record#:

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

Project Number 0161-013-R9 TASK #:
Consultant Name GeoEngineers
Address 8410 154th AVE NE,
Project Contact NORM PURI
(Phone) 861-6000 FAX: 861-6050
Samples Collected by (Name) DAVE COOK, DON WYL
Signature David Cook

UNOCAL Contact (Name) Mary Brooks
(Phone)
UNOCAL Facility # 55 5353
UNOCAL Address PO Box 76
UNOCAL City, State ZIP Seattle, WA 98111
Site Specific Release Number MXB282

467128

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)	Purgable 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, (4) Day*	Remarks
13MW-4	1	5	Water	7/14/94	2135	X					X																				
98SMW-3	2	5			2210	X					X																				
[redacted]MW-45	3	5			2200	X					X																				
[redacted] MW-47	4	5			2245	X					X																				
MW-41	5	5			2340	X					X																				
MW-43	6	5			2355	X					X																				
MW-42	7	5		7/15/94	0015	X					X																				
MW-44	8	5			0030	X					X																				
MW-36	9	5			0055	X					X																				
MW-35	10	5		7/14/94	2145	X					X																				
MW-32A	11	5			2220	X					X																				
MW-34	12	5			2245	X					X																				* FREE PRODUCT

PLEASE ANALYZE FREE PRODUCT FRACTION ONLY!

Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Orgainzation	Date/Time
David Cook	GEI	7/15/94 1000		ATI	7/15/94 1100
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:

OREGON / WASHINGTON

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

Chain-of-Custody-Record#:

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

Project Number 0801-013-R69 TASK #:
Consultant Name GeoEngineers
Address
Project Contact Norm Puri
(Phone) 861-6000 FAX: 861-6050
Samples Collected by (Name) Dave Lock, Don Wyll
Signature Dave Cook

UNOCAL Contact (Name) Mark Brearley
(Phone)
UNOCAL Facility #
UNOCAL Address
UNOCAL City, State ZIP
Site Specific Release Number

407128

B	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)	Purgable 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
1	MW-46	13	5	Water	7/15/94	1115	X					X																				
87	MW-37	14	5	"	"	0130	X					X																				
	MW-40	15	5	"	"	0200	X					X																				
	PW-1	16	2	↓	↓	0210		X							X																	

Relinquished By (Signature)	Organization	Date/Time	Received By (Signature)	Orgainzation	Date/Time
Dave Cook	GEI	7/15/94 1000		ATI	7/15/94 1100
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

NOV 10 1994

Routing NLP

File 9114-13

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 #5353, #9161-013-R69	Sampled:	Oct 25, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 26, 1994
Redmond, WA 98052	Analysis Method:	WTPH-G	Analyzed:	Oct 31, 1994
Attention: Norm Puri	First Sample #:	410-1612	Reported:	Nov 7, 1994

TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

Sample Number	Sample Description	Sample Result µg/L (ppb)	Surrogate Recovery %
410-1612	SMW-3	N.D.	105
410-1613	SMW-4	29,000	119
410-1614	MW-32A	19,000	142
410-1615	MW-34	13,000	124
410-1616	MW-35	2,800	102
410-1617	MW-36	N.D.	97
410-1618	MW-37 10/26/94	170,000	95
410-1619	MW-40 10/26/94	1,200	S-2
410-1620	MW-41	N.D.	91
410-1621	MW-42 10/26/94	92	148

GeoEngineers
NOV 10 1994
Routing
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
Project Manager

Please Note:
S-2 = The Surrogate Recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample.

4101612.GEO <1>

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 #5353, #9161-013-R69	Sampled:	Oct 25, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 26, 1994
Redmond, WA 98052	Analysis Method:	WTPH-G	Analyzed:	Oct 31, 1994
Attention: Norm Puri	First Sample #:	410-1622	Reported:	Nov 7, 1994

TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

Sample Number	Sample Description	Sample Result µg/L (ppb)	Surrogate Recovery %
410-1622	MW-43 10/26/94	160	101
410-1623	MW-44 10/26/94	N.D.	85
410-1624	MW-45	19,000	101
410-1625	MW-46	N.D.	85
410-1626	MW-47	51	83
BLK103194-I	Method Blank	N.D.	83
BLK103194-II	Method Blank	N.D.	95

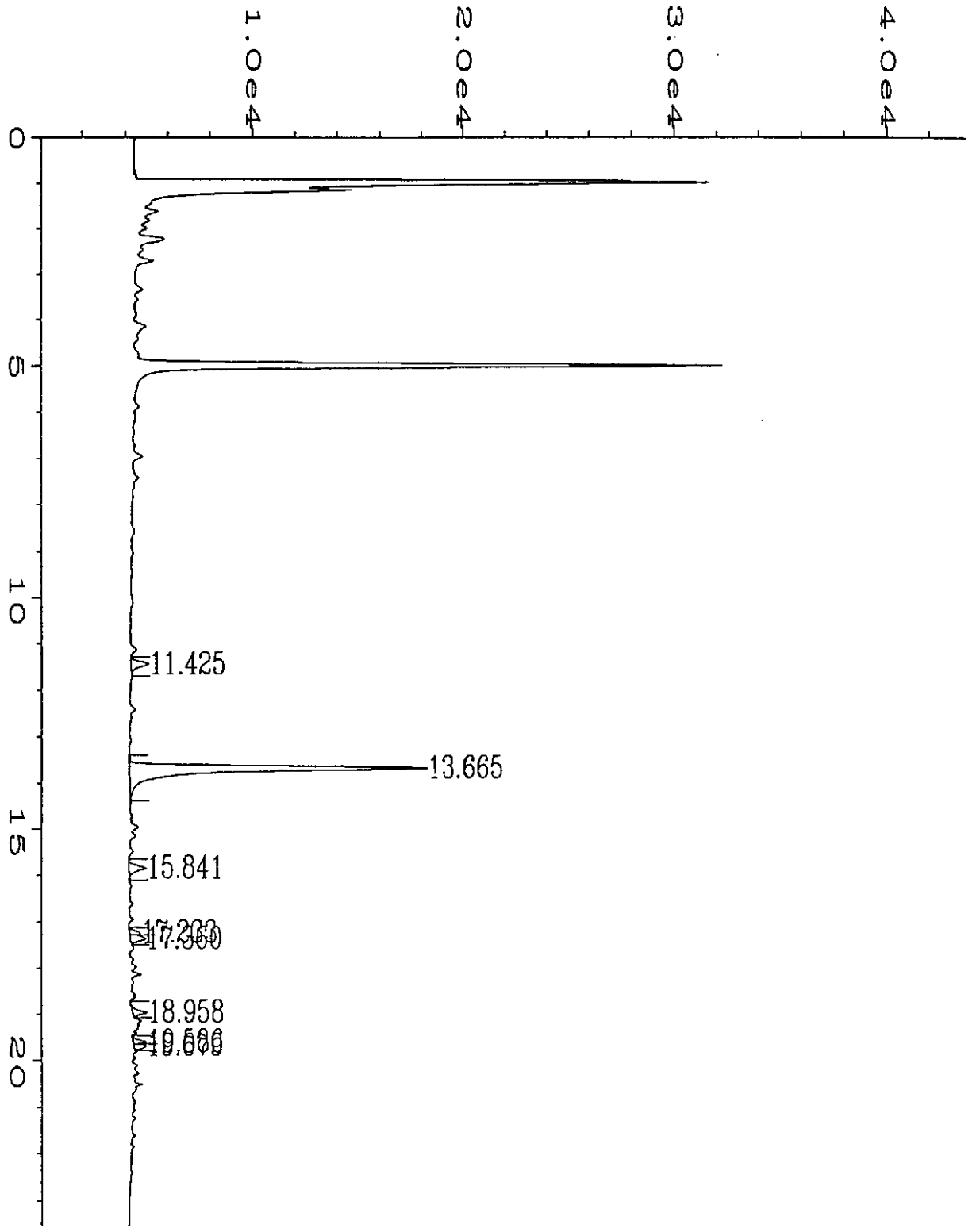
Reporting Limit:	50

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.

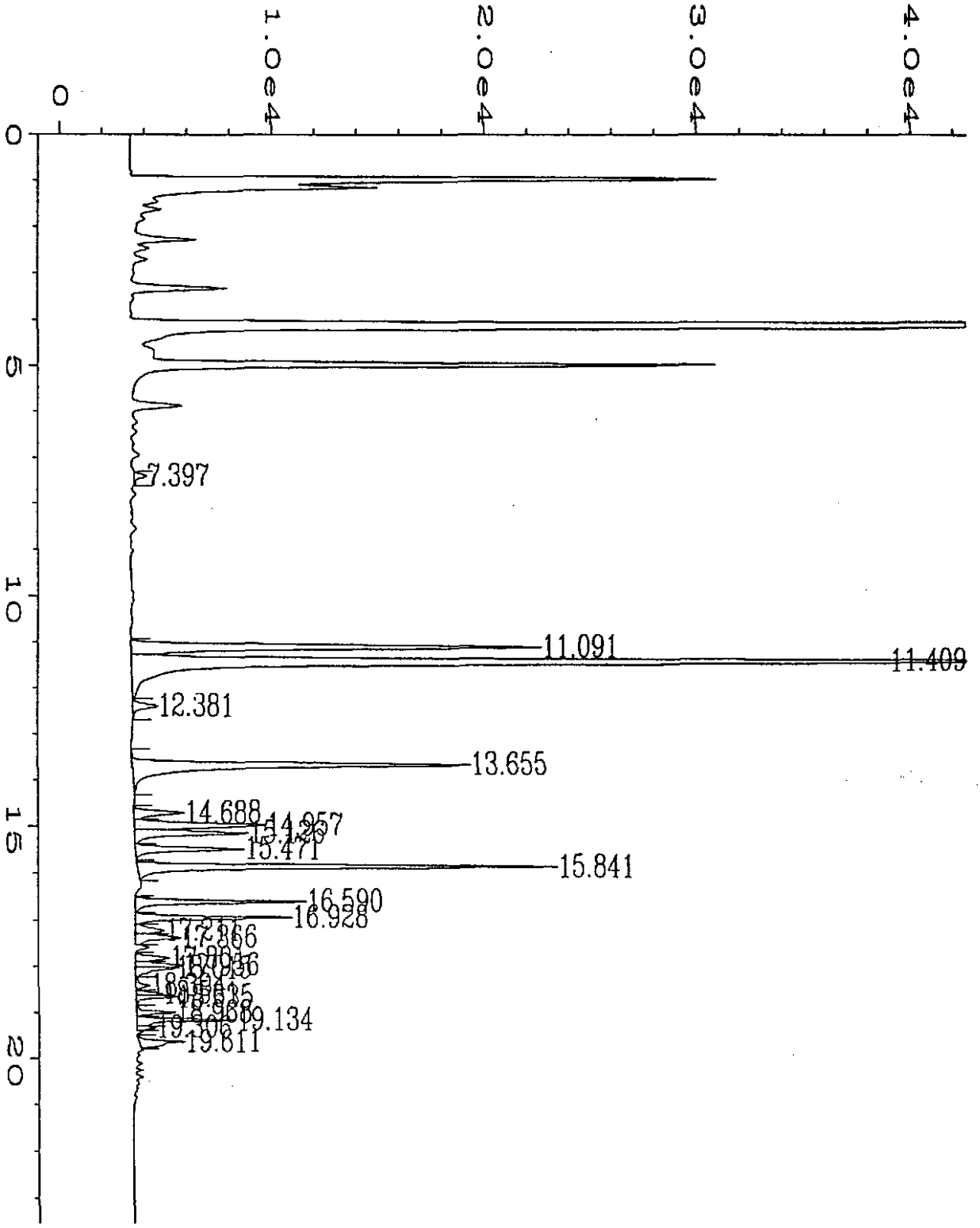
Laura Dutton
Project Manager

4101612.GEO <2>



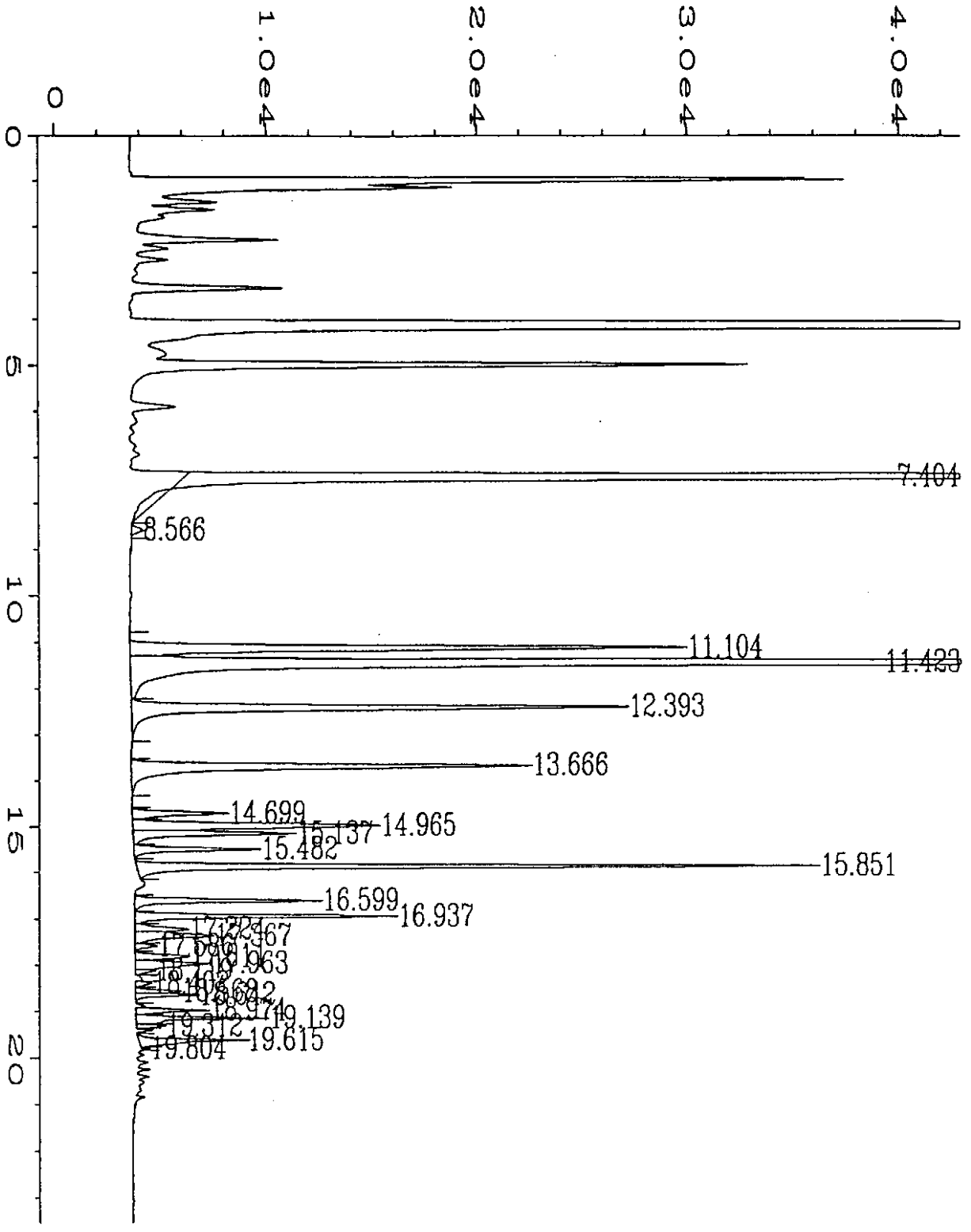
Data File Name : C:\HPCHEM\1\DATA\103194\004F0101.D
Operator :
Instrument : GC #8
Sample Name : 4101612
Run Time Bar Code:
Acquired on : 31 Oct 94 10:47 AM
Report Created on: 31 Oct 94 11:11 AM
Sample Info : 5 ml

Page Number : 1
Vial Number : 4
Injection Number : 1
Sequence Line : 1
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



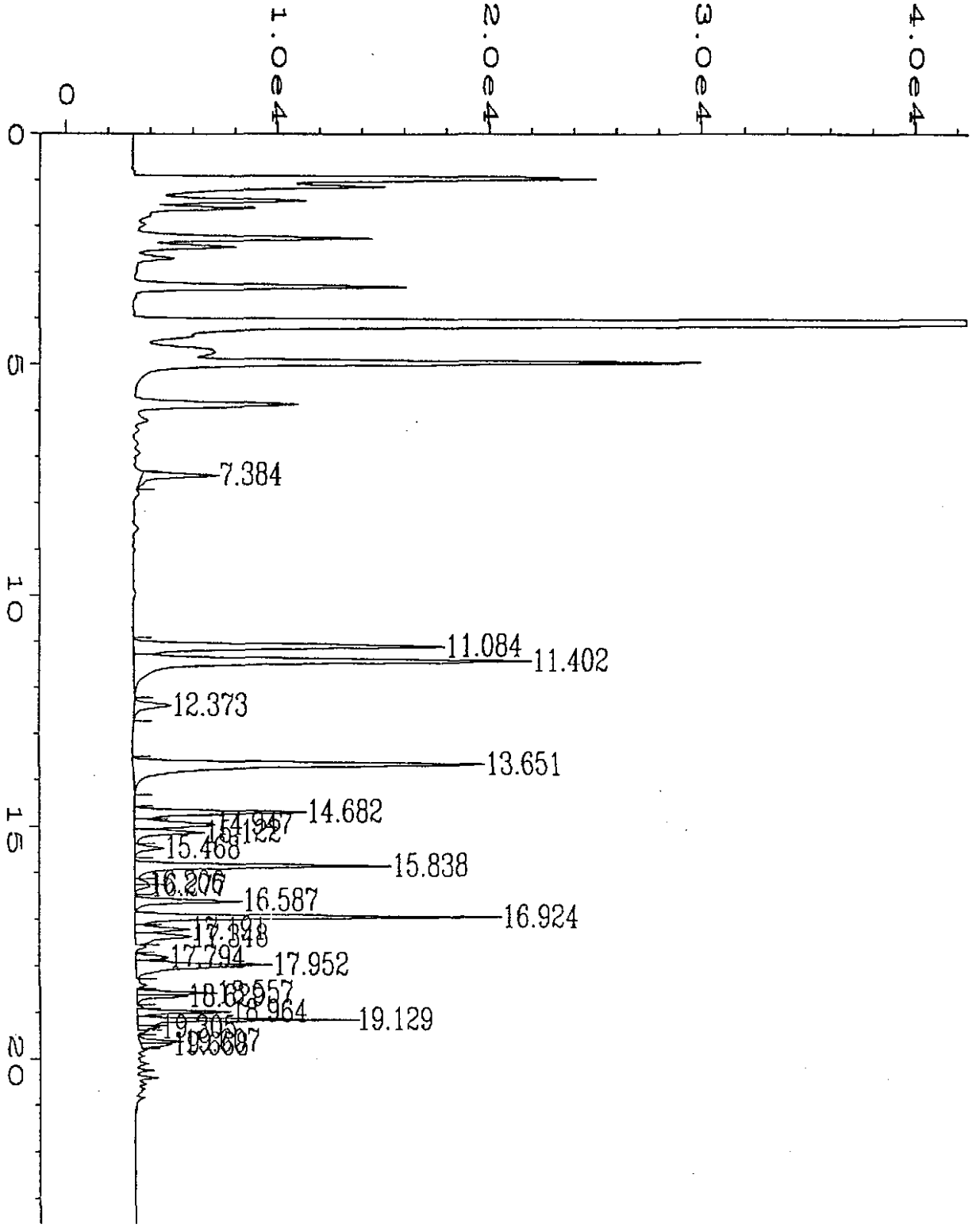
Data File Name : C:\HPCHEM\1\DATA\103194\023F0301.D
Operator :
Instrument : GC #8
Sample Name : 4101613 r1
Run Time Bar Code:
Acquired on : 31 Oct 94 08:14 PM
Report Created on: 31 Oct 94 08:38 PM
Multiplier : 200
Sample Info : 25 ul reshot

