Results of Quarterly Ground Water Monitoring and Sampling
March 1997
Former Unocal Service Station 5472
Seattle, Washington

March 27, 1997

For

76 Products Company

GeoEngineers

March 27, 1997

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

76 Products Company
P.O. Box 76
Seattle, Washington 98111

Attention: Mr. Leigh Carlson

Results of Quarterly Ground Water Monitoring and Sampling
March 1997
Former Unocal Service Station 5472
Seattle, Washington
File No. 9161-350-62

INTRODUCTION AND BACKGROUND

This letter report presents the results of GeoEngineers' quarterly ground water sampling during the first quarter of 1997 at former Unocal Service Station 5472, located at 3460 First Avenue South in Seattle, Washington. Ecology's (Washington State Department of Ecology) UST (underground storage tank) identification number for the site is 008459 and the LUST (leaking underground storage tank) incident number is 1975. A site plan is presented in Figure 1.

SAFE Research Inc. published a history of the site in 1993. RZA-AGRA Inc. conducted subsurface studies and ground water monitoring at the site from 1989 until December 1993. GeoEngineers completed one episode of ground water monitoring in 1994, three episodes in 1995, and four episodes in 1996. Results of our previous ground water monitoring events are on file at 76 Products.

Ground water levels were measured, and ground water samples were obtained from monitoring wells MW-1, MW-6 through MW-9, MW-11 and MW-12 on March 5, 1997. We were unable to access MW-10 during our March 1997 site visit because the license agreement extension had not been approved by the adjacent property owner (Vasco Properties Inc.). 76 Products currently is working with the property owner to obtain approval. GeoEngineers obtained ground water samples before and after purging the monitoring wells during our March 1997 site visit at the request of 76 Products Company. GeoEngineers' scope of services completed for this phase of study is listed in Attachment A. Our ground water sampling

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procedures are described in Attachment B. The ground water levels and elevations for this reporting period and the last three monitoring events (four events total) are presented in Table 1. The ground water elevations and the approximate ground water flow direction for the March 5, 1997 site visit are shown in Figure 1. The ground water analytical results for this reporting period and the last three monitoring events are summarized in Table 2 and Figure 2. The laboratory reports and the laboratory quality control data are included in Attachment C.

SUMMARY OF MONITORING RESULTS

- The depths to ground water ranged from approximately 3.94 to 5.78 feet below the top of the casing rims. The shallow ground water flow direction is to the west across the site, based on the water table measurements obtained during this site visit. This is consistent with previous ground water flow directions measured at the site.
- Free product was not detected in monitoring well MW-1 during this ground water monitoring event. Minor thicknesses of product have been detected intermittently in MW-1 since 1990.
- Petroleum hydrocarbons were detected at concentrations exceeding MTCA (Model Toxics Control Act) Method A cleanup levels in the ground water samples obtained from monitoring wells MW-1, MW-8, MW-9, and MW-12 prior to and after purging ground water from the wells during this reporting period.
- The concentrations of gasoline-range hydrocarbons, ethylbenzene, toluene and xylenes generally were greater in the pre-purge samples than concentrations detected in samples obtained after purging of the monitoring wells.
- The concentrations of benzene generally were greater in the pre-purge samples than concentrations detected in samples obtained after purging of the monitoring wells.
- The concentrations of diesel-range hydrocarbons generally were greater in the pre-purge samples than concentrations detected in samples obtained after purging of the monitoring wells.
- The gasoline-range, ethylbenzene, toluene and xylene pre- and post-purging results are consistent with the California well purging study completed at 101 sites in the fall of 1995 and spring of 1996 (results compiled by SECOR Environmental and published on "The California Well Purging Study" Internet web page). The results for benzene and diesel- and heavy oil-range hydrocarbons do not appear to be consistent.
- Petroleum hydrocarbons either were not detected or were detected at concentrations less than MTCA Method A cleanup levels in ground water samples obtained from the remaining monitoring wells (MW-6, MW-7 and MW-11).

FUTURE MONITORING

GeoEngineers will continue to obtain quarterly ground water samples from selected monitoring wells at the site for analysis of petroleum hydrocarbons. Additionally, free product, if any, will be removed by hand bailing from MW-1 during the next quarterly monitoring visit. The results of our monitoring activities will be summarized in semiannual reports to 76 products.

LIMITATIONS

We have prepared this report for use by 76 Products Company. This report may be made available to regulatory agencies and prospective buyers of the property. This report is not intended for use by others and the information contained herein is not applicable to other sites. Our interpretation of ground water conditions is based on field observations and our interpretation of chemical analytical data.

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

We appreciate the opportunity to be of service to 76 Products Company on this project. Please contact us if you have questions regarding this report.

Respectfully submitted,

GeoEngineers, Inc.

Jenco-King for

David A. Cook
Project Geologist

for JF

Julia Fowler, P.E.
Associate

TMK:DAC:JF:cms
Document ID: P:\9161350.PR5

Attachments
Two copies submitted

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

TABLE 1 (Page 1 of 2)
GROUND WATER ELEVATIONS[1]
FORMER UNOCAL SERVICE STATION 5472
SEATTLE, WASHINGTON

Monitoring Well[2]	Date Measured	Depth to Ground Water[3] (feet)	Ground Water Elevation[4] (feet)
MW-1	04/10/96	5.86[5]	93.76
	07/29/96	5.83	93.69
	10/25/96	6.32[5]	93.37
	03/05/97	4.96	94.56
MW-6	04/10/96	5.73	93.94
	07/29/96	5.55	94.12
	10/25/96	6.25	93.42
	03/05/97	5.09	94.58
MW-7	04/10/96	4.63	93.87
	07/29/96	4.55	93.95
	10/25/96	4.98	93.52
	03/05/97	3.94	94.56
MW-8	04/10/96	5.63	93.33
	07/29/96	4.22	94.74
	10/25/96	6.03	92.93
	03/05/97	4.91	94.05
MW-9	04/10/96	4.86	93.80
	07/29/96	4.71	93.95
	10/25/96	5.22	93.44
	03/05/97	4.11	94.55
MW-10	04/10/96	6.08	93.54
	07/29/96	5.24	94.38
	10/25/96[6]	–	–
	03/05/97[6]	–	–
MW-11	04/10/96	5.97	93.73
	07/29/96	5.84	93.86
	10/25/96	6.55	93.15
	03/05/97	5.41	94.29
MW-12	04/10/96	6.53	93.79
	07/29/96	6.24	94.08
	10/25/96	7.08	93.24
	03/05/97	5.78	94.54

Notes appear on page 2 of 2.

TABLE 1 (Page 2 of 2)

Notes:

[1]Ground water monitoring data from 1991 through January 1996 can be found in our previous reports.

[2]The approximate monitoring well locations are shown in Figure 1.

[3]Below casing rim.

[4]Elevations are measured relative to a temporary benchmark with an assumed elevation of 100.00 feet. The benchmark was established by the previous consultant.

[5]Approximately 0.02 feet of free product was observed in MW-1 on 04/10/96 and 10/25/96. Free product has been observed between a trace to 0.4 feet during prior monitoring events. Ground water elevations were corrected by multiplying the product thickness by 0.75 (specific gravity of gasoline) and adding the result to the measured ground water elevation.

[6]We were denied access to MW-10 by the property owner (Vasco Properties, Inc.) on 10/25/96 and 03/05/97.

"--" = not measured

Document ID: P:\9161350\FINALS\161350M1.WK1

TABLE 2 (Page 1 of 2)
SUMMARY OF GROUND WATER CHEMICAL ANALYTICAL DATA[1]
FORMER UNOCAL SERVICE STATION 5472
SEATTLE, WASHINGTON

Monitoring Well[2]	Date Sampled	BETX[3] EPA Method 8020 (µg/l)				Gasoline-range Hydrocarbons WTPH-G (mg/l)	Diesel Extended Hydrocarbons WTPH-D Extended[4] (mg/l)	
		B	E	T	X		Diesel	Heavy Oil
MW-1	07/29/96	753	159	5.50	22.5	6.7	6.21	2.95
	10/25/96[5]	–	–	–	–	–	–	–
	03/05/97	114	18.7	<2.50	<5.00	4.24	3.86	2.10
	03/05/97[6]	40.7	58.9	<2.50	15.3	8.15	0.534	<0.75
MW-6	04/10/96	<0.50	<0.50	<0.50	<1.0	<0.05	<0.25	<0.75
	07/29/96	<0.50	<0.05	<0.05	<0.10	<0.005	<0.25	<0.75
	10/25/96	<0.50	<0.50	<0.50	<1.0	<0.05	<0.25	<0.75
	03/05/97	<0.5	<0.5	<0.5	<1.0	<0.05	<0.25	<0.75
	03/05/97[6]	<0.5	<0.5	<0.5	<1.0	<0.05	<0.25	<0.75
MW-7	04/10/96	<0.50	<0.50	<0.50	<1.0	<0.05	<0.25	<0.75
	07/29/96	<0.50	<0.05	<0.05	<0.10	<0.005	<0.25	<0.75
	10/25/96	<0.50	<0.50	<0.50	<1.0	<0.05	<0.25	<0.75
	03/05/97	<0.5	<0.5	<0.5	<1.0	<0.05	<0.25	<0.75
	03/05/97[6]	<0.5	<0.5	<0.5	<1.0	<0.05	<0.25	<0.75
MW-8	04/10/96	3,400	<20	<20	21	2.3	2.0	0.75
	07/29/96	8,550	<25.0	<25.0	<50.0	3.0	1.0	<0.75
	10/25/96	3,500	<25.0	<25.0	50.3	3.5	<0.25	<0.75
	03/05/97	3,970	<10.0	<10.0	<20.0	3.49	0.398	<0.75
	03/05/97[6]	830	11.5	<5.0	<10.0	7.73	0.375	<0.75
MW-9	04/10/96	170	170	<2.0	49	3.8	3.0	1.0
	07/29/96	1,060	17.0	<12.5	<25.0	1.6	0.99	0.89
	10/25/96	687	9.91	9.31	<10.0	2.1	1.91	<0.75
	03/05/97	49.4	15.6	<0.5	<1.0	1.03	22.4	2.24
	03/05/97[6]	48.4	17.9	<1.0	2.11	2.12	8.15	1.06
MTCA[8] Method A Cleanup Level		5	30	40	20	1.0[9]		

Notes appear on page 2 of 2.

TABLE 2 (Page 2 of 2)

Monitoring Well[2]	Date Sampled	BETX[3] EPA Method 8020 (µg/l)				Gasoline-range Hydrocarbons WTPH-G (mg/l)	Diesel Extended Hydrocarbons WTPH-D Extended[4] (mg/l)	
		B	E	T	X		Diesel	Heavy Oil
MW-10	04/10/96	920	15	19	50	1.5	0.30	<0.75
	07/29/96	3,660	<25.0	27.6	<50.0	<2.5	0.26	<0.75
	10/25/96[7]	--	--	--	--	--	--	--
	03/05/97[7]	--	--	--	--	--	--	--
MW-11	04/10/96	<0.50	<0.50	<0.50	<1.0	<0.05	<0.25	<0.75
	07/29/96	<0.05	<0.05	<0.05	<0.10	<0.005	<0.25	<0.75
	10/25/96	<0.50	<0.50	<0.50	<1.0	<0.05	<0.25	<0.75
	03/05/97	<0.5	<0.5	<0.5	<1.0	<0.05	<0.25	<0.75
	03/05/97[6]	<0.5	<0.5	<0.5	<1.0	<0.05	<0.25	<0.75
MW-12	04/10/96	390	590	7.7	940	20	1.3	<0.75
	07/29/96	3,300	535	<25.0	1,320	15.1	1.4	<0.75
	10/25/96	2,660	492	<25.0	1,040	9.9	0.29	<0.75
	03/05/97	652	15	727	1,610	17.9	0.372	<0.75
	03/05/97[6]	637	646	<10.0	968	14.5	0.431	<0.75
MTCA[8] Method A Cleanup Level		5	30	40	20	1.0[9]		

Notes:

[1]Chemical analytical data for 1991 through January 1996 can be found in our previous reports on file at 76 Products.

[2]The approximate monitoring well locations are shown in Figures 1 and 2.

[3]B = benzene, E = ethylbenzene, T = toluene, X = xylenes.

[4]Ecology's WTPH-D extended analysis was used to quantify diesel- and heavy oil-range hydrocarbons. The 10/25/96 and 03/05/97 samples were analyzed using a silica gel cleanup following Ecology's draft "Washington State Total Petroleum Hydrocarbons Analytical Methods" dated October 20, 1995.

[5]Ground water samples were not obtained from MW-1 on 10/25/96 because of the presence of 0.02 feet of free product in this well.

[6]Sample results represent ground water that was obtained prior to purging the well (pre-purge sample results).

[7]We were denied access to MW-10 by the property owner (Vaco Properties, Inc.) on 10/25/96 and 03/05/97.