Page Number : 1
Vial Number : 23
Injection Number : 1
Sequence Line : 3
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



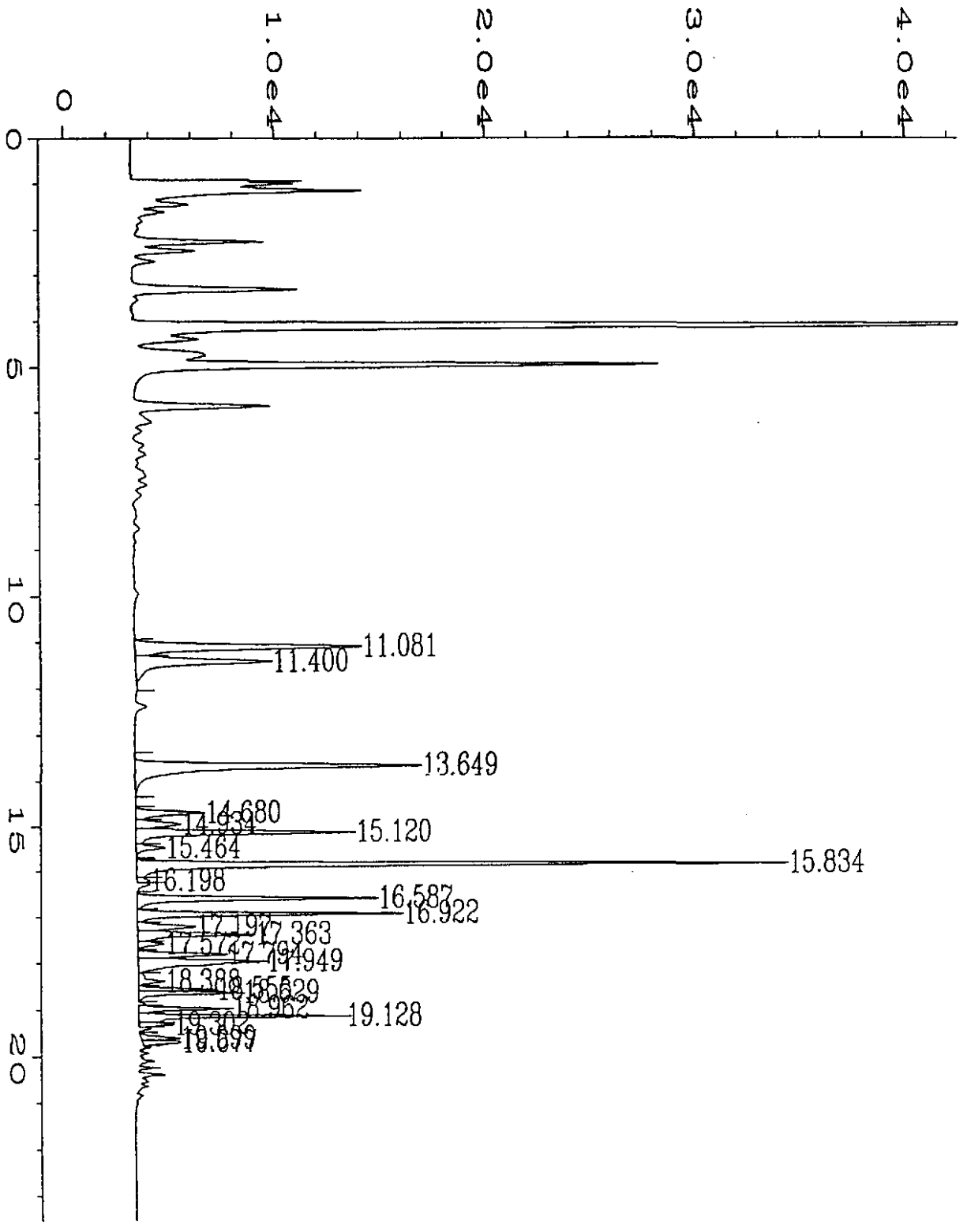
Data File Name : C:\HPCHEM\1\DATA\103194\007F0101.D
Operator :
Instrument : GC #8
Sample Name : 4101614
Run Time Bar Code:
Acquired on : 31 Oct 94 12:25 PM
Report Created on: 31 Oct 94 12:49 PM
Multiplier : 50
Sample Info : 100 ul

Page Number : 1
Vial Number : 7
Injection Number : 1
Sequence Line : 1
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



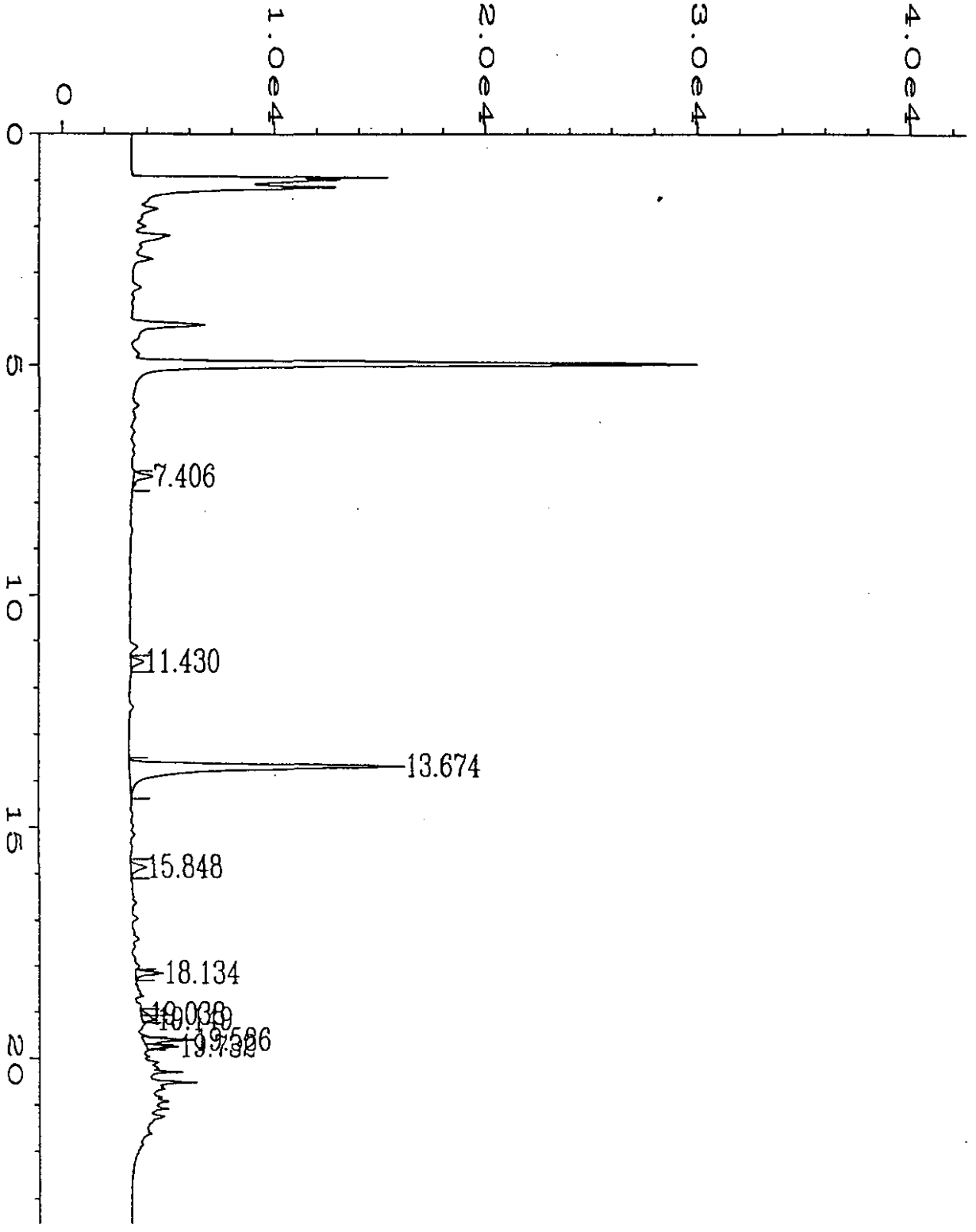
Data File Name : C:\HPCHEM\1\DATA\110194\004F0101.D
Operator :
Instrument : GC #8
Sample Name : 4101615 r2
Run Time Bar Code:
Acquired on : 01 Nov 94 09:29 AM
Report Created on: 01 Nov 94 09:53 AM
Multiplier : 100
Sample Info : 50 ul reshot

Page Number : 1
Vial Number : 4
Injection Number : 1
Sequence Line : 1
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



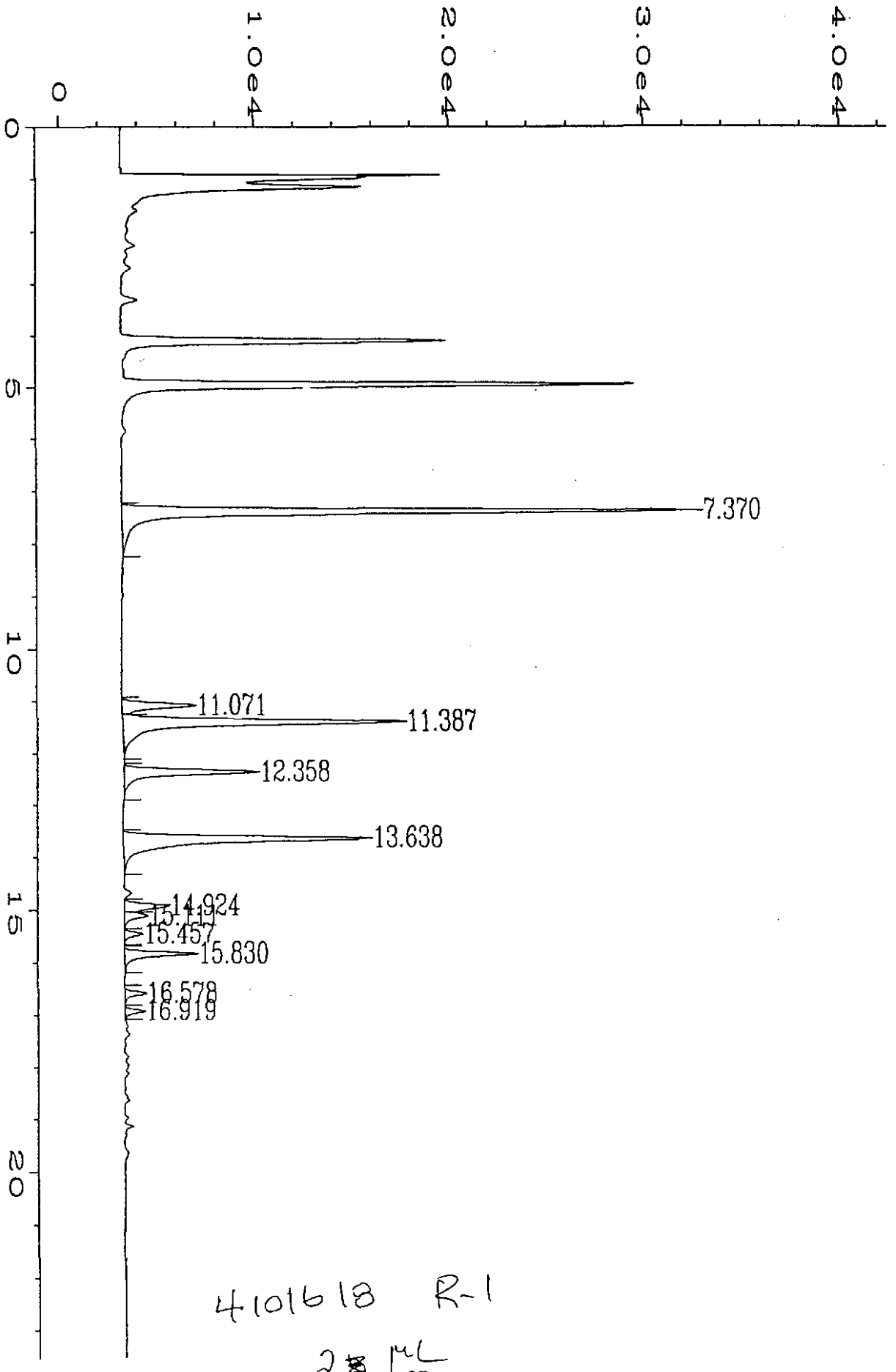
Data File Name : C:\HPCHEM\1\DATA\103194\031F0501.D
Operator :
Instrument : GC #8
Sample Name : 4101616 r1
Run Time Bar Code:
Acquired on : 31 Oct 94 11:26 PM
Report Created on: 31 Oct 94 11:50 PM
Multiplier : 20
Sample Info : 250ul

Page Number : 1
Vial Number : 31
Injection Number : 1
Sequence Line : 5
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



Data File Name : C:\HPCHEM\1\DATA\103194\011F0201.D
Operator :
Instrument : GC #8
Sample Name : 4101617
Run Time Bar Code:
Acquired on : 31 Oct 94 02:18 PM
Report Created on: 31 Oct 94 02:42 PM
Sample Info : 5 ml

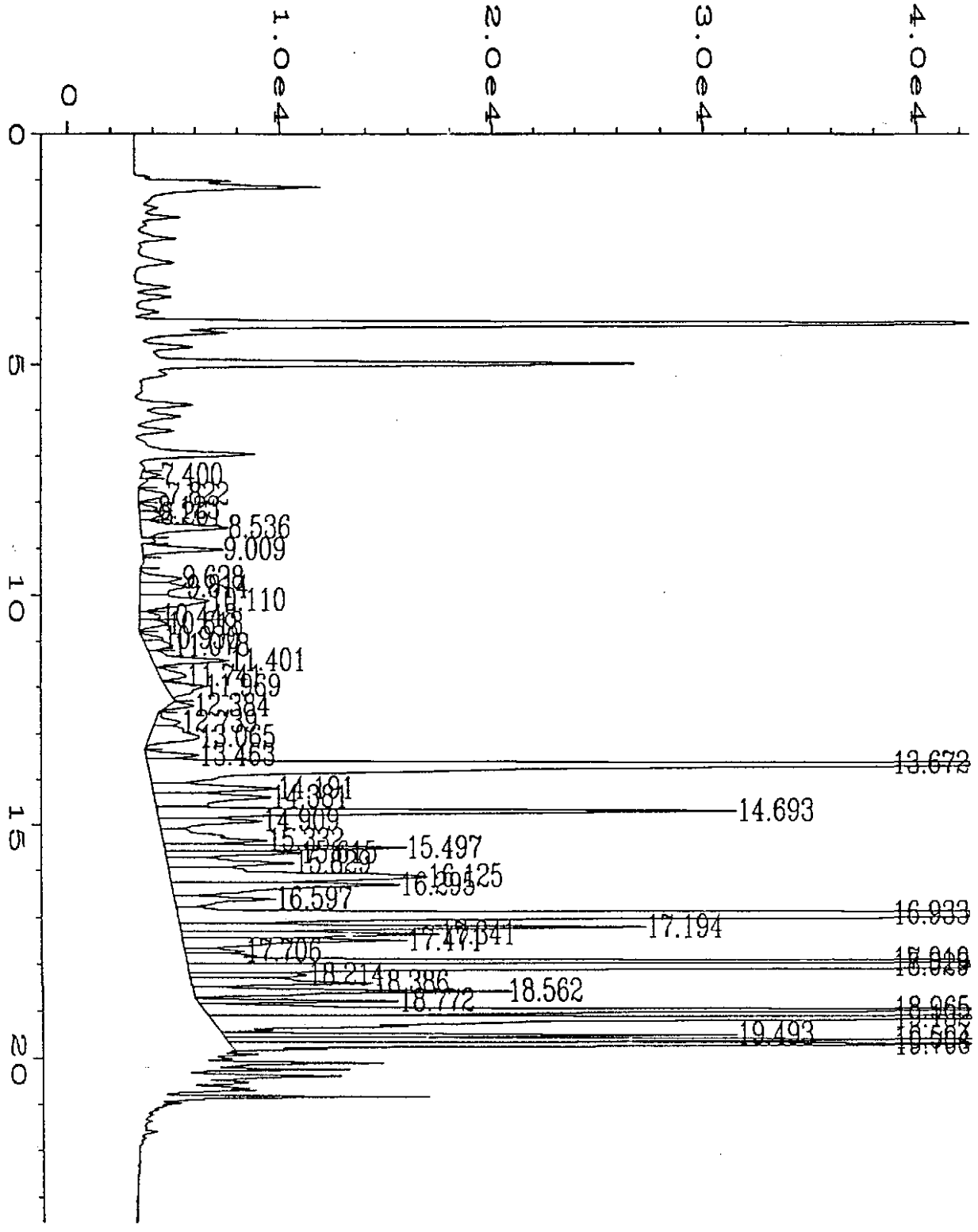
Page Number : 1
Vial Number : 11
Injection Number : 1
Sequence Line : 2
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



Sig. 1 in C:\HPCHEM\1\DATA\103194\038F0501.D

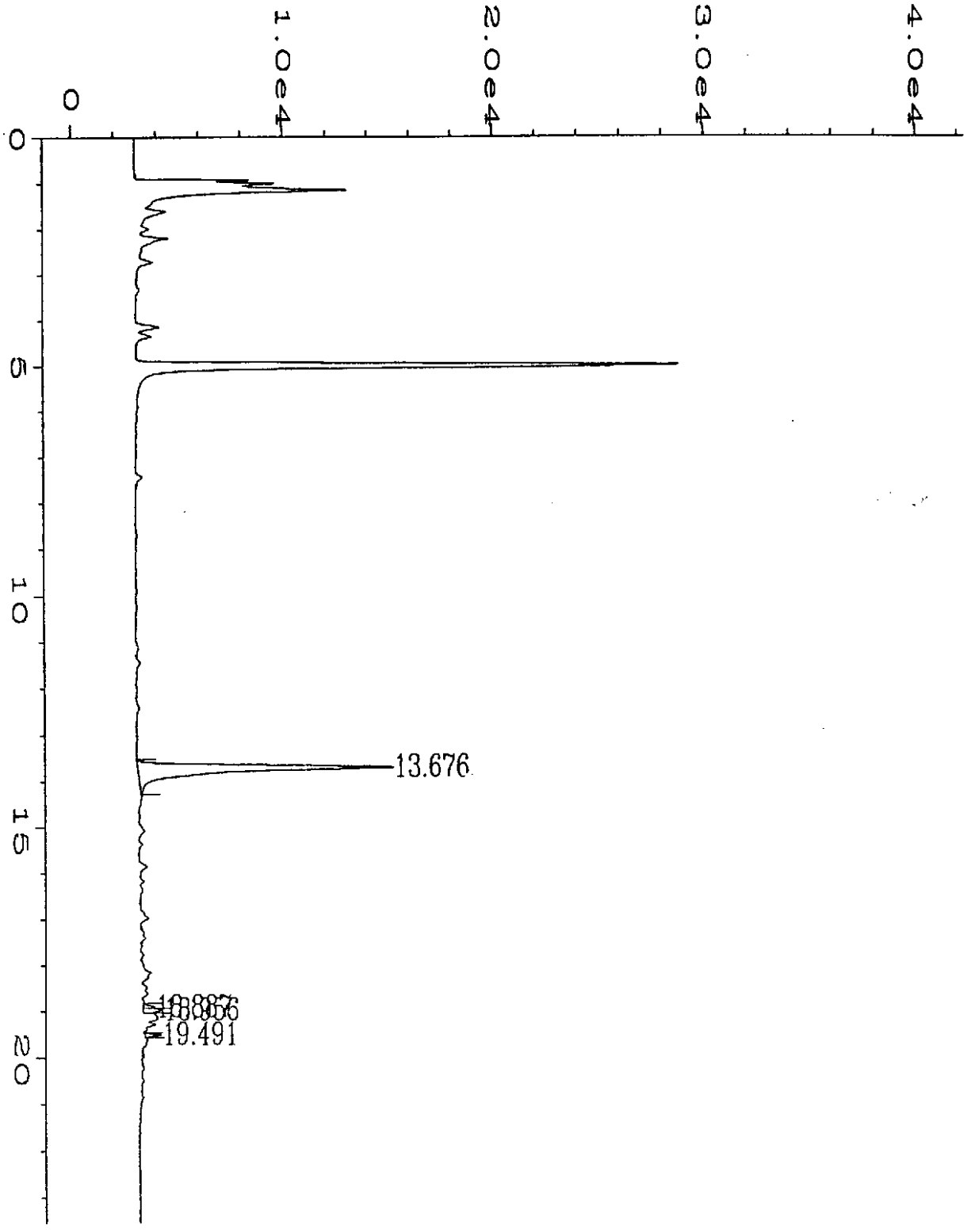
410618 R-1

2 μL



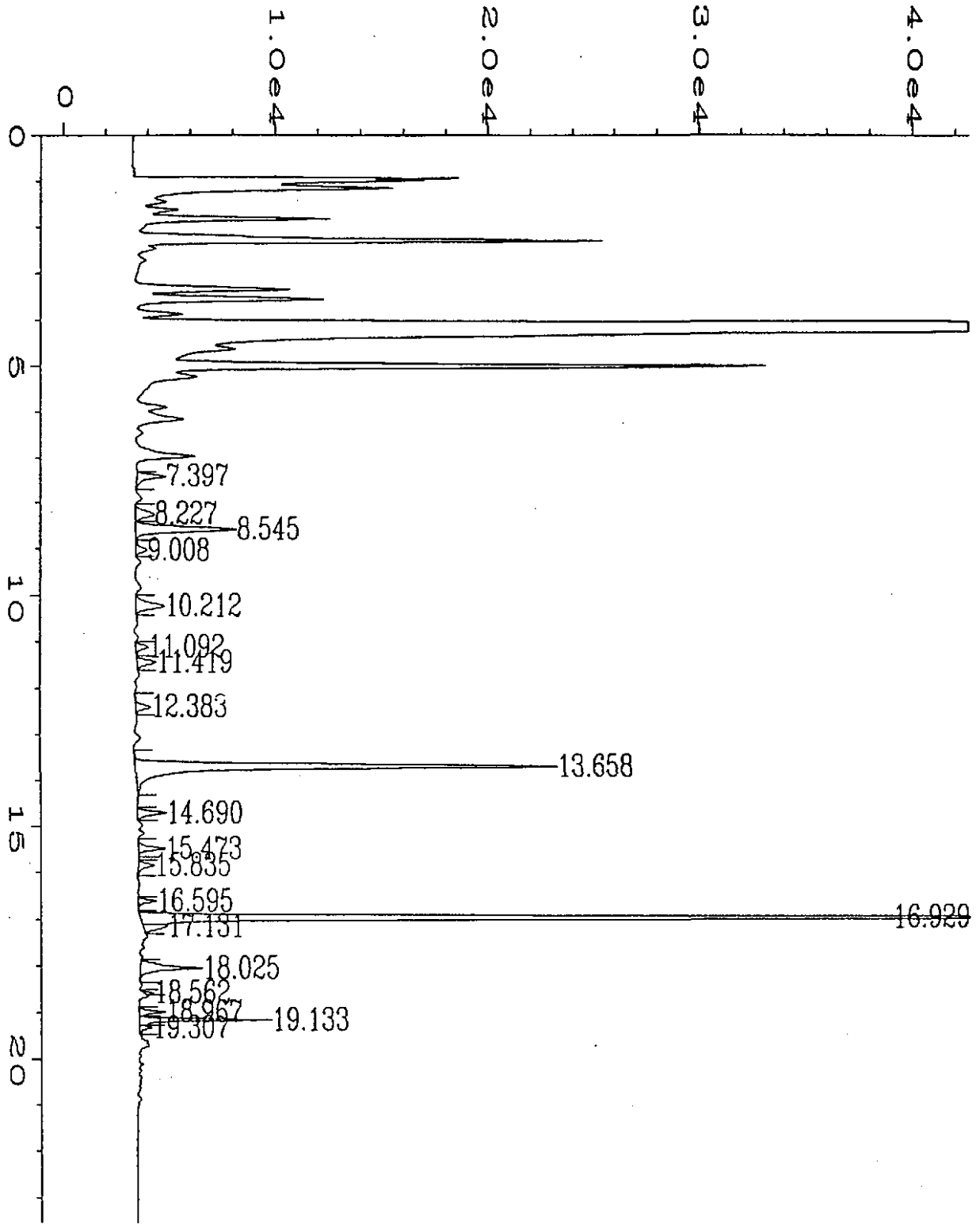
Data File Name : C:\HPCHEM\1\DATA\103194\014F0301.D
Operator :
Instrument : GC #8
Sample Name : 4101619
Run Time Bar Code:
Acquired on : 31 Oct 94 03:23 PM
Report Created on: 31 Oct 94 03:47 PM
Sample Info : 5 ml

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



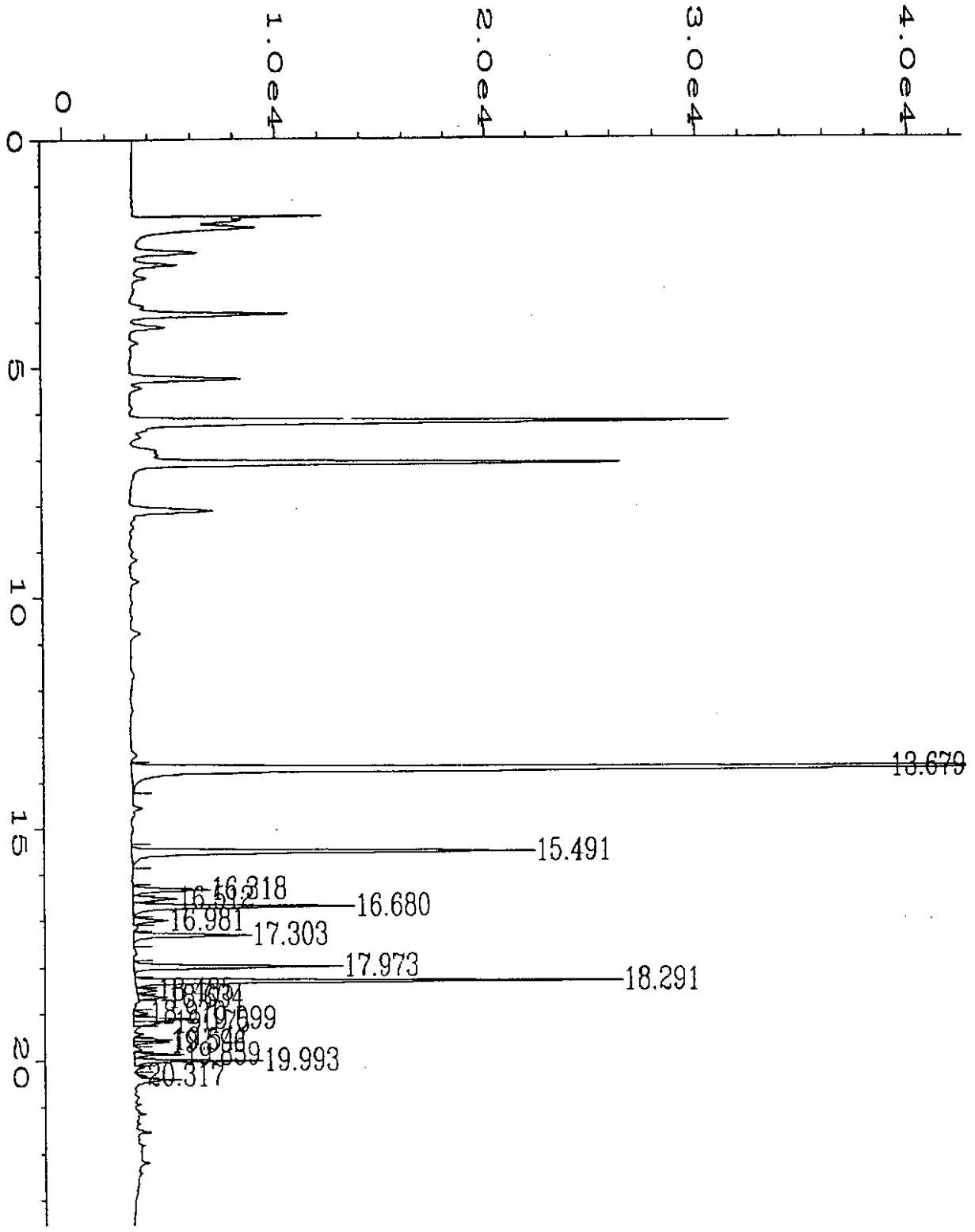
Data File Name : C:\HPCHEM\1\DATA\103194\015F0301.D
Operator :
Instrument : GC #8
Sample Name : 4101620
Run Time Bar Code:
Acquired on : 31 Oct 94 03:56 PM
Report Created on: 31 Oct 94 04:20 PM
Sample Info : 5 ml

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



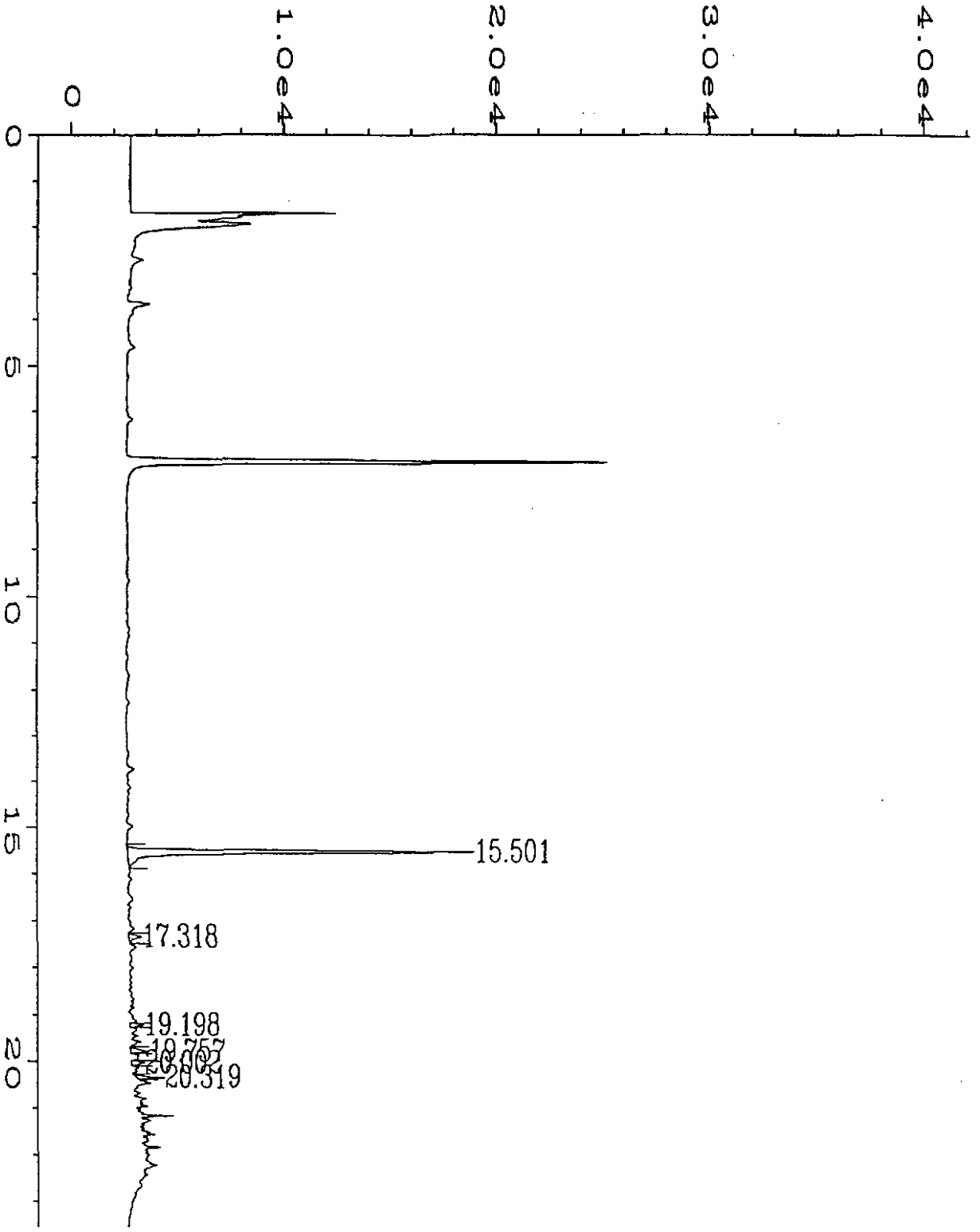
Data File Name : C:\HPCHEM\1\DATA\103194\021F0301.D
Operator :
Instrument : GC #8
Sample Name : 4101621
Run Time Bar Code:
Acquired on : 31 Oct 94 07:10 PM
Report Created on: 31 Oct 94 07:34 PM
Sample Info : 5 ml

Page Number : 1
Vial Number : 21
Injection Number : 1
Sequence Line : 3
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



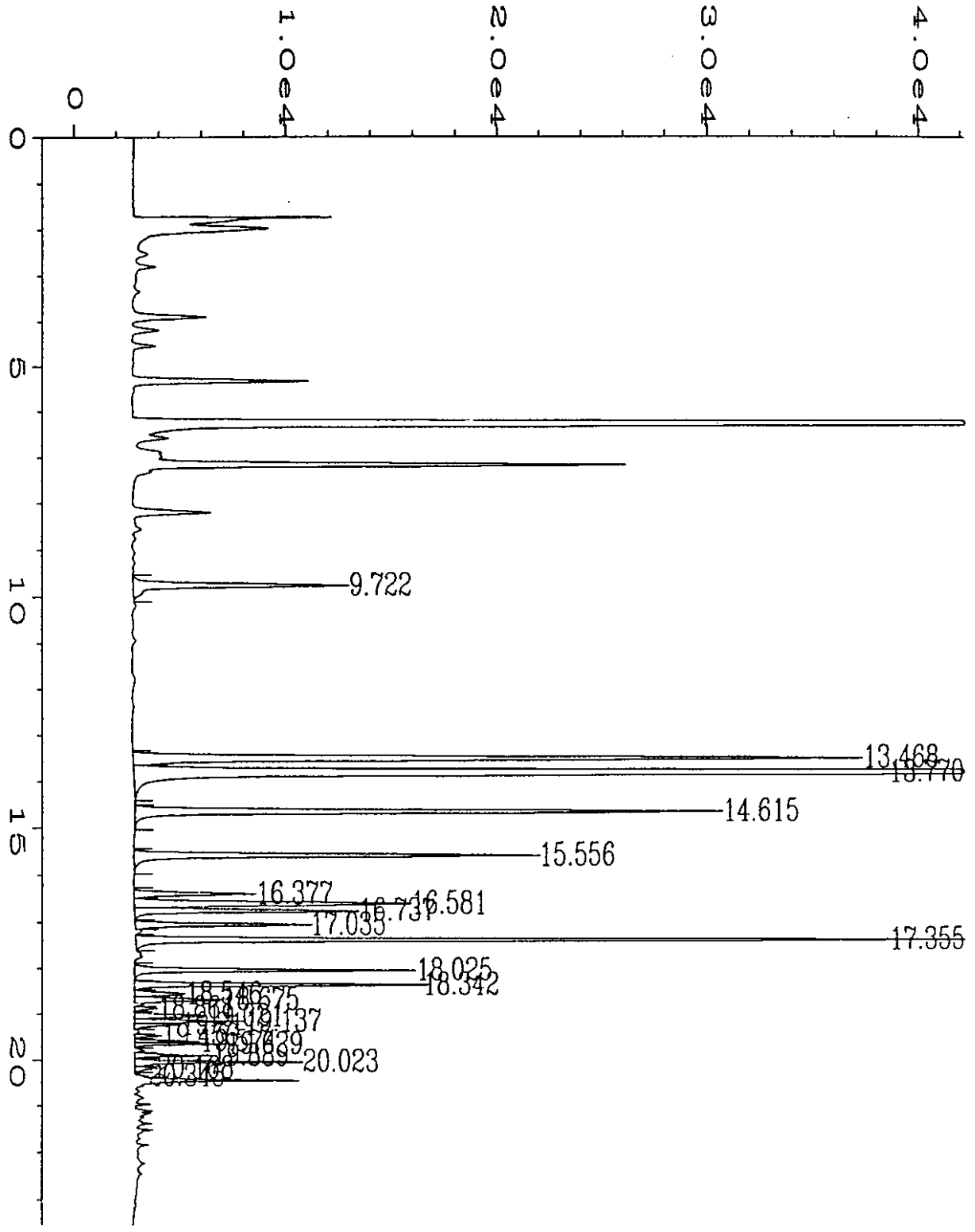
Data File Name : C:\HPCHEM\3\DATA\103194\007F0101.D
Operator :
Instrument : GC #2
Sample Name : 4101622
Run Time Bar Code:
Acquired on : 31 Oct 94 12:26 PM
Report Created on: 31 Oct 94 12:51 PM
Sample Info : 5 ml