[8]MTCA = Model Toxics Control Act

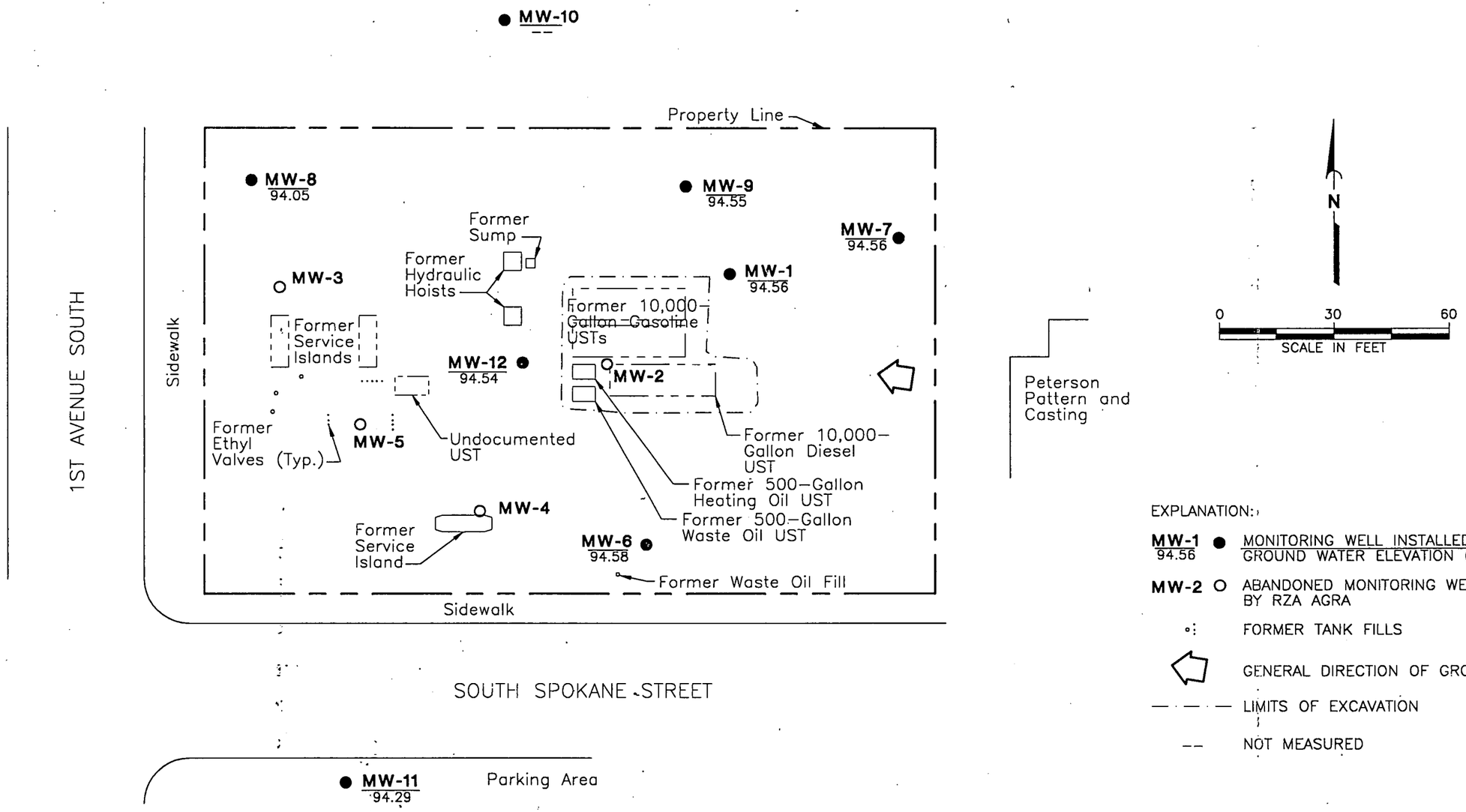
[9]The MTCA Method A cleanup level for the sum of gasoline-, diesel-, and heavy oil-range hydrocarbon concentrations is 1.0 mg/l if carbon ranges are distinctly quantified using gas chromatography methods.

"--" = not tested

µg/l = micrograms per liter

mg/l = milligrams per liter

Shaded results indicate concentrations that exceed MTCA Method A cleanup level.



EXPLANATION:

MW-1 94.56 ● MONITORING WELL INSTALLED BY RZA AGRA
GROUND WATER ELEVATION (FEET) ON 03/05/97

MW-2 ○ ABANDONED MONITORING WELL BY RZA AGRA

FORMER TANK FILLS

GENERAL DIRECTION OF GROUND WATER FLOW

— · — · — LIMITS OF EXCAVATION

-- NOT MEASURED

Note: The locations of all features shown are approximate.

Reference: Base drawing prepared by RZA AGRA, Inc., Engineering Consultants job number W-6839-13, dated 02/93.

Geo Engineers

SITE PLAN

FIGURE 1

DAC:HLA D:\0161\350\0161350A.DWG 03/26/97

MW-8	B	G	D	O
01/22/96	8,500	2.5	2.5	1.0
04/10/96	3,400	2.3	2.0	0.75
07/29/96	8,550	3.0	1.0	<0.75
10/25/96	3,500	3.5	<0.25	<0.75
03/05/97	3,970	3.49	0.398	<0.75
03/05/97[1]	830	7.73	0.375	<0.75
MTCA	5.0	1.0		

MW-10	B	G	D	O
01/22/96	1,200	1.9	0.44	<0.75
04/10/96	920	1.5	0.30	<0.75
07/29/96	3,660	<2.5	0.26	<0.75
10/25/96	--	--	--	--
03/05/97	--	--	--	--
MTCA	5.0	1.0		

MW-9	B	G	D	O
01/22/96	110	4.0	9.2	1.9
04/10/96	170	3.8	3.0	1.0
07/29/96	1,060	1.6	0.99	0.89
10/25/96	687	2.1	1.91	<0.75
03/05/97	49.4	1.03	22.4	2.24
03/05/97[1]	48.4	2.12	8.15	1.06
MTCA	5.0	1.0		

MW-7	B	G	D	O
01/22/96	1.5	<0.05	0.52	<0.75
04/10/96	<0.50	<0.05	<0.25	<0.75
07/29/96	<0.05	<0.005	<0.25	<0.75
10/25/96	<0.50	<0.05	<0.25	<0.75
03/05/97	<0.50	<0.05	<0.25	<0.75
03/05/97[1]	<0.50	<0.05	<0.25	<0.75
MTCA	5.0	1.0		

Property Line

MW-3

MW-2

MW-5

MW-4

MW-1	B	G	D	O
07/29/96	753	6.7	6.21	2.95
03/05/97	114	4.24	3.86	2.10
03/05/97[1]	40.7	8.15	0.534	<0.75
MTCA	5.0		1.0	

MW-12	B	G	D	O
01/22/96	1,400	33	1.7	1.1
04/10/96	390	20	1.3	<0.75
07/29/96	3,300	15.1	1.4	<0.75
10/25/96	2,660	9.9	0.29	<0.75
03/05/97	652	17.9	0.372	<0.75
03/05/97[1]	637	14.5	0.431	<0.75
MTCA	5.0	1.0		

MW-6	B	G	D	O
01/22/96	<0.50	<0.05	0.61	<0.75
04/10/96	<0.50	<0.05	<0.25	<0.75
07/29/96	<0.05	<0.005	<0.25	<0.75
10/25/96	<0.50	<0.05	<0.25	<0.75
03/05/97	<0.5	<0.05	<0.25	<0.75
03/05/97[1]	<0.5	<0.05	<0.25	<0.75
MTCA	5.0	1.0		

MW-11	B	G	D	O
04/10/96	<0.50	<0.05	<0.25	<0.75
07/29/96	<0.05	<0.005	<0.25	<0.75
10/25/96	<0.50	<0.05	<0.25	<0.75
03/05/97	<0.50	<0.05	<0.25	<0.75
03/05/97[1]	<0.50	<0.05	<0.25	<0.75
MTCA	5.0	1.0		

1ST AVENUE SOUTH

SOUTH SPOKANE STREET

N

0 30 60

SCALE IN FEET

EXPLANATION:

- MW-6 ● MONITORING WELL
- B BENZENE (µg/l)
- G GASOLINE-RANGE HYDROCARBONS (mg/l)
- D DIESEL-RANGE HYDROCARBONS (mg/l)
- O HEAVY OIL-RANGE HYDROCARBONS (mg/l)
- -- NOT TESTED
- MTCA MODEL TOXICS CONTROL ACT METHOD A GROUND WATER CLEANUP LEVELS
- — — — LIMITS OF EXCAVATION
- O⋮ FORMER TANK FILLS
- µg/l MICROGRAMS PER LITER
- mg/l MILLIGRAMS PER LITER

Notes: 1. Sample results represent ground water samples that were obtained prior to purging the well.
2. The locations of all features shown are approximate.
3. See Figure 1 for former site facilities identification.

Reference: Base drawing prepared by RZA AGRA, Inc., Engineering Consultants job number W-6839-13, dated 02/93.

Geo Engineers

SUMMARY OF GROUND WATER ANALYTICAL DATA

FIGURE 2

DAC:HLA D:\0161\350\0161350B.DWG 03/26/97

ATTACHMENT A

ATTACHMENT A

SCOPE

The specific scope of services that was completed includes the following:

1. Measure the depths to ground water in the monitoring well casings and calculate ground water elevations. Measure each well for free (floating) hydrocarbons.
2. Obtain ground water samples from the monitoring wells both prior to and following ground water purging for chemical analysis of the following: BETX by EPA Method 8020; gasoline-, diesel- and heavy oil-range hydrocarbons by Ecology Methods WTPH-G and WTPH-D extended, respectively.
3. Prepare a report summarizing the results of the ground water monitoring and chemical testing.

ATTACHMENT B

ATTACHMENT B

FIELD PROCEDURES

GROUND WATER ELEVATIONS

The depths to ground water were measured relative to the monitoring well casing rims. The ground water measurements were made using an electronic water level indicator. Water level elevations were calculated by subtracting the water level depth from the casing rim elevations. The depths and elevations of ground water are presented in Table 1.

FREE PRODUCT MEASUREMENTS

The potential presence of free product in MW-1 was determined by lowering an ORS oil/water interface probe into the well. The interface probe measures the thickness of petroleum products floating on the ground water table.

GROUND WATER SAMPLING PROGRAM

Ground water samples were obtained from the on- and off-site monitoring wells, with the exception of MW-10, by GeoEngineers with dedicated disposable cords and polyethylene bailers prior to and after a minimum of three well casing volumes of water were removed from each well casing.

The water samples were transferred to 40 ml (milliliter) septum vials and 500 ml to 1,000 ml bottles in the field and kept on ice during transport to the testing laboratory. Chain-of-custody procedures were followed during transport of the samples to the testing laboratory.

PURGE WATER SAMPLING AND DISPOSAL PROGRAM

One composite water sample (P-030597) was obtained from the purge water and decontamination water generated during the October 1996 and March 1997 sampling events. The composite water sample was obtained with a dedicated disposable bailer. The purge water sample was submitted for analysis of BETX by EPA Method 8020 and FOG (fats, oils, and grease) by EPA Method 413.2 for disposal purposes. The purge water was sparged for at least 30 minutes prior to obtaining the composite sample. Chemical analytical results for the purge water sample were less than the Metro disposal limits. Approximately 208 gallons of purge water generated during this and the previous site visits remains on site pending disposal by a Unocal approved contractor.

ATTACHMENT C

ATTACHMENT C

CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

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

A silica gel cleanup was requested for all samples analyzed by Ecology's WTPH-D extended analysis. In our opinion, at least a fraction of the diesel- and/or heavy oil-range hydrocarbon concentrations detected in the samples previously obtained from the site may have been the result of interference in the analytical method by non-regulated, naturally-occurring organic matter in the ground water. The silica gel cleanup is an optional technique provided for the WTPH-D extended analysis in Ecology's draft "Washington State Total Petroleum Hydrocarbons Analytical Methods" dated October 20, 1995.

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, where appropriate. The laboratory compared each group of samples with the existing data quality goals and noted any exceptions in the laboratory report. The data quality exceptions documented by the laboratory in the laboratory reports were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "Guidance Document for the Assessment of RCRA Environmental Data Quality," draft dated 1988; "National Functional Guidelines for Organic Data Review," draft dated 1991; and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses," dated 1988.

ANALYTICAL DATA REVIEW SUMMARY

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

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL ▪ (206) 481-9200 ▪ FAX 485-2992
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Geo Engineers - Redmond	Project:	UNOCAL #5472	Sampled: 3/5/97
8410 154th Ave NE	Project Number:	9161-350	Received: 3/6/97
Redmond, WA 98052	Project Manager:	Dave Cook	Reported: 3/19/97 16:46

Summary Report*
(Please refer to the Analytical Report for a thorough review of the complete data set.)

Method	Analyte	Units	MW-1np Water 3/5/97 B703075-01	MW-1 Water 3/5/97 B703075-02	MW-6np Water 3/5/97 B703075-03	MW-6 Water 3/5/97 B703075-04	MW-7np Water 3/5/97 B703075-05
WTPH-G/8020	Gasoline Range Hydrocarbons	ug/l	8150	4240	<50.0	<50.0	<50.0
"	Benzene	"	40.7	114	<0.500	<0.500	<0.500
"	Toluene	"	<2.50	<2.50	<0.500	<0.500	<0.500
"	Ethylbenzene	"	58.9	18.7	<0.500	<0.500	<0.500
"	Xylenes (total)	"	15.3	<5.00	<1.00	<1.00	<1.00
WTPH-Dext m	Diesel Range Hydrocarbons	mg/l	0.534	3.86	<0.250	<0.250	<0.250
"	Heavy Oil Range Hydrocarbons	"	<0.750	2.10	<0.750	<0.750	<0.750
EPA 8020A	Benzene	ug/l	-	-	-	-	-
"	Toluene	"	-	-	-	-	-
"	Ethylbenzene	"	-	-	-	-	-
"	Xylenes (total)	"	-	-	-	-	-
EPA 413.2	Oil & Grease	mg/l	-	-	-	-	-

North Creek Analytical, Inc.

Laura Dutton

Laura L Dutton, Director, Office of Analytical Services

The Summary Report is a subset of the final Analytical Report and does not include substantial supportive information such as quality control data; this report accurately summarizes sample results for your convenience only.

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Geo Engineers - Redmond	Project: UNOCAL #5472	Sampled: 3/5/97
8410 154th Ave NE	Project Number: 9161-350	Received: 3/6/97
Redmond, WA 98052	Project Manager: Dave Cook	Reported: 3/19/97 16:46

Summary Report*

(Please refer to the Analytical Report for a thorough review of the complete data set.)

Method	Analyte	Units	MW-7 Water 3/5/97 B703075-06	MW-8np Water 3/5/97 B703075-07	MW-8 Water 3/5/97 B703075-08	MW-9np Water 3/5/97 B703075-09	MW-9 Water 3/5/97 [illegible]
WTPH-G/8020	Gasoline Range Hydrocarbons	ug/l	<50.0	7730	3490	2120	1[illegible]0
"	Benzene	"	<0.500	830	3970	48.4	4[illegible]4
"	Toluene	"	<0.500	<5.00	<10.0	<1.00	<0.500
"	Ethylbenzene	"	<0.500	11.5	<10.0	17.9	1[illegible]6
"	Xylenes (total)	"	<1.00	<10.0	<20.0	2.11	<1[illegible]0
WTPH-Dext m	Diesel Range Hydrocarbons	mg/l	<0.250	0.370	0.398	8.15	22.4
"	Heavy Oil Range Hydrocarbons	"	<0.750	<0.750	<0.750	1.06	2[illegible]
EPA 8020A	Benzene	ug/l	-	-	-	-	-
"	Toluene	"	-	-	-	-	-
"	Ethylbenzene	"	-	-	-	-	-
"	Xylenes (total)	"	-	-	-	-	-
EPA 413.2	Oil & Grease	mg/l	-	-	-	-	-

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Summary Report*

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Method	Analyte	Units	MW-11np Water 3/5/97 B703075-11	MW-11 Water 3/5/97 B703075-12	MW-12np Water 3/5/97 B703075-13	MW-12 Water 3/5/97 B703075-14	P-030597 Water 3/5/97 B703075-15
WTPH-G/8020	Gasoline Range Hydrocarbons	ug/l	<50.0	<50.0	14500	17900	-
"	Benzene	"	<0.500	<0.500	637	652	-
"	Toluene	"	<0.500	<0.500	<10.0	15.0	-
"	Ethylbenzene	"	<0.500	<0.500	646	727	-
"	Xylenes (total)	"	<1.00	<1.00	968	1610	-
WTPH-Dext m	Diesel Range Hydrocarbons	mg/l	<0.250	<0.250	0.431	0.372	-
"	Heavy Oil Range Hydrocarbons	"	<0.750	<0.750	<0.750	<0.750	-
EPA 8020A	Benzene	ug/l	-	-	-	-	30.6
"	Toluene	"	-	-	-	-	2.05
"	Ethylbenzene	"	-	-	-	-	28.8
"	Xylenes (total)	"	-	-	-	-	76.4
EPA 413.2	Oil & Grease	mg/l	-	-	-	-	4.83

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ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1np	B703075-01	Water	3/5/97
MW-1	B703075-02	Water	3/5/97
MW-6np	B703075-03	Water	3/5/97
MW-6	B703075-04	Water	3/5/97
MW-7np	B703075-05	Water	3/5/97
MW-7	B703075-06	Water	3/5/97
MW-8np	B703075-07	Water	3/5/97
MW-8	B703075-08	Water	3/5/97
MW-9np	B703075-09	Water	3/5/97
MW-9	B703075-10	Water	3/5/97
MW-11np	B703075-11	Water	3/5/97
MW-11	B703075-12	Water	3/5/97
MW-12np	B703075-13	Water	3/5/97
MW-12	B703075-14	Water	3/5/97
P-030597	B703075-15	Water	3/5/97

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

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Redmond, WA 98052	Project Manager:	Dave Cook	Reported: 3/19/97 16:40

Gasoline Hydrocarbons (Toluene to Dodecane) and BTEX by WTPH-G and EPA 8020A
North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1np			**B703075-01**				**Water**	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		250	**8150**	ug/l	
Benzene	"	"	"		2.50	**40.7**	"	
Toluene	"	"	"		2.50	ND	"	
Ethylbenzene	"	"	"		2.50	**58.9**	"	
Xylenes (total)	"	"	"		5.00	**15.3**	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*120*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*109*	"	
MW-1			**B703075-02**				**Water**	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		250	**4240**	ug/l	
Benzene	"	"	"		2.50	**114**	"	
Toluene	"	"	"		2.50	ND	"	
Ethylbenzene	"	"	"		2.50	**18.7**	"	
Xylenes (total)	"	"	"		5.00	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*144*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*113*	"	
MW-6np			**B703075-03**				**Water**	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		50.0	ND	ug/l	
Benzene	"	"	"		0.500	ND	"	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*91.3*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*92.5*	"	
MW-6			**B703075-04**				**Water**	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		50.0	ND	ug/l	
Benzene	"	"	"		0.500	ND	"	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*99.4*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*92.5*	"	
MW-7np			**B703075-05**				**Water**	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		50.0	ND	ug/l	
Benzene	"	"	"		0.500	ND	"	

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

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Gasoline Hydrocarbons (Toluene to Dodecane) and BTEX by WTPH-G and EPA 8020A
North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-7np (continued)			**B703075-05**				**Water**	
Toluene	0370406	3/17/97	3/17/97		0.500	ND	ug/l	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*101*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*94.4*	"	
MW-7			**B703075-06**				**Water**	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		50.0	ND	ug/l	
Benzene	"	"	"		0.500	ND	"	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*99.4*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*93.1*	"	
MW-8np			**B703075-07**				**Water**	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		500	**7730**	ug/l	
Benzene	"	"	"		5.00	**830**	"	
Toluene	"	"	"		5.00	ND	"	
Ethylbenzene	"	"	"		5.00	**11.5**	"	
Xylenes (total)	"	"	"		10.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*NR*	%	*1*
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*118*	"	
MW-8			**B703075-08**				**Water**	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		1000	**3490**	ug/l	
Benzene	"	"	"		25.0	**3970**	"	
Toluene	"	"	"		10.0	ND	"	
Ethylbenzene	"	"	"		10.0	ND	"	
Xylenes (total)	"	"	"		20.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*128*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*104*	"	
MW-9np			**B703075-09**				**Water**	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		100	**2120**	ug/l	2
Benzene	"	"	"		1.00	**48.4**	"	
Toluene	"	"	"		1.00	ND	"	
Ethylbenzene	"	"	"		1.00	**17.9**	"	

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North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-9np (continued)			**B703075-09**				Water	
Xylenes (total)	0370406	3/17/97	3/17/97		2.00	**2.11**	ug/l	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*141*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*111*	"	
MW-9			**B703075-10**				Water	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		50.0	**1030**	ug/l	2
Benzene	"	"	"		0.500	**49.4**	"	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	**15.6**	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*NR*	%	*1*
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*114*	"	
MW-11np			**B703075-11**				Water	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		50.0	ND	ug/l	
Benzene	"	"	"		0.500	ND	"	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*96.2*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*91.9*	"	
MW-11			**B703075-12**				Water	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		50.0	ND	ug/l	
Benzene	"	"	"		0.500	ND	"	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*95.6*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*91.9*	"	
MW-12np			**B703075-13**				Water	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		1000	**14500**	ug/l	
Benzene	"	"	"		10.0	**637**	"	
Toluene	"	"	"		10.0	ND	"	
Ethylbenzene	"	"	"		10.0	**646**	"	
Xylenes (total)	"	"	"		20.0	**968**	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*133*	%	

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Gasoline Hydrocarbons (Toluene to Dodecane) and BTEX by WTPH-G and EPA 8020A
North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-12np (continued)			B703075-13				Water	
Surrogate: 4-BFB (PID)	*0370406*	*3/17/97*	*3/17/97*	*50.0-150*		*113*	*%*	
MW-12			B703075-14				Water	
Gasoline Range Hydrocarbons	0370406	3/17/97	3/17/97		1000	**17900**	ug/l	
Benzene	"	"	"		10.0	**652**	"	
Toluene	"	"	"		10.0	**15.0**	"	
Ethylbenzene	"	"	"		10.0	**727**	"	
Xylenes (total)	"	"	"		20.0	**1610**	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*140*	*%*	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*115*	"	

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Diesel Hydrocarbons (C12-C24) and Heavy Oil (C24-C40) by WTPH-D (extended) with Silica Gel Clean-up
North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1np			B703075-01				Water	3
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	**0.534**	mg/l	4
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*84.7*	%	
MW-1			B703075-02				Water	3,5
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	**3.86**	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	**2.10**	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*53.9*	%	
MW-6np			B703075-03				Water	
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*74.4*	%	
MW-6			B703075-04				Water	
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*81.2*	%	
MW-7np			B703075-05				Water	
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*71.0*	%	
MW-7			B703075-06				Water	
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*84.3*	%	
MW-8np			B703075-07				Water	3
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	**0.370**	mg/l	4
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*78.2*	%	
MW-8			B703075-08				Water	3
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	**0.398**	mg/l	4
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*87.8*	%	

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Redmond, WA 98052	Project Manager:	Dave Cook	Reported: 3/19/97 16:40

Diesel Hydrocarbons (C12-C24) and Heavy Oil (C24-C40) by WTPH-D (extended) with Silica Gel Clean-up
North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-9np			B703075-09				Water	5
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	**8.15**	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	**1.06**	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*84.0*	%	
MW-9			B703075-10				Water	5
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	**22.4**	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	**2.24**	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*101*	%	
MW-11np			B703075-11				Water	
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*80.8*	%	
MW-11			B703075-12				Water	
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*81.4*	%	
MW-12np			B703075-13				Water	3
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	**0.431**	mg/l	4
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*73.7*	%	
MW-12			B703075-14				Water	3
Diesel Range Hydrocarbons	0370114	3/6/97	3/11/97		0.250	**0.372**	mg/l	4
Heavy Oil Range Hydrocarbons	"	"	"		0.750	ND	"	
Surrogate: 2-FBP	"	"	"	*50.0-150*		*70.0*	%	

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Geo Engineers - Redmond	Project:	UNOCAL #5472	Sampled: 3/5/97
8410 154th Ave NE	Project Number:	9161-350	Received: 3/6/97
Redmond, WA 98052	Project Manager:	Dave Cook	Reported: 3/19/97 16:40

BTEX by EPA Method 8020A
North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
P-030597			B703075-15				Water	
Benzene	0370406	3/17/97	3/18/97		1.00	**30.6**	ug/l	
Toluene	"	"	"		1.00	**2.05**	"	
Ethylbenzene	"	"	"		1.00	**28.8**	"	
Xylenes (total)	"	"	"		2.00	**76.4**	"	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*102*	%	

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8410 154th Ave NE	Project Number:	9161-350	Received: 3/6/97
Redmond, WA 98052	Project Manager:	Dave Cook	Reported: 3/19/97 16:40

Conventional Chemistry Parameters by APHA/EPA Methods
North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
P-030597			B703075-15				Water	
Oil & Grease	0370295	3/13/97	3/14/97	EPA 413.2	1.00	4.83	mg/l	

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Geo Engineers - Redmond	Project:	UNOCAL #5472	Sampled: 3/5/97
8410 154th Ave NE	Project Number:	9161-350	Received: 3/6/97
Redmond, WA 98052	Project Manager:	Dave Cook	Reported: 3/19/97 16:40

Gasoline Hydrocarbons (Toluene to Dodecane) and BTEX by WTPH-G and EPA 8020A/Quality Control
North Creek Analytical - Bothell

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0370406	**Date Prepared: 3/17/97**					**Extraction Method: EPA 5030**				
Blank	**0370406-BLK1**									
Gasoline Range Hydrocarbons	3/17/97			ND	ug/l	50.0				
Benzene	"			ND	"	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Surrogate: 4-BFB (FID)	"	*16.0*		*15.7*	"	*50.0-150*	*98.1*			
Surrogate: 4-BFB (PID)	"	*16.0*		*14.7*	"	*50.0-150*	*91.9*			
LCS	**0370406-BS1**									
Gasoline Range Hydrocarbons	3/17/97	500		498	ug/l	80.0-120	99.6			
Surrogate: 4-BFB (FID)	"	*16.0*		*19.0*	"	*50.0-150*	*119*			
Duplicate	**0370406-DUP1**		**B703075-08**							
Gasoline Range Hydrocarbons	3/17/97		3490	3130	ug/l			25.0	10.9	
Surrogate: 4-BFB (FID)	"	*16.0*		*17.2*	"	*50.0-150*	*108*			
Duplicate	**0370406-DUP2**		**B703075-10**							
Gasoline Range Hydrocarbons	3/17/97		1030	866	ug/l			25.0	17.3	
Surrogate: 4-BFB (FID)	"	*16.0*		*16.7*	"	*50.0-150*	*104*			
Matrix Spike	**0370406-MS1**		**B703116-01**							
Benzene	3/18/97	10.0	ND	9.66	ug/l	70.0-130	96.6			
Toluene	"	10.0	ND	9.49	"	70.0-130	94.9			
Ethylbenzene	"	10.0	ND	9.51	"	70.0-130	95.1			
Xylenes (total)	"	30.0	ND	28.3	"	70.0-130	94.3			
Surrogate: 4-BFB (PID)	"	*16.0*		*15.5*	"	*50.0-150*	*96.9*			
Matrix Spike Dup	**0370406-MSD1**		**B703116-01**							
Benzene	3/18/97	10.0	ND	9.83	ug/l	70.0-130	98.3	15.0	1.74	
Toluene	"	10.0	ND	9.47	"	70.0-130	94.7	15.0	0.211	
Ethylbenzene	"	10.0	ND	9.54	"	70.0-130	95.4	15.0	0.315	
Xylenes (total)	"	30.0	ND	28.3	"	70.0-130	94.3	15.0	0	
Surrogate: 4-BFB (PID)	"	*16.0*		*15.6*	"	*50.0-150*	*97.5*			

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Geo Engineers - Redmond	Project:	UNOCAL #5472	Sampled: 3/5/97
8410 154th Ave NE	Project Number:	9161-350	Received: 3/6/97
Redmond, WA 98052	Project Manager:	Dave Cook	Reported: 3/19/97 16:40

Diesel Hydrocarbons (C12-C24) and Heavy Oil (C24-C40) by WTPH-D (extended) with Silica Gel Clean-up/Quality Control
North Creek Analytical - Bothell