Page Number : 1
Vial Number : 7
Injection Number : 1
Sequence Line : 1
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



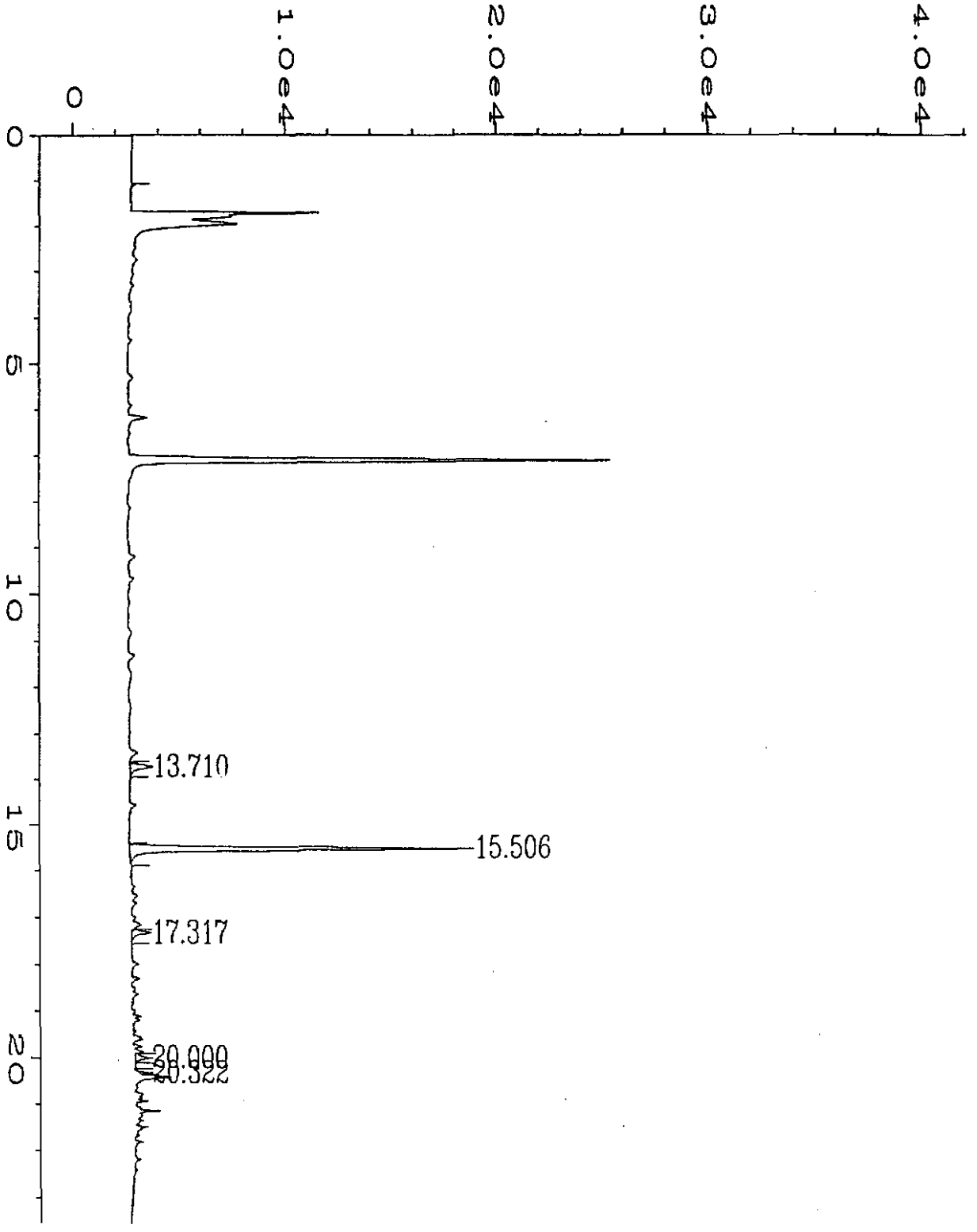
Data File Name : C:\HPCHEM\3\DATA\103194\014F0101.D
Operator :
Instrument : GC #2
Sample Name : 4101623
Run Time Bar Code:
Acquired on : 31 Oct 94 04:14 PM
Report Created on: 31 Oct 94 04:38 PM
Sample Info : 5 ml

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



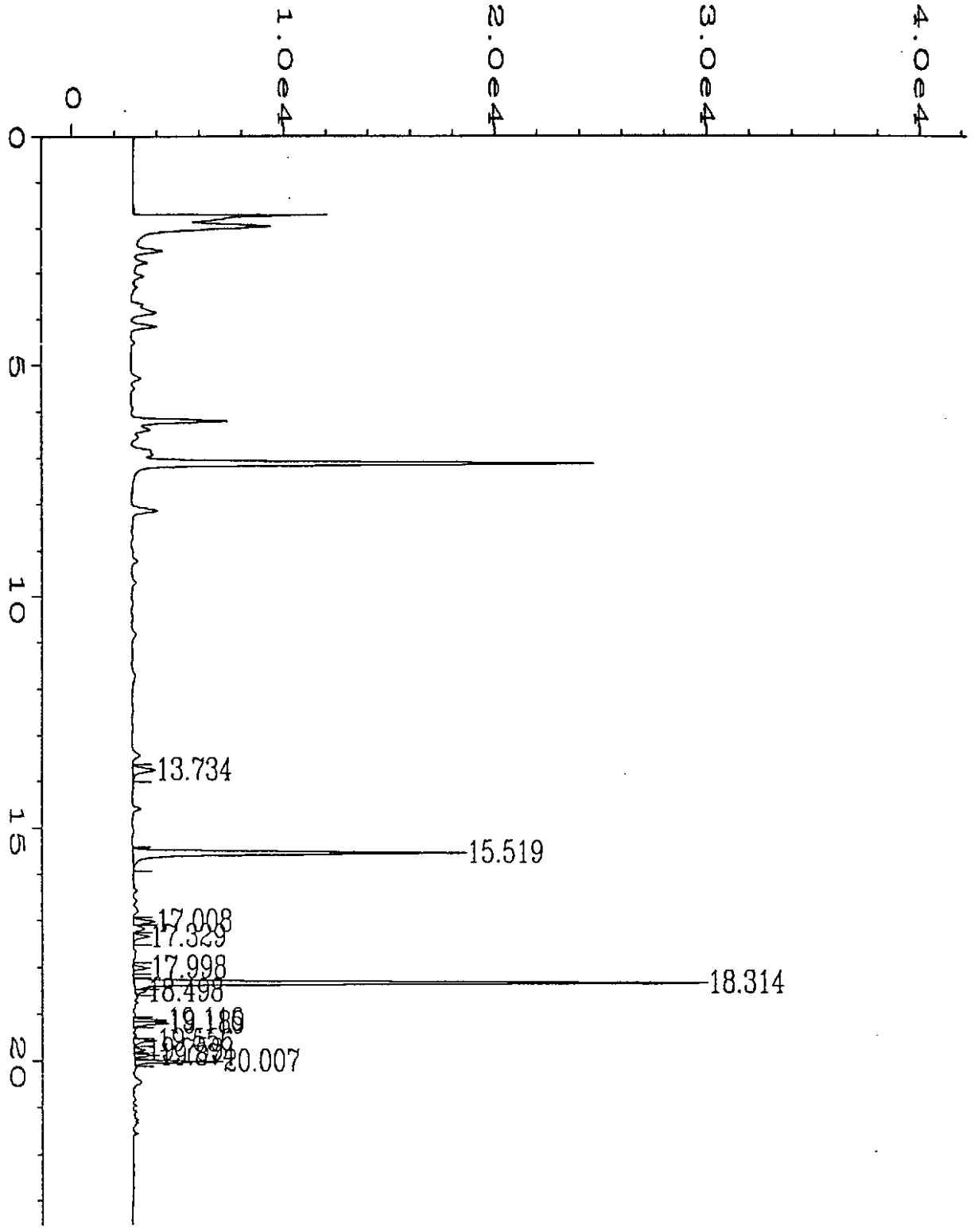
Data File Name : C:\HPCHEM\3\DATA\110194\005F0101.D
Operator :
Instrument : GC #2
Sample Name : 4101624 r1
Run Time Bar Code:
Acquired on : 01 Nov 94 10:06 AM
Report Created on: 01 Nov 94 10:30 AM
Multiplier : 50
Sample Info : 100 ul

Page Number : 1
Vial Number : 5
Injection Number : 1
Sequence Line : 1
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



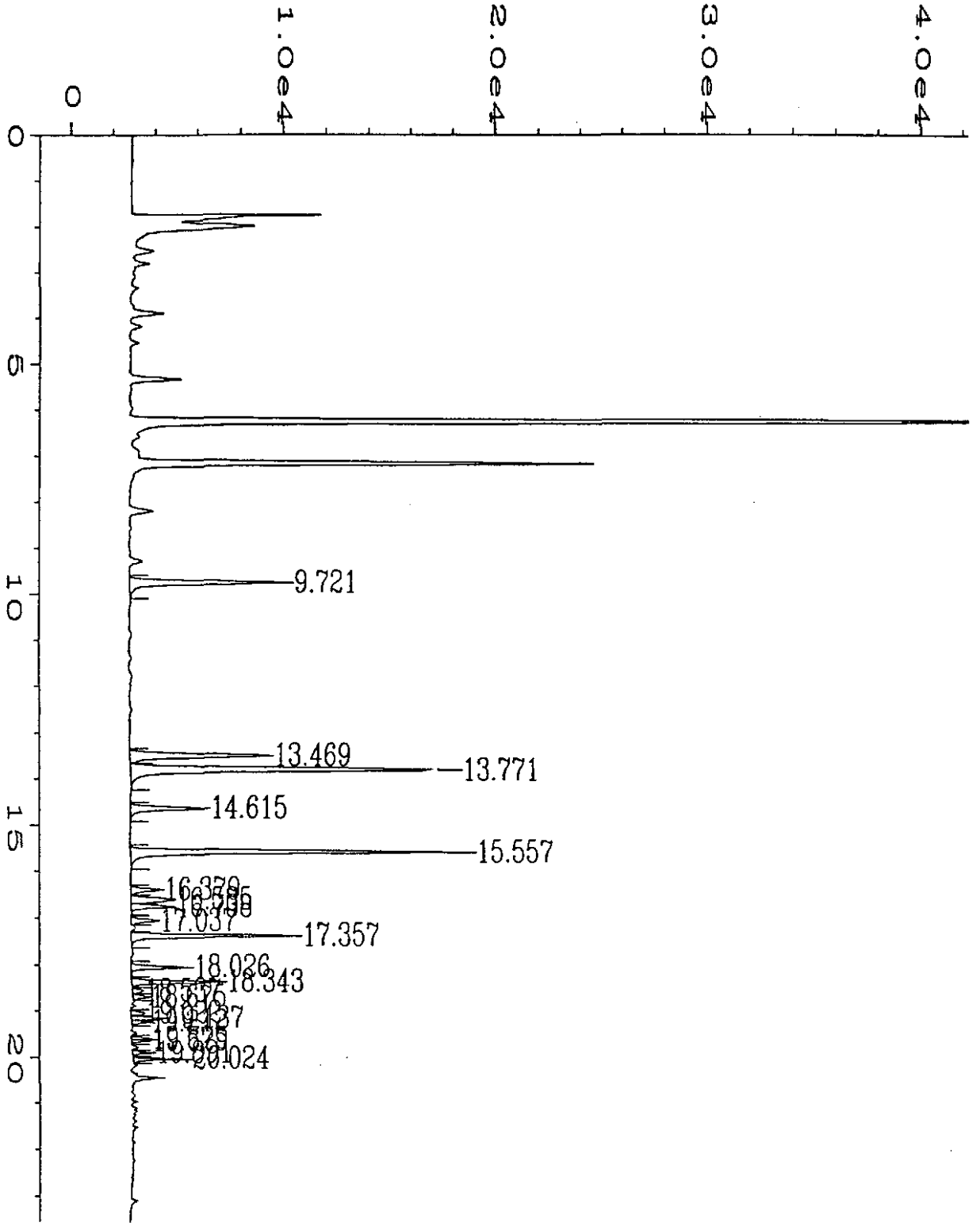
Data File Name : C:\HPCHEM\3\DATA\103194\016F0101.D
Operator :
Instrument : GC #2
Sample Name : 4101625
Run Time Bar Code:
Acquired on : 31 Oct 94 05:19 PM
Report Created on: 31 Oct 94 05:42 PM
Sample Info : 5 ml

Page Number : 1
Vial Number : 16
Injection Number : 1
Sequence Line : 1
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



Data File Name : C:\HPCHEM\3\DATA\103194\019F0101.D
Operator :
Instrument : GC #2
Sample Name : 4101626
Run Time Bar Code:
Acquired on : 31 Oct 94 06:55 PM
Report Created on: 31 Oct 94 07:20 PM
Sample Info : 5 ml

Page Number : 1
Vial Number : 19
Injection Number : 1
Sequence Line : 1
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH



Data File Name : C:\HPCHEM\3\DATA\110194\006F0101.D
Operator :
Instrument : GC #2
Sample Name : 4101627 r1
Run Time Bar Code:
Acquired on : 01 Nov 94 10:38 AM
Report Created on: 01 Nov 94 11:01 AM
Multiplier : 50
Sample Info : 100 ul

Page Number : 1
Vial Number : 6
Injection Number : 1
Sequence Line : 1
Instrument Method: WA-WATER.MTH
Analysis Method : WA-WATER.MTH

NORTH CREEK ANALYTICAL

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

GeoEngineers, Inc.	Client Project ID: UNOCAL #5353, #9161-013-R69	Analyst:	R. Lister
8410 154th Avenue N.E.	Sample Matrix: Water		F. Shino
Redmond, WA 98052	Analysis Method: WTPH-G		
Attention: Norm Puri	Units: µg/L (ppb)	Analyzed:	Oct 31, 1994
		Reported:	Nov 7, 1994

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

	Gasoline	Gasoline
Spike Conc. Added:	100	100
Spike Result:	74	90
% Recovery:	74	90
Upper Control Limit %:	114	114
Lower Control Limit %:	55	55

PRECISION ASSESSMENT
Sample Duplicate

	Gasoline Range Organics	Gasoline Range Organics
Sample Number:	410-1612	410-1622
Original Result:	N.D.	160
Duplicate Result:	N.D.	160
Relative % Difference	Q-5	0.0
Maximum RPD:	38	38

Q-5 = RPD values are not reported at sample concentration levels < 10 X the Reporting Limit.

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Laura Dutton
Project Manager

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

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

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GeoEngineers, Inc.	Client Project ID:	UNOCAL #5353, #9161-013-R69	Sampled:	Oct 25, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 26, 1994
Redmond, WA 98052	Analysis Method:	EPA 8020	Analyzed:	Oct 31, 1994
Attention: Norm Puri	First Sample #:	410-1612	Reported:	Nov 7, 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 %
410-1612	SMW-3	N.D.	N.D.	N.D.	N.D.	86
410-1613	SMW-4	8,500	64	1,700	4,500	94
410-1614	MW-32A	4,600	2,300	560	2,300	105
410-1615	MW-34	6,500	170	680	1,000	96
410-1616	MW-35	360	3.6	100	82	84
410-1617	MW-36	1.2	N.D.	N.D.	N.D.	82
410-1618	MW-37 10/26/94	14,000	30,000	4,400	26,000	81
410-1619	MW-40 10/26/94	20	0.53	0.77	2.0	S-2
410-1620	MW-41	N.D.	N.D.	N.D.	N.D.	80
410-1621	MW-42 10/26/94	530	0.55	N.D.	N.D.	101
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.

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Project Manager

Please Note:
S-2 = The Surrogate Recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample.

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GeoEngineers, Inc.	Client Project ID:	UNOCAL #5353, #9161-013-R69	Sampled:	Oct 25, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 26, 1994
Redmond, WA 98052	Analysis Method:	EPA 8020	Analyzed:	Oct 31, 1994
Attention: Norm Puri	First Sample #:	410-1622	Reported:	Nov 7, 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 %
410-1622	MW-43 10/26/94	9.1	N.D.	N.D.	30	109
410-1623	MW-44 10/26/94	N.D.	N.D.	N.D.	N.D.	101
410-1624	MW-45	2,600	230	920	3,000	111
410-1625	MW-46	N.D.	N.D.	N.D.	N.D.	100
410-1626	MW-47	1.8	N.D.	N.D.	N.D.	101
410-1627	PW-1	1,300	190	190	550	103
BLK103194-I	Method Blank	N.D.	N.D.	N.D.	N.D.	98
BLK103194-II	Method Blank	N.D.	N.D.	N.D.	N.D.	78

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.