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0370114	**Date Prepared: 3/6/97**					**Extraction Method: EPA 3520/600 Series**				
Blank	**0370114-BLK1**									
Diesel Range Hydrocarbons	3/11/97			ND	mg/l	0.250				
Heavy Oil Range Hydrocarbons	"			ND	"	0.750				
Surrogate: Octacosane	"	*0.341*		*0.221*	"	*50.0-150*	*64.8*			
LCS	**0370114-BS1**									
Diesel Range Hydrocarbons	3/11/97	2.04		1.68	mg/l	39.0-121	**82.4**			
Surrogate: 2-FBP	"	*0.344*		*0.294*	"	*50.0-150*	*85.5*			
Duplicate	**0370114-DUP1**		**B703075-01**							
Diesel Range Hydrocarbons	3/11/97		0.534	0.495	mg/l			44.0		
Surrogate: 2-FBP	"	*0.687*		*0.562*	"	*50.0-150*	*81.8*			
Duplicate	**0370114-DUP2**		**B703075-04**							
Diesel Range Hydrocarbons	3/11/97		ND	ND	mg/l			44.0		
Surrogate: 2-FBP	"	*0.687*		*0.542*	"	*50.0-150*	*78.9*			

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Geo Engineers - Redmond	Project: UNOCAL #5472	Sampled: 3/5/97
8410 154th Ave NE	Project Number: 9161-350	Received: 3/6/97
Redmond, WA 98052	Project Manager: Dave Cook	Reported: 3/19/97 16:40

BTEX by EPA Method 8020A/Quality Control
North Creek Analytical - Bothell

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0370406	**Date Prepared: 3/17/97**					**Extraction Method: EPA 5030**				
Blank	**0370406-BLK1**									
Benzene	3/17/97			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Surrogate: 4-BFB (PID)	"	*16.0*		*14.7*	"	*50.0-150*	*91.9*			
Matrix Spike	**0370406-MS1**		**B703116-01**							
Benzene	3/18/97	10.0	ND	9.66	ug/l	70.0-130	96.6			
Toluene	"	10.0	ND	9.49	"	70.0-130	94.9			
Ethylbenzene	"	10.0	ND	9.51	"	70.0-130	95.1			
Xylenes (total)	"	30.0	ND	28.3	"	70.0-130	94.3			
Surrogate: 4-BFB (PID)	"	*16.0*		*15.5*	"	*50.0-150*	*96.9*			
Matrix Spike Dup	**0370406-MSD1**		**B703116-01**							
Benzene	3/18/97	10.0	ND	9.83	ug/l	70.0-130	98.3	15.0	1.74	
Toluene	"	10.0	ND	9.47	"	70.0-130	94.7	15.0	0.211	
Ethylbenzene	"	10.0	ND	9.54	"	70.0-130	95.4	15.0	0.315	
Xylenes (total)	"	30.0	ND	28.3	"	70.0-130	94.3	15.0	0	
Surrogate: 4-BFB (PID)	"	*16.0*		*15.6*	"	*50.0-150*	*97.5*			

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Geo Engineers - Redmond	Project: UNOCAL #5472	Sampled: 3/5/97
8410 154th Ave NE	Project Number: 9161-350	Received: 3/6/97
Redmond, WA 98052	Project Manager: Dave Cook	Reported: 3/19/97 16:40

Conventional Chemistry Parameters by APHA/EPA Methods/Quality Control
North Creek Analytical - Bothell

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0370295	**Date Prepared: 3/13/97**					**Extraction Method: TPH 418.1**				
Blank	0370295-BLK1									
Oil & Grease	3/14/97			ND	mg/l	1.00				
LCS	0370295-BS1									
Oil & Grease	3/14/97	5.00		4.52	mg/l	65.8-123	90.4			
LCS Dup	0370295-BSD1									
Oil & Grease	3/14/97	5.00		4.52	mg/l	65.8-123	90.4	60.0	0	
Duplicate	0370295-DUP1		B703075-15							
Oil & Grease	3/14/97		4.83	4.55	mg/l			60.0	5.97	

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Geo Engineers - Redmond	Project:	UNOCAL #5472	Sampled: 3/5/97
8410 154th Ave NE	Project Number:	9161-350	Received: 3/6/97
Redmond, WA 98052	Project Manager:	Dave Cook	Reported: 3/19/97 16:40

Notes and Definitions

#	Note
1	The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample.
2	This sample appears to contain extractable diesel range organics.
3	This sample appears to contain volatile range organics.
4	The diesel range organics present are due to hydrocarbons eluting primarily in the gasoline range.
5	The hydrocarbons present are a complex mixture of diesel range and heavy oil range organics.
6	Due to problems encountered with the use of the primary surrogate the results of the back-up surrogate have been used to control the analysis.
7	Analyses are not controlled on RPD values from sample concentrations less than 10 times the reporting limit.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

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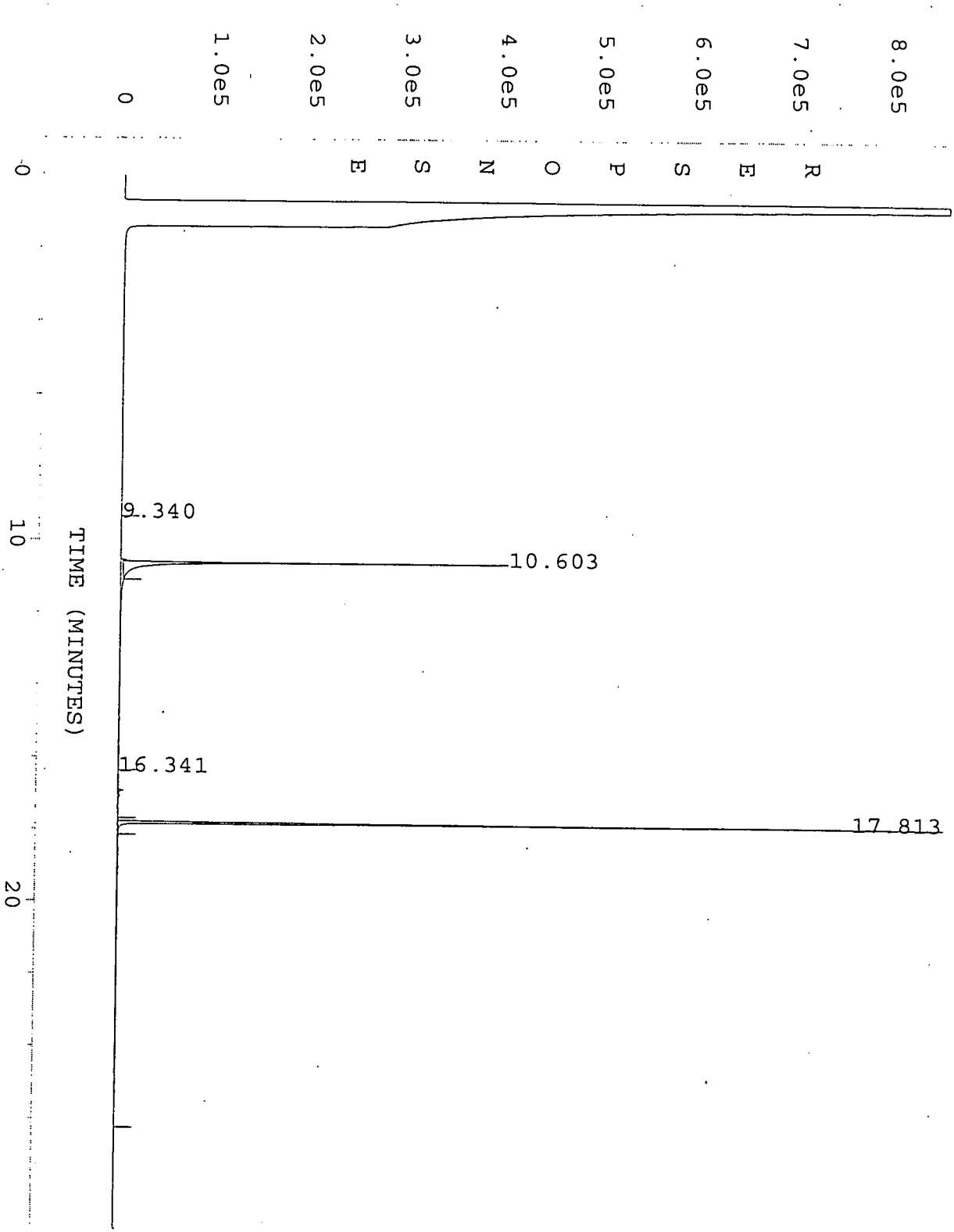

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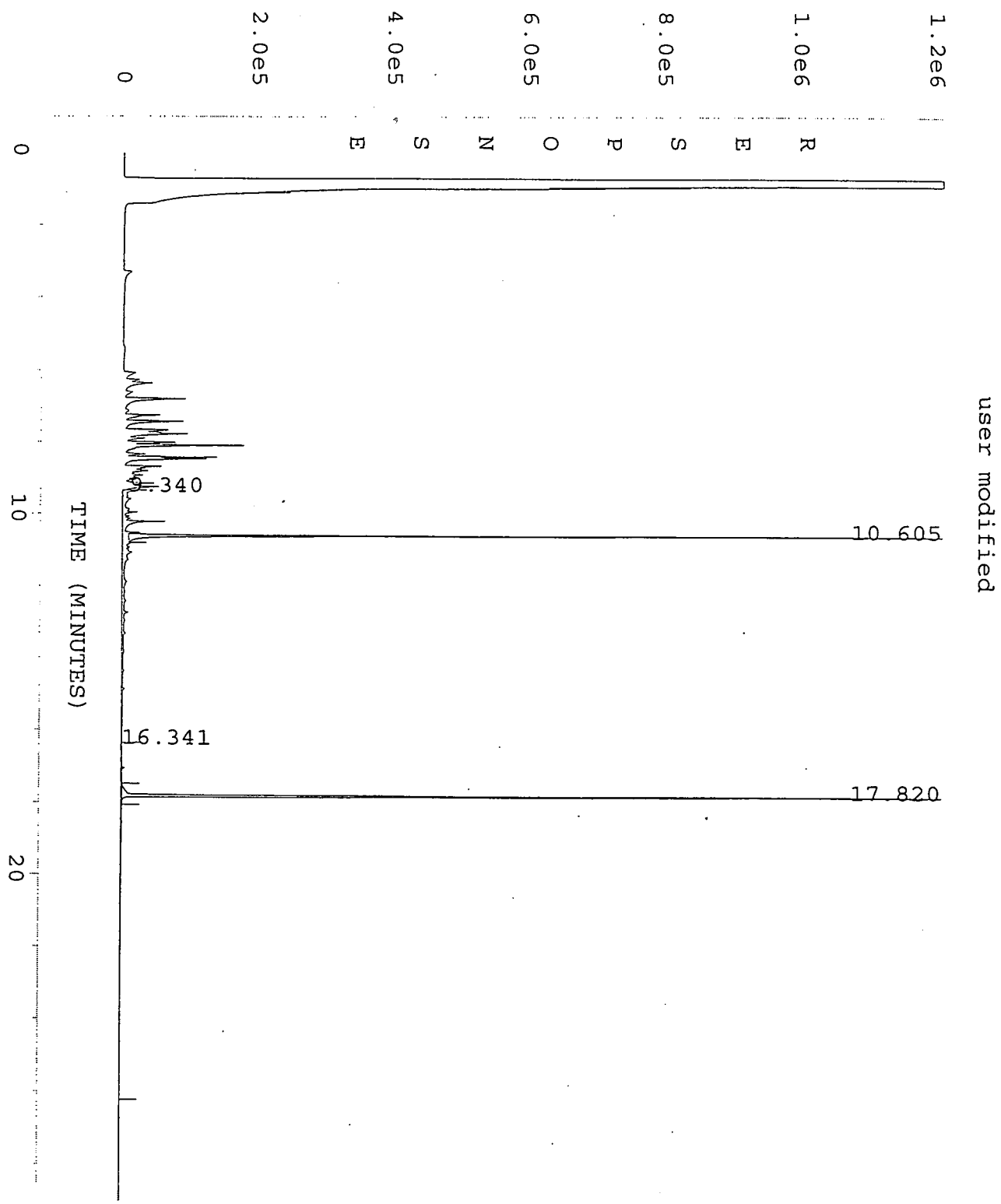
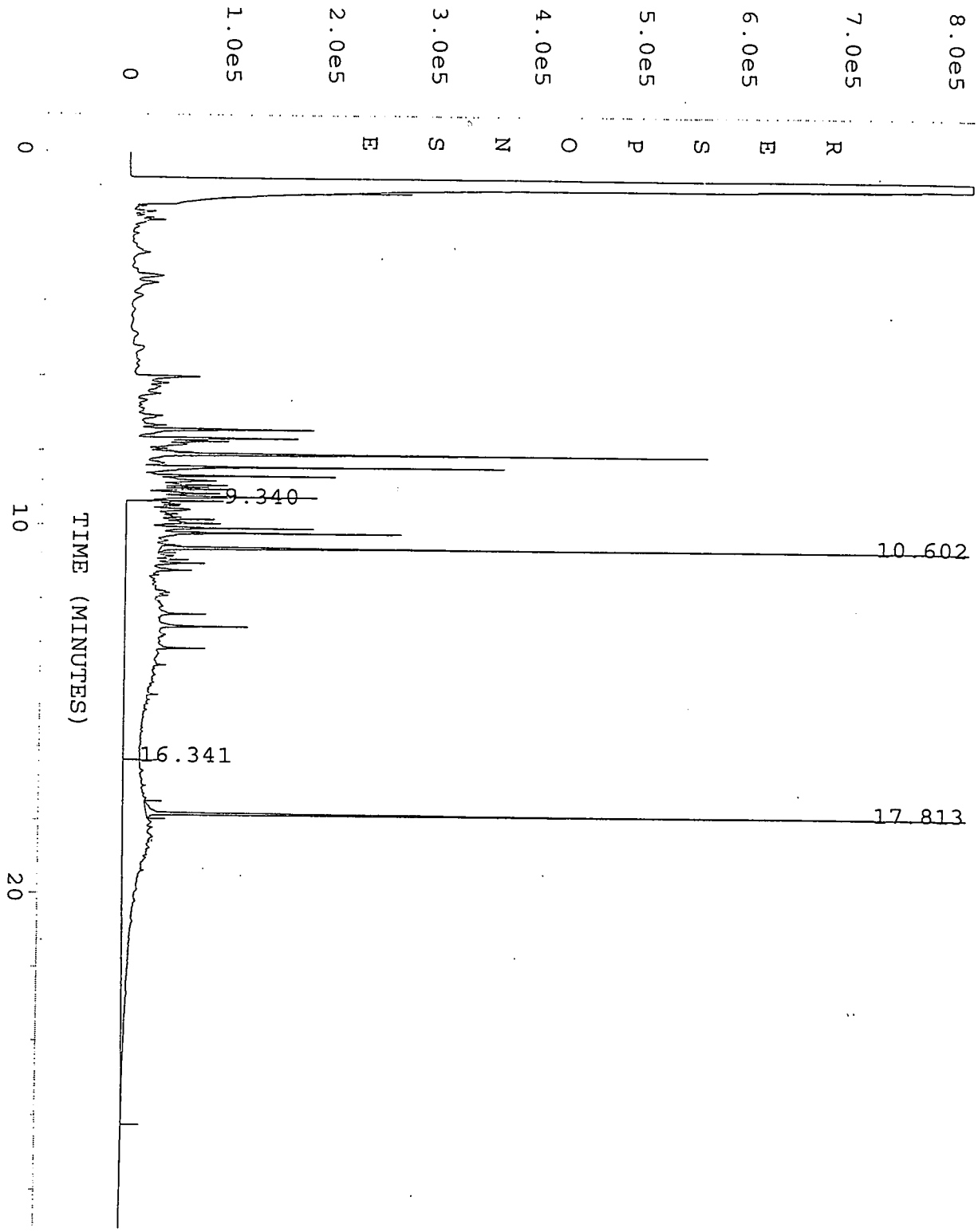
Data File Name : C:\HPCHEM\3\DATA\MAR10\015F0901.D
Operator : SD
Instrument : FUBAR
Sample Name : 0370114-BLK W SG
Run Time Bar Code:
Acquired on : 11 Mar 97 07:00 AM
Report Created on: 12 Mar 97 04:34 PM

Page Number : 1
Vial Number : 15
Injection Number : 1
Sequence Line : 9
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



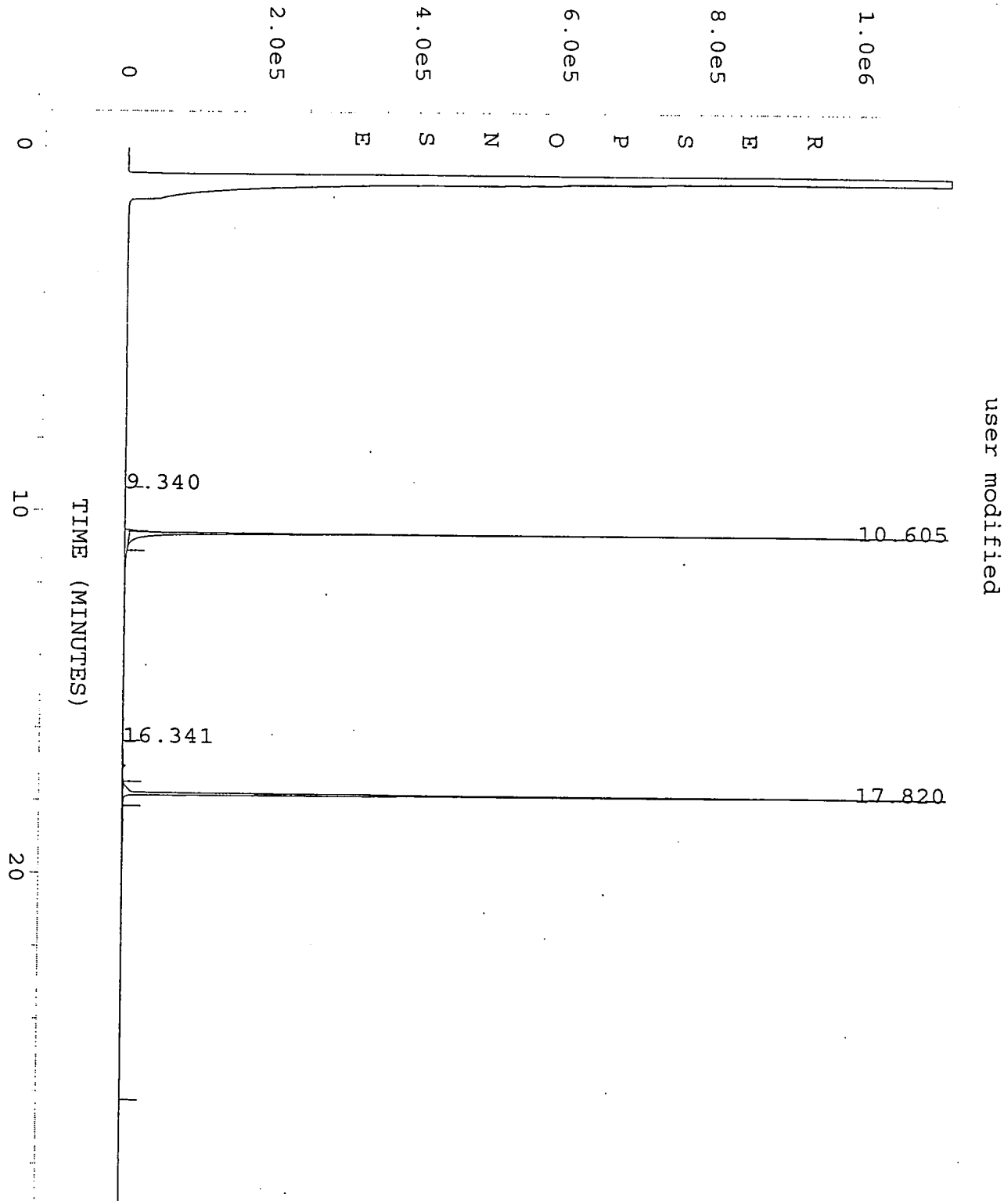
Data File Name : C:\HPCHEM\3\DATA\MAR10\017F0901.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-01 W
Run Time Bar Code:
Acquired on : 11 Mar 97 08:16 AM
Report Created on: 12 Mar 97 04:36 PM

Page Number : 1
Vial Number : 17
Injection Number : 1
Sequence Line : 9
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



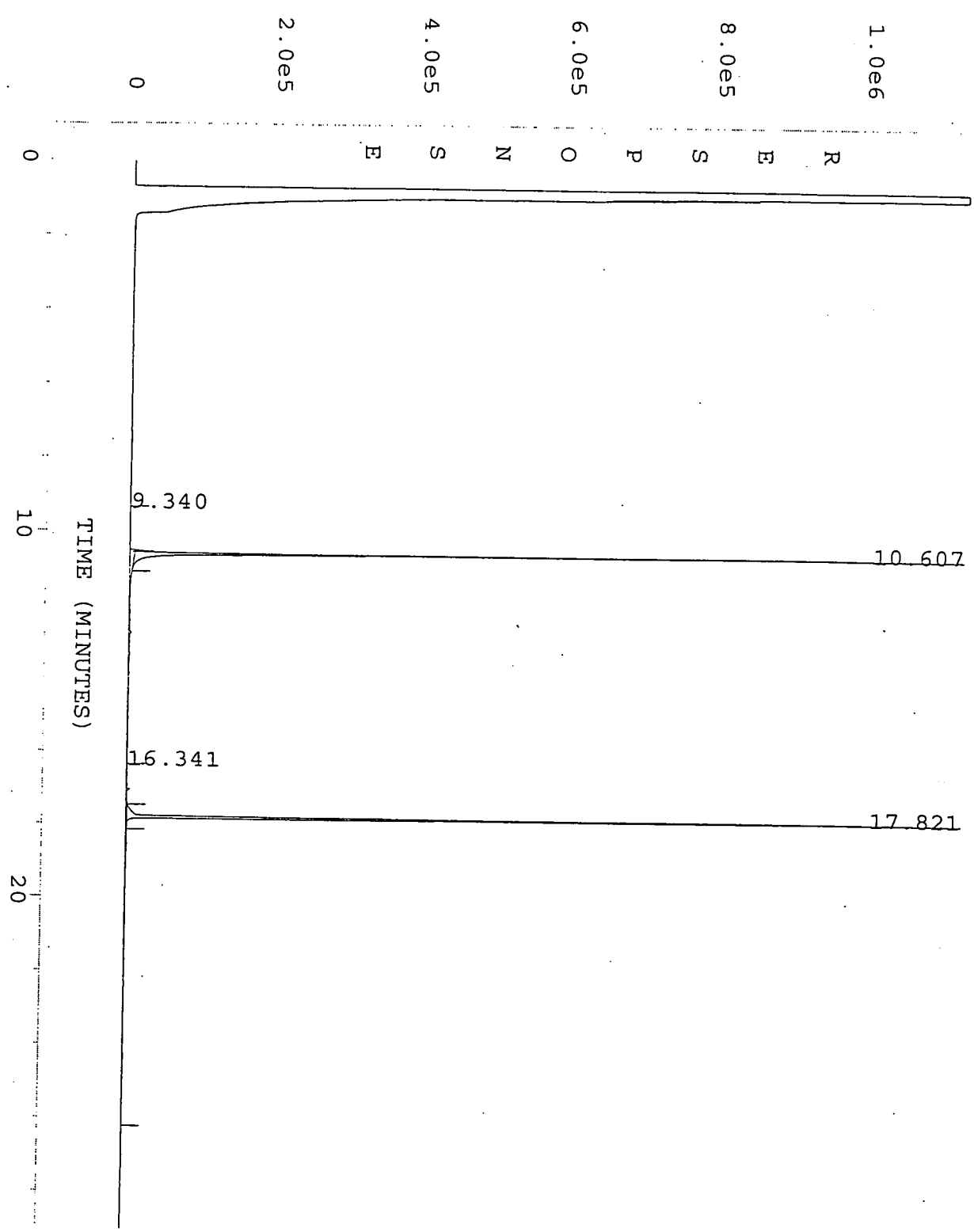
Data File Name : C:\HPCHEM\3\DATA\MAR10\019F1101.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-02 W
Run Time Bar Code:
Acquired on : 11 Mar 97 10:29 AM
Report Created on: 12 Mar 97 04:37 PM

Page Number : 1
Vial Number : 19
Injection Number : 1
Sequence Line : 11
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



Data File Name : C:\HPCHEM\3\DATA\MAR10\020F1101.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-03 W
Run Time Bar Code:
Acquired on : 11 Mar 97 11:00 AM
Report Created on: 12 Mar 97 04:37 PM

Page Number : 1
Vial Number : 20
Injection Number : 1
Sequence Line : 11
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