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Laura Dutton
Project Manager

4101612.GEO <5>

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GeoEngineers, Inc.	Client Project ID: UNOCAL #5353, #9161-013-R69	Analyst:	R. Lister
8410 154th Avenue N.E.	Sample Matrix: Water		F. Shino
Redmond, WA 98052	Analysis Method: EPA 8020		
Attention: Norm Puri	Units: µg/L (ppb)	Analyzed:	Oct 31, 1994
	QC Sample #: 410-1621	Reported:	Nov 7, 1994

MATRIX SPIKE QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Sample Result:	530	N.D.	N.D.	N.D.
Spike Conc. Added:	10.0	10.0	10.0	30.0
Spike Result:	Q-3	10.7	10.8	32.4
Spike % Recovery:	Q-3	107%	108%	108%
Spike Dup. Result:	Q-3	10.8	11.0	33.0
Spike Duplicate % Recovery:	Q-3	108%	110%	110%
Upper Control Limit %:	138	121	126	130
Lower Control Limit %:	57	78	83	77
Relative % Difference:	Q-3	1.0%	1.9%	1.9%
Maximum RPD:	9.0	9.0	13	20

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Please Note:
Q-3 = The Spike Recovery for this QC sample cannot be accurately calculated due to high concentration of analyte in the sample.

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GeoEngineers, Inc.	Client Project ID:	UNOCAL #5353, #9161-013-R69	Sampled:	Oct 25, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 26, 1994
Redmond, WA 98052	Analysis Method:	WTPH-D Extended	Extracted:	Oct 28, 1994
Attention: Norm Puri	First Sample #:	410-1612	Analyzed:	Nov 2, 1994
			Reported:	Nov 7, 1994

TOTAL PETROLEUM HYDROCARBONS - DIESEL RANGE EXTENDED

Sample Number	Sample Description	Diesel Result mg/L (ppm)	Heavy Oil Result mg/L (ppm)	Surrogate Recovery %
410-1612	SMW-3	0.32	N.D.	65
410-1613	SMW-4	5.3 D-1	1.2	72
410-1614	MW-32A	1.1 D-1	1.0	60
410-1615	MW-34	4.1 D-1	1.9	79
410-1616	MW-35	1.3 D-1	1.2	97
410-1617	MW-36	0.67	1.3	85
410-1618	MW-37 10/26/94	35 D-1	7.5	112
410-1619	MW-40 10/26/94	2.9 D-1	2.6	81
410-1620	MW-41	0.50	N.D.	81
410-1621	MW-42 10/26/94	1.3	2.5	51
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

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

GeoEngineers, Inc.	Client Project ID:	UNOCAL #5353, #9161-013-R69	Sampled:	Oct 25, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 26, 1994
Redmond, WA 98052	Analysis Method:	WTPH-D Extended	Extracted:	Oct 28, 1994
Attention: Norm Puri	First Sample #:	410-1622	Analyzed:	Nov 2, 1994
			Reported:	Nov 7, 1994

TOTAL PETROLEUM HYDROCARBONS - DIESEL RANGE EXTENDED

Sample Number	Sample Description	Diesel Result mg/L (ppm)	Heavy Oil Result mg/L (ppm)	Surrogate Recovery %
410-1622	MW-43 10/26/94	0.58	N.D.	81
410-1623	MW-44 10/26/94	0.28	N.D.	68
410-1624	MW-45	1.0 D-1	N.D.	77
410-1625	MW-46	1.5	7.3	99
410-1626	MW-47	0.27	N.D.	51
BLK102894	Method Blank	N.D.	N.D.	81

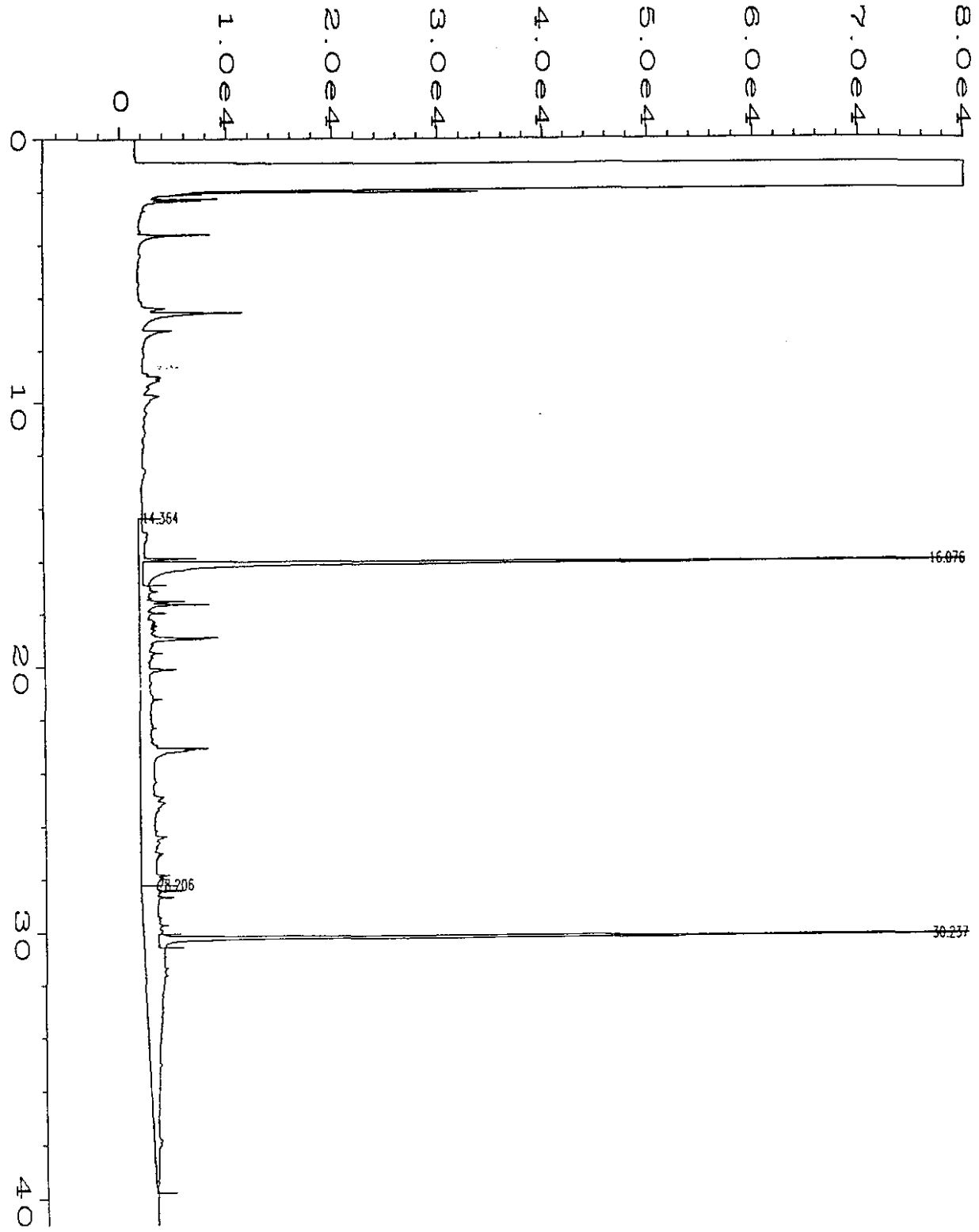
Reporting Limit:	0.25	0.75

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.

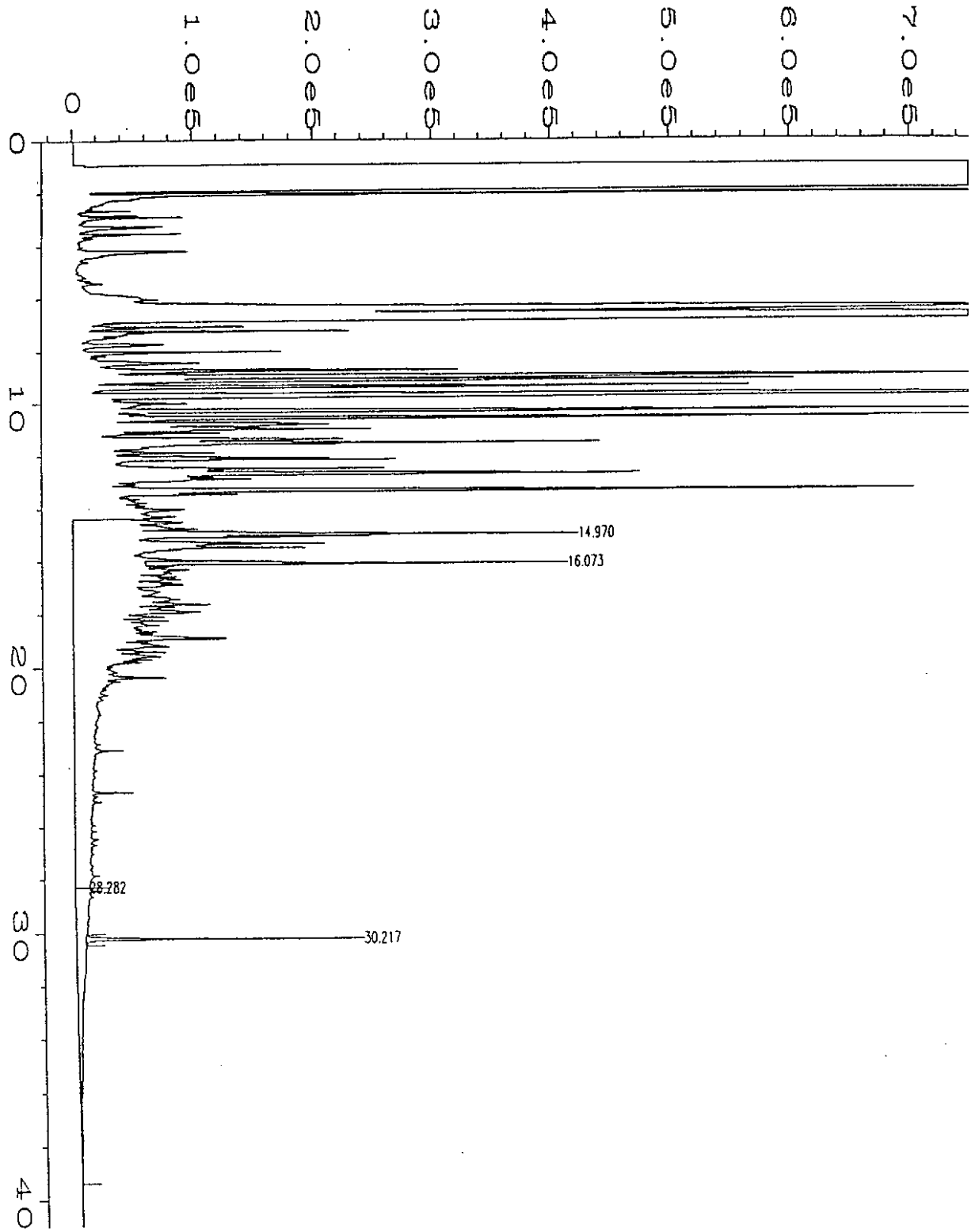
Laura Dutton

Laura Dutton
Project Manager



Data File Name : C:\HPCHEM\1\DATA\NOV01\028F1901.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1612
Run Time Bar Code:
Acquired on : 02 Nov 94 11:34 AM
Report Created on: 03 Nov 94 11:10 AM

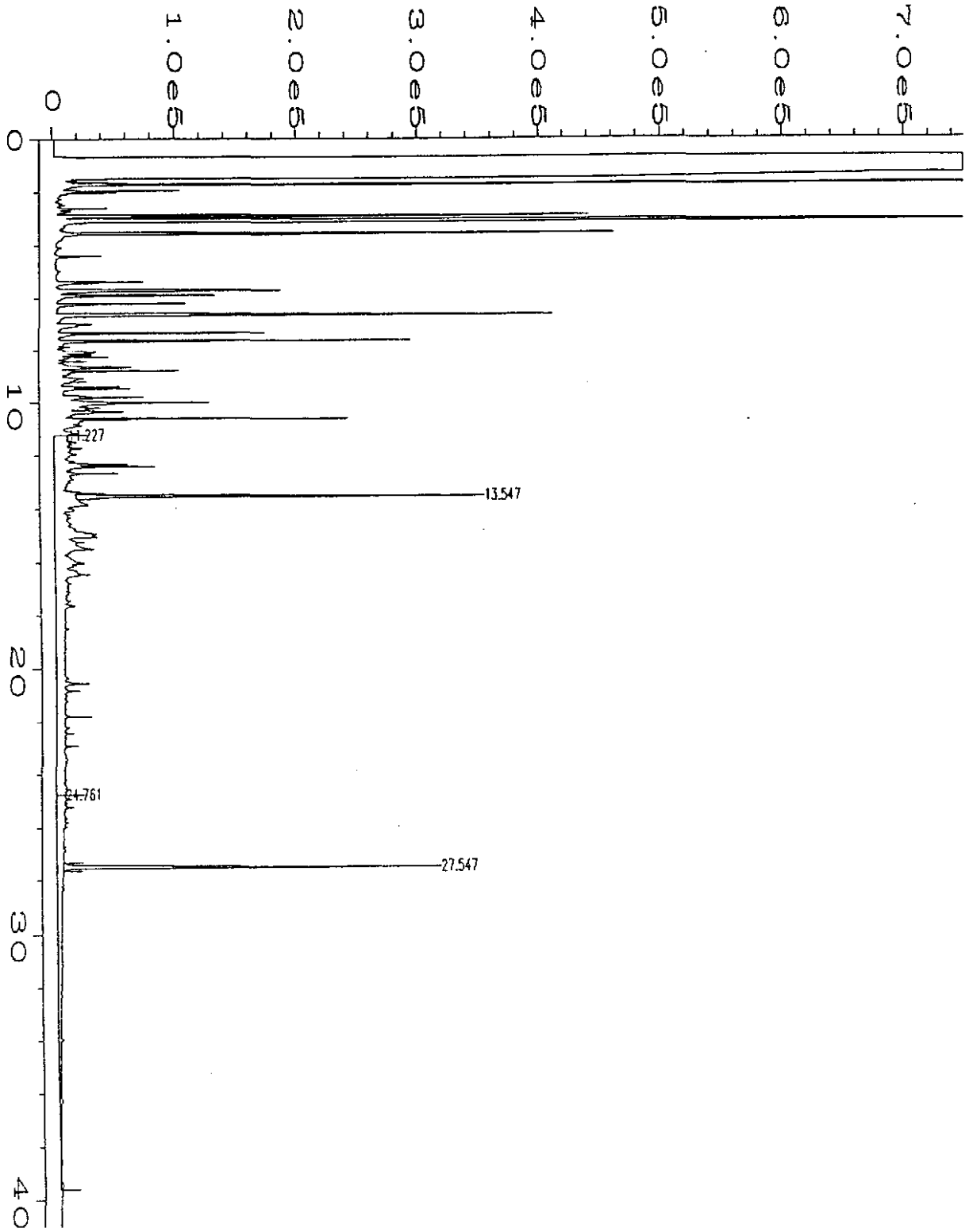
Page Number : 1
Vial Number : 28
Injection Number : 1
Sequence Line : 19
Instrument Method: TPH1F.MTH
Analysis Method : STD1F.MTH



user modified

Data File Name : C:\HPCHEM\1\DATA\NOV01\030F1901.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1613
Run Time Bar Code:
Acquired on : 02 Nov 94 01:20 PM
Report Created on: 03 Nov 94 11:16 AM

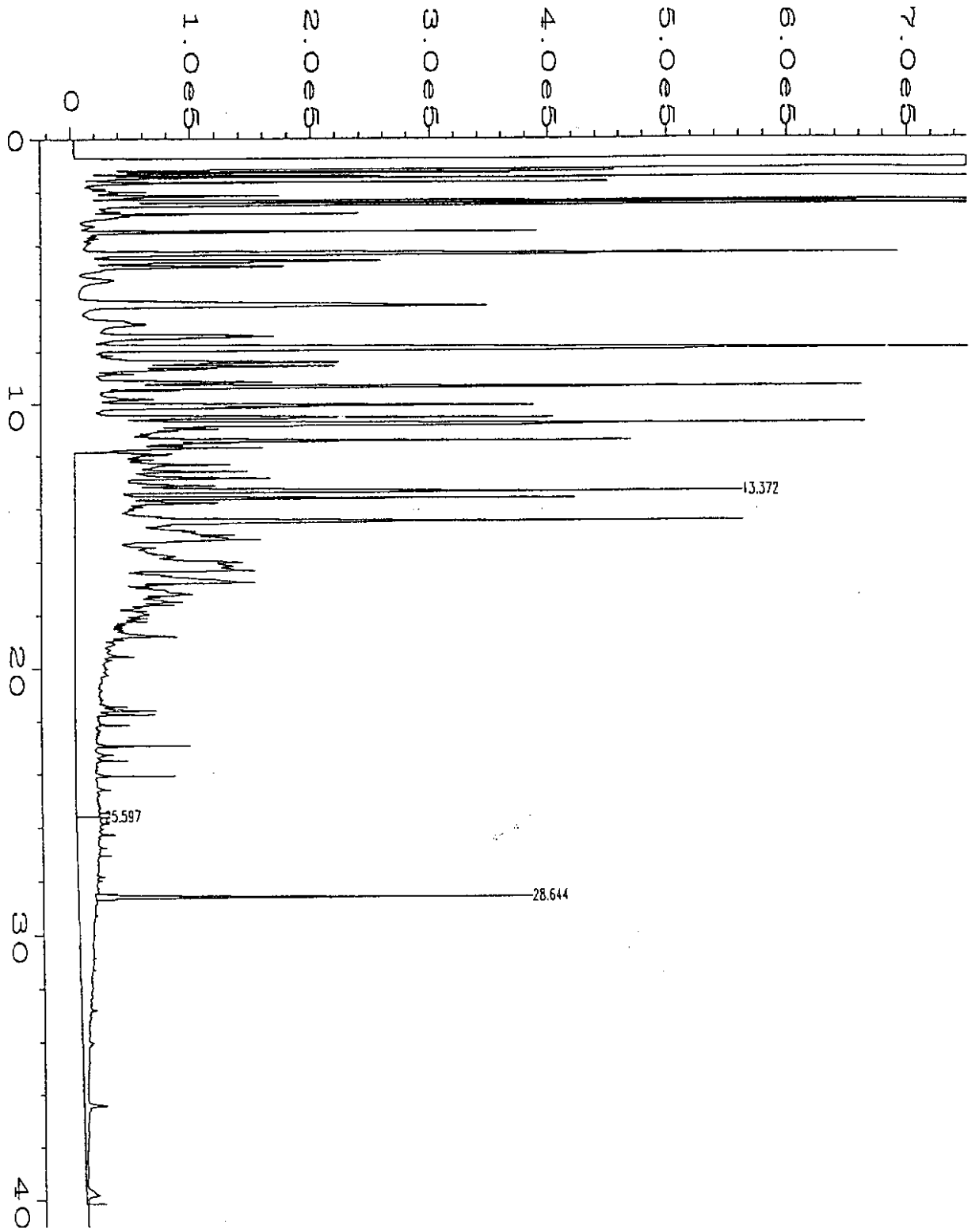
Page Number : 1
Vial Number : 30
Injection Number : 1
Sequence Line : 19
Instrument Method: TPH1F.MTH
Analysis Method : STD1F.MTH



user modified

Data File Name : C:\HPCHEM\1\DATA\NOV01\070R1601.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1614
Run Time Bar Code:
Acquired on : 02 Nov 94 07:11 AM
Report Created on: 03 Nov 94 11:19 AM