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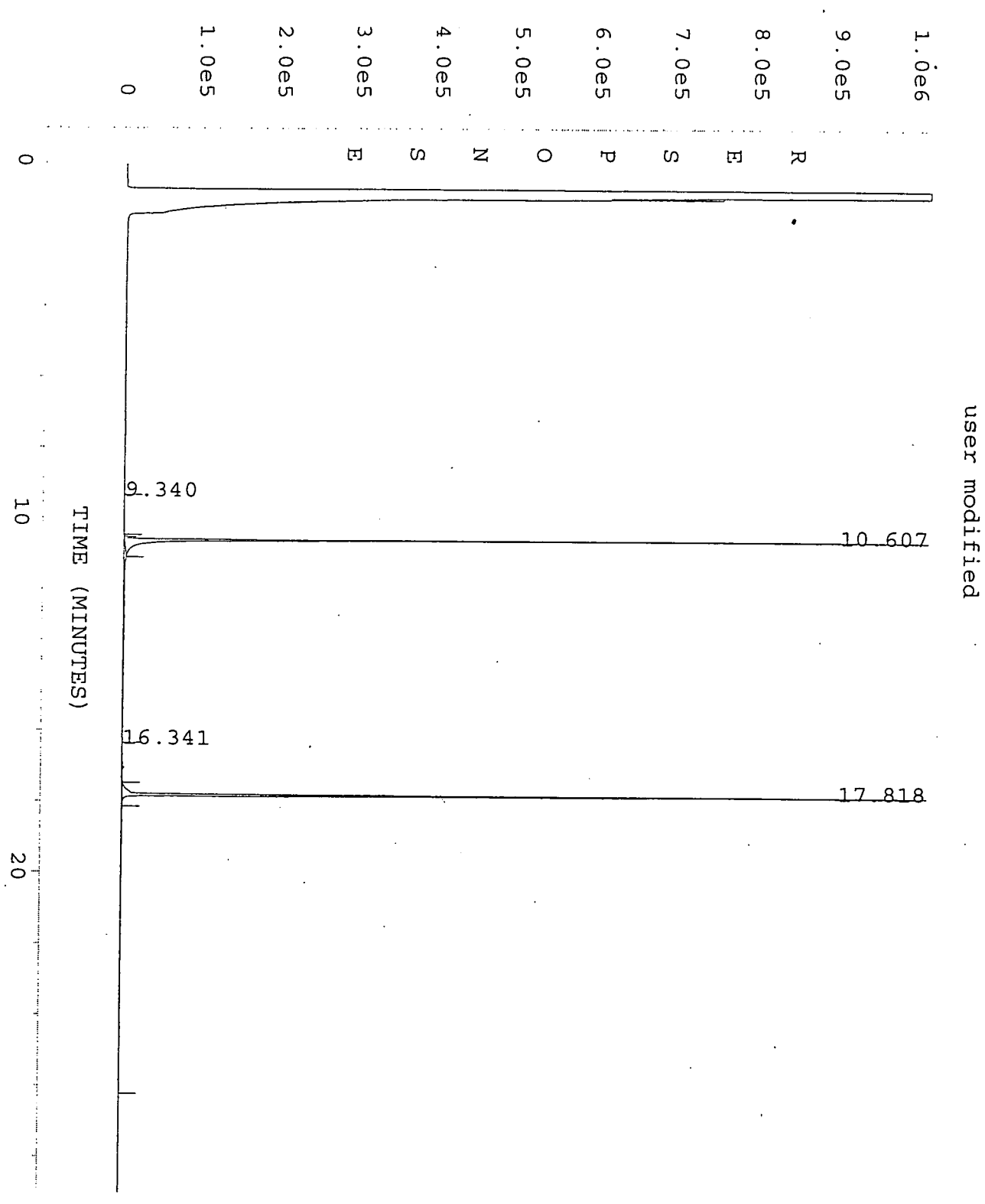
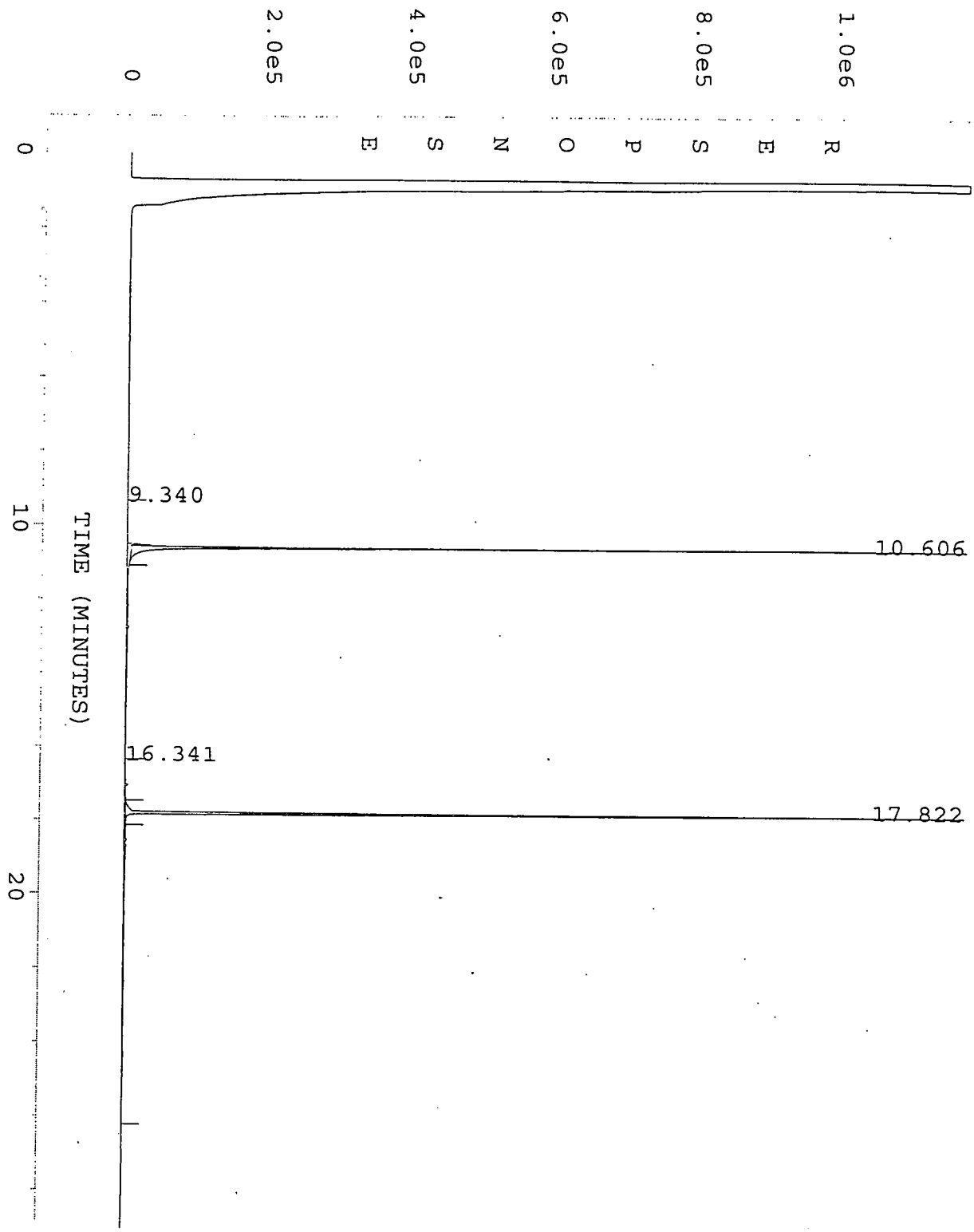
Data File Name : C:\HPCHEM\3\DATA\MAR10\021F1101.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-04 W
Run Time Bar Code:
Acquired on : 11 Mar 97 11:38 AM
Report Created on: 12 Mar 97 04:46 PM

Page Number : 1
Vial Number : 21
Injection Number : 1
Sequence Line : 11
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



Data File Name : C:\HPCHEM\3\DATA\MAR10\023F1101.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-05 W
Run Time Bar Code:
Acquired on : 11 Mar 97 12:56 PM
Report Created on: 12 Mar 97 04:47 PM

Page Number : 1
Vial Number : 23
Injection Number : 1
Sequence Line : 11
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



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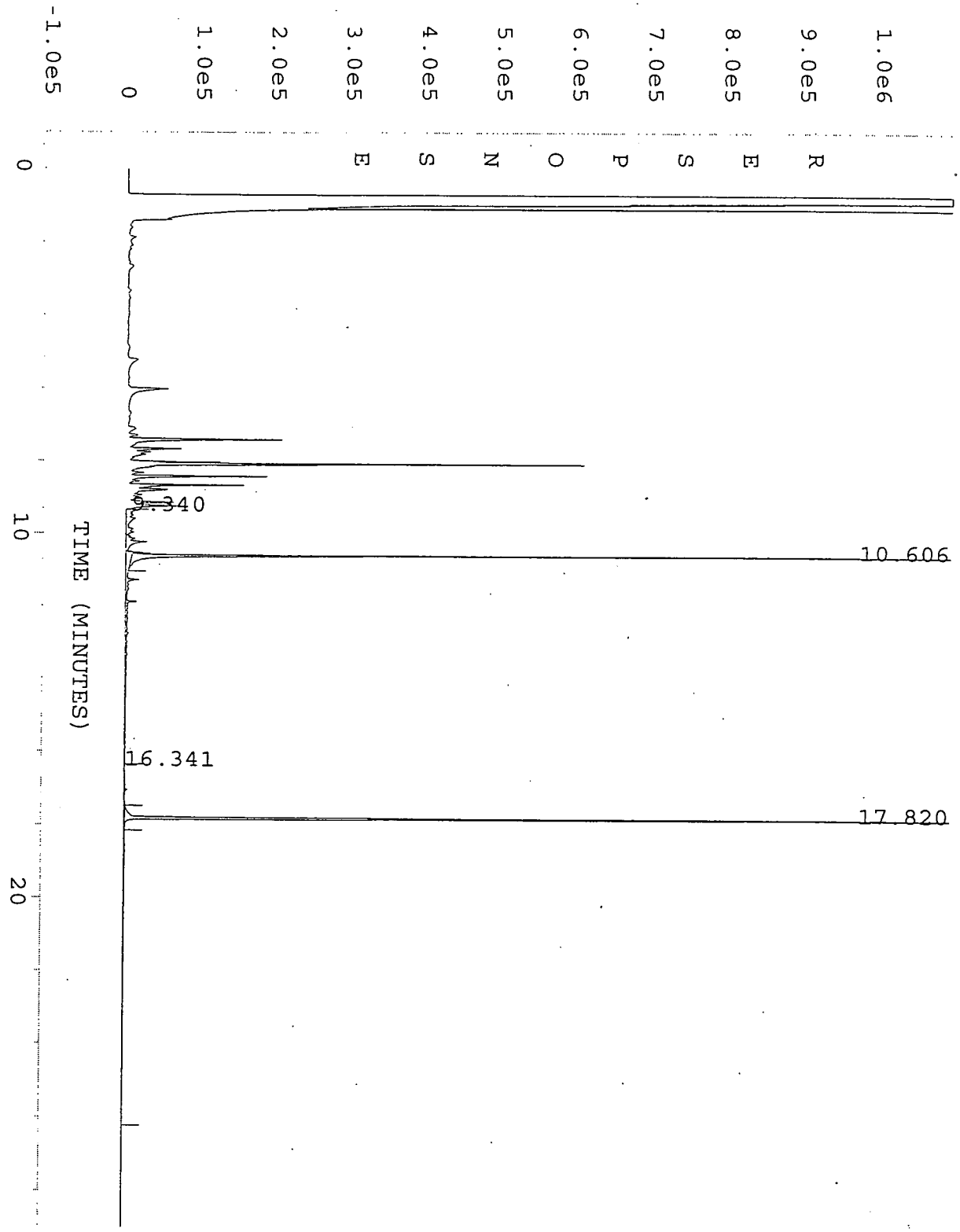
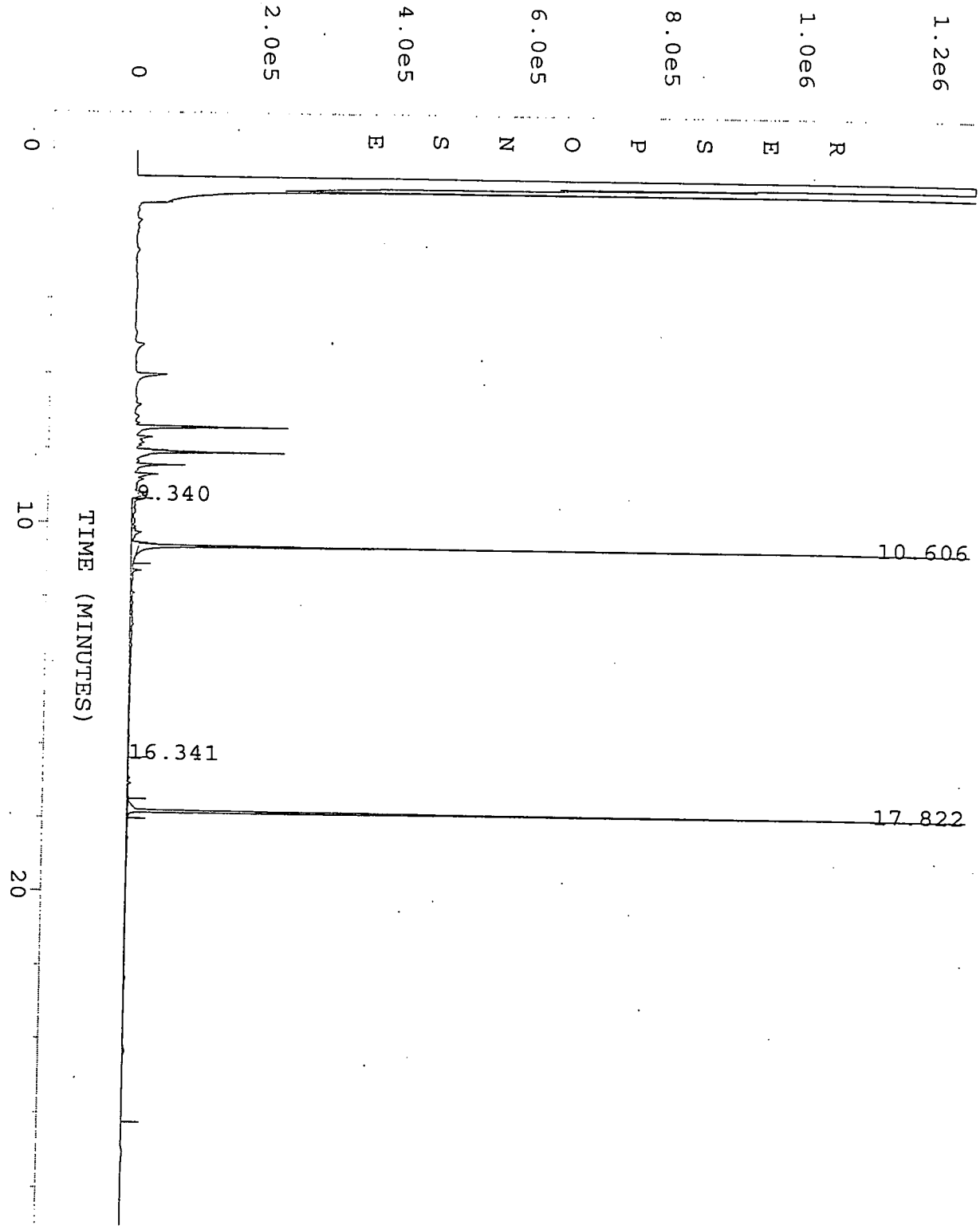
Data File Name : C:\HPCHEM\3\DATA\MAR10\024F1401.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-06 W
Run Time Bar Code:
Acquired on : 11 Mar 97 03:31 PM
Report Created on: 12 Mar 97 04:49 PM

Page Number : 1
Vial Number : 24
Injection Number : 1
Sequence Line : 14
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



Data File Name : C:\HPCHEM\3\DATA\MAR10\025F1401.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-07 W
Run Time Bar Code:
Acquired on : 11 Mar 97 04:10 PM
Report Created on: 12 Mar 97 04:50 PM

Page Number : 1
Vial Number : 25
Injection Number : 1
Sequence Line : 14
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



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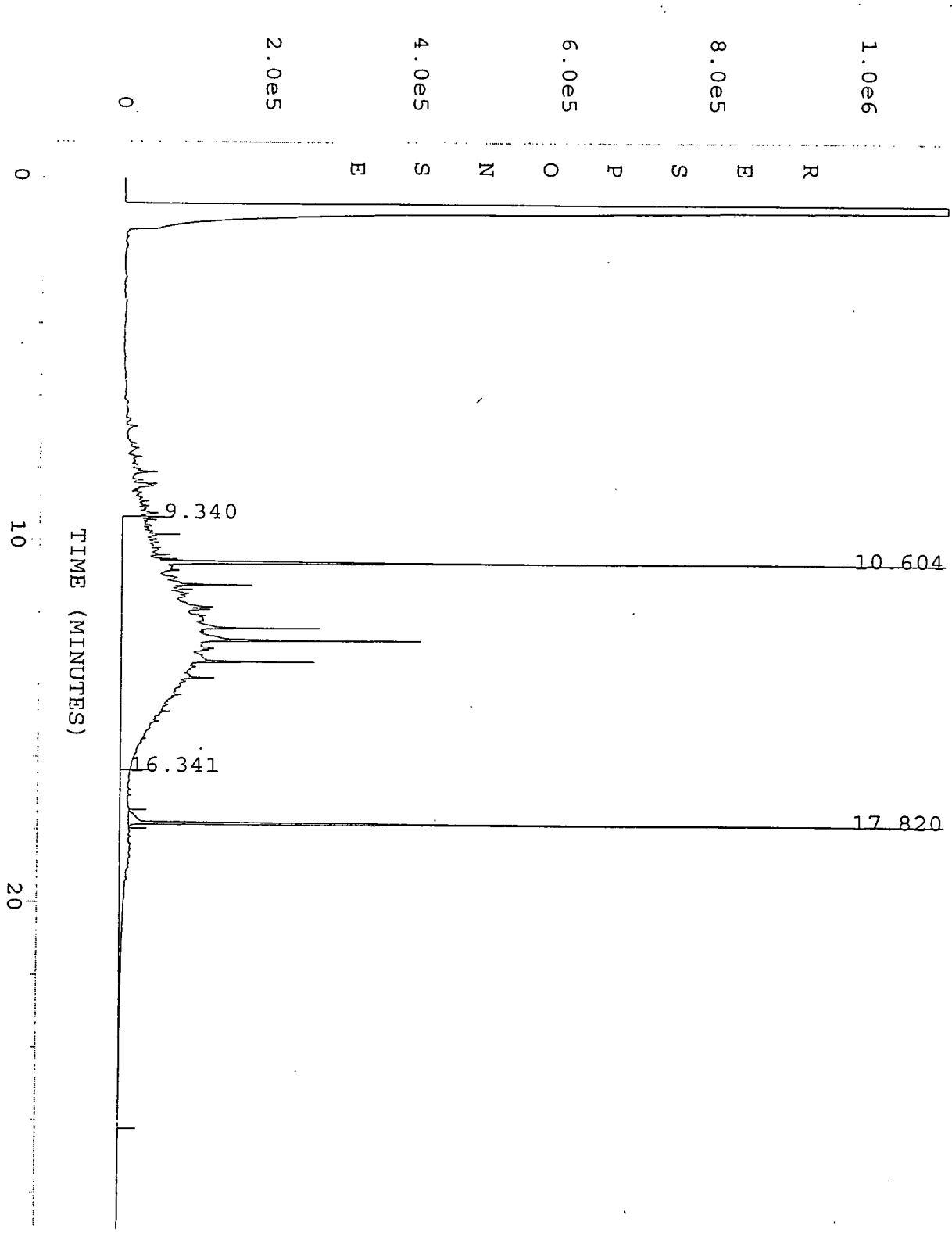
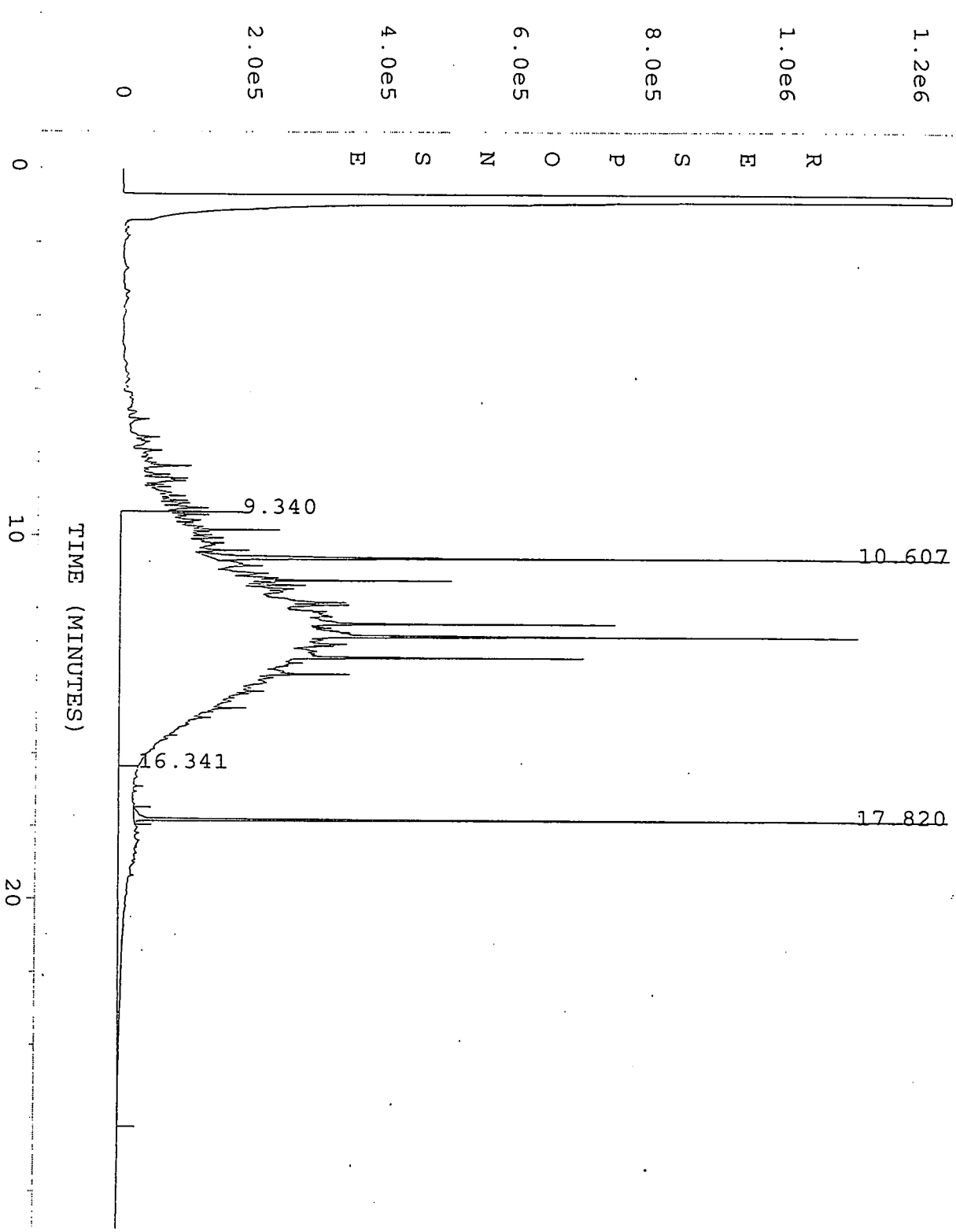
Data File Name : C:\HPCHEM\3\DATA\MAR10\026F1401.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-08 W
Run Time Bar Code:
Acquired on : 11 Mar 97 04:48 PM
Report Created on: 12 Mar 97 04:50 PM

Page Number : 1
Vial Number : 26
Injection Number : 1
Sequence Line : 14
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



Data File Name : C:\HPCHEM\3\DATA\MAR10\027F1401.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-09 W
Run Time Bar Code:
Acquired on : 11 Mar 97 05:27 PM
Report Created on: 12 Mar 97 04:51 PM

Page Number : 1
Vial Number : 27
Injection Number : 1
Sequence Line : 14
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



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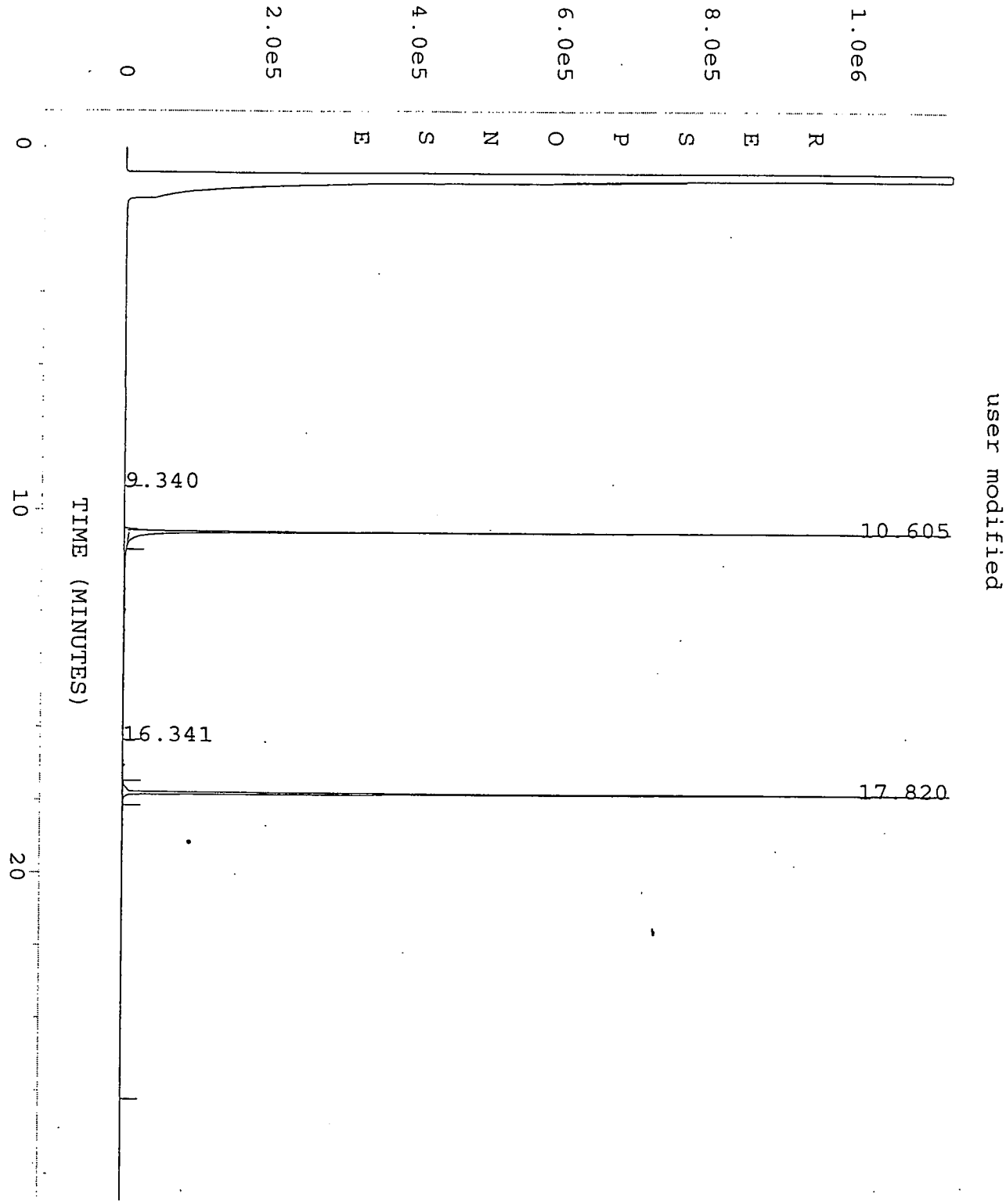
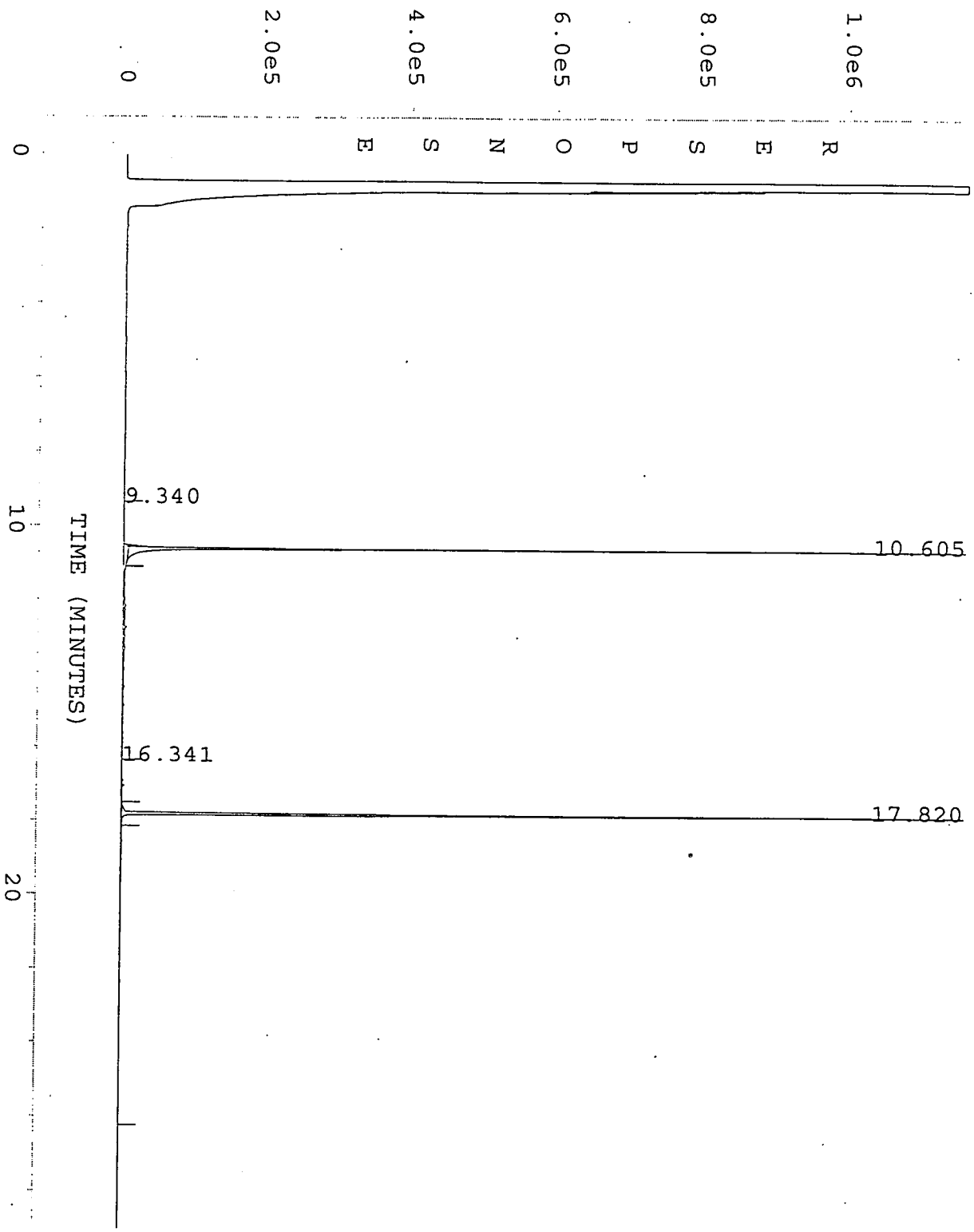
Data File Name : C:\HPCHEM\3\DATA\MAR10\028F1401.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-10 W
Run Time Bar Code:
Acquired on : 11 Mar 97 06:06 PM
Report Created on: 12 Mar 97 04:52 PM

Page Number : 1
Vial Number : 28
Injection Number : 1
Sequence Line : 14
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



Data File Name : C:\HPCHEM\3\DATA\MAR10\029F1601.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-11 W
Run Time Bar Code:
Acquired on : 11 Mar 97 07:23 PM
Report Created on: 12 Mar 97 04:52 PM

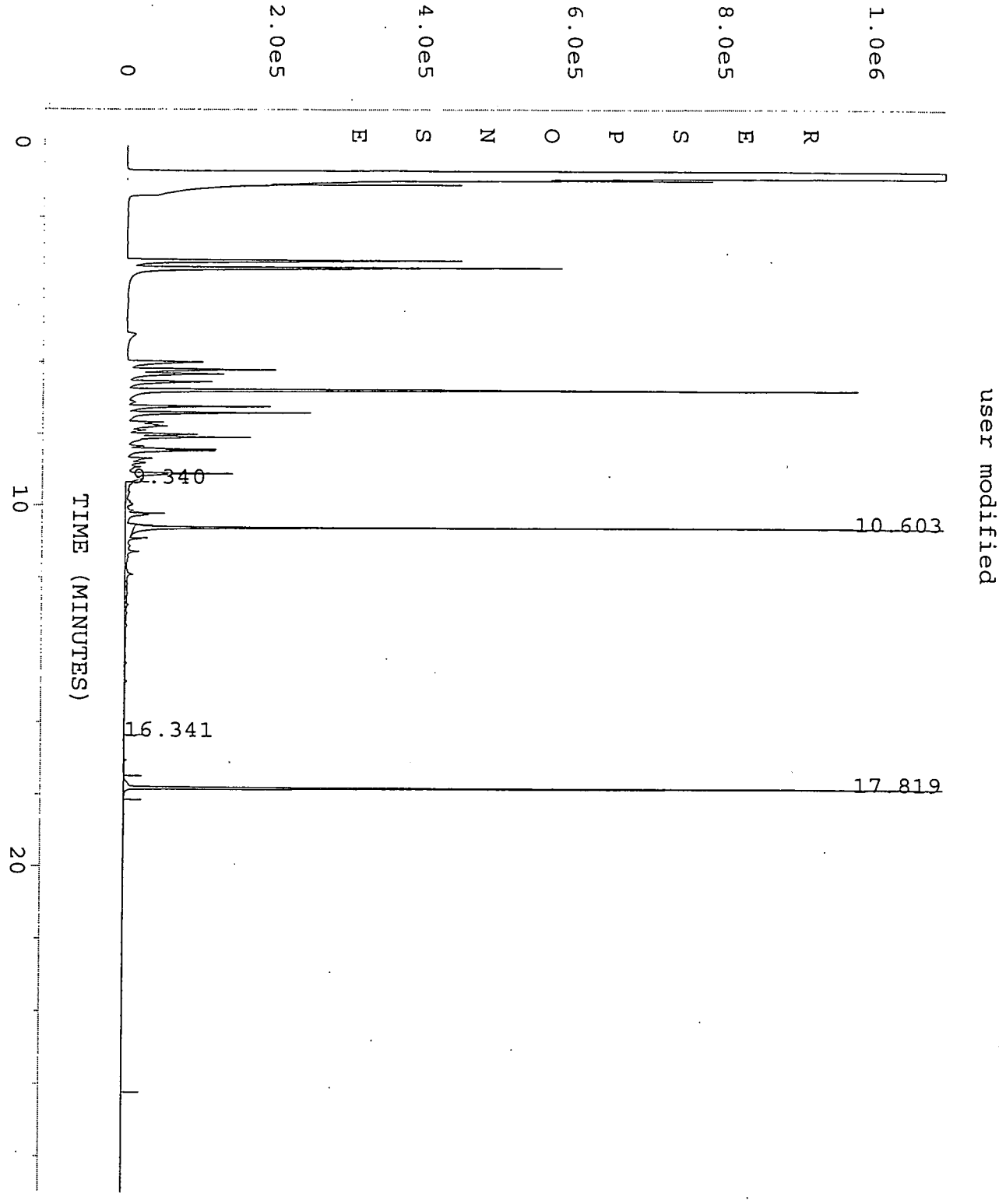
Page Number : 1
Vial Number : 29
Injection Number : 1
Sequence Line : 16
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



user modified

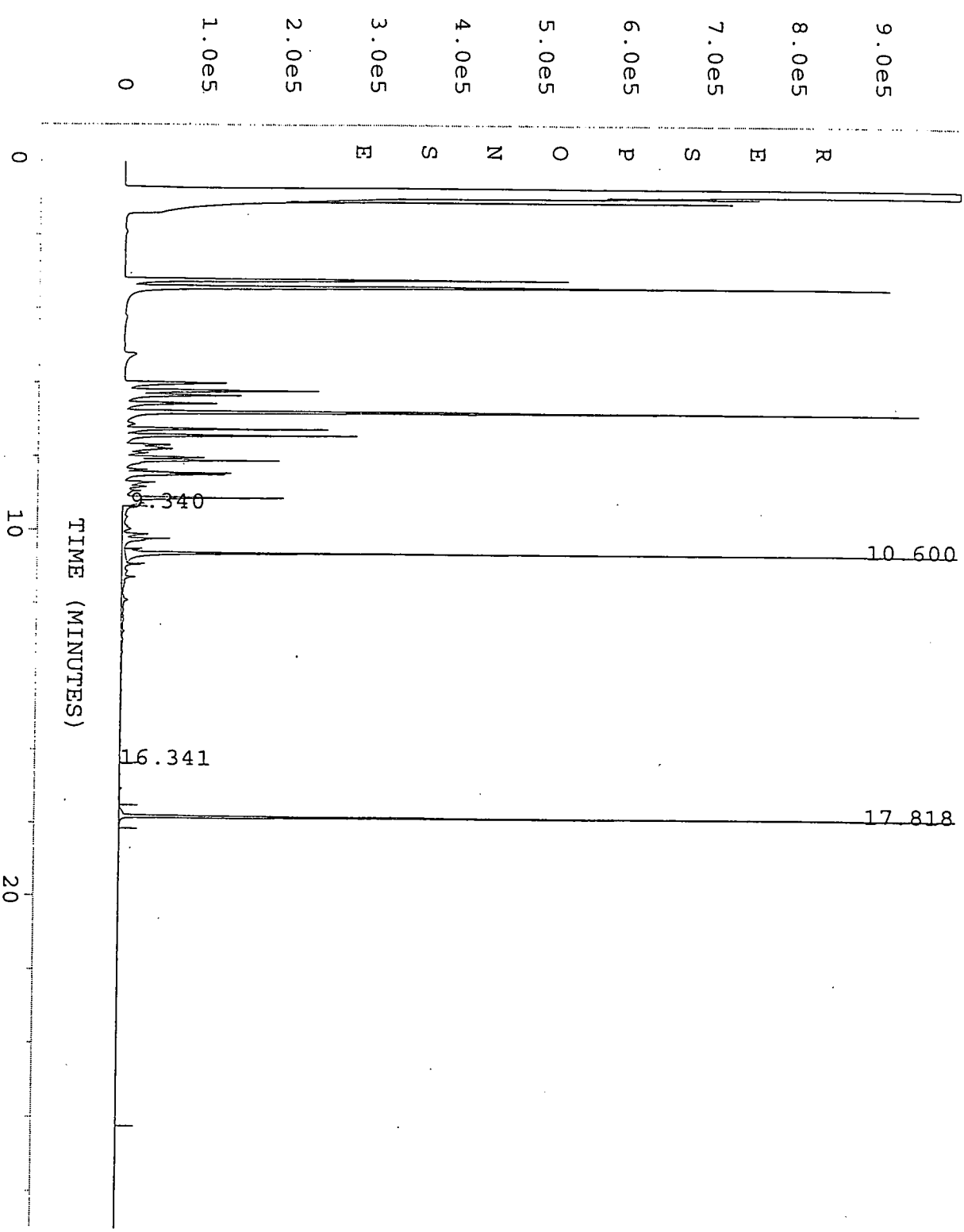
Data File Name : C:\HPCHEM\3\DATA\MAR10\030F1601.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-12 W
Run Time Bar Code:
Acquired on : 11 Mar 97 08:02 PM
Report Created on: 12 Mar 97 04:53 PM

Page Number : 1
Vial Number : 30
Injection Number : 1
Sequence Line : 16
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



Data File Name : C:\HPCHEM\3\DATA\MAR10\031F1601.D
Operator : SD
Instrument : FUBAR
Sample Name : 703075-13 W
Run Time Bar Code:
Acquired on : 11 Mar 97 08:40 PM
Report Created on: 12 Mar 97 04:53 PM

Page Number : 1
Vial Number : 31
Injection Number : 1
Sequence Line : 16
Instrument Method: TPHE.MTH
Analysis Method : TPHE.MTH



user modified

Data File Name	: C:\HPCHEM\3\DATA\MAR10\032F1601.D		
Operator	: SD	Page Number	: 1
Instrument	: FUBAR	Vial Number	: 32
Sample Name	: 703075-14 W	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 16
Acquired on	: 11 Mar 97 09:18 PM	Instrument Method	: TPHE.MTH
Report Created on	: 12 Mar 97 04:54 PM	Analysis Method	: TPHE.MTH

NORTH CREEK ANALYTICAL
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East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

UNOCAL CHAIN OF CUSTODY REPORT B703075

UNOCAL INFORMATION

Facility Number: 5472
Site Address: 1st Ave. S. + Spokane
City, State, ZIP: Seattle, WA
Site Release Number:
Unocal Manager: Leigh Coulson
CERT INFO: (check one) o Evaluation o Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers Project Number: 9161-350-62
Address: Redmond, WA
Phone: 861-6000 Fax: 861-6050
Project Manager: Dave Cook
Sample Collection by: Shawn Dam

Chain of Custody Record #:

Quality Assurance Data Level: A [X]
A: Standard Summary
B: Standard + Chromatograms
Laboratory Turnaround Days: [X] 10 | 5 | 3 | 2 | 1

o Oregon [X] Washington Hydrocarbon Methods

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. MW-1nP	03/05/97 1000	W	3				X		X										B703075-01
2. MW-1	1000						X		X										-02
3. MW-6nP	1150						X		X										-03
4. MW-6	1150						X		X										-04
5. MW-7nP	1030						X		X										-05
6. MW-7	1030						X		X										-06
7. MW-8nP	1400						X		X										-07
8. MW-8	1400						X		X										-08
9. MW-9nP	1120						X		X										-09
10. MW-9	1120						X		X										-10

w/ silica gel cleanup

Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1. Shawn Dam	GEI	03/05/97 19:45	Russell Lister	NCA	3/5/97 19:45
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:

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Rev. 2.2, 11/94

Comments:

Distribution: White - Laboratory Yellow - Consultant Photocopy - Unocal

NORTH CREEK ANALYTICAL

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East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290 [ ]
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202 [ ]

UNOCAL CHAIN OF CUSTODY REPORT

UNOCAL INFORMATION

Facility Number: 5472
Site Address: 1st Ave. S + Spokane
City, State, ZIP: Seattle, WA
Site Release Number:
Unocal Manager: Leigh Carlson
CERT INFO: (check one) o Evaluation o Remediation
o Detection o Demolition o Closure o Miscellaneous

CONSULTANT INFORMATION

Firm: GeoEngineers Project Number: 961-350-62
Address:
Redmond, WA
Phone: 861-6000 Fax: 861-6050
Project Manager: Dave Cook
Sample Collection by: Shawn Doan

Chain of Custody Record #:

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

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

o Oregon X Washington Hydrocarbon Methods

#	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)	EDC 413.2				NCA SAMPLE NUMBER
1.	MW-11 up	03/05/97 1440	W	3				X		X														B703075-11
2.	MW-11	1440	↓	↓				X		X														-12
3.	MW-12 up	1240	↓	↓				X		X														-13
4.	MW-12	1240	↓	↓				X		X														-14
5.	P-030597	1550	↓	↓			X													X				-15
6.																								
7.																								
8.																								
9.																								
10.																								

(TPH-Diesel Extended, samples 1–4, circled: w/ silica gel cleanup)

	Relinquished by:	Firm:	Date & Time	Received by:	Firm:	Date & Time
1.	Shawn Doan	GEI	03/05/97 19:45	Russell Sitter	NCA	3/5/97 19:45
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

[redacted] rm: [redacted] te:

Page 2 of 2

Comments:

Rev. 2.2, 11/94

[redacted] ution: [redacted] ite - L[redacted]ry [redacted] - Con[redacted] Photocopy - Unocal