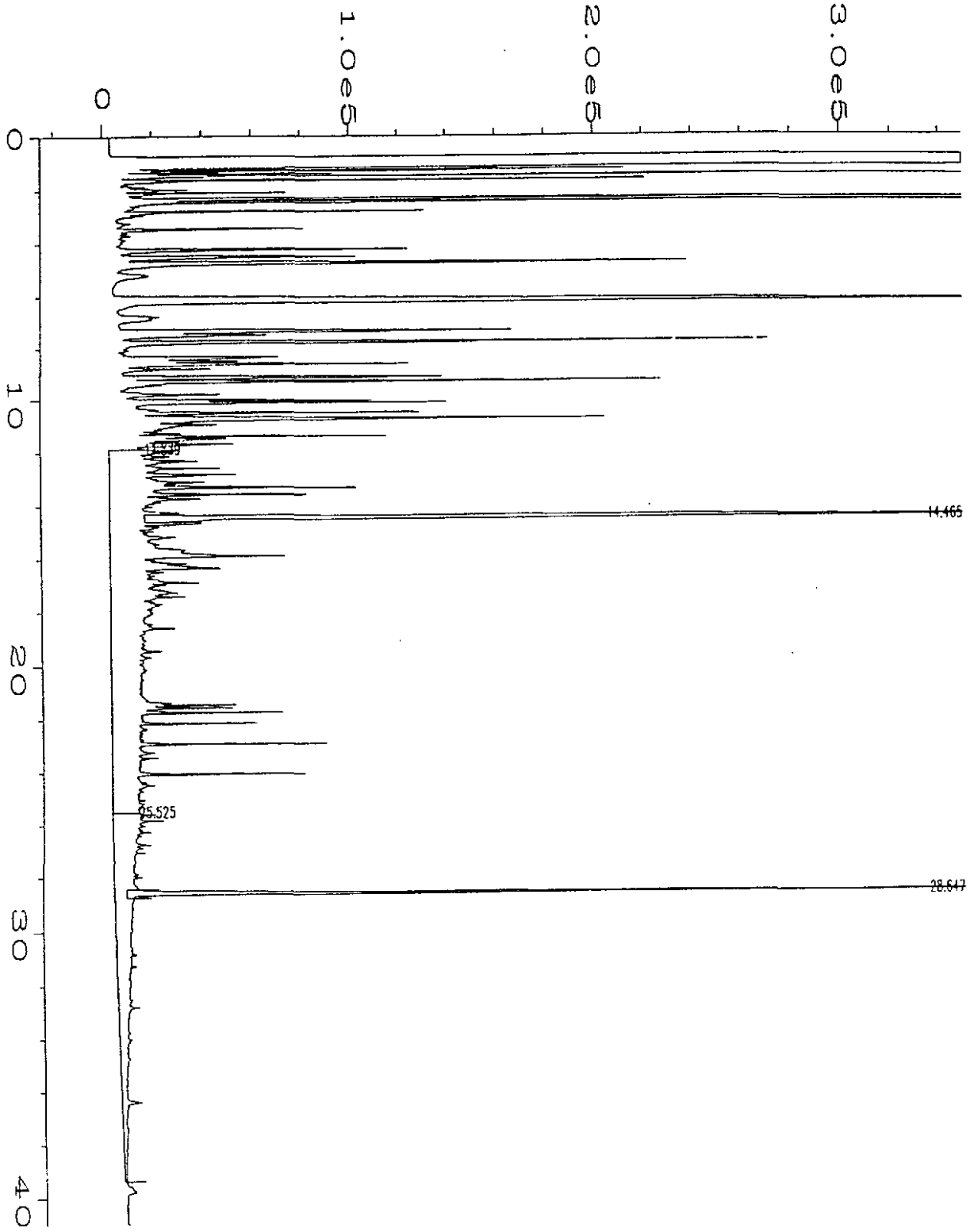
Page Number : 1
Vial Number : 70
Injection Number : 1
Sequence Line : 16
Instrument Method: TPH1F.MTH
Analysis Method : STD1F.MTH



user modified

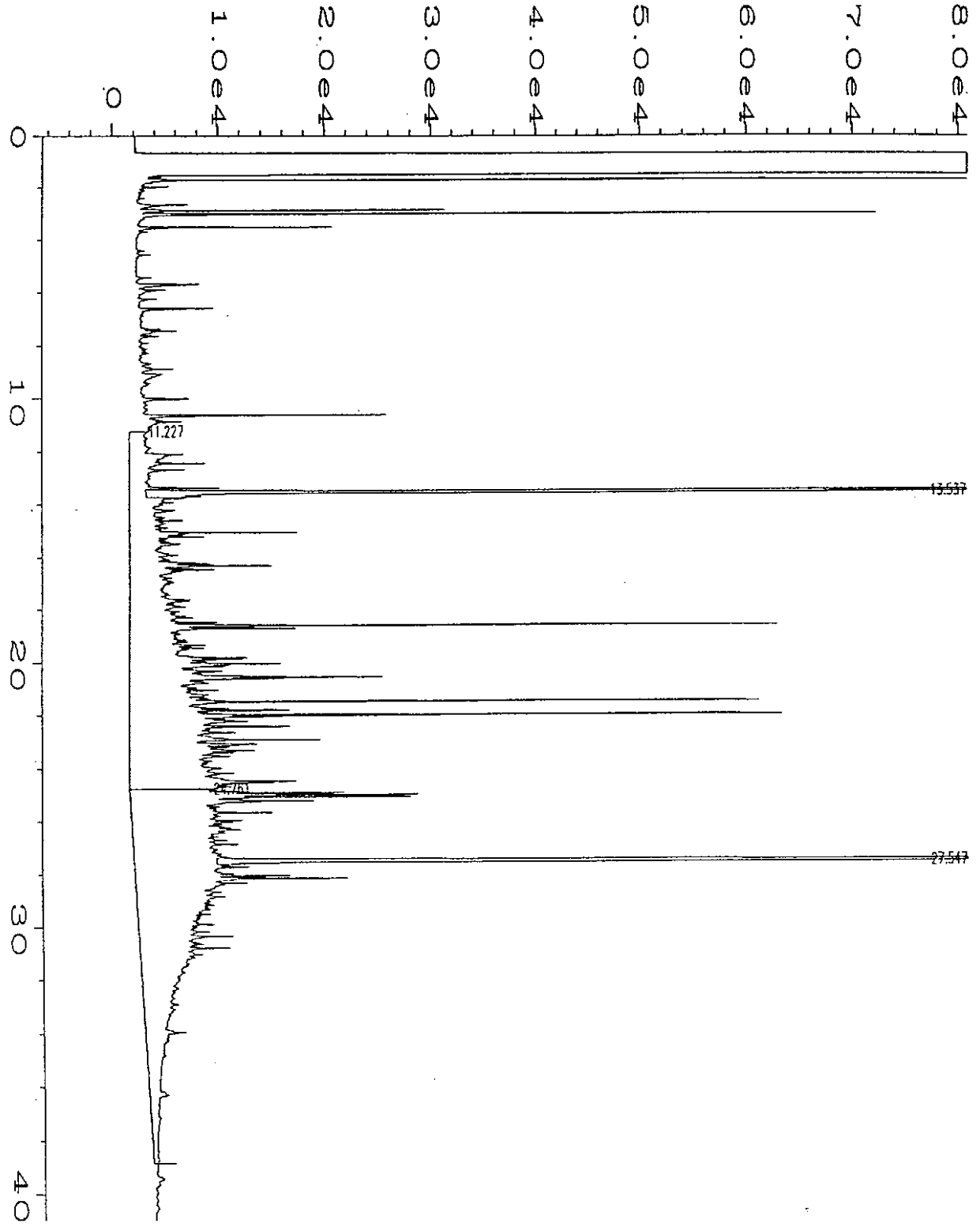
Data File Name : C:\HPCHEM\2\DATA\NOV04\007F0501.D
Operator : SK
Instrument : ROBERT
Sample Name : 410-1615W
Run Time Bar Code:
Acquired on : 04 Nov 94 11:00 PM
Report Created on: 05 Nov 94 02:54 PM

Page Number : 1
Vial Number : 7
Injection Number : 1
Sequence Line : 5
Instrument Method: TPH3F.MTH
Analysis Method : TPH1F.MTH



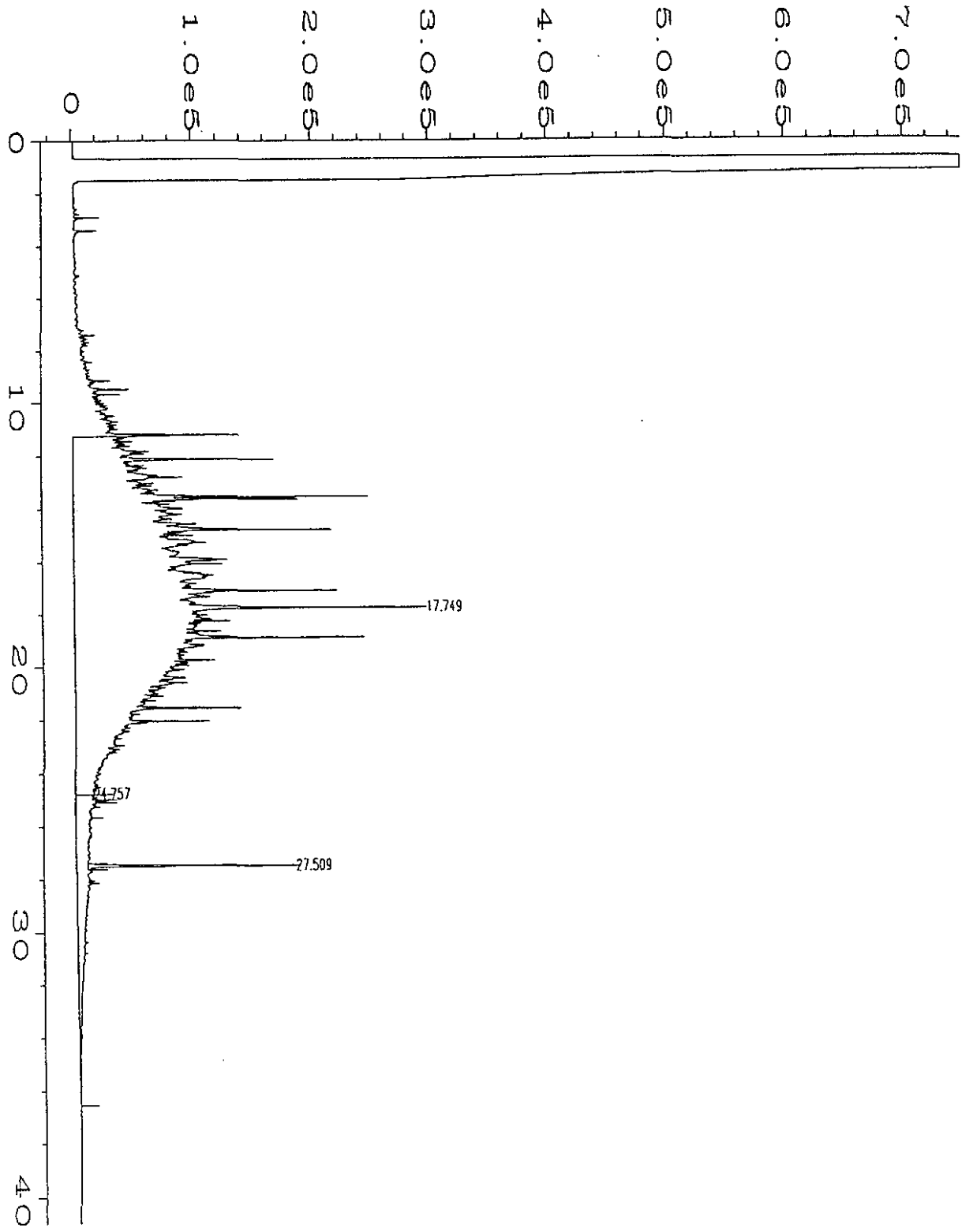
Data File Name : C:\HPCHEM\2\DATA\NOV04\005F0501.D
Operator : SK
Instrument : ROBERT
Sample Name : 410-1616W
Run Time Bar Code:
Acquired on : 04 Nov 94 09:15 PM
Report Created on: 05 Nov 94 02:49 PM

Page Number : 1
Vial Number : 5
Injection Number : 1
Sequence Line : 5
Instrument Method: TPH3F.MTH
Analysis Method : TPH1F.MTH



Data File Name : C:\HPCHEM\1\DATA\NOV01\073R1601.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1617
Run Time Bar Code:
Acquired on : 02 Nov 94 09:46 AM
Report Created on: 03 Nov 94 11:32 AM

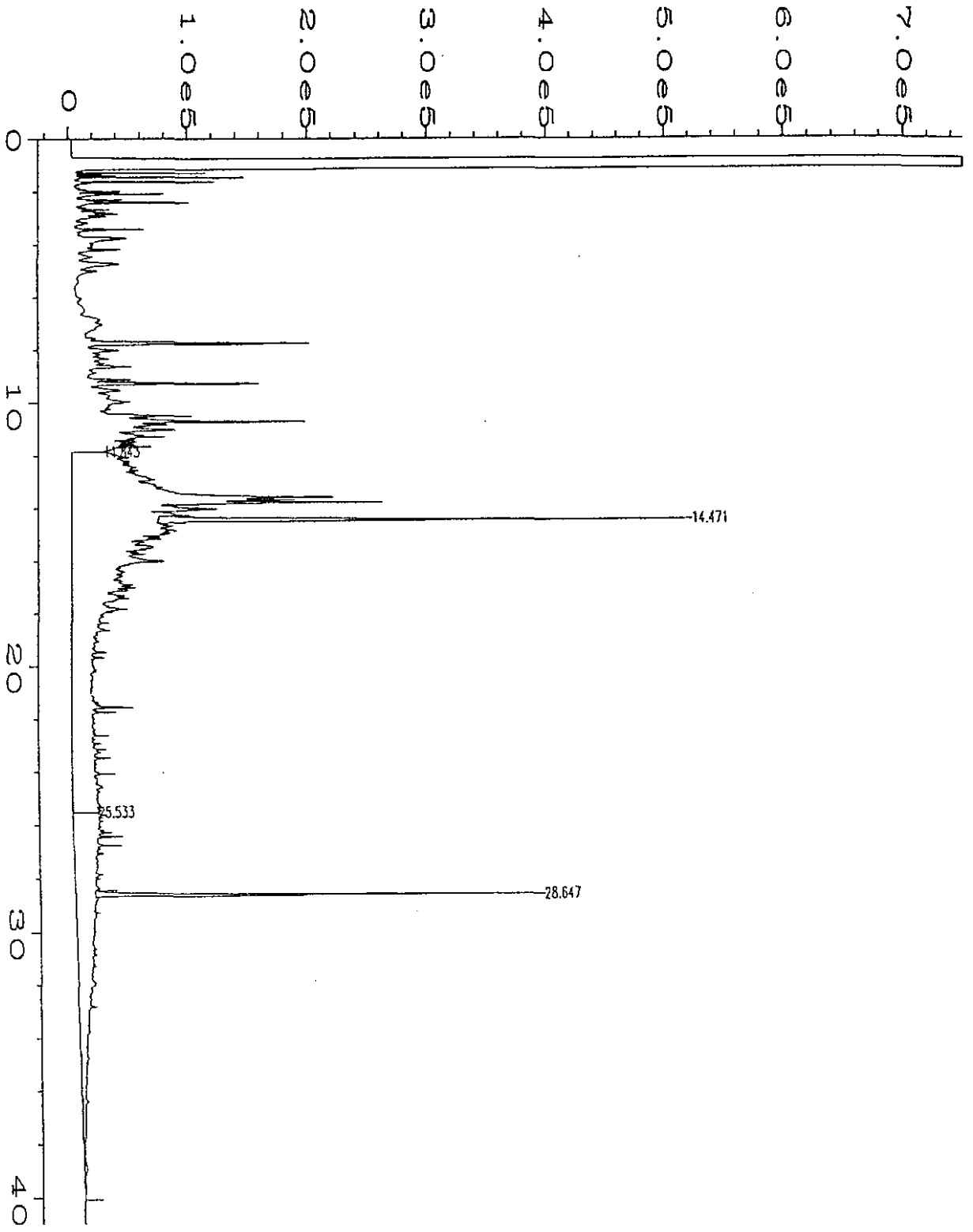
Page Number : 1
Vial Number : 73
Injection Number : 1
Sequence Line : 16
Instrument Method: TPH1F.MTH
Analysis Method : STD1F.MTH



user modified

Data File Name : C:\HPCHEM\1\DATA\NOV01\074R1601.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1618
Run Time Bar Code:
Acquired on : 02 Nov 94 10:40 AM
Report Created on: 03 Nov 94 12:10 PM

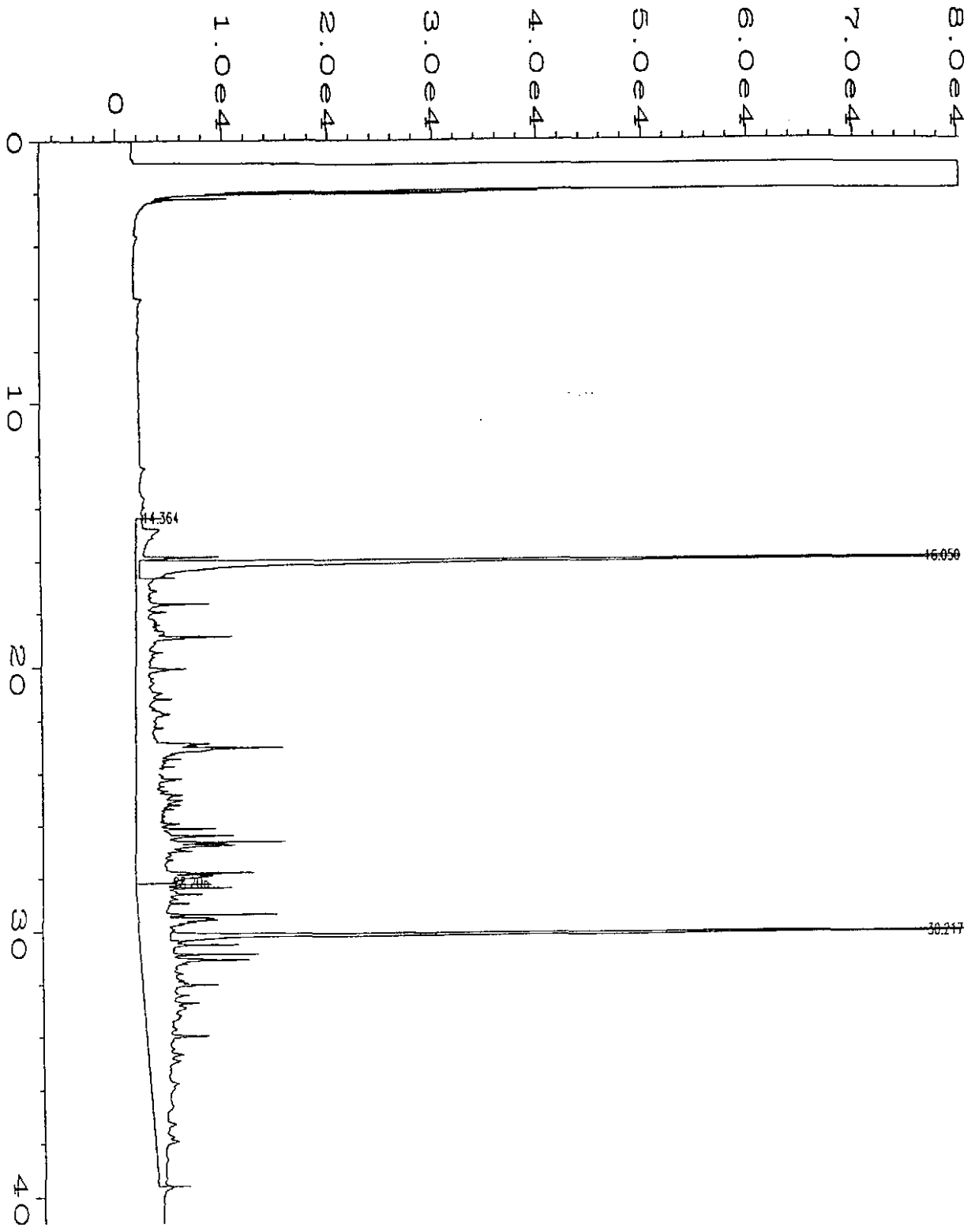
Page Number : 1
Vial Number : 74
Injection Number : 1
Sequence Line : 16
Instrument Method: TPH1F.MTH
Analysis Method : STDMO1F.MTH



user modified

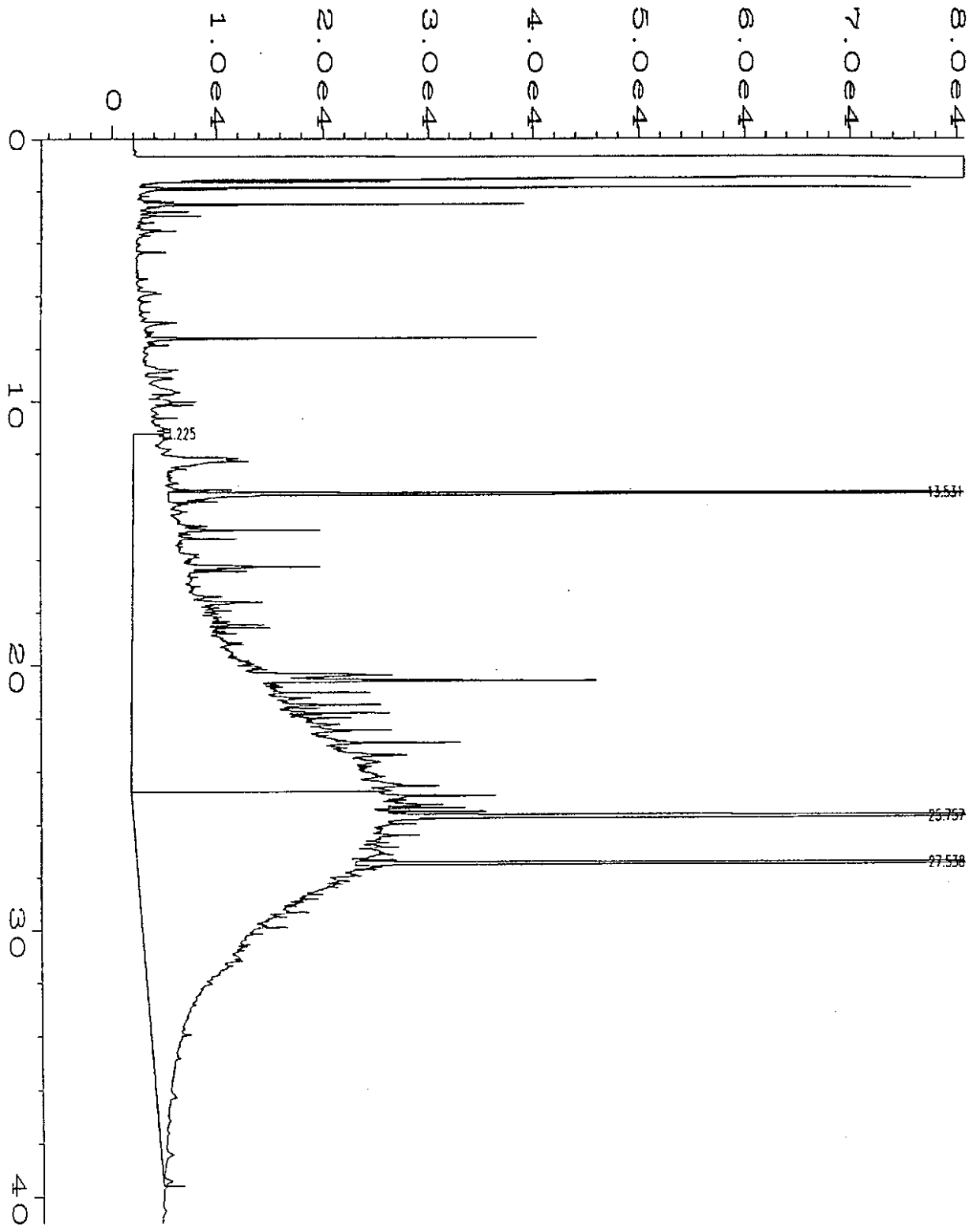
Data File Name : C:\HPCHEM\2\DATA\NOV04\006F0501.D
Operator : SK
Instrument : ROBERT
Sample Name : 410-1619W
Run Time Bar Code:
Acquired on : 04 Nov 94 10:08 PM
Report Created on: 05 Nov 94 02:51 PM

Page Number : 1
Vial Number : 6
Injection Number : 1
Sequence Line : 5
Instrument Method: TPH3F.MTH
Analysis Method : TPH1F.MTH



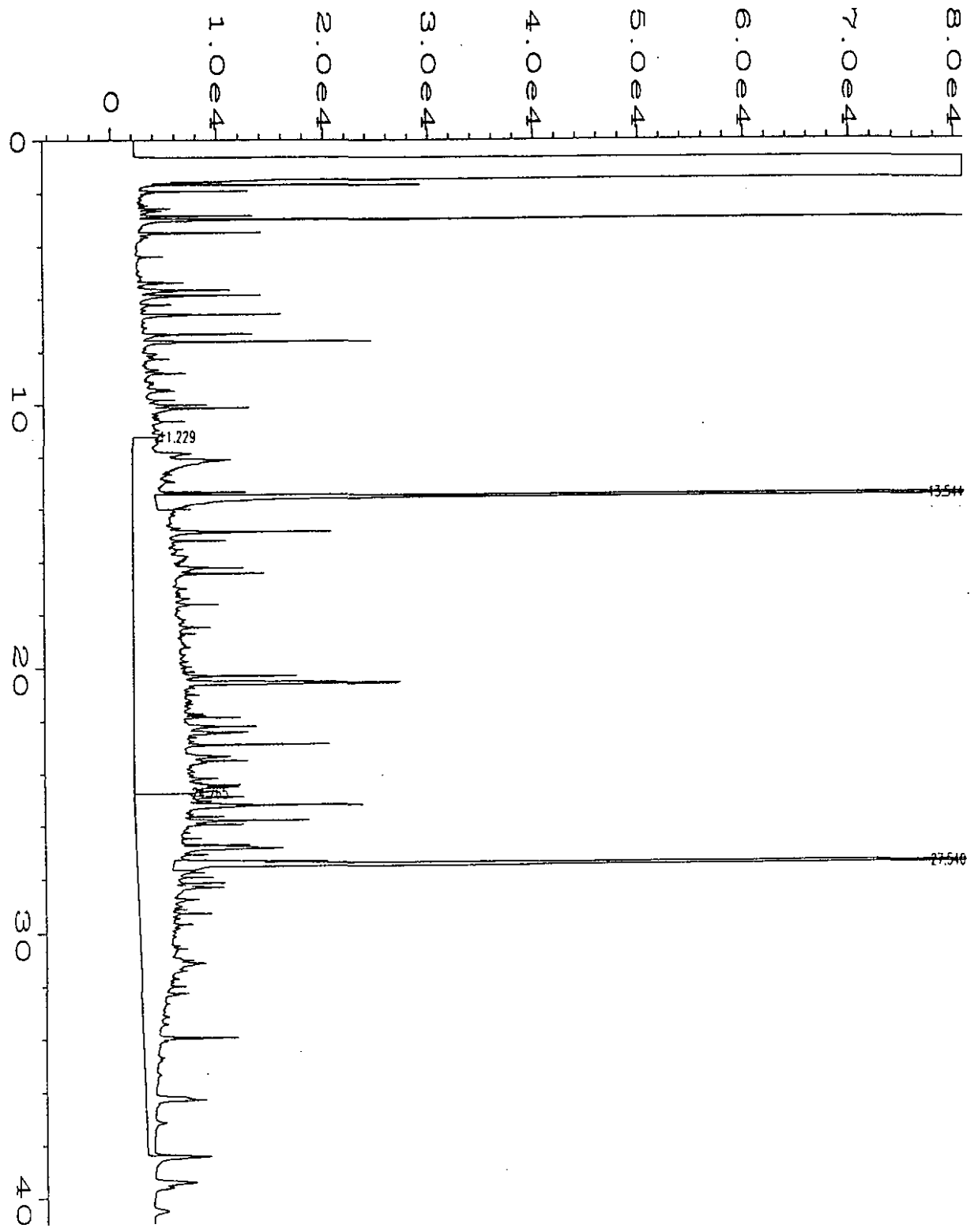
Data File Name : C:\HPCHEM\1\DATA\NOV05\006F0501.D
Operator : SK
Instrument : PHILLIP
Sample Name : 410-1620
Run Time Bar Code:
Acquired on : 05 Nov 94 04:29 PM
Report Created on: 05 Nov 94 07:14 PM

Page Number : 1
Vial Number : 6
Injection Number : 1
Sequence Line : 5
Instrument Method: TPH1F.MTH
Analysis Method : TPH1F.MTH



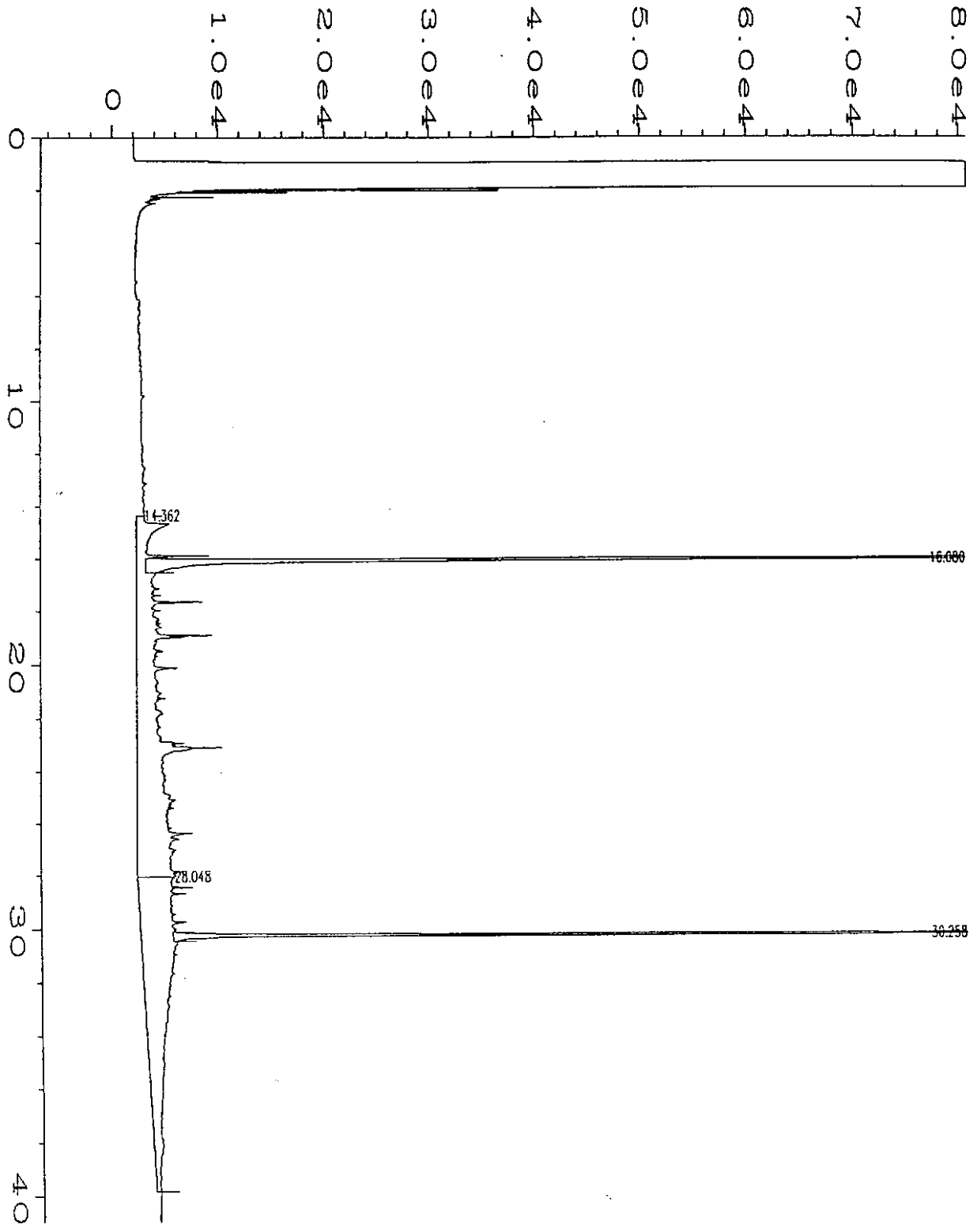
Data File Name : C:\HPCHEM\1\DATA\NOV01\077R1801.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1621
Run Time Bar Code:
Acquired on : 02 Nov 94 02:14 PM
Report Created on: 03 Nov 94 12:19 PM

Page Number : 1
Vial Number : 77
Injection Number : 1
Sequence Line : 18
Instrument Method: STD1F.MTH
Analysis Method : STDMO1F.MTH



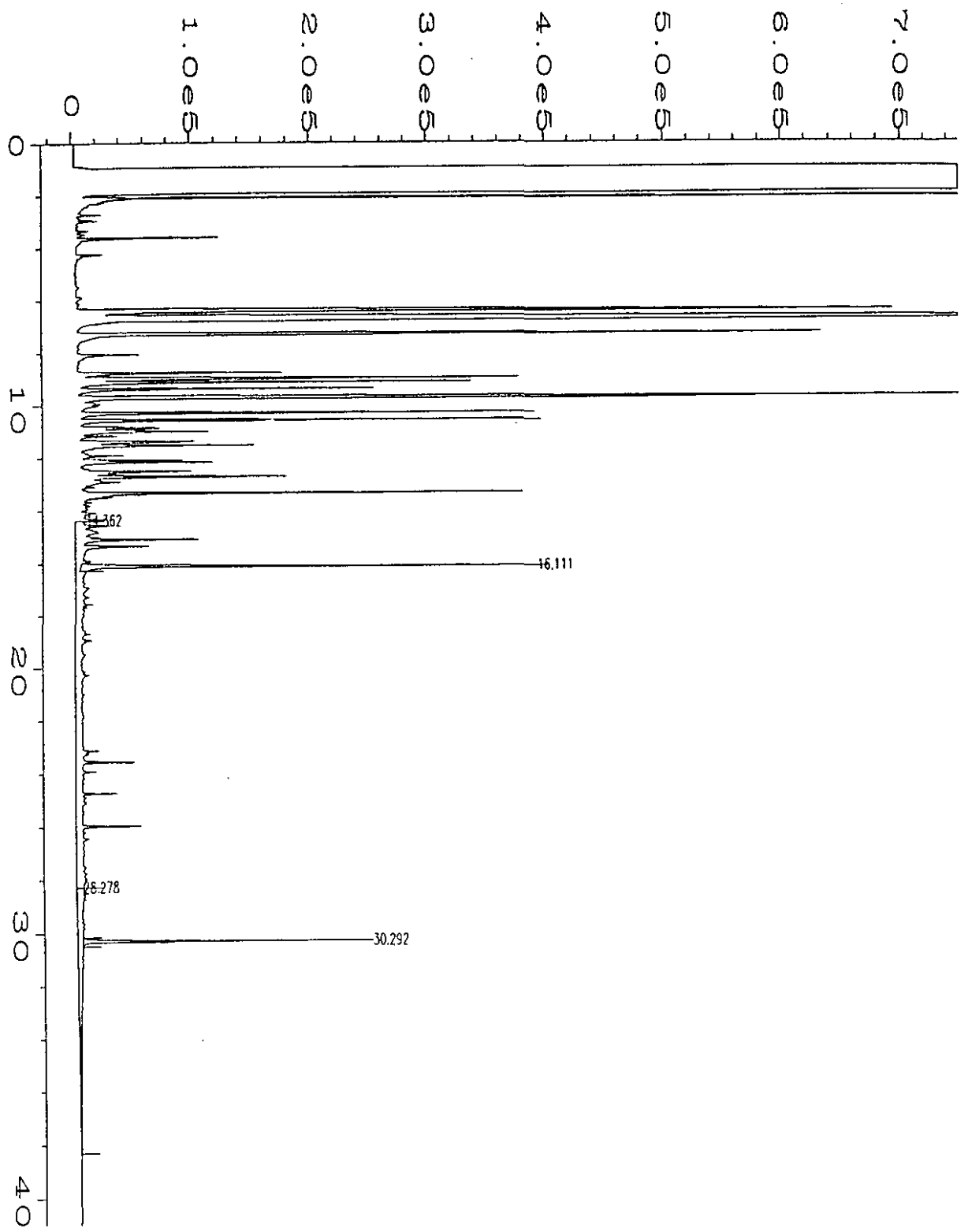
Data File Name : C:\HPCHEM\1\DATA\NOV05\051R0601.D
Operator : SK
Instrument : PHILLIP
Sample Name : 410-1622
Run Time Bar Code:
Acquired on : 05 Nov 94 04:29 PM
Report Created on: 05 Nov 94 07:16 PM

Page Number : 1
Vial Number : 51
Injection Number : 1
Sequence Line : 6
Instrument Method: TPH1F.MTH
Analysis Method : TPH1F.MTH



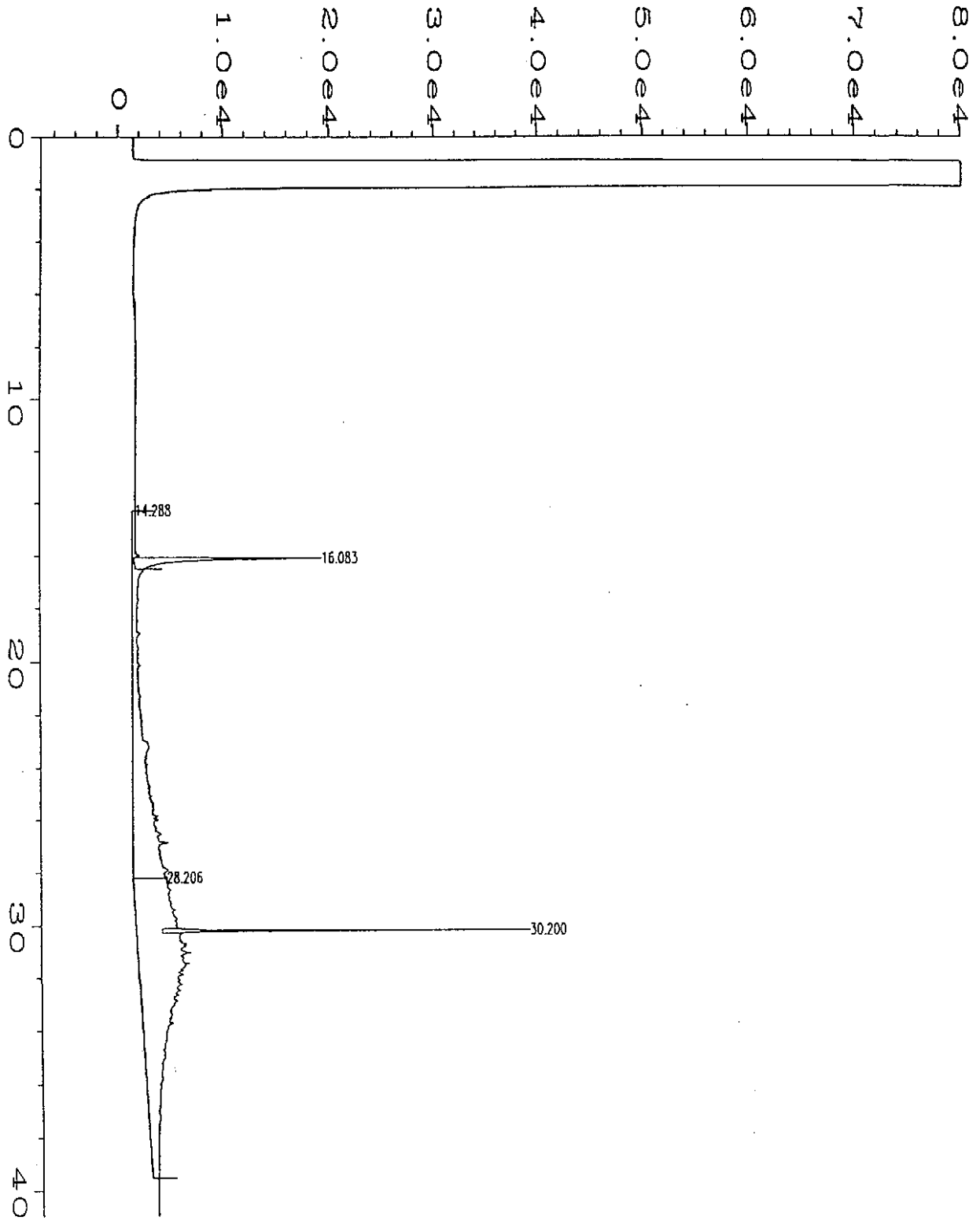
Data File Name : C:\HPCHEM\1\DATA\NOV01\012F1001.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1623
Run Time Bar Code:
Acquired on : 01 Nov 94 08:50 PM
Report Created on: 03 Nov 94 12:28 PM

Page Number : 1
Vial Number : 12
Injection Number : 1
Sequence Line : 10
Instrument Method: TPH1F.MTH
Analysis Method : STDMO1F.MTH



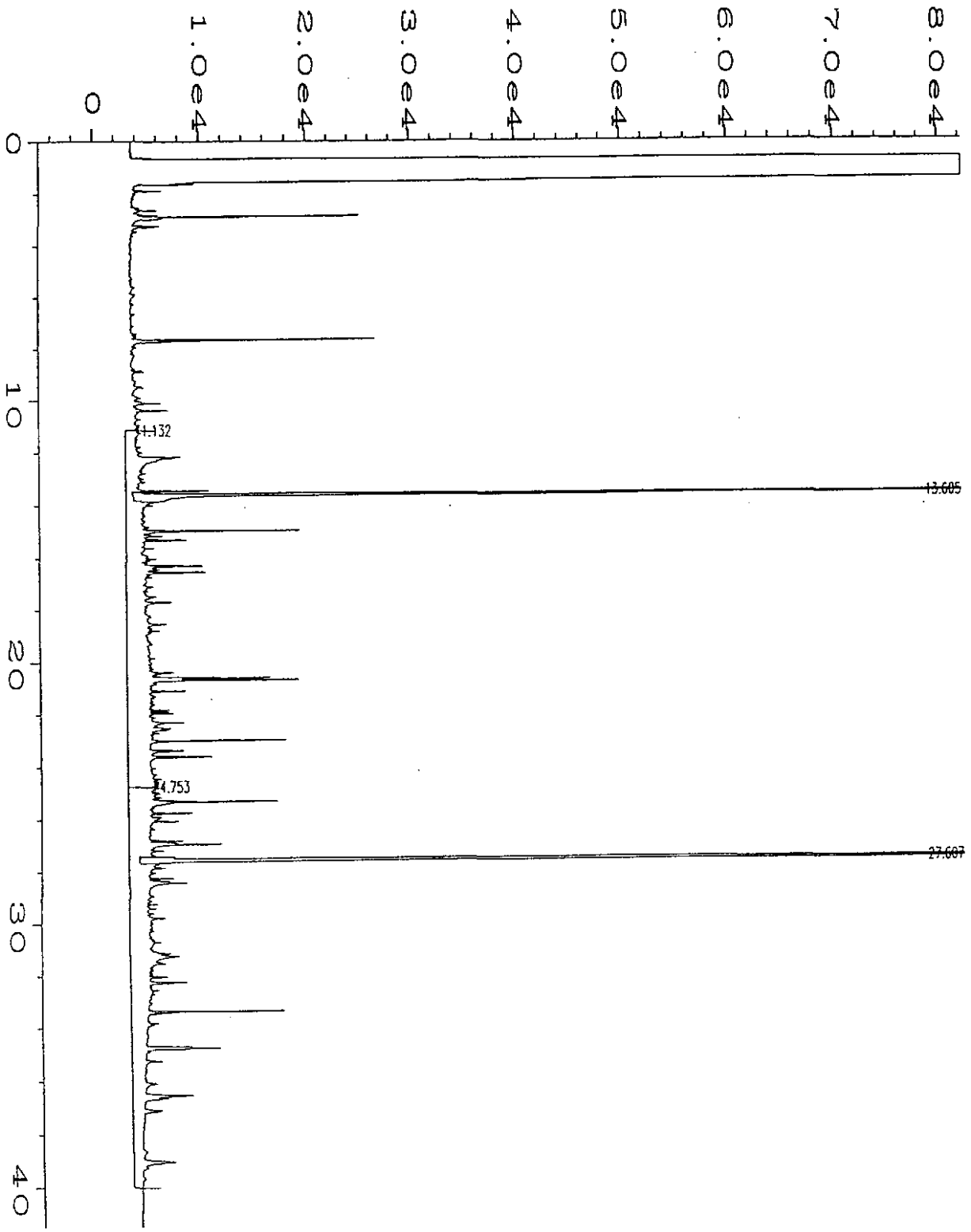
Data File Name : C:\HPCHEM\1\DATA\NOV01\013F1001.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1624
Run Time Bar Code:
Acquired on : 01 Nov 94 09:43 PM
Report Created on: 05 Nov 94 03:00 PM

Page Number : 1
Vial Number : 13
Injection Number : 1
Sequence Line : 10
Instrument Method: TPH1F.MTH
Analysis Method : TPH1F.MTH



Data File Name : C:\HPCHEM\1\DATA\NOV01\010F0901.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1625 11X
Run Time Bar Code:
Acquired on : 01 Nov 94 07:58 PM
Report Created on: 05 Nov 94 03:02 PM

Page Number : 1
Vial Number : 10
Injection Number : 1
Sequence Line : 9
Instrument Method: TPH1F.MTH
Analysis Method : TPH1F.MTH



Data File Name : C:\HPCHEM\1\DATA\NOV01\062R1001.D
Operator : DAVE
Instrument : PHILLIP
Sample Name : 410-1626 W
Run Time Bar Code:
Acquired on : 01 Nov 94 10:37 PM
Report Created on: 05 Nov 94 03:04 PM

Page Number : 1
Vial Number : 62
Injection Number : 1
Sequence Line : 10
Instrument Method: BLK.MTH
Analysis Method : TPH1F.MTH

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HYDROCARBON ANALYSIS FOOTNOTES

2/94, Rev. 3

VOLATILE HYDROCARBONS - GASOLINE RANGE ORGANICS

G 1 This sample appears to contain extractable diesel range organics.

G 2 The chromatogram for this sample does not resemble a typical gasoline pattern. Please refer to the sample chromatogram.

G 3 The total hydrocarbon result in this sample is primarily due to an individual compound(s) eluting in the volatile hydrocarbon range. Identification and quantitation by EPA 8010, 8021 or 8240 is recommended.

G 4 This sample contains compound(s) not identified as Benzene, Toluene, Ethyl benzene or Xylene.

G 5 This sample appears to contain or be saturated with gasoline product.

EXTRACTABLE HYDROCARBONS - DIESEL RANGE ORGANICS

D 1 This sample appears to contain volatile gasoline range organics.

D 2 The hydrocarbons present in this sample resemble heavy, non-resolvable oil range organics. Quantitation by TPH-Diesel Extended or TPH 418.1 is recommended.

D 3 The hydrocarbon concentration result in this sample is partially due to an individual peak(s) eluting in the diesel / motor oil carbon range.

D 4 The hydrocarbons present in this sample are a complex mixture of diesel range and heavy oil range organics.

D 5 The hydrocarbon result shown is an estimated (greater than) value due to the high concentration. Reanalysis is being performed to yield a quantitative result. An amended report will follow.

D 6 The sample chromatographic pattern does not resemble the fuel standard used for quantitation. A fuel fingerprint is advised.

D 7 This sample appears to contain or be saturated with diesel product.

Oils and Lubricants
[----------]
TRPH 418.1

Diesel & Fuel Oils
[----------]
Extractable Hydrocarbons (TPH-D)

Gasoline
[----------]
Volatile Hydrocarbons (TPH-G)

HYDROCARBON BOILING POINT RANGE

LOW LOW TO MEDIUM MEDIUM MEDIUM TO HIGH VERY HIGH

CARBON RANGE:

5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31+

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GeoEngineers, Inc.	Client Project ID: UNOCAL #5353, #9161-013-R69	Analyst:	D. Anderson
8410 154th Avenue N.E.	Sample Matrix: Water		
Redmond, WA 98052	Analysis Method: WTPH-D	Extracted:	Oct 28, 1994
Attention: Norm Puri	Units: mg/L (ppm)	Analyzed:	Nov 2, 1994
		Reported:	Nov 7, 1994

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

Diesel

Spike Conc. Added:	2.1
Spike Result:	1.7
% Recovery:	81
Upper Control Limit %:	126
Lower Control Limit %:	71

PRECISION ASSESSMENT
Sample Duplicate

Diesel Range Organics

Sample Number:	410-1491
Original Result:	0.87
Duplicate Result:	0.77
Relative % Difference	Relative Percent Difference values are not reported at sample concentration levels less than 10 times the Detection Limit.
Maximum RPD:	39

NORTH CREEK ANALYTICAL Inc.

Laura Dutton
Project Manager

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

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

4101612.GEO <9>

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

GeoEngineers, Inc.	Client Project ID:	UNOCAL #5353, #9161-013-R69	Sampled:	Oct 26, 1994
8410 154th Avenue N.E.	Sample Matrix:	Water	Received:	Oct 26, 1994
Redmond, WA 98052	Analysis Method:	EPA 413.2 (I.R.)	Extracted:	Nov 1, 1994
Attention: Norm Puri	First Sample #:	410-1627	Analyzed:	Nov 1, 1994
			Reported:	Nov 7, 1994

TOTAL OIL & GREASE

Sample Number	Sample Description	Sample Result mg/L (ppm)
410-1627	PW-1	1.8
BLK110194	Method Blank	N.D.

Reporting Limit:	1.0

Analytes reported as N.D. were not detected above the stated Reporting Limit.

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Laura Dutton
Project Manager

4101612.GEO <10>

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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 #5353, #9161-013-R69	Analyst:	J. Cooper
8410 154th Avenue N.E.	Sample Matrix: Water		
Redmond, WA 98052	Analysis Method: EPA 413.2 (I.R.)	Extracted:	Nov 1, 1994
Attention: Norm Puri	Units: mg/L (ppm)	Analyzed:	Nov 1, 1994
		Reported:	Nov 7, 1994

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT

Laboratory Control Sample

Oil and Grease

Spike Conc. Added:	4.1
Spike Result:	4.3
% Recovery:	106
Upper Control Limit %:	134
Lower Control Limit %:	60

PRECISION ASSESSMENT

Sample Duplicate

Oil and Grease

Sample Number:	410-1553
Original Result:	1.1
Duplicate Result:	N.D.
Relative % Difference	Relative Percent Difference values are not reported at sample concentration levels less than ten times the Detection Limit.
Maximum RPD:	45

NORTH CREEK ANALYTICAL Inc.

Laura Dutton
Project Manager

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

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

4101612.GEO <11>

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT

Chain of Custody Record #:

UNOCAL INFORMATION

Facility Number: SS 5353
Site Address: Westlake & Mercer
City, State, ZIP: Seattle, WA
Site Release Number:
Unocal Manager: Dr. Mark Brearley

CONSULTANT INFORMATION

Firm: GeoEngineers, Inc. Project Number: 9161-013-R69
Address: 8410 154th Ave NE
Redmond, WA 98052
Phone: (206) 861-6000 Fax: (206) 861-6050
CERT CRRS Code: ____-600
Project Manager: Norm Puri
Sample Collection by: Dave Cook / Laura Maffei

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

B-132 SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	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. SMW-3	10/25/94 2055	W	3				X		X						410612				All samples are fairly hot
2. SMW-4	2100		3				X		X						410613				
3. MW-32A	2220		3				X		X						410614				
4. MW-34	2225		3				X		X						410615				
5. MW-35	2145		3				X		X						410616				
6. MW-36	2300		3				X		X						410617				
7. MW-37	10/26/94 0045		3				X		X						410618				Sample contains product
8. MW-40	10/26/94 0100		3				X		X						410619				
9. MW-41	10/25/94 2345		3				X		X						410620				
10. MW-42	10/26/94 0015		3				X		X						410621				

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. Laura Maffei	GEI	10/26/94 1430			
2.					
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
Firm: Date:

Page 1 of 2
Rev. 2.1, 9/94

Comments: FAX results to Norm Puri

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT

Chain of Custody Record #:

UNOCAL INFORMATION

Facility Number: SS 5353
Site Address: WL & Mercer
City, State, ZIP: Seattle, WA
Site Release Number:
Unocal Manager: Dr. Mark Brearley

CONSULTANT INFORMATION

Firm: GEI Project Number: 9161-013-R69
Address:
Phone: Fax:
CERT CRRS Code: ____-600
Project Manager: Norm Puri
Sample Collection by:

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

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

O Oregon O Washington Hydrocarbon Methods

B-133	SAMPLE IDENTIFICATION	SAMPLING DATE / TIME	MATRIX (W,S,O)	# OF CONTAINERS	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)	FOG EPA 413.2				NCA SAMPLE NUMBER
1.	MW-43	10/26/94 0005	W	3				X		X														410 1622
2.	MW-44	↓ 0030		3				X		X														410 1623
3.	MW-45	10/25/94 2150		3				X		X														410 1624
4.	MW-46	↓ 2320		3				X		X														410 1625
5.	MW-47	↓ 2245		3				X		X														410 1626
6.	PW-1	10/26/94 0110		3			X													X				410 1627
7.																								
8.																								
9.																								
10.																								

	Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1.	[signature]	GEI	10/26/94 1430	[signature]	NCA	10/26/94 1801
2.						
3.						

Final Report Approval

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

Firm: Date:

Page 2 of 2

Comments: