DEPARTMENT OF ECOLOGY
3611 NWRO/TCP TANK UNIT

INTERIM CLEANUP REPORT	☑
SITE CHARACTERIZATION	☐
FINAL CLEANUP REPORT	☐
OTHER	☐
AFFECTED MEDIA: SOIL	☐
OTHER GW	☑

INSPECTOR (INIT.) WM DATE 2-3-93

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Results of Ground Water and Soil Stockpile Sampling August and December 1992 Former Unocal Bulk Plant 0138 Coupeville, Washington

January 22, 1993

Independent Action Report Review

Site Name: Unocal # 0138 ARCO STATION / SHOP

Inc. #: 3611 Date of Report: 1-2.

County: _____ Date Report Rec'd: 1-25-93

Reviewed by: W. Moon

Comments (e.g.free prod.,tank info.,contaminant migration,PCS treated?):

GW monitoring will continue. Fluctuating levels of BTEX in MWs.

GeoEngineers

January 22, 1993

Geotechnical,
Geoenvironmental and
Geologic Services

Unocal
P.O. Box 76
Seattle, Washington 98111

Attention: Dr. Mark Brearley

Results of Ground Water
and Soil Stockpile Sampling
August and December 1992
Former Unocal Bulk Plant 0138
Coupeville, Washington
File No. 0161-205-R04

INTRODUCTION

This report summarizes the results of GeoEngineers' August and December 1992 sampling and testing of ground water and soil stockpile sampling at the site of former Unocal Bulk Plant 0138 in Coupeville, Washington. The former bulk plant is located southwest of the intersection between Coveland Street and Alexander Street in Coupeville, Washington. The site location relative to surrounding physical features is shown on the Vicinity Map, Figure 1. The approximate locations of the on- and off-site monitoring wells and exploratory borings are shown on the Location Map, Figure 2. The general layout of the site prior to removal of the facilities and the approximate locations of on-site monitoring wells are shown on the Site Plan, Figure 3.

PREVIOUS STUDIES

GeoEngineers has conducted environmental studies at the site since 1989. GeoEngineers observed the removal of one semiburied 6,000-gallon diesel storage tank from the site in September 1989. Soil samples were taken from the final limits of the excavation and analyzed for petroleum-related contaminants. Petroleum-related contaminants either were not detected or the detected concentrations were less than current MTCA (Model Toxics Control Act) Method A cleanup levels.

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Redmond, WA 98052
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GeoEngineers explored subsurface conditions at the site in November 1989 by drilling six exploratory borings and excavating three test pits. Ground water monitoring wells (MW-1 through MW-6) were completed in the exploratory borings at the approximate locations shown in Figures 2 and 3. Concentrations of petroleum hydrocarbons greater than MTCA Method A cleanup levels were detected in boring soil samples obtained from depths of 3 feet, 20.5 feet and 23 feet in MW-1, MW-4 and MW-5, respectively. Petroleum-related contaminants were detected at concentrations greater than MTCA Method A cleanup levels in ground water samples obtained from MW-1, MW-4 and MW-5. The compound EDC (1,2-dichloroethane) was detected at a concentration exceeding the MTCA Method A cleanup level in the ground water sample obtained from monitoring well MW-4.

GeoEngineers observed the removal of one 550-gallon heating oil tank and the associated product lines, and the completion of five remedial excavations at the site between August and October 1990. A GeoEngineers representative was present to observe site activities and obtain soil samples from the limits of the excavations.

A GeoEngineers representative observed the completion of one boring (B-1), five on-site monitoring wells (MW-7 through MW-11) and two off-site monitoring wells (MW-12 and MW-13) and the excavation of approximately 850 cubic yards of contaminated soil at the site between March and July 1991. Petroleum hydrocarbon-related contamination was not detected in the soil samples obtained from the borings. Petroleum-related contaminants were detected at concentrations greater than MTCA Method A cleanup levels in ground water samples obtained from on-site monitoring wells MW-5, MW-8, MW-9, MW-10 and MW-11. Petroleum-related contaminants either were not detected or were detected at concentrations less than MTCA Method A cleanup levels in ground water samples obtained from on-site monitoring wells MW-2, MW-6 and MW-7 and off-site monitoring wells MW-12 and MW-13.

The results of our previous site studies indicate that soil contamination remains at depth in areas near MW-5, MW-11, north of the former aboveground storage tanks, north of the former loading rack and east of the former office building. It appears that most of the shallow subsurface soil containination was removed during remedial excavation activities at the site in 1990 and 1991.

GeoEngineers began quarterly ground water quality monitoring at the site in April 1991. Results of initial monitoring indicated ground water contamination in monitoring wells MW-5, MW-8, MW-9, MW-10 and MW-11.

The results of our previous site studies and ground water monitoring are presented in our reports dated October 6, 1989, January 30, 1990, November 2, 1990, September 17, 1991, March 18, 1992, March 20, 1992 and August 17, 1992. A summary of ground water chemical analytical results and combustible vapor concentrations measured in the well casings during past reporting periods is presented in Table 1.

least four consecutive sampling events; therefore, these wells were last sampled in February 1992. Monitoring wells MW-8 and MW-10 were last sampled in May 1992. If water quality on or around the site appears to change, additional monitoring wells will be added to the quarterly ground water sampling events.

Ground water samples were obtained from on-site monitoring wells MW-5, MW-9 and MW-11 and off-site monitoring well MW-12 on August 28, 1992. The ground water samples were submitted to ATI (Analytical Technologies, Inc.) for analysis of one or more of the following: fuel hydrocarbons by modified EPA Method 8015, BETX (benzene, ethylbenzene, toluene and xylenes) by EPA Method 8020 and dissolved lead by EPA Method 7421.

Ethylbenzene, xylenes and fuel hydrocarbons (quantified as gasoline and diesel) were detected at concentrations greater than the MTCA Method A cleanup levels in the ground water sample obtained from MW-5. The concentrations of benzene and toluene in the ground water sample obtained from MW-5 were less than the MTCA Method A cleanup levels. BETX and fuel hydrocarbons in the remaining samples either were not detected or were detected at concentrations less than the MTCA Method A cleanup levels. Dissolved lead was not detected in the ground water sample obtained from monitoring well MW-9. Laboratory reports are provided in Attachment B.

DECEMBER 1992 FIELD MEASUREMENTS

A GeoEngineers representative measured the depth to the ground water table and the concentrations of combustible vapors in on-site monitoring wells MW-5 through MW-11 and off-site monitoring wells MW-12 and MW-13 on December 1, 1992. Monitoring well MW-2 could not be located at the time of our site visit. The ground water table elevations ranged from 76.39 feet to 91.43 feet at the time of our December 1992 measurements. Ground water elevation data was calculated relative to a temporary datum with an assumed elevation of 100.00 feet. Ground water elevations beneath the site are variable as a result of perched water conditions. Based on surface topography and general trends in the measured ground water elevations, it appears that the ground water flow direction is toward the north. Ground water elevations measured during our December 1992 site visit are shown in Figure 3. The concentrations of combustible vapors measured in the well casings in December 1992 ranged from less than 400 ppm to 760 ppm (Table 1). Our field procedures are described in Attachment A.

DECEMBER 1992 GROUND WATER QUALITY

GeoEngineers obtained ground water samples from on-site monitoring wells MW-5, MW-9 and MW-11 and off-site monitoring well MW-12 on December 1, 1992. The ground water samples were submitted to ATI for chemical analysis of fuel hydrocarbons and BETX.

Ethylbenzene, xylenes and fuel hydrocarbons (quantified as gasoline and diesel) were detected at concentrations greater than MTCA Method A cleanup levels in the ground water sample obtained from monitoring well MW-5. Benzene and toluene were detected at concentrations less than Method A cleanup levels in the sample obtained from MW-5. BETX and fuel hydrocarbons either were not detected or were detected at concentrations less than MTCA Method A cleanup levels in the ground water samples obtained from monitoring wells MW-9, MW-11 and MW-12.

SOIL STOCKPILE SAMPLING

Approximately 850 cubic yards of contaminated soil were excavated during remedial activities conducted in 1991 and stockpiled on the site. The stockpile was spread for treatment by aeration in June 1991 and tilled weekly by A.L. Sleister and Sons Construction, Inc. from July to October 1991. A GeoEngineers representative obtained six samples (911002-1 through 911002-6) from the aerating soil on October 2, 1991. The samples were submitted to an analytical laboratory for analysis of one or more of the following: BETX by EPA Method 8020, fuel hydrocarbons by modified EPA Method 8015 and TPH by EPA Method 418.1. The results of analytical testing are summarized in Table 2.

TPH was detected at concentrations greater than MTCA Method A cleanup levels in five of the six samples. TPH was detected at a concentration less than the MTCA Method A cleanup level in the remaining sample (911002-1). BETX and fuel hydrocarbons were not detected in the soil samples. The portion of the aerating soil represented by sample 911002-1 (approximately 140 cubic yards) was used to grade the northwest portion of the site. The remaining soil (approximately 700 cubic yards) was tilled by A.L. Sleister and Sons Construction between October 2 and October 12, 1991.

Four samples (911012-1 through 911012-4) were obtained from the aerating soil on October 12, 1991 and submitted to the chemical laboratory for analysis of petroleum-related contaminants by EPA Method 418.1. Petroleum-related contaminants were detected at concentrations greater than the Method A cleanup level in two of the four samples. The 700 cubic yards of aerating soil was stockpiled and covered in the southwest portion of the site between November 1991 and July 1992.

The contaminated soil stockpile was spread for treatment by aeration and tilled by A.L. Sleister and Sons Construction in August 1992. A GeoEngineers representative obtained four samples from the aerating soil on August 28, 1992 and submitted the samples for analysis of petroleum-related contaminants by EPA Method 418.1. Petroleum-related contaminants were detected at concentrations less than the MTCA Method A cleanup level in the soil samples. The treated soil will be used for grading at the site in the near future. Soil stockpile sampling techniques are described in Attachment A. Laboratory reports for the October 1991 and August 1992 stockpile samples are included in Attachment B.

ADDITIONAL SITE ACTIVITIES

A water sample (Drum-1) was obtained on December 1, 1992 for disposal purposes from the purge water generated during our December 1992 sampling event. The sample was submitted to the chemical laboratory for analysis of BETX by EPA Method 8020 and fatty oils and grease by EPA Method 413.2. Concentrations of detected contaminants were within METRO requirements for water disposal. During our future sampling events, purge water generated at the site will be disposed of by GeoEngineers at a METRO disposal facility. Laboratory reports for the ground water and purge water samples are included in Attachment B.

The remaining aboveground structures were removed from the site during November 1992. Joe Hall Construction, Inc. dismantled the five aboveground storage tanks and associated aboveground product piping. GeoEngineers was not present to observe site demolition activities.

DISCUSSION

Concentrations of ethylbenzene, xylenes and fuel hydrocarbons have been greater than MTCA Method A cleanup levels in the ground water samples obtained from monitoring well MW-5 from April 1991 to December 1992. Detected concentrations of benzene and toluene in samples from MW-5 obtained in August and December 1992 were less than the MTCA Method A cleanup levels; however, the concentrations of contaminants in site ground water historically have fluctuated.

Detected concentrations of benzene, ethylbenzene, xylenes and fuel hydrocarbons quantified as gasoline in ground water samples from MW-9 have historically been greater than MTCA Method A cleanup levels. Concentrations of BETX and fuel hydrocarbons quantified as gasoline in the ground water obtained from MW-9 have decreased significantly in the past year and were not detected during the August and December 1992 sampling events.

Concentrations of BETX and fuel hydrocarbons generally have decreased in the ground water samples obtained from MW-11. Benzene has been detected in ground water obtained from MW-11 once since our initial ground water sampling event in April 1991. Detected concentrations of ethylbenzene have been at or below the MTCA Method A cleanup level in MW-11, but appear to fluctuate with time. Concentrations of toluene have decreased to below detection limits in the MW-11 ground water samples. Concentrations of xylenes are currently less than the MTCA Method A cleanup level, but appear to fluctuate in the ground water samples obtained from MW-11.

BETX and fuel hydrocarbons either have never been detected or have been detected at concentrations less than MTCA Method A cleanup levels during the last four consecutive sampling events in the remaining monitoring wells.

Based on our observations and a review of laboratory data, there appears to be no general or seasonal trend in the concentrations of ground water contaminants. Table 1 summarizes the field measurements and chemical analytical data from the beginning of our sampling at the site to our most recent sampling event.

FUTURE MONITORING

We will continue to obtain ground water samples from monitoring wells MW-5, MW-9 and MW-11 on a quarterly basis to monitor for petroleum-related contaminants. Additionally, ground water samples will be obtained from monitoring well MW-12 on a quarterly basis to monitor downgradient water quality. Because of changes in Ecology guidance, we recommend using Ecology-specified analytical procedures for gasoline- and diesel-range TPH. Ground water from monitoring wells MW-5 and MW-12 will be submitted to the chemical laboratory for analysis by WTPH-G (Washington Total Petroleum Hydrocarbons-Gasoline), BETX and WTPH-D (Washington Total Petroleum Hydrocarbons-Diesel). Ground water from monitoring wells MW-9 and MW-11 will be submitted to the chemical laboratory for analysis by WTPH-G/BETX. The results of our sampling events will be summarized in reports prepared twice per year for Unocal.

We appreciate the opportunity to provide these continued services to Unocal. Please contact us if you have questions regarding this letter.

Yours very truly,

GeoEngineers, Inc.

Barbara J. Sherupski
Staff Geologist

James A. Miller, P.E. for
Principal

BJS:JAM:vvv
Document ID: 0161205.GW

Attachments

Two copies submitted

cc: Mr. Joseph Hickey
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TABLE 1 (Page 1 of 5)
CHEMICAL ANALYTICAL DATA[1]
GROUND WATER MONITORING WELLS

Monitoring Well Number	Date Measured	Ground Water Table Elevation[2] (feet)	Combustible Vapor Concentrations[3] (ppm)	Volatile Aromatic Hydrocarbons[4] (EPA Method 8020) (µg/l)				Fuel Hydrocarbons[5] (Modified EPA Method 8015) (mg/l)	
				B	E	T	X	Gasoline	Diesel
MW-1[6]	11/22/89[7,8]	69.16	760	5.3	1.5	2.2	8.4	–	–
	09/24/90	–	–	<0.5	<0.5	<0.5	<0.5	–	–
MW-2	04/25/91	76.01	<400	<0.5	<0.5	<0.5	<0.5	–	–
	08/02/91	76.42	1,500	<0.5	<0.5	<0.5	<0.5	<1	<1
	11/06/91	75.71	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	02/27/92	76.94	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	05/28/92	76.79	<400	–	–	–	–	–	–
	08/27/92	76.53	3,500	–	–	–	–	–	–
MW-3[6]	11/22/89[8]	89.78	>10,000	<0.5	1.6	2.9	1.4	–	–
MW-4[6]	11/22/89[7,8]	68.24	>10,000	5.4	2.7	1.5	12	–	–
MW-5	11/22/89[8]	67.85	>10,000	<0.5	130	<0.5	160	–	–
	09/26/90[7]	86.49	–	<1	0.003	<1	<1	–	–
	04/25/91	78.38	<400	11	29	370	690	63	59
	08/01/91	77.48	2,500	<0.5	160	20	280	7	<1
	11/05/91	76.83	<400	<0.5	150	21	440	37	7
	02/27/92[7,9]	78.28	–	8.6	400	38	780	22	5
	05/28/92[7,9]	78.06	<400	7.5	400	32	760	14	5
	08/27/92	76.75	400	0.9	84	9.1	190	11	3
	12/01/92	73.39	760	1.8	160	9.4	360	32	8

Notes appear on page 5 of 5.

TABLE 1 (Page 2 of 5)

Monitoring Well Number	Date Measured	Ground Water Table Elevation[2] (feet)	Combustible Vapor Concentrations[3] (ppm)	Volatile Aromatic Hydrocarbons[4] (EPA Method 8020) (µg/l)				Fuel Hydrocarbons[5] (Modified EPA Method 8015) (mg/l)	
				B	E	T	X	Gasoline	Diesel
MW-6	11/22/89[8]	68.44	600	<0.5	<0.5	<0.5	<0.5	--	--
	09/26/90[7]	86.51	<400	<1	<1	<1	<1	--	--
	04/25/91	78.94	9,000	<0.5	<0.5	<0.5	<0.5	--	--
	08/01/91	78.08	850	<0.5	<0.5	<0.5	<0.5	<1	<1
	11/05/91	77.45	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	02/27/92	78.73	--	<0.5	<0.5	<0.5	<0.5	<1	<1
	05/28/92	78.62	<400	--	--	--	--	--	--
	08/27/92	77.00	<400	--	--	--	--	--	--
	12/01/92	76.48	<400	--	--	--	--	--	--
MW-7	04/25/91	80.82	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	08/02/91	79.21	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	11/05/91	78.71	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	02/27/92	79.54	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	05/28/92	79.79	<400	--	--	--	--	--	--
	08/27/92	78.87	<400	--	--	--	--	--	--
	12/01/92	78.18	<400	--	--	--	--	--	--
MW-8	04/25/91	79.59	<400	52	38	10	130	<1	<1
	08/02/91	78.96	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	11/05/91	78.21	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	02/27/92	79.61	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	05/28/92	79.39	<400	--	--	--	--	--	--
	08/27/92	78.76	<400	--	--	--	--	--	--
	12/01/92	78.02	<400	--	--	--	--	--	--

Notes appear on page 5 of 5.

TABLE 1 (Page 3 of 5)

Monitoring Well Number	Date Measured	Ground Water Table Elevation[2] (feet)	Combustible Vapor Concentrations[3] (ppm)	Volatile Aromatic Hydrocarbons[4] (EPA Method 8020) (µg/l)				Fuel Hydrocarbons[5] (Modified EPA Method 8015) (mg/l)	
				B	E	T	X	Gasoline	Diesel
MW-9	04/25/91	87.51	<400	57	43	11	140	<1	<1
	11/05/91	81.98	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	02/27/92	87.15	5,500	360	180	12	900	8	1
	05/28/92	85.44	<400	72	32	<0.5	42	1	<1
	08/27/92	83.25	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	12/01/92	90.62	<400	<1	<1	<1	<1	<1	<1
MW-10	04/25/91	77.91	<400	85	1.9	<0.5	3.1	<1	<1
	08/01/91	80.96	3,200	<0.5	<0.5	<0.5	<0.5	<1	<1
	11/05/91	75.82	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	02/27/92	83.20	2,000	<0.5	<0.5	<0.5	<0.5	<1	<1
	05/28/92	84.49	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	08/27/92	83.85	<400	--	--	--	--	--	--
	12/01/92	80.77	<400	--	--	--	--	--	--
MW-11	04/25/91	92.23	400	<0.5	53	36	32	2	<1
	08/01/91	89.89	800	<0.5	12	2.1	32	7	<1
	11/05/91	88.45	<400	<0.5	30	<0.5	32	14	2
	02/27/92[7,9]	93.68	<400	<0.5	2.5	<0.5	2.2	<1	<1
	05/28/92[7,9]	91.85	<400	0.7	4.5	<0.5	108	6	<1
	08/27/92	90.61	<400	<0.5	3.1	<0.5	2.3	<1	<1
	12/01/92	91.43	<400	<0.5	1.5	<0.5	2.1	<1	<1

Notes appear on page 5 of 5.

TABLE 1 (Page 4 of 5)

Monitoring Well Number	Date Measured	Ground Water Table Elevation[2] (feet)	Combustible Vapor Concentrations[3] (ppm)	Volatile Aromatic Hydrocarbons[4] (EPA Method 8020) (µg/l)				Fuel Hydrocarbons[5] (Modified EPA Method 8015) (mg/l)	
				B	E	T	X	Gasoline	Diesel
MW-12	05/17/91	78.82	<400	<0.5	4	1.1	5.9	<1	<1
	08/02/91	77.24	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	11/05/91	76.49	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	02/28/92	77.75	--	<0.5	<0.5	<0.5	<0.5	<1	<1
	05/28/92	77.56	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	08/27/92	77.21	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	12/01/92	76.61	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
MW-13	05/17/91	--	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	08/02/91	76.81	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	11/05/91	76.31	<400	<0.5	<0.5	<0.5	<0.5	<1	<1
	02/28/92	77.52	--	<0.5	<0.5	<0.5	<0.5	<1	<1
	05/28/92	77.33	<400	--	--	--	--	--	--
	08/27/92	76.82	<400	--	--	--	--	--	--
	12/01/92	76.73	<400	--	--	--	--	--	--

Notes appear on page 5 of 5.

TABLE 1 (Page 5 of 5)

Notes:

[1]Current chemical analyses conducted by Analytical Technologies, Inc. Laboratory reports for August and December 1992 samples are attached.

[2]Ground water table elevations calculated using laser-level data obtained on 08/27/92. The manhole cover located northeast of the site at the intersection of Alexander and Coveland Streets was used as a temporary benchmark with an assumed elevation of 100.00 feet.

[3]Combustible vapors measured in monitoring well casings using a Bacharach TLV Sniffer calibrated to hexane.

[4]B = benzene, E = ethylbenzene, T = toluene, X = total xylenes

[5]Fuel hydrocarbons quantified to a gasoline or diesel standard.

[6]Monitoring wells MW-1, MW-3 and MW-4 were abandoned during on-site excavation activities.

[7]Sample also analyzed for halogenated volatile organic compounds by EPA Method 8010. EDC (1,2-dichloroethane) was detected at 20 µg/l on 11/22/89 and at 23 µg/l on 01/16/90 in ground water samples from MW-4, greater than the MTCA Method A cleanup level of 5 µg/l. Halogenated volatile organic compounds either were not detected or were detected at concentrations less than MTCA cleanup levels in the remaining ground water samples.

[8]Sample also analyzed for TPH (total petroleum hydrocarbons) by EPA Method 418.1. TPH was detected at a concentration of 20 mg/l on 11/22/89 in the ground water sample obtained from MW-5. TPH either was not detected or was detected at concentrations less than the MTCA Method A cleanup level (1 mg/l) in the remaining monitoring wells.

[9]Sample also analyzed for total and/or dissolved lead by EPA Method 7421. Total lead was detected at 10 µg/l in the ground water sample from MW-5 on 02/28/92, greater than the MTCA Method A cleanup level of 5 µg/l. Total and/or dissolved lead were not detected in the remaining ground water samples.

ppm = parts per million; µg/l = micrograms per liter; mg/l = milligrams per liter; "--" = not tested or measured.

TABLE 2
SUMMARY OF FIELD SCREENING RESULTS AND CHEMICAL ANALYTICAL DATA[1]
SOIL STOCKPILE

Soil Sample Number[2]	Date Sampled	Field Screening Results[3]		Fuel Hydrocarbons[4] (Modified EPA Method 8015) (mg/kg)		BETX[5] (EPA Method 8020) (mg/kg)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/kg)
		Headspace Vapors (ppm)	Sheen	Gasoline	Diesel	B	E	T	X	
911002-1	10/02/91	<100, <100	SS, SS	<5	<5	—	—	—	—	170
911002-2	10/02/91	<100, <100	SS, SS	—	—	—	—	—	—	230
911002-3	10/02/91	<100, <100	SS, MS	<5	<5	<.025	<.025	<.025	<.025	330
911002-4	10/02/91	<100, <100	MS, SS	—	—	—	—	—	—	260
911002-5	10/02/91	<100, <100	SS, SS	<5	<5	—	—	—	—	420
911002-6	10/02/91	<100, <100	SS, MS	—	—	<.025	<.025	<.025	<.025	220
911012-1	10/12/91	—	—	—	—	—	—	—	—	260
911012-2	10/12/91	—	—	—	—	—	—	—	—	180
911012-3	10/12/91	—	—	—	—	—	—	—	—	230
911012-4	10/12/91	—	—	—	—	—	—	—	—	49
920828-1	08/28/92	—	NS, NS	—	—	—	—	—	—	57
920828-2	08/28/92	—	NS, NS	—	—	—	—	—	—	100
920828-3	08/28/92	—	NS, NS	—	—	—	—	—	—	130
920828-4	08/28/92	—	NS, NS	—	—	—	—	—	—	72
MTCA Method A cleanup level				100	200	0.5	20	40	20	200

Notes:

[1]Soil samples analyzed by Analytical Technologies, Inc. of Renton, Washington. Chemical analytical data sheets for the aerating soil samples are included in Attachment B of this report.

[2]Soil sample numbers represent two discrete soil samples. Discrete samples either were composited in the field or were composited at the analytical laboratory. Sampling techniques are described in Attachment A of this report.

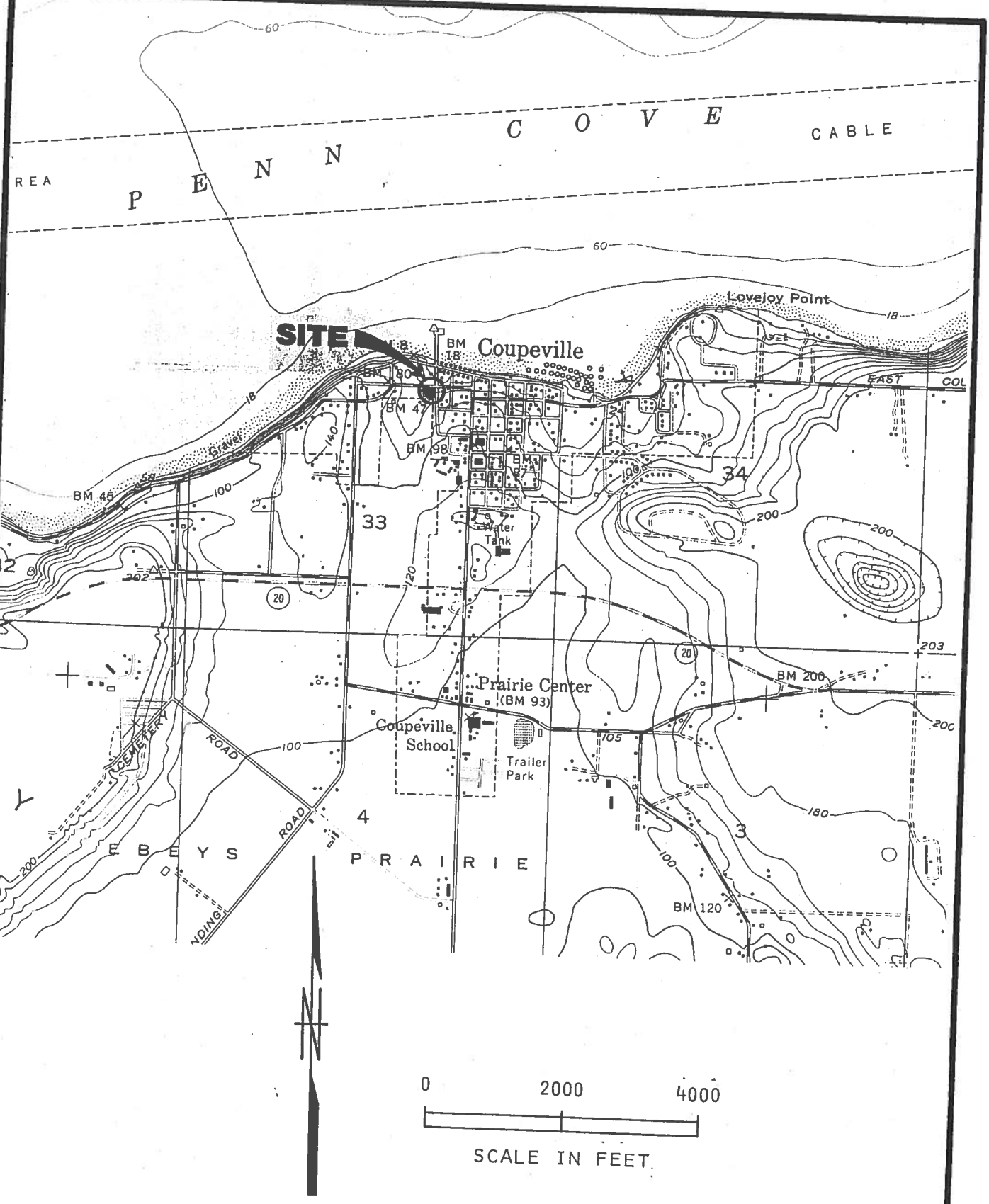
[3]Combustible vapors measured using a Bacharach TLV Sniffer calibrated to hexane. Field screening techniques are described in Attachement A of this report.

[4]Fuel hydrocarbons quantified to a gasoline or diesel standard.

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

ppm=parts per million, mg/kg=milligrams per kilogram, "—"=not sampled or measured,

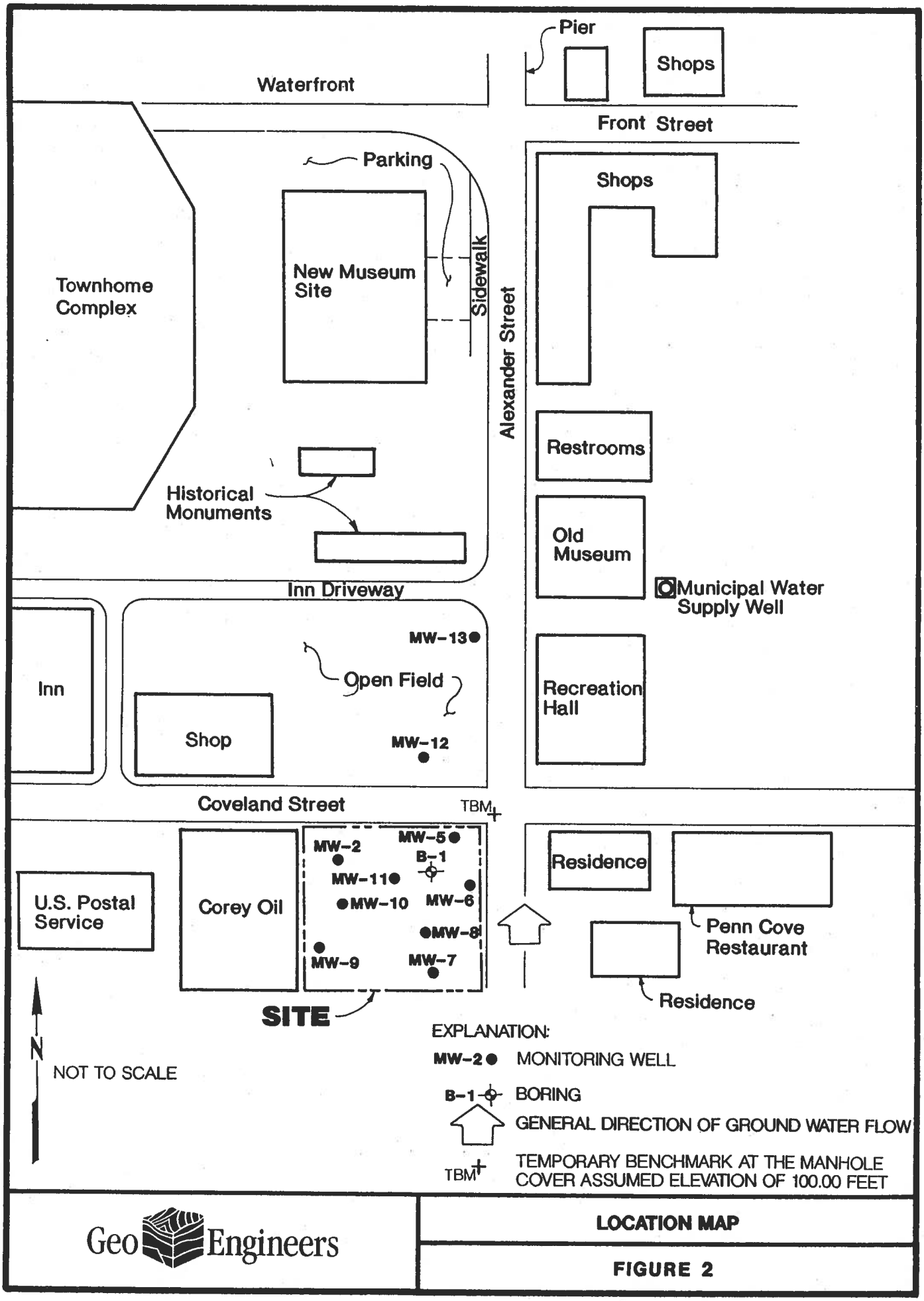
NS=no sheen, SS=slight sheen, MS=moderate sheen



REFERENCE: USGS 7.5' TOPOGRAPHIC QUADRANGLE MAP "COUPEVILLE, WASH."

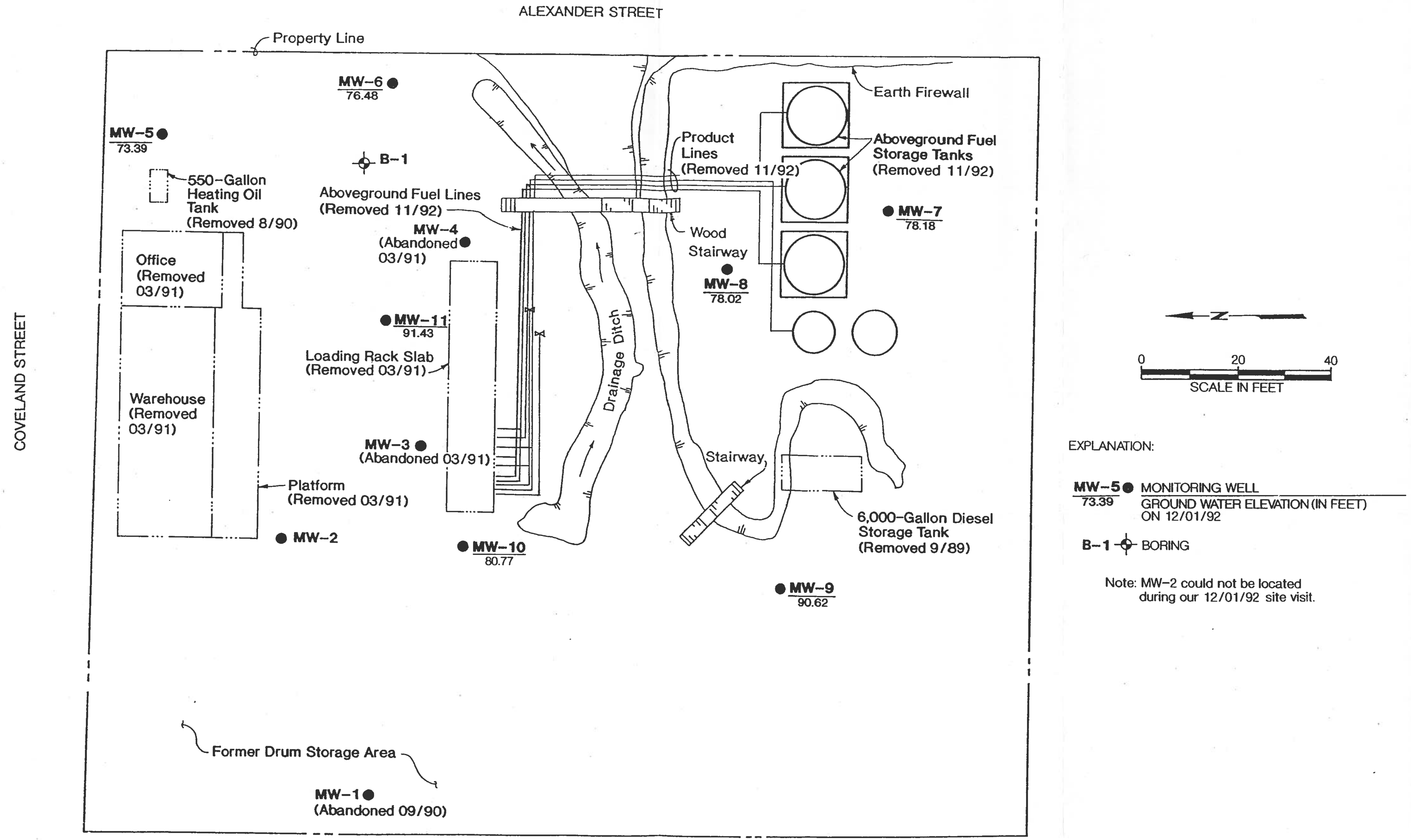
GeoEngineers	VICINITY MAP
	FIGURE 1

0161-205-B04 CLH:KKT 9.11.89



0161-205-R04 BJS:LJD 5/13/91

0161-205-B04 REV. BJS:LJD (KVB) BJS:BDH (B)



Reference: Drawing entitled "Coupeville, Washington, Coveland and Alexander Streets, Bulk Plant, General Arrangement," by Unocal, dated 04/22/81.

GeoEngineers

SITE PLAN

FIGURE 3

ATTACHMENT A

ATTACHMENT A

FIELD METHODS

GROUND WATER SAMPLING PROGRAM

Ground water samples were collected from the on-site monitoring wells MW-5, MW-9 and MW-11 and off-site monitoring well MW-12 by GeoEngineers on August 28 and December 1, 1992. Ground water parameters (temperature, pH and specific conductance) were obtained during purging at approximately 1-2 gallon intervals using a Hydac meter. Wells were sampled when the ground water parameters stabilized to within 10 percent for three consecutive readings and after at least three well volumes of water were removed from each well casing.

The water samples were collected with disposable polyethylene bailers. A new bailer and cord were used to sample each monitoring well to minimize the possibility of cross-contamination. The water samples were transferred to 250-milliliter glass bottles and 40-milliliter septum vials in the field. In addition, the MW-9 sample obtained on August 28, 1992 was transferred to a preserved 500-milliliter plastic polyethylene container for analysis of lead. The MW-9 sample was filtered by the chemical laboratory. Chain-of-custody procedures were followed and samples were kept cool with blue ice during transport of the samples to the analytical laboratory.

GROUND WATER ELEVATIONS

The depth to the shallow ground water surface relative to the monitoring well casing rims was measured on August 27 and December 1, 1992. An electric interface probe was used to measure the depth to water. Depth to water was measured to the nearest 0.01 foot. Ground water elevations were calculated by subtracting the depth to water from the casing rim elevations. The casing rim elevations were resurveyed during our August 1992 site visit. The ground water table elevations measured on August 27 and December 1, 1992 are summarized in Table 1. The ground water table elevations measured in December 1992 are shown in Figure 3.

COMBUSTIBLE VAPOR CONCENTRATIONS

Combustible vapor concentrations were measured in each monitoring well casing on August 27 and December 1, 1992 using a Bacharach TLV Sniffer calibrated to hexane. The measurements were obtained by lowering a tube connected to the TLV Sniffer to within 1 foot of the water table, and covering the top of the well casing to trap any vapors present. The lower threshold of significance for the Bacharach TLV Sniffer in this application is 400 ppm (parts per million), or 3.6 percent of the lower explosive limit of hexane. The combustible vapor concentrations measured on August 27 and December 1, 1992 are summarized in Table 1.

SOIL STOCKPILE SAMPLING

Twelve discrete soil samples were obtained from the on-site aerating soil by a GeoEngineers' representative on October 2, 1991. The samples were obtained from the top 1-2 feet of the soil. One half of each sample was placed directly into clean glass jars supplied by the analytical laboratory and the other half was field screened using visual analysis, combustible vapor analysis and sheen screening. The twelve samples were combined into six composite samples (911002 1 through 911002-6) at the analytical laboratory.

Four composite samples (91 012-1 through 911012-4) were obtained from the on-site aerating soil by a GeoEngineers' representative on October 12, 1991. No information on sampling techniques or field screening is available for these soil samples.

Four composite soil samples (920828-1 through 920828-4) were obtained from the on-site aerating soil by a GeoEngineers' representative on August 28, 1992 using a stainless steel hand-augering device. The hand auger was decontaminated between samples using a TSP (trisodium phosphate) detergent and distilled water rinse. For each composite, one discrete sample was obtained from 6 to 12 inches in the soil and a second discrete sample was obtained from a depth greater than 1 foot. Each discrete soil sample was field screened using visual analysis and sheen screening. The two samples were composited by gently mixing in a plastic bag and the composite sample was transferred to clean glass jars supplied by the analytical laboratory. Field screening results are summarized in Table 2 of this report. Laboratory data sheets for the aerating soil samples are attached.

FIELD SCREENING OF SOIL SAMPLES

A GeoEngineers representative conducted field screening on soil samples obtained from the aerating soil to detect evidence of petroleum hydrocarbons or other regulated compounds. The field screening methods used included (1) visual examination, (2) sheen screening and/or (3) combustible vapor screening using a TLV Sniffer calibrated to hexane. The results of field screening are included in Table 2.

Visual screening consists of inspecting the soil for stains indicative of the presence of regulated compounds. Visual screening is generally more effective in detecting the presence of heavy petroleum hydrocarbons such as motor oil, or when concentrations of other regulated substances are great. Sheen screening and combustible vapor screening are more sensitive methods that have been effective in detecting the presence of regulated substances at concentrations less than regulatory cleanup guidelines.

Sheen screening involves placing soil in water and observing the water surface for signs of sheen.

Sheens are classified as follows:

NS - No Sheen	No visible sheen on water surface.
SS - Slight Sheen	Light colorless film, spotty to globular; spread is irregular, not rapid; areas of no sheen remain; film dissipates rapidly.

MS - Moderate Sheen	Light to heavy film, may have some color or iridescence, globular to stringy; spread is irregular to flowing.
HS - Heavy Sheen	Heavy colorful film with iridescence; stringy, spread is rapid, sheen flows off the sample; most of water surface is covered.

Combustible 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 tip of the TLV Sniffer is inserted into the bag, and the instrument measures the concentration of combustible/organic vapor in the sample headspace. The TLV Sniffer measures vapor concentrations in ppm (parts per million). The lower threshold of significance for the Bacharach TLV Sniffer in this application is 100 ppm.

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

ATTACHMENT B

ATTACHMENT B

CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

Samples from this project were analyzed by ATI (Analytical Technologies, Inc.) of Renton, Washington. Chain-of-custody procedures were followed during transport of the samples to the analytical laboratory. All samples were kept cool prior to and during transport to the chemical analytical laboratory. The samples were held in cold storage pending extraction and/or analysis. A total of 11 water samples and 14 soil samples were analyzed using one or more of the following methods:

Analyte	Technique/Equipment	Method
BETX	Gas Chromatography/ Photoionization Detector	EPA 8020
Fuel Hydrocarbons	Gas Chromatography/ Flame Ionization Detector	Modified EPA 8015
TPH	Infrared Spectrophotometry	EPA Method 418.1
Lead	Atomic Absorption/ Graphite Furnace	EPA Method 7421

ANALYTICAL DATA REVIEW

Data Quality Goals

ATI maintains an internal quality assurance program as documented in its laboratory quality assurance manual. The laboratory uses a combination of surrogate percent recovery, matrix spike recovery and duplicate recovery to evaluate the validity of analytical results. ATI also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods.

Data Quality Review

Surrogates. Surrogates were added to all samples prior to extraction and analysis for organic compounds to monitor sample handling procedures, matrix effects and purging efficiency. Surrogate recoveries for EPA Method 8020 and modified EPA Method 8015 were within recommended limits.

Matrix Spike/Matrix Spike Duplicates (MS/MSD). Matrix spikes and matrix spike duplicates were analyzed in all tests performed to monitor matrix effects. MS/MSD recoveries and relative percent differences for all but the lead analysis (MW-9, August 28, 1992) were within recommended control limits. The sample analyzed for dissolved lead was diluted prior to analysis. The MS percent recovery for the sample was out of limits because of matrix interference and dilution. Because the MS percent recovery was out of limits, the RPD (relative percent difference) could not be calculated for that sample.

Holding Times. All samples were extracted and analyzed within the recommended holding times.

Trip Blanks. Trip blanks were prepared at the analytical testing laboratory and taken into the field during the August and December 1992 monitoring well sampling events. Trip blanks were analyzed for BETX by EPA Method 8020 to monitor for cross-contamination of water samples during transport to the laboratory. BETX was not detected in either trip blank.

SUMMARY

Quality control goals were met by ATI for the analyses performed for this project except one deviation:

The MS recovery in the lead analysis was out of limits and the RPD not calculated. Based on the other analytical QC results, the data are acceptable for use.

The Drum-1 sample (12/01/92) was submitted for analysis of BETX by EPA Method 8020 and Fatty Oils/Grease by EPA Method 413.2. The Drum-1 sample was analyzed for BETX and 418.1 (TPH) instead of 413.2. ATI added a narrative to the sample batch that details the differences between the requested analysis and the analysis performed. Based on our review of the analytical data, it is our opinion that the data are of acceptable quality for use on this project.

Analytical Technologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335
John H. Taylor, Jr., Laboratory Manager
Frederick W. Grothkopp, Technical Director

ATI I.D. # 9212-008

December 17, 1992

GeoEngineers
DEC 18 1992
Routing 39.9
File

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

Attention : Barbara Sherupski

Project Number : 0161-205-R04

Project Name : Unocal - Coupeville

On December 2, 1992, Analytical Technologies, Inc., received six 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.

Donna M. McKinney
Senior Project Manager

DMM/hal/ff

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

Analytical Technologies, Inc.

ATI I.D. # 9212-008

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9212-008-1	MW-5	12/01/92	WATER
9212-008-2	MW-9	12/01/92	WATER
9212-008-3	MW-11	12/01/92	WATER
9212-008-4	MW-12	12/01/92	WATER
9212-008-5	DRUM-1	12/01/92	WATER
9212-008-6	TRIP BLANK	N/A	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	6

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. # 9212-008

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020	R
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED	R
PETROLEUM HYDROCARBONS	IR	WA DOE WTPH-418.1 MODIFIED	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. # 9212-008

CASE NARRATIVE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

CASE NARRATIVE: VOLATILE ORGANICS ANALYSIS

Six water samples were received by ATI on December 1, 1992, for BETX analysis by EPA method 8020.

Sample 9212-008-2 (MW-9) foamed extensively in the sparge tube during analysis. Therefore, a two fold dilution factor was required.

Analytical Technologies, Inc.

ATI I.D. # 9212-008

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/03/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	88	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	93	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008-1

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/01/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-5	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 2

COMPOUND	RESULT	
BENZENE	1.8	
ETHYLBENZENE	160	
TOLUENE	9.4	
TOTAL XYLENES	360	D7

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	103	76 - 120

D7 = Value from a 100 fold diluted analysis.

Analytical Technologies, Inc.

ATI I.D. # 9212-008-2

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/01/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-9	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 2*

COMPOUND	RESULT
BENZENE	<1.0
ETHYLBENZENE	<1.0
TOLUENE	<1.0
TOTAL XYLENES	<1.0

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	99	76 - 120

* See case narrative.

Analytical Technologies, Inc.

ATI I.D. # 9212-008-3

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/01/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-11	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	1.5
TOLUENE	<0.5
TOTAL XYLENES	2.1

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	97	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008-4

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/01/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-12	DATE ANALYZED	: 12/03/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	91	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008-5

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/01/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: DRUM-1	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	44
TOLUENE	21
TOTAL XYLENES	86

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	103	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008-6

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: TRIP BLANK	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	94	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008

VOLATILE ORGANIC ANALYSIS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE
EPA METHOD : 8020 (BETX)
SAMPLE MATRIX : WATER

SAMPLE I.D. # : 9212-008-4
DATE EXTRACTED : N/A
DATE ANALYZED : 12/03/92
UNITS : ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<0.5	20.0	16.7	84	16.6	83	1
TOLUENE	<0.5	20.0	17.0	85	16.7	84	2
TOTAL XYLENES	<0.5	40.0	36.3	91	36.3	91	0

CONTROL LIMITS	% REC.	RPD
BENZENE	77 - 112	20
TOLUENE	72 - 113	20
TOTAL XYLENES	80 - 110	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	97	94	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008

VOLATILE ORGANIC ANALYSIS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE
EPA METHOD : 8020 (BETX)
SAMPLE MATRIX : WATER

SAMPLE I.D. # : 9212-019-1
DATE EXTRACTED : N/A
DATE ANALYZED : 12/04/92
UNITS : ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	15.6	20.0	36.1	103	37.4	109	4
TOLUENE	12.1	20.0	33.0	105	32.5	102	2
TOTAL XYLENES	22.7	40.0	64.0	103	61.4	97	4

CONTROL LIMITS	% REC.	RPD
BENZENE	77 - 112	20
TOLUENE	72 - 113	20
TOTAL XYLENES	80 - 110	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	99	91	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008

VOLATILE ORGANIC ANALYSIS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE
EPA METHOD : 8020 (BETX)
SAMPLE MATRIX : WATER

SAMPLE I.D. # : BLANK SPIKE
DATE EXTRACTED : N/A
DATE ANALYZED : 12/03/92
UNITS : ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<0.5	20.0	17.3	87	17.6	88	2
TOLUENE	<0.5	20.0	17.5	88	18.7	94	7
TOTAL XYLENES	<0.5	40.0	36.4	91	37.6	94	3

CONTROL LIMITS	% REC.	RPD
BENZENE	80 - 111	20
TOLUENE	78 - 111	20
TOTAL XYLENES	80 - 114	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	94	92	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008

VOLATILE ORGANIC ANALYSIS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE
EPA METHOD : 8020 (BETX)
SAMPLE MATRIX : WATER

SAMPLE I.D. # : BLANK SPIKE
DATE EXTRACTED : N/A
DATE ANALYZED : 12/04/92
UNITS : ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<0.5	20.0	21.1	106	21.5	108	2
TOLUENE	<0.5	20.0	20.6	103	21.1	106	2
TOTAL XYLENES	<0.5	40.0	41.3	103	42.1	105	2

CONTROL LIMITS	% REC.	RPD
BENZENE	80 - 111	20
TOLUENE	78 - 111	20
TOTAL XYLENES	80 - 114	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	90	92	76 - 120

Analytical Technologies, Inc.

ATI I.D. # 9212-008

CASE NARRATIVE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

CASE NARRATIVE: FUEL HYDROCARBONS ANALYSIS

The samples associated with this accession number were analyzed by a modification of EPA method 8015. This method involves the extraction of 25 ml of water into 5 ml of methylene chloride, during the extract with anhydrous sodium sulfate, and injection of the extract into a GC/FID. Calibration and quantitation was performed against gasoline and diesel fuel standards.

The reporting level for diesel in a water sample analyzed by a Modified 8015 test has been recently raised to 5 mg/L. A reporting level of 1 mg/L was confirmed on these samples by analyzing for gasoline, then concentrating the extract by a factor of five, and reanalyzing.

Analytical Technologies, Inc.

ATI I.D. # 9212-008

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 12/04/92
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	81	68 - 144

Analytical Technologies, Inc

ATI I.D. # 9212-008-1

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/01/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 12/04/92
CLIENT I.D.	: MW-5	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	32
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	8
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	98	68 - 144

Analytical Technologies, Inc.

ATI I.D. # 9212-008-2

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/01/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 12/04/92
CLIENT I.D.	: MW-9	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	72	68 - 144

Analytical Technologies, Inc.

ATI I.D. # 9212-008-3

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/01/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 12/04/92
CLIENT I.D.	: MW-11	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	98	68 - 144

Analytical Technologies, Inc.

ATI I.D. # 9212-008-4

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/01/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 12/02/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 12/04/92
CLIENT I.D.	: MW-12	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	87	68 - 144

Analytical Technologies, Inc.

ATI I.D. # 9212-008

FUEL HYDROCARBON ANALYSIS
CONTINUING CALIBRATION STANDARDS SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: 400 PPM CCV	DATE ANALYZED	: 12/04/92
SAMPLE MATRIX	: WATER	UNITS	: %
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	% DIFFERENCE
FUEL HYDROCARBONS QUANTITATED USING GASOLINE	6
FUEL HYDROCARBONS QUANTITATED USING DIESEL	14

Analytical Technologies, Inc.

ATI I.D. # 9212-008

FUEL HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE
METHOD : 8015 (MODIFIED)
SAMPLE MATRIX : WATER

SAMPLE I.D. # : 9212-008-4
DATE EXTRACTED : 12/04/92
DATE ANALYZED : 12/04/92
UNITS : mg/L

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
FUEL HYDROCARBONS (GASOLINE)	<1.0	<1.0	NC	50.0	49.8	100	47.2	94	5

CONTROL LIMITS	% REC.	RPD
GASOLINE	64 - 118	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	101	91	68 - 144

NC = Not Calculable.

Analytical Technologies, Inc.

ATI I.D. # 9212-008

FUEL HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: BLANK SPIKE
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: 12/04/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE ANALYZED	: 12/04/92
METHOD	: 8015 (MODIFIED)	UNITS	: mg/L
SAMPLE MATRIX	: WATER		

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
FUEL HYDROCARBONS (GASOLINE)	<1.0	50.0	46.0	92	53.8	108	16

CONTROL LIMITS	% REC.	RPD
GASOLINE	52 - 124	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	79	104	68 - 144

Analytical Technologies, Inc.

ATI I.D. # 9212-008

CASE NARRATIVE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

CASE NARRATIVE: TOTAL PETROLEUM HYDROCARBONS (418.1) ANALYSIS

This sample was submitted for an oil and grease analysis by EPA 413.2. This sample was inadvertently tested for total petroleum hydrocarbons by EPA 418.1. This method is identical to EPA 413.2, except that silica gel is added to the extract to remove non-petroleum based oils and fats prior to reading on the IR spectrophotometer. Unless non-petroleum organic material is suspected in the sample, the tests are equivalent.

Analytical Technologies, Inc.

ATI I.D. # 9212-008

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE EXTRACTED	: 12/04/92
PROJECT #	: 0161-205-R04	DATE ANALYZED	: 12/04/92
PROJECT NAME	: UNOCAL - COUPEVILLE	UNITS	: mg/L
METHOD	: WA DOE WTPH-418.1 MODIFIED	SAMPLE MATRIX	: WATER

ATI I.D. #	CLIENT I.D.	TOTAL PETROLEUM HYDROCARBONS	TOTAL PETROLEUM HYDROCARBONS *
9212-008-5	DRUM-1	3.9	3.8
METHOD BLANK	-	<1.0	<1.0

* Reanalyzed after second aliquot of silica gel added.

Analytical Technologies, Inc.

ATI I.D. # 9212-008

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: ICV
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: N/A
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE ANALYZED	: 12/04/92
METHOD	: WA DOE WTPH-418.1 MODIFIED	UNITS	: mg/L
SAMPLE MATRIX	: WATER		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
PETROLEUM HYDROCARBONS	N/A	N/A	N/A	100	101	101	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. # 9212-008

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: BLANK SPIKE
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: 12/04/92
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE ANALYZED	: 12/04/92
METHOD	: WA DOE WTPH-418.1 MODIFIED	UNITS	: mg/L
SAMPLE MATRIX	: WATER		

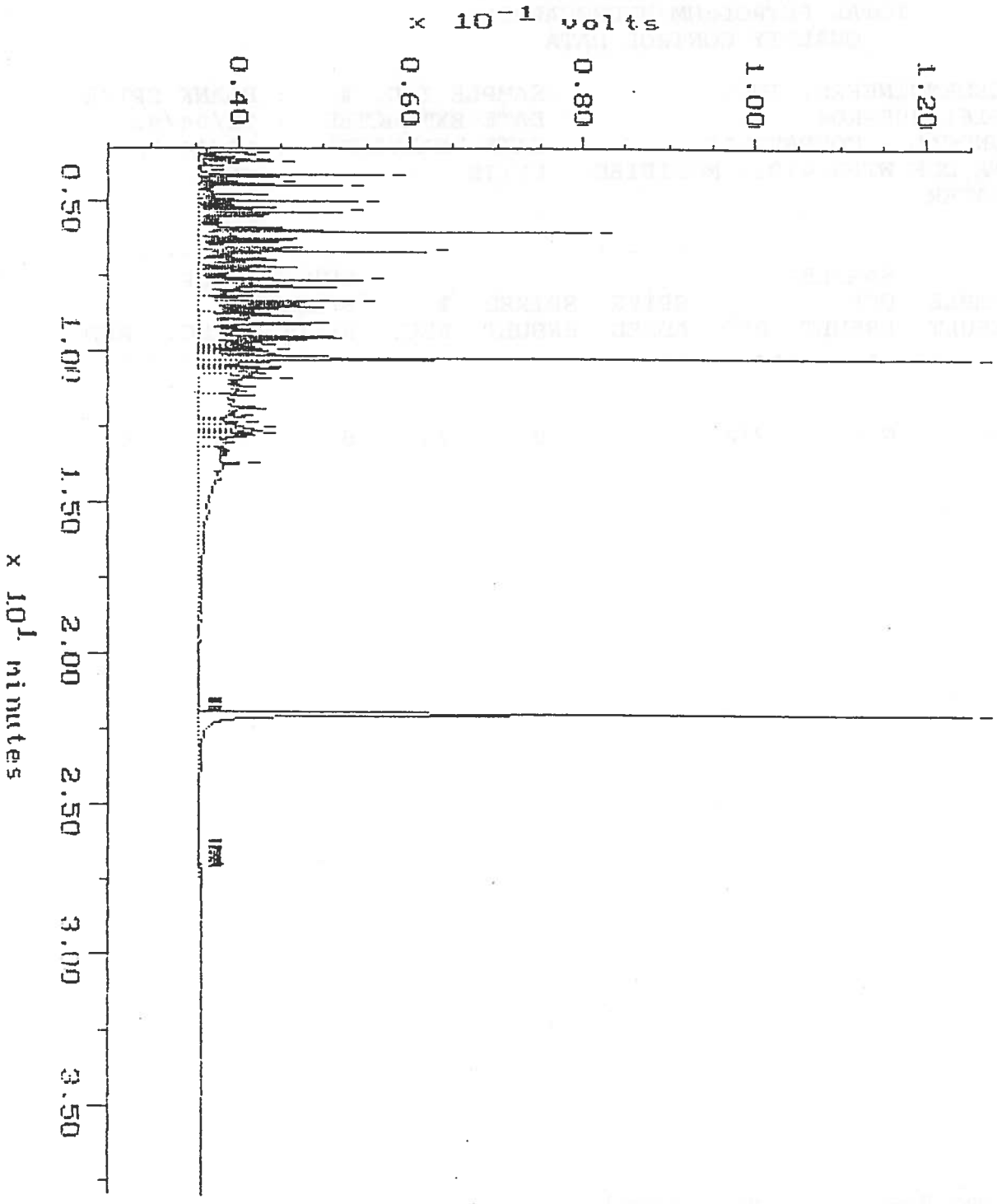
COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
PETROLEUM HYDROCARBONS	<20	N/A	N/A	10	7.8	78	8.3	83	6

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

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

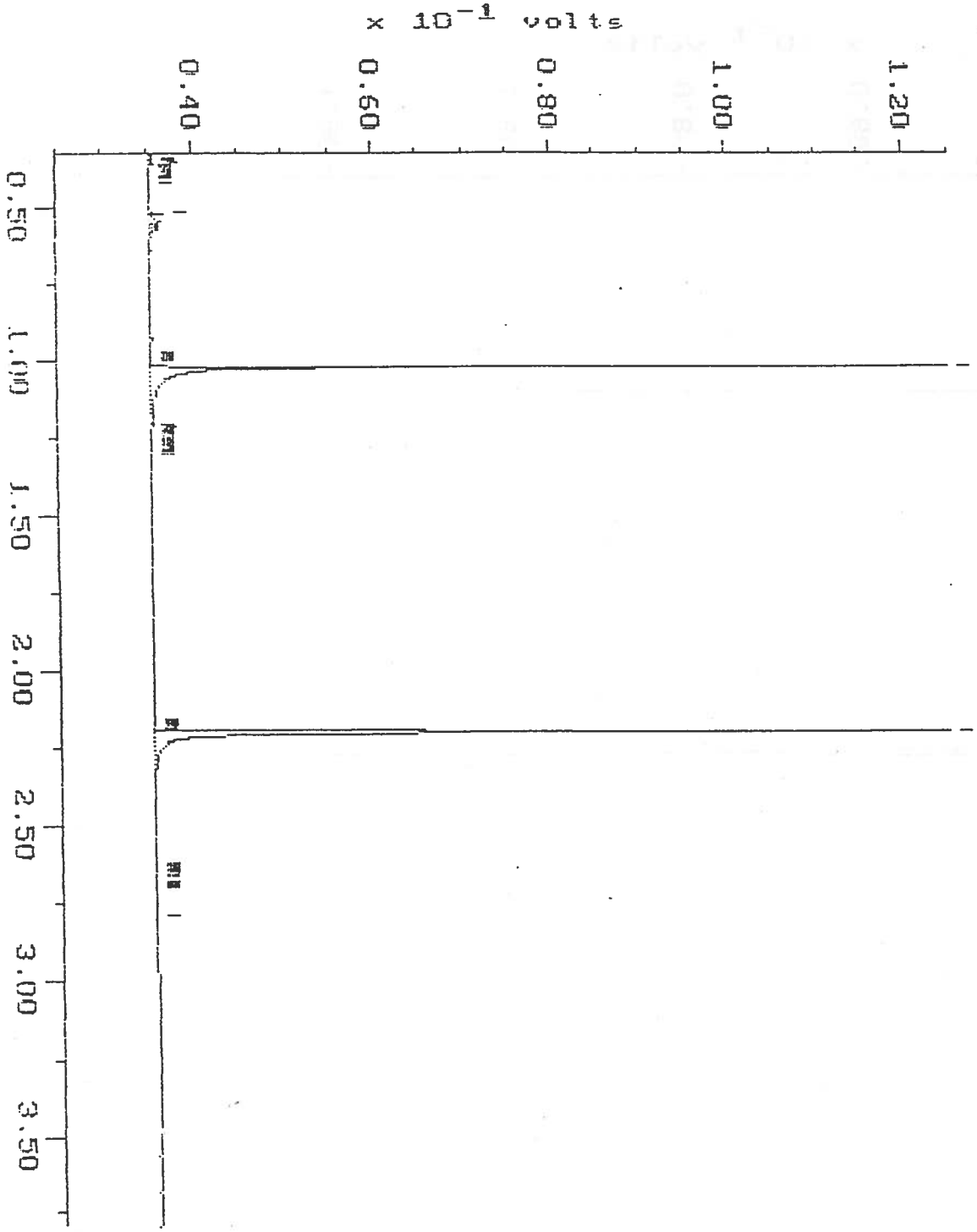
EPA 8015 Modified

Sample: 9212-008-1 Channel: DEMITRI Filename: 1204SD10
Acquired: 04-DEC-92 10:01 Method: H:\BRO2\MAXDATA\SERGE-D\FUEL1204 Operator: ATI
Inj Vol: 1.00



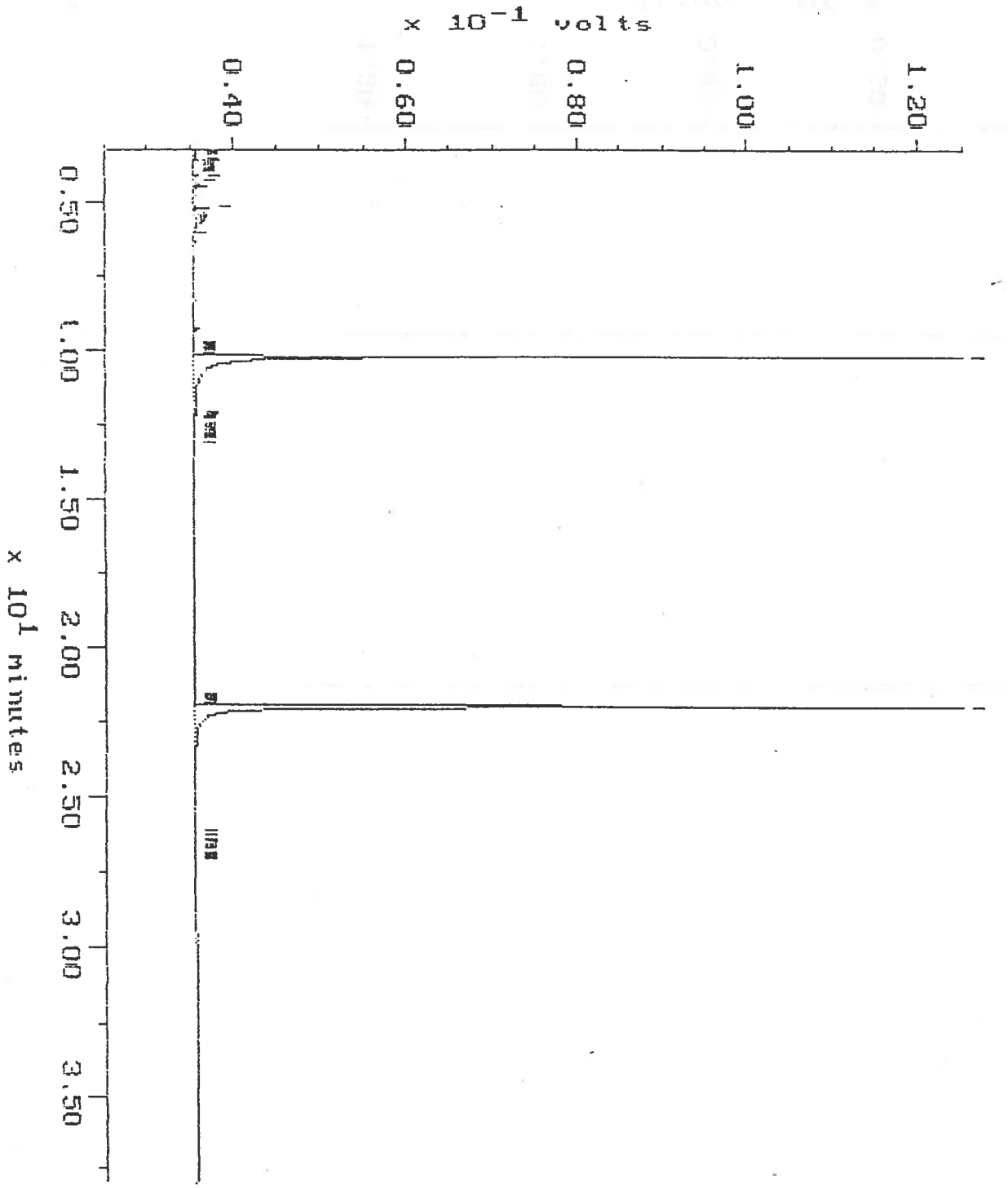
EPA 8015 Modified

Sample: 9212-003-2 Channel: DEMITRI Filename: 12043D11
Acquired: 04-DEC-92 18:48 Method: H:\BRO2\MAXDATA\SERGE-D\FUEL1204 Operator: ATI
Inj Vol: 1.00



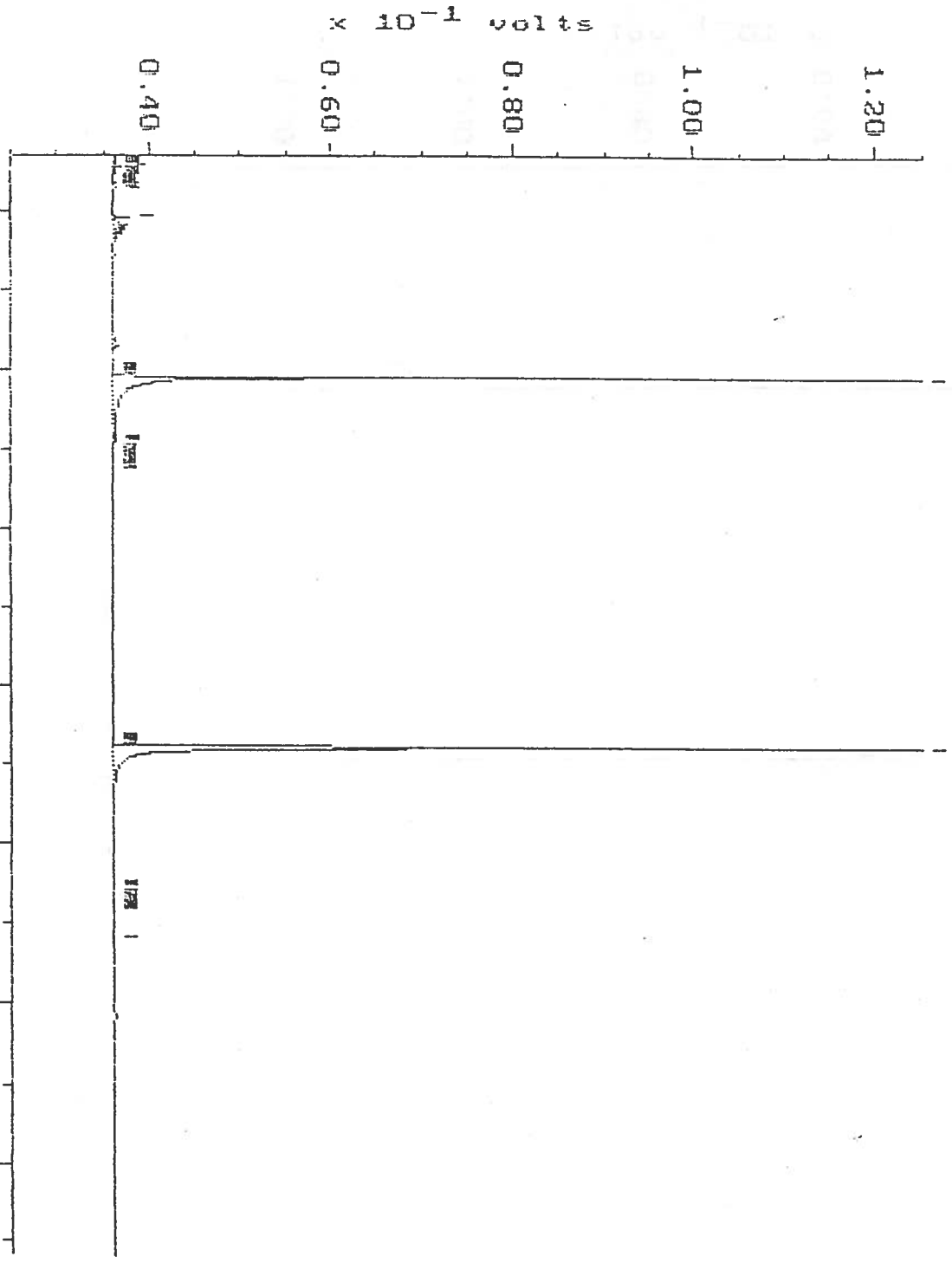
EPA 8015 Modified

Sample: 9212-008-3 Channel: DEMITRI Filename: 1204SD12
Acquired: 04-DEC-92 19:35 Method: H:\BRO2\MAXDATA\SERGE-D\FUEL1204 Operator: All
Inj Vol: 1.00



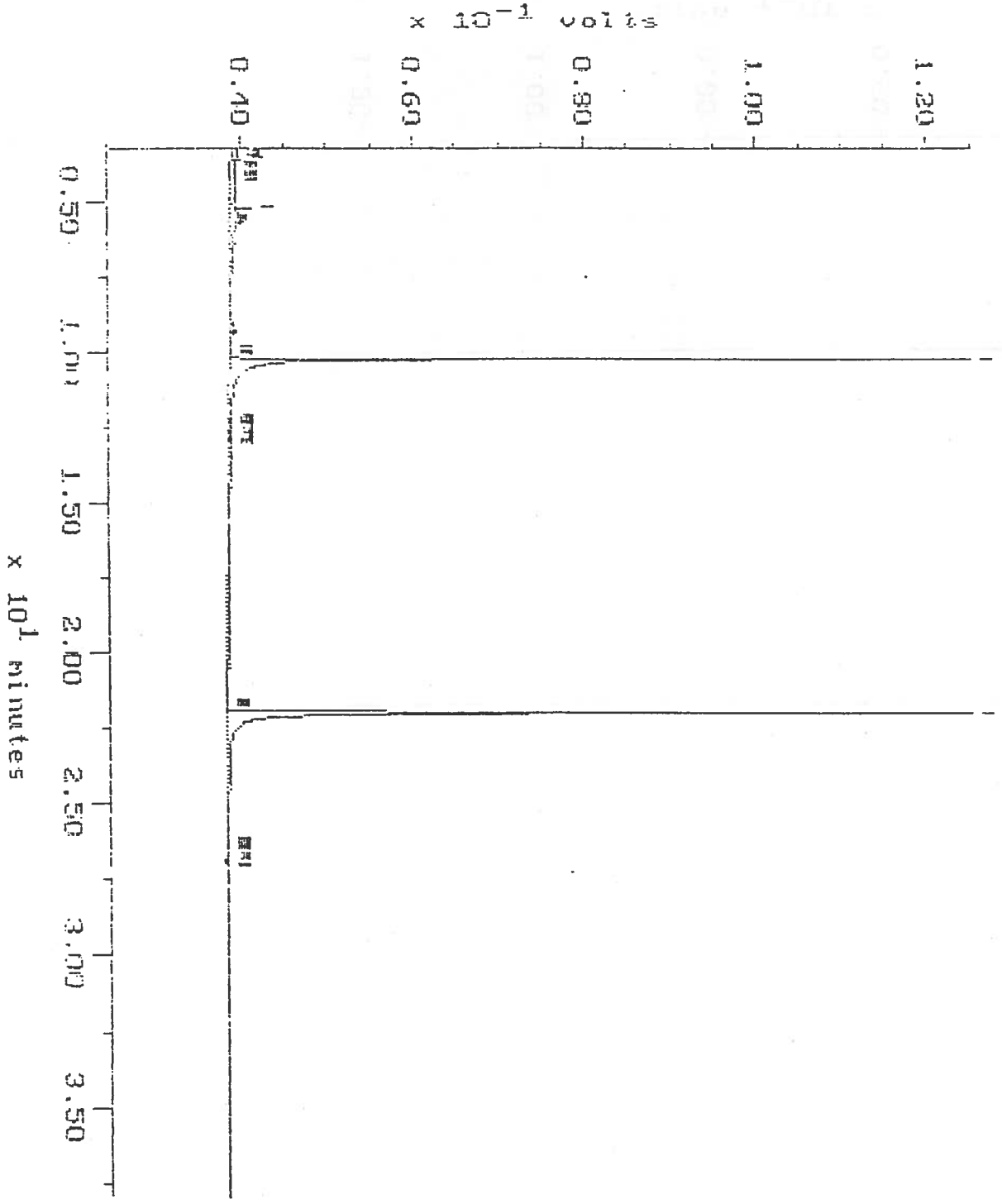
EPA 8015 Modifie

Sample: 9212-008-4
Acquired: 04-DEC-92 13:53
Inj Vol: 1.00
Channel: DEMITRI
Method: H:\aR02\MAXDATA\SERGE-D\FUEL1204
Filename: 12045D06
Operator: Hil



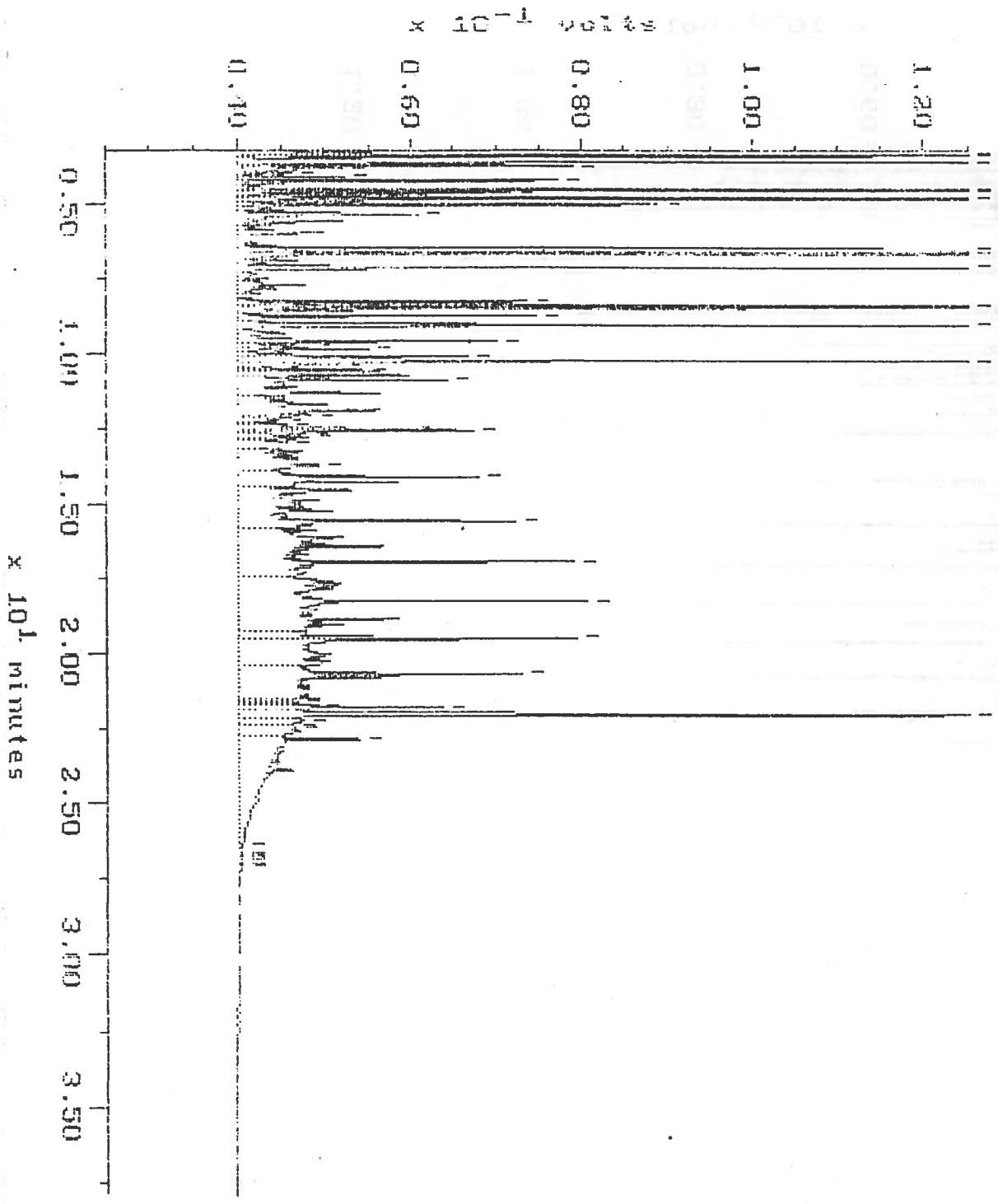
Blank

Sample: WRB12-4 Channel: DEMITRI Filename: 12045003
Acquired: 04-DEC-92 11:30 Method: H:\BRO2\MAXDATA\SERGE-D\FUEL1204 Operator: ATI
Inj Vol: 1.00



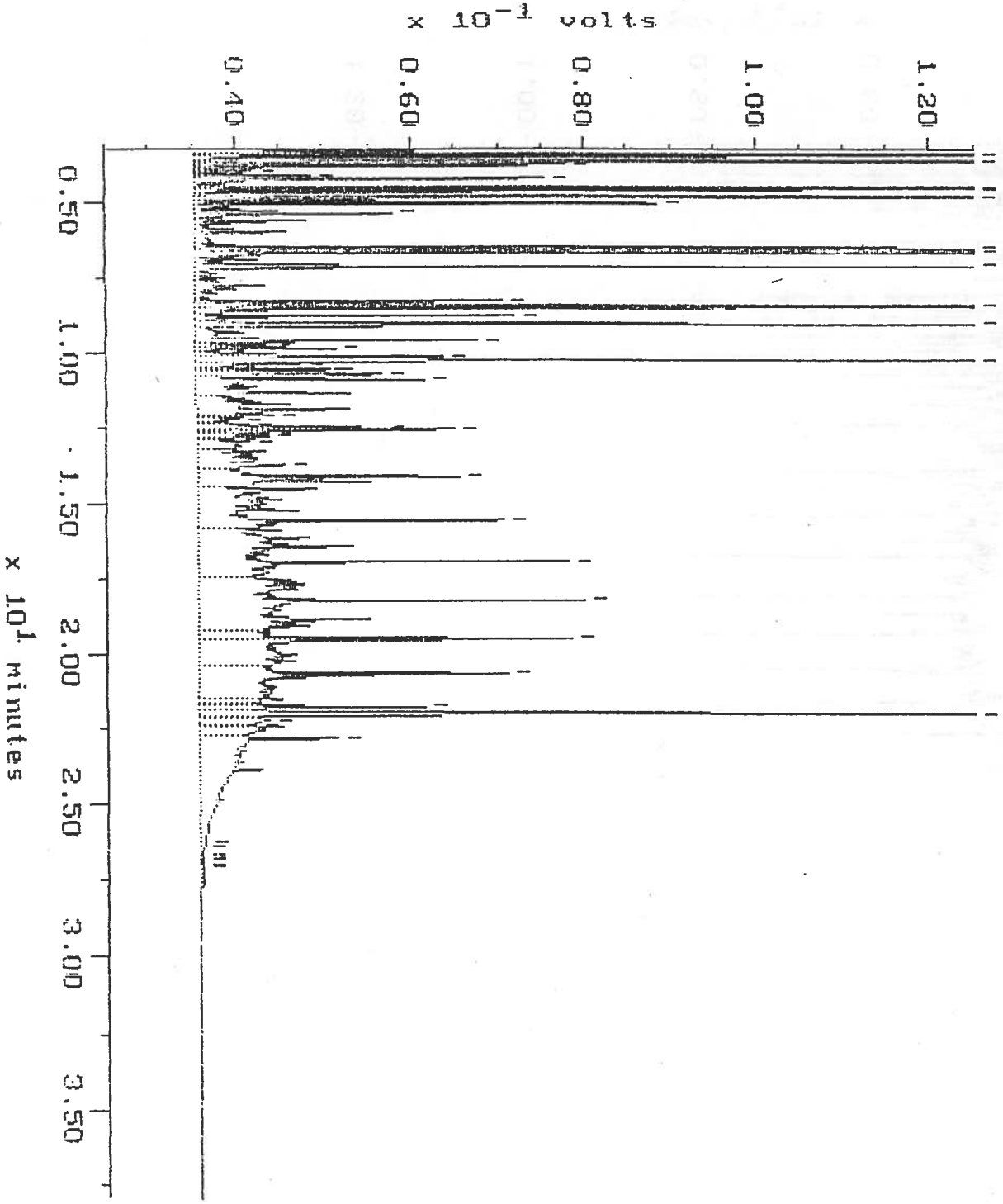
Continuing Calibration

Sample: DB 400 Channel: DEMITRI Filename: 1204SD02
Acquired: 04-DEC-92 10:45 Method: H:\BRO2\MAXDATA\SEREE-D\FUEL1204 Operator: ATI
Inj Vol: 1.00



Continuing Calibration

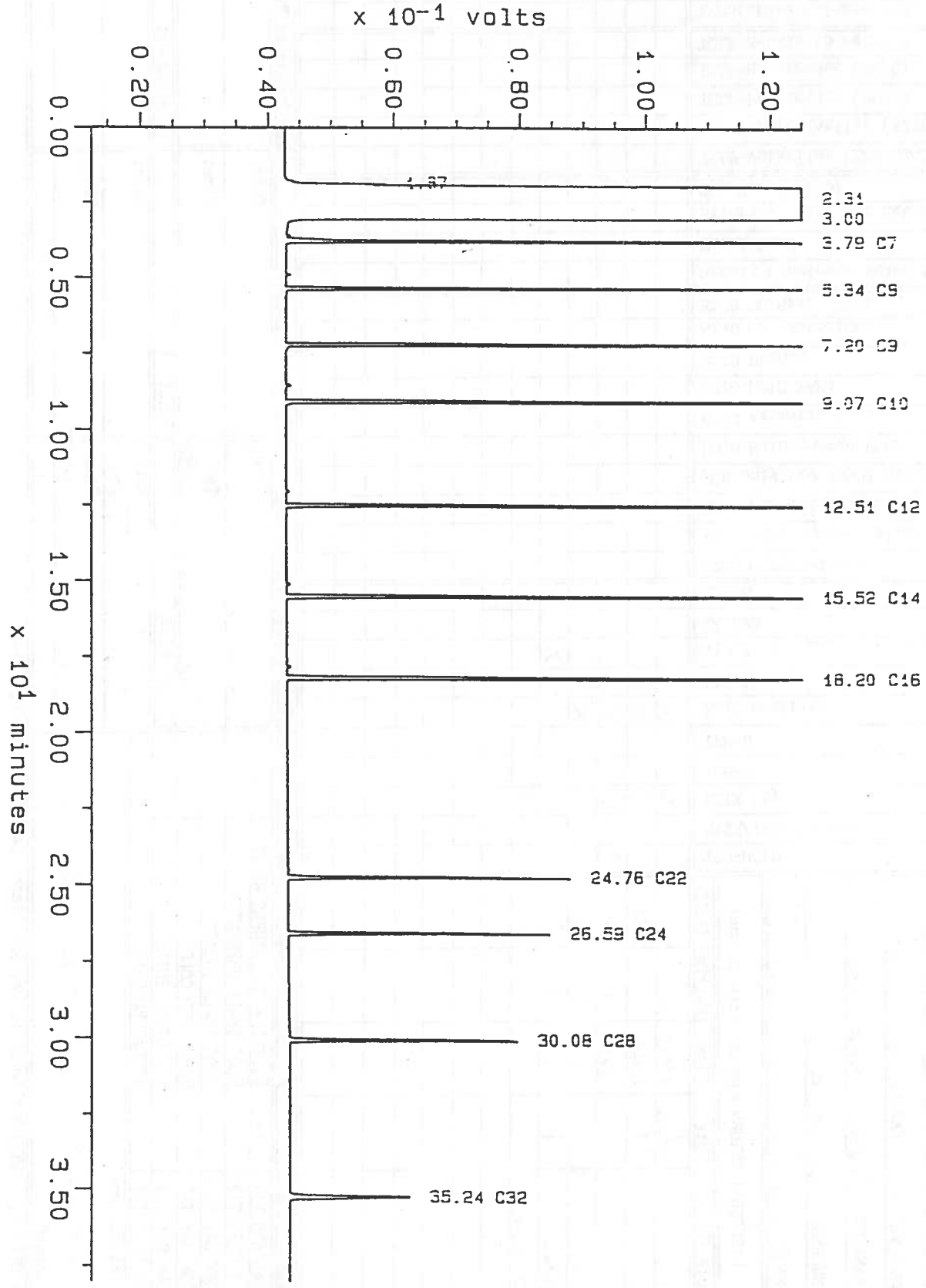
Sample: GG 400 Channel: DEMITRI Filename: 1204GD14
Acquired: 04-DEC-92 21:08 Method: H:\BRO2\MAXDATA\SERGE-D\FUEL1204 Operator: ATI
Inj Vol: 1.00



Sample: ALKANE
Acquired: 02-NOV-92 12:49
Inj Vol: 1.00

Channel: DEMITRI
Method: L:\BR02\MAXDATA\SERGE-D\FUEL0902

Filename: 1102SD02
Operator: ATI



Analytical**Technologies**,Inc.

DATE: 12/2/92 Page 1 of 1 ATI ACCESSION # [illegible]

COMPANY: GEO ENGINEERS
REPORT TO: BARBE SHERUDSKI
ADDRESS: 8410 154th AVE NE
REDMOND WA. 98052
PHONE: (206) 861-6000 FAX: (206) 861-6050
PROJECT MANAGER: BARBE SHERUDSKI
PROJECT NUMBER: 1161-225-R04
PROJECT NAME: UNOCAL [illegible]
ATI will DISPOSE / RETURN samples (circle one)

Sample ID	Date	Time	Matrix	LabID	FUELS: TPH-HCID (WA/OR)	BETX/TPH-G combo (WA/OR)	BETX (by 8020)	TPH-G (WA/OR)	TPH-D (WA/OR)	8015 modified	418.1 (WA/OR)	413.2 (GREASE [illegible])	AK-GRO	AK-DRO	ORGANIC COMPOUNDS: 8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 Pesticides/PCBs	PCB only (by 8080) STD/lo level	8010 Halogenated VOCs	8020 Aromatic VOCs	8310 HPLC PAHs	8040 Phenols	8140 OP Pesticides	8150 OC Herbicides	METALS: Metals (Indicate below *)	Total Lead	Priority Pollutant Metals (13)	TAL Metals (23)	TCLP: TCLP-Volatiles (ZHE-8240)	TCLP-Semivolatiles (8270)	TCLP-Pesticides (8080)	TCLP-Herbicides (8150)	TCLP-Metals (8 metals)	OTHER: % Moisture (please indicate)					Total # of Containers/sample
MW-5	12/1/92	1100	H2O	1			X			X																													[illegible]
MW-9		1140		2			X			X																													[illegible]
MW-11		1215		3			X			X																													[illegible]
MW-12		1300		4			X			X																													[illegible]
DRUM-1		1500		5			X					X																											[illegible]
TRIP BLANK				6			✓																																[illegible]

Turnaround Time	
STANDARD TAT	✓
1 WEEK TAT	
4 WORK DAY TAT	
3 WORK DAY TAT	
2 WORK DAY TAT	
24 HOUR TAT	

Sample Receipt	
TOTAL # CONTAINERS RECVD	17
COC SEALS PRESENT?	✓
COC SEALS INTACT?	✓
RECEIVED COLD?	✓
RECEIVED INTACT?	✓
RECEIVED VIA:	[illegible]

Relinquished By:	Relinquished By:	Relinquished By:
[signature] Date: 12/2/92	Date:	Date:
Dave [illegible] Time: 0800	Time:	Time:
Received By:	**Received By:**	**Received By:**
[signature] Date: 12/2/92	Date:	Date:
[illegible] Time: 10:[illegible]	Time:	Time:

Special Instructions:
FAX RESULTS TO BARBE SHERUDSKI

* Metals needed:

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

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

ATI I.D. # 9208-259

September 21, 1992

GeoEngineers
SEP 22 1992
Routing BJS
File

GeoEngineers, Inc.
3410 154th Ave. N.E.
Redmond, WA 98052

Attention : Barbara J. Sherupski

Project Number : 0161-205-R04

Project Name : Unocal Coupeville

On August 31, 1992, Analytical Technologies, Inc., received five water and four soil 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 per client request, the metals sample was filtered after receipt. The sample had been preserved prior to filtering.

Donna M. McKinney
Senior Project Manager

Frederick W. Grothkopp
Laboratory Manager

FWG/hal/ff

Analytical Technologies, Inc.

ATI I.D. # 9208-259

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9208-259-1	MW-9	08/28/92	WATER
9208-259-2	MW-11	08/28/92	WATER
9208-259-3	MW-5	08/28/92	WATER
9208-259-4	MW-12	08/28/92	WATER
9208-259-5	TRIP BLANK	N/A	WATER
9208-259-6	920828-1	08/28/92	SOIL
9208-259-7	920828-2	08/28/92	SOIL
9208-259-8	920828-3	08/28/92	SOIL
9208-259-9	920828-4	08/28/92	SOIL

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	4
WATER	5

ATI STANDARD DISPOSAL PRACTICE

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

AnalyticalTechnologies,Inc.

ATI I.D. # 9208-259

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020	R
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED	R
PETROLEUM HYDROCARBONS	IR	WA DOE WTPH-418.1 MODIFIED	R
LEAD	AA/GF	EPA 7421	R
MOISTURE	GRAVIMETRIC	CLP SOW ILMO1.0	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. # 9208-259

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 09/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	86

Analytical Technologies, Inc.

ATI I.D. # 9208-259

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 09/05/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	88

Analytical Technologies, Inc.

ATI I.D. # 9208-259-1

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 08/28/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 08/31/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-9	DATE ANALYZED	: 09/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	91

Analytical Technologies, Inc.

ATI I.D. # 9208-259-2

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 08/28/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 08/31/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-11	DATE ANALYZED	: 09/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	3.1
TOLUENE	<0.5
TOTAL XYLENES	2.3

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	89

Analytical Technologies, Inc.

ATI I.D. # 9208-259-3

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 08/28/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 08/31/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-5	DATE ANALYZED	: 09/05/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT	
BENZENE	0.9	
ETHYLBENZENE	84	
TOLUENE	9.1	
TOTAL XYLENES	190	D

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	106

D = Value from a ten fold diluted analysis.

Analytical Technologies, Inc.

ATI I.D. # 9208-259-4

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 08/28/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 08/31/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-12	DATE ANALYZED	: 09/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	89

Analytical Technologies, Inc.

ATI I.D. # 9208-259-5

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 08/31/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: TRIP BLANK	DATE ANALYZED	: 09/04/92
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	87

AnalyticalTechnologies,Inc.

ATI I.D. # 9208-259

VOLATILE ORGANIC ANALYSIS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: 9208-262-6
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: N/A
PROJECT NAME	: UNOCAL COUPEVILLE	DATE ANALYZED	: 09/04/92
EPA METHOD	: 8020 (BETX)	UNITS	: ug/L
SAMPLE MATRIX	: WATER		

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	1.21	20.0	20.1	94	19.5	91	3
TOLUENE	1.06	20.0	19.3	91	19.0	90	2
TOTAL XYLENES	0.688	40.0	37.7	93	36.9	91	2

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

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

Analytical Technologies, Inc.

ATI I.D. # 9208-259

VOLATILE ORGANIC ANALYSIS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: 9209-018-1
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: N/A
PROJECT NAME	: UNOCAL COUPEVILLE	DATE ANALYZED	: 09/05/92
EPA METHOD	: 8020 (BETX)	UNITS	: ug/L
SAMPLE MATRIX	: WATER		

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<0.5	20.0	18.3	92	19.2	96	5
TOLUENE	<0.5	20.0	18.9	95	19.8	99	5
TOTAL XYLENES	<0.5	40.0	37.4	94	39.5	99	5

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

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

Analytical Technologies, Inc.

ATI I.D. # 9208-259

VOLATILE ORGANIC ANALYSIS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: BLANK SPIKE
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: N/A
PROJECT NAME	: UNOCAL COUPEVILLE	DATE ANALYZED	: 09/04/92
EPA METHOD	: 8020 (BETX)	UNITS	: ug/L
SAMPLE MATRIX	: WATER		

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<0.5	20.0	19.0	95	18.5	93	3
TOLUENE	<0.5	20.0	18.8	94	17.9	90	5
TOTAL XYLENES	<0.5	40.0	37.3	93	35.6	89	5

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

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

Analytical Technologies, Inc.

ATI I.D. # 9208-259

VOLATILE ORGANIC ANALYSIS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE
EPA METHOD : 8020 (BETX)
SAMPLE MATRIX : WATER

SAMPLE I.D. # : BLANK SPIKE
DATE EXTRACTED : N/A
DATE ANALYZED : 09/05/92
UNITS : ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<0.5	20.0	18.8	94	20.2	101	7
TOLUENE	<0.5	20.0	18.1	91	20.2	101	11
TOTAL XYLENES	<0.5	40.0	35.8	90	35.4	99	10

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

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

Analytical Technologies, Inc.

ATI I.D. # 9208-259

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: 09/02/92
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 09/02/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY

-TERPHENYL	119

Analytical Technologies, Inc.

ATI I.D. # 9208-259-1

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 08/28/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 08/31/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: 09/02/92
CLIENT I.D.	: MW-9	DATE ANALYZED	: 09/03/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY

O-TERPHENYL	97

AnalyticalTechnologies,Inc.

ATI I.D. # 9208-259-2

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 08/28/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 08/31/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: 09/02/92
CLIENT I.D.	: MW-11	DATE ANALYZED	: 09/03/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY

O-TERPHENYL	99

Analytical Technologies, Inc.

ATI I.D. # 9208-259-3

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 08/28/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 08/31/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: 09/02/92
CLIENT I.D.	: MW-5	DATE ANALYZED	: 09/03/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	11
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	3
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
SURROGATE PERCENT RECOVERY	
O-TERPHENYL	94

Analytical Technologies, Inc.

ATI I.D. # 9208-259-4

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 08/28/92
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 08/31/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: 09/02/92
CLIENT I.D.	: MW-12	DATE ANALYZED	: 09/03/92
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<1
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY

O-TERPHENYL	95

Analytical Technologies, Inc.

ATI I.D. # 9208-259

FUEL HYDROCARBON ANALYSIS
CONTINUING CALIBRATION STANDARDS SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL COUPEVILLE	DATE EXTRACTED	: N/A
CLIENT I.D.	: 400 PPM CCV	DATE ANALYZED	: 09/03/92
SAMPLE MATRIX	: WATER	UNITS	: %
METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	% DIFFERENCE
FUEL HYDROCARBONS QUANTITATED USING GASOLINE	1
FUEL HYDROCARBONS QUANTITATED USING DIESEL	15

Analytical Technologies, Inc.

ATI I.D. # 9208-259

FUEL HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: 9208-262-7
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: 09/02/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE ANALYZED	: 09/02/92
METHOD	: 8015 (MODIFIED)	UNITS	: mg/L
SAMPLE MATRIX	: WATER		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
FUEL HYDROCARBONS (GASOLINE)	<1.0	<1.0	NC	50.0	42.2	84	44.6	89	6

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. # 9208-259

FUEL HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: BLANK SPIKE
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: 09/02/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE ANALYZED	: 09/02/92
METHOD	: 8015 (MODIFIED)	UNITS	: mg/L
SAMPLE MATRIX	: WATER		

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
FUEL HYDROCARBONS (GASOLINE)	<1.0	50.0	40.4	81	41.0	82	1

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

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

Analytical Technologies, Inc.

ATI I.D. # 9208-259

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE
METHOD : WA DOE WTPH-418.1 MODIFIED
RESULTS ARE CORRECTED FOR MOISTURE CONTENT

DATE EXTRACTED : 09/01/92
DATE ANALYZED : 09/01/92
UNITS : mg/Kg
SAMPLE MATRIX : SOIL

ATI I.D. #	CLIENT I.D.	TOTAL PETROLEUM HYDROCARBONS	TOTAL PETROLEUM HYDROCARBONS *
9208-259-[illegible]	920828-1	59	57
9208-259-[illegible]	920828-2	100	100
9208-259-[illegible]	920828-3	140	130
9208-259-[illegible]	920828-4	69	72
REAGENT BLANK	-	<20	<20

* Reanalyzed after second aliquot of silica gel added.

Analytical Technologies, Inc.

ATI I.D. # 9208-259

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: ICV
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: 09/01/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE ANALYZED	: 09/01/92
METHOD	: WA DOE WTPH-418.1 MODIFIED	UNITS	: mg/L
SAMPLE MATRIX	: WATER		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
PETROLEUM HYDROCARBONS	N/A	N/A	N/A	100	104	104	N/A	N/A	N/A

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

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

AnalyticalTechnologies, Inc.

ATI I.D. # 9208-259

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: 9208-255-1
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: 09/01/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE ANALYZED	: 09/01/92
METHOD	: WA DOE WTPH-418.1 MODIFIED	UNITS	: mg/Kg
SAMPLE MATRIX	: SOIL		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
PETROLEUM HYDROCARBONS (MOTOR OIL)	<20	<20	NC	400	425	106	415	104	2

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. # 9208-259

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: BLANK SPIKE
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: 09/01/92
PROJECT NAME	: UNOCAL COUPEVILLE	DATE ANALYZED	: 09/01/92
METHOD	: WA DOE WTPH-418.1 MODIFIED	UNITS	: mg/Kg
SAMPLE MATRIX	: SOIL		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
PETROLEUM HYDROCARBONS (MOTOR OIL)	<20	N/A	N/A	400	447	112	451	113	1

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

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

AnalyticalTechnologies, Inc.

ATI I.D. # 9208-259

METALS ANALYSIS

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE

MATRIX : WATER

ELEMENT	DATE PREPARED	DATE ANALYZED
LEAD	09/09/92	09/11/92

Analytical Technologies, Inc.

ATI I.D. # 9208-259

METALS ANALYSIS
DATA SUMMARY

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE

MATRIX : WATER
UNITS : mg/L

ATI I.D. #	CLIENT I.D.	LEAD
9208-259-1	MW-9	<0.015*
REAGENT BLANK	-	<0.0030

* Sample diluted due to matrix interference.

Analytical Technologies, Inc.

ATI I.D. # 9208-259

METALS ANALYSIS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE

MATRIX : WATER
UNITS : mg/L

ELEMENT	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
LEAD	9208-259-1	<0.015	<0.015	NC	0.0324	0.025	130F
LEAD	BLANK SPIKE	<0.0030	N/A	N/A	0.0208	0.025	83

F = Out of limits due to matrix interference.
NC = Not Calculable.

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

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D. # 9208-259

GENERAL CHEMISTRY ANALYSIS

CLIENT : GEOENGINEERS, INC. MATRIX : SOIL
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE

PARAMETER	DATE ANALYZED
MOISTURE	09/02/92

Analytical Technologies, Inc.

ATI I.D. # 9208-259

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : GEOENGINEERS, INC. MATRIX : SOIL
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE UNITS : %

ATI I.D. #	CLIENT I.D.	MOISTURE
9208-259-6	920828-1	13
9208-259-7	920828-2	8.4
9208-259-8	920828-3	7.0
9208-259-9	920828-4	9.9

Analytical Technologies, Inc.

ATI I.D. # 9208-259

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL COUPEVILLE

MATRIX : SOIL
UNITS : %

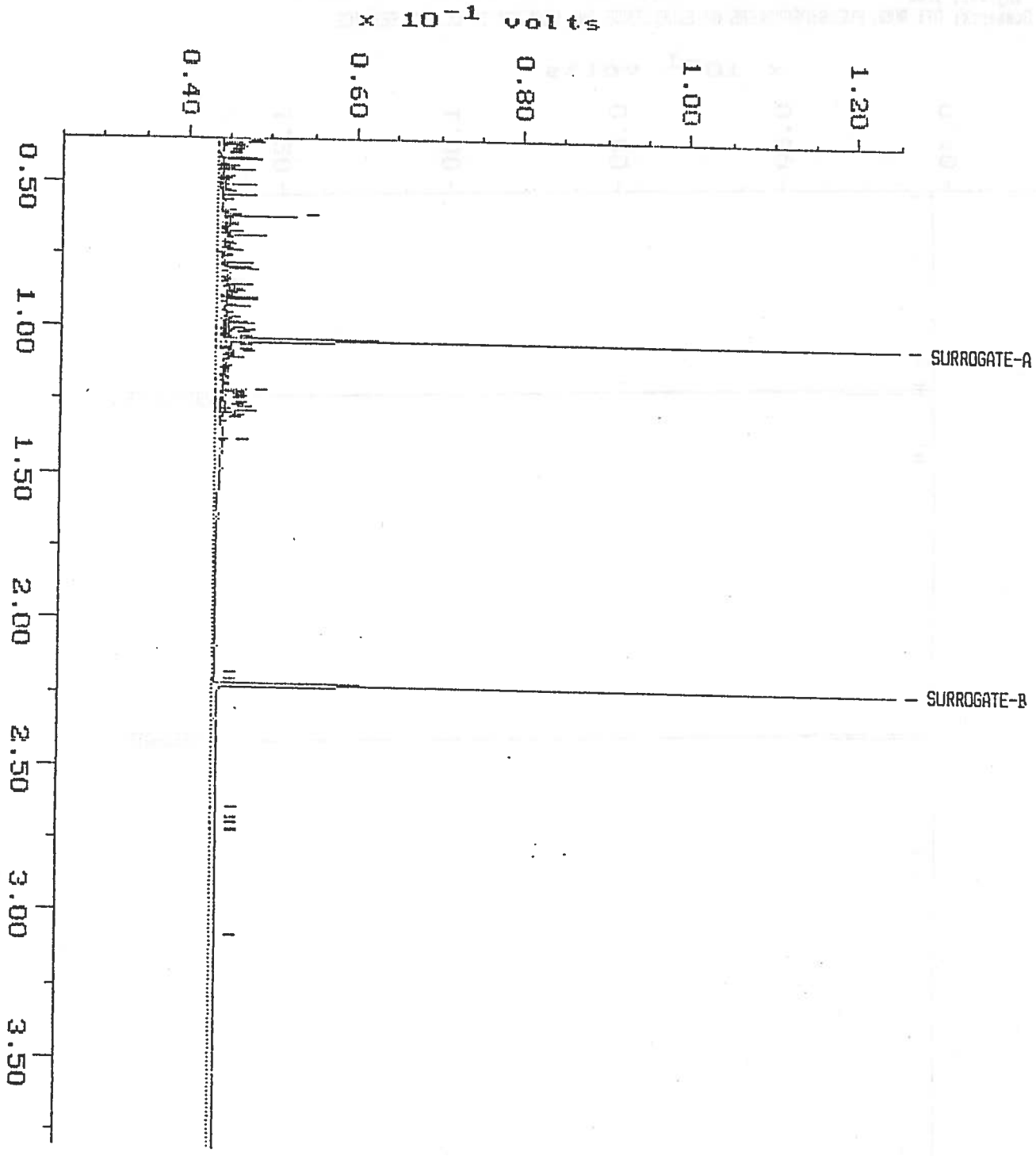
PARAMETER	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
MOISTURE	9208-254-19	15	16	6	N/A	N/A	N/A

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

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

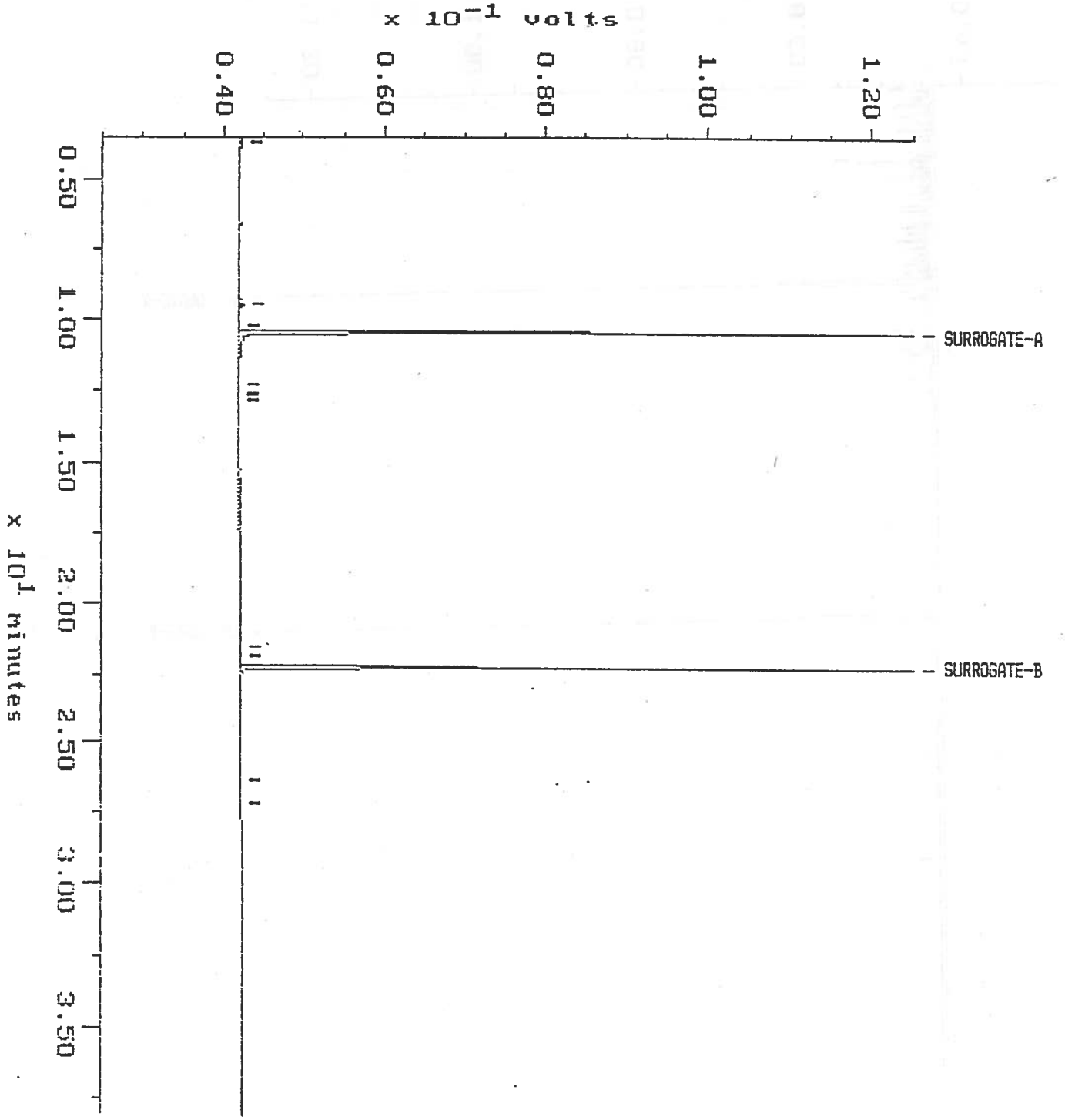
8015 (MODIFIED)

Sample: 9208-259-3 Channel: NANCY Filename: 0902NW23
Acquired: 03-SEP-92 6:40 Method: L:\BRO2\MAXDATA\NANCY\FUEL0902 Operator: ATI
Inj Vol: 1.00
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



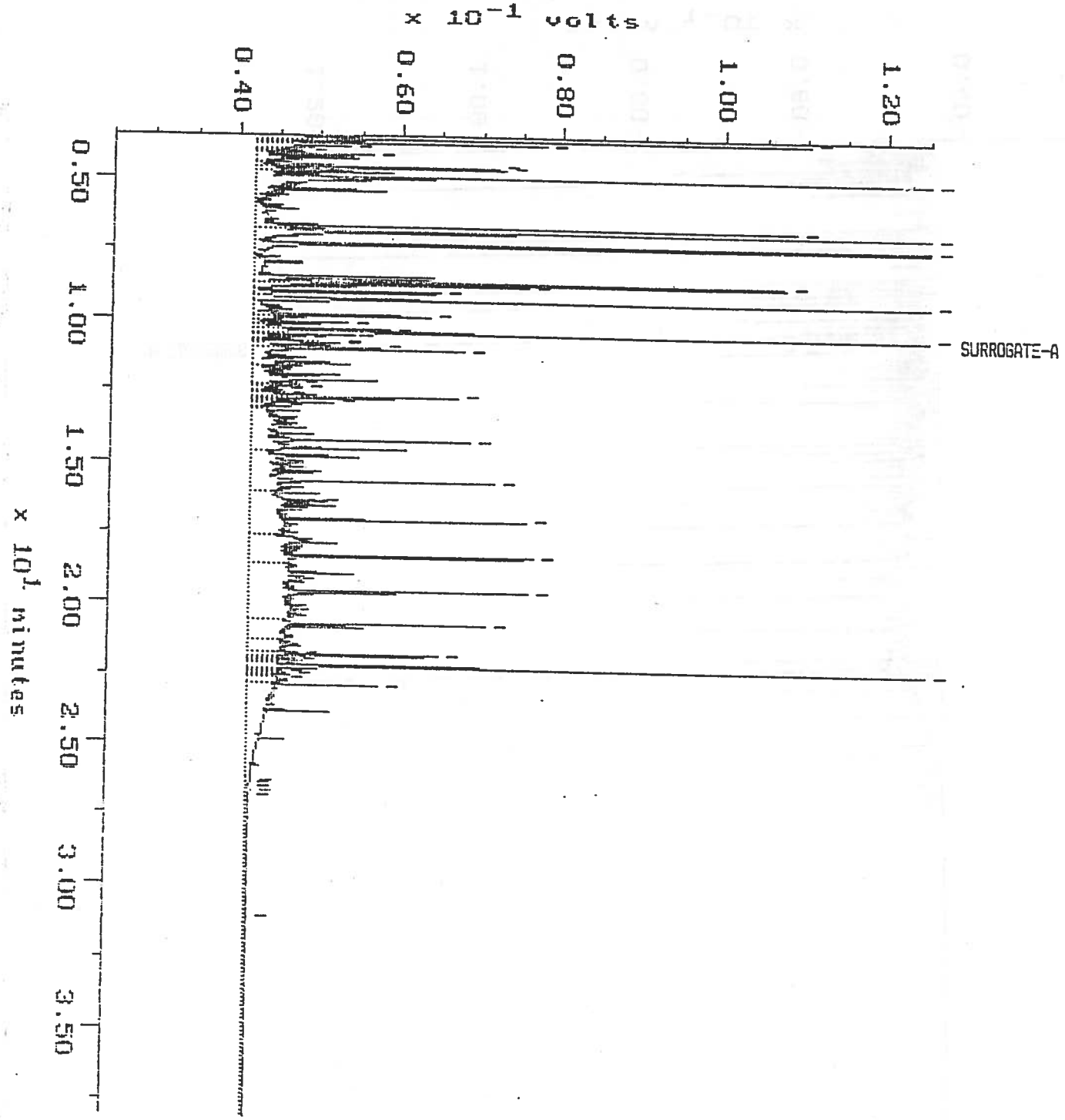
8015 (MODIFIED)

Sample: WRB92 Channel: NANCY Filename: 0902NW03
Acquired: 02-SEP-92 14:28 Method: L:\BRO2\MAXDATA\NANCY\FUEL0902 Operator: ATI
Inj Vol: 1.00
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



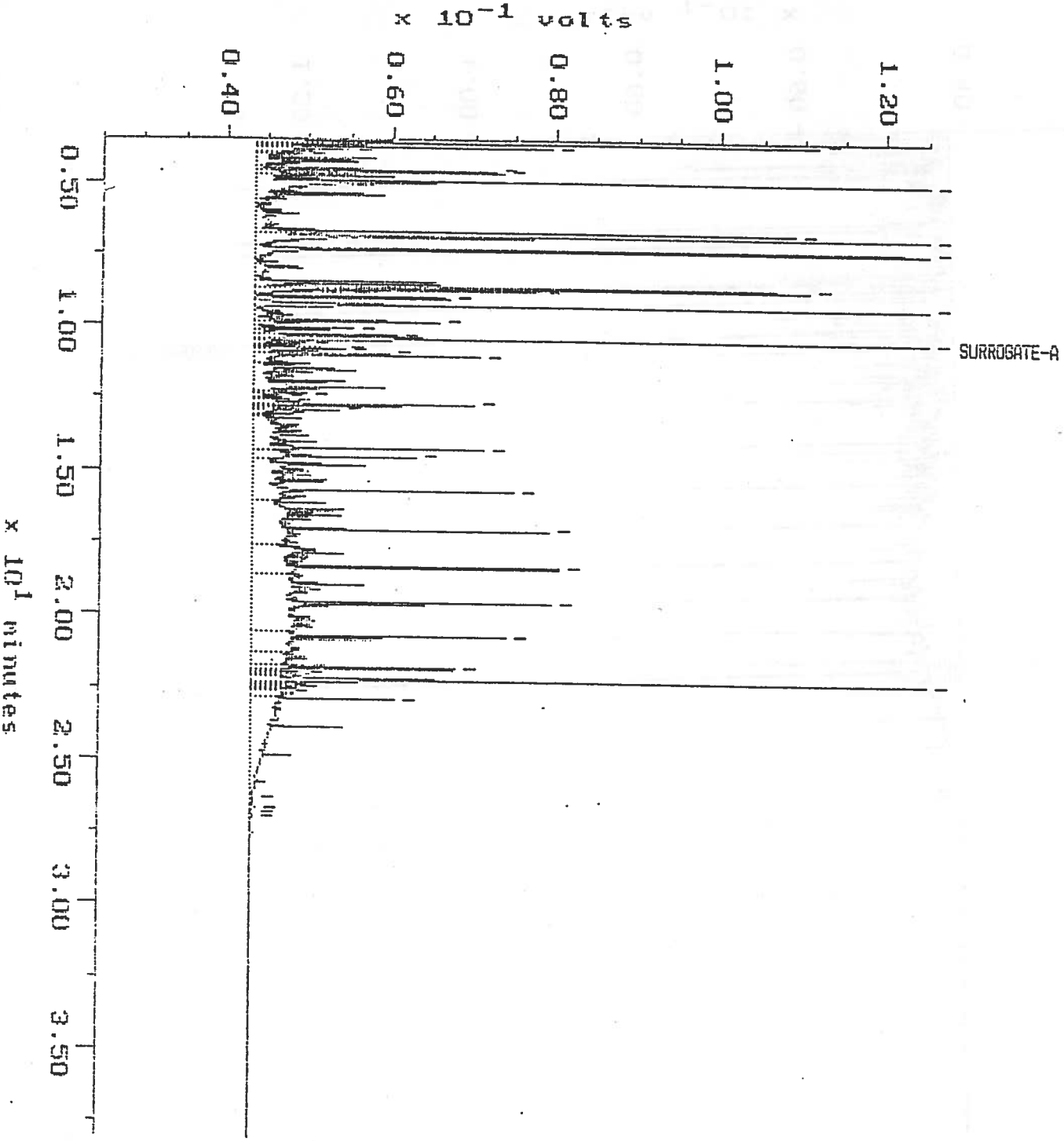
8015 (MODIFIED)

Sample: DG 400 Channel: NANCY
Acquired: 02-SEP-92 13:37 Method: L:\BR02\MAXDATA\NANCY\FUEL0902 Filename: 0902NW02
Inj Vol: 1.00 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



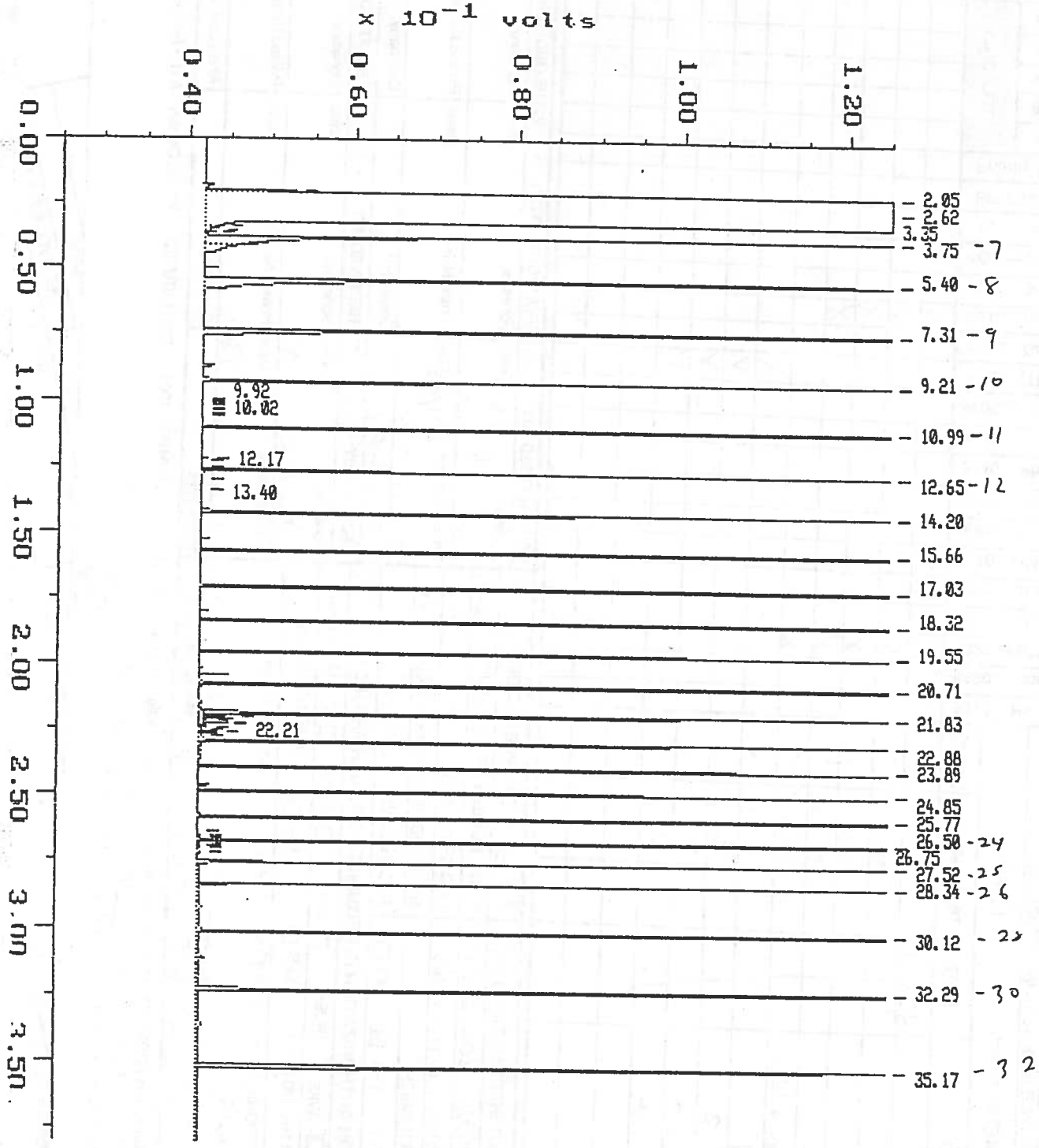
8015 (MODIFIED)

Sample: DG 400 Channel: NANCY
Acquired: 03-SEP-92 8:15 Method: L:\BRO2\MAXDATA\NANCY\FUEL0902 Filename: 0902NW25
Inj Vol: 1.00 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



8015 (MODIFIED)

Sample: ALKANE
Acquired: 19-AUG-92 14:39
Inj Vol: 1.00
Channel: NANCY
Method: L:\BRO2\MAXDATA\NANCY\FUEL0819
Filename: 0819NW02
Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



560 Naches Avenue SW, Suite 101 Renton, WA 98055 (206)228-8335

Chain of Custody

PROJECT MANAGER: Barbara J Sherupski
COMPANY: GeoEngineers, Inc.
ADDRESS: 8410 154th Ave NE Redmond, WA
PHONE: 861-6000 SAMPLED BY: BJS

SAMPLE DISPOSAL INSTRUCTIONS
☒ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	8010 Halogenated Volatiles	8020 Aromatic Volatiles	8020 BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	8080 PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	~~TOX 9020~~ Furnace	% Moisture	EP TOX Metals (8) EP EXT	Priority Pollutant Metals (13)	TCLP ONLY 8080 Pesticide (4)	TCLP ONLY 8240 ZH-EXT	TCLP ONLY 8270	TCLP ONLY 8150 Herbicides (2)	TCLP ONLY Metals (8)	Dissolved Lead	Composite	NUMBER OF CONTAINERS
MW-9	8/28/92		Water	1			X											X		✓									✓		4
MW-11			Water	2			X											X													3
MW-5			Water	3			X											X													3
MW-12			Water	4			X											X													3
TRIP BLANK			Water	5			X																								2
920828-1			Soil	6												X														Y	2
920828-2			Soil	7												X														Y	2
920828-3			Soil	8												X														Y	2
920828-4	↓		Soil	9												X														Y	2

PROJECT INFORMATION Task #1.5
PROJECT NUMBER: 0161-205-R04
PROJECT NAME: Unocal Coupeville
PURCHASE ORDER NUMBER:
ONGOING PROJECT? YES ☒ NO ☐

SAMPLE RECEIPT
TOTAL NUMBER OF CONTAINERS: 23
COC SEALS/INTACT? Y/N/NA: Y/Y
RECEIVED GOOD COND./COLD: Y/Y
RECEIVED VIA: courier

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS
TAT: (NORMAL) ☒ 2WKS (RUSH) ☐ 24HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK
GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS: Composite like-numbered soil samples.
* MW-9 (lead) was NOT field filtered & was preserved - can lab filter & run on dissolved? call
I know there are voids - please hold & analyze ATI
B.S.

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Barbara J Sherupski Time:	Signature: Time:	Signature: Time:
Printed Name: Barbara Sherupski Date: 8/31/92	Printed Name: Date:	Printed Name: Date:
Company: GEI	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: [illegible] Time: 10:00	Signature: Time:	Signature: Time:
Printed Name: [illegible] Date: 8/31/92	Printed Name: Date:	Printed Name: Date:
Company: ATI	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619)458-9141 • Phoenix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

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

ATI I.D. # 9110-040

October 8, 1991

GeoEngineers
OCT 11 1991
Routing CSL
File

GeoEngineers
8410-154th Ave N.E.
Redmond, WA 98052

Attention : Chuck Lindsay

Project Number : 0161-205-R04

Project Name : Unocal - Coupeville

On October 3, 1991, Analytical Technologies, Inc., received 6 soil 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.

Bob A. Olsiewski
Project Manager

Frederick W. Grothkopp
Laboratory Manager

FWG/hal/cn

Analytical Technologies, Inc.

ATI I.D. # 9110-040

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9110-040-1	911002-1	10/02/91	SOIL
9110-040-2	911002-2	10/02/91	SOIL
9110-040-3	911002-3	10/02/91	SOIL
9110-040-4	911002-4	10/02/91	SOIL
9110-040-5	911002-5	10/02/91	SOIL
9110-040-6	911002-6	10/02/91	SOIL

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	6

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. # 9110-040

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020	R
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED	R
PETROLEUM HYDROCARBONS	IR	EPA 418.1	R
MOISTURE	GRAVIMETRIC	METHOD 7-2.2	R

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

AnalyticalTechnologies,Inc.

ATI I.D. # 9110-040

VOLATILE ORGANIC COMPOUNDS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 10/04/91
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/04/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUNDS	RESULTS
BENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
TOTAL XYLENES	<0.025

SURROGATE PERCENT RECOVERIES

BROMOFLUOROBENZENE	98

Analytical Technologies, Inc.

ATI I.D. # 9110-040-3

VOLATILE ORGANIC COMPOUNDS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/02/91
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 10/03/91
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 10/04/91
CLIENT I.D.	: 911002-3	DATE ANALYZED	: 10/05/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1
RESULTS BASED ON DRY WEIGHT		% MOISTURE	: 11

COMPOUNDS	RESULTS
BENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
TOTAL XYLENES	<0.025

SURROGATE PERCENT RECOVERIES

BROMOFLUOROBENZENE	90

Analytical Technologies, Inc.

ATI I.D. # 9110-040-6

VOLATILE ORGANIC COMPOUNDS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/02/91
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 10/03/91
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 10/04/91
CLIENT I.D.	: 911002-6	DATE ANALYZED	: 10/05/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1
RESULTS BASED ON DRY WEIGHT		% MOISTURE	: 12

COMPOUNDS	RESULTS
BENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
TOTAL XYLENES	<0.025

SURROGATE PERCENT RECOVERIES

BROMOFLUOROBENZENE	94

AnalyticalTechnologies,Inc.

ATI I.D. # 9110-040

VOLATILE ORGANIC COMPOUNDS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE
EPA METHOD : 8020 (BETX)
SAMPLE MATRIX : SOIL

SAMPLE I.D. # : 9110-054-1
DATE EXTRACTED : 10/04/91
DATE ANALYZED : 10/04/91
UNITS : mg/Kg

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.025	1.00	0.650	65	0.672	67	3
TOLUENE	<0.025	1.00	0.710	71	0.740	74	4
TOTAL XYLENES	<0.025	2.00	1.45	73	1.54	77	6

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

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

Analytical Technologies, Inc.

ATI I.D. # 9110-040

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 0161-205-R04	DATE RECEIVED	: N/A
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 10/04/91
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/04/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 9110-040-1

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/02/91
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 10/03/91
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 10/04/91
CLIENT I.D.	: 911002-1	DATE ANALYZED	: 10/05/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 9110-040-3

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/02/91
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 10/03/91
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 10/04/91
CLIENT I.D.	: 911002-3	DATE ANALYZED	: 10/05/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 9110-040-5

FUEL HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/02/91
PROJECT #	: 0161-205-R04	DATE RECEIVED	: 10/03/91
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE EXTRACTED	: 10/04/91
CLIENT I.D.	: 911002-5	DATE ANALYZED	: 10/05/91
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 (MODIFIED)	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	C7 - C12
HYDROCARBON QUANTITATION USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 9110-040

FUEL HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D. #	: 9110-054-1
PROJECT #	: 0161-205-R04	DATE EXTRACTED	: 10/04/91
PROJECT NAME	: UNOCAL - COUPEVILLE	DATE ANALYZED	: 10/04/91
EPA METHOD	: 8015 (MODIFIED)	UNITS	: mg/Kg
SAMPLE MATRIX	: SOIL		

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	<5.0	500	430	86	445	89	3

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

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

Analytical Technologies, Inc.

ATI I.D. # 9110-040

GENERAL CHEMISTRY RESULTS

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

DATE EXTRACTED : 10/03/91
DATE ANALYZED : 10/03/91
MATRIX : SOIL
UNITS : mg/Kg

ATI I.D. #	CLIENT I.D.	PETROLEUM HYDROCARBONS
9110-040	REAGENT BLANK	<5
9110-040-1	911002-1	170
9110-040-2	911002-2	230
9110-040-3	911002-3	330
9110-040-4	911002-4	260
9110-040-5	911002-5	420
9110-040-6	911002-6	220

AnalyticalTechnologies, Inc.

ATI I.D. # 9110-040

GENERAL CHEMISTRY QUALITY CONTROL

CLIENT : GEOENGINEERS, INC. SAMPLE MATRIX : SOIL
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
PETROLEUM HYDROCARBONS	mg/Kg	9110-040-1	170	180	6	420	250	100

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

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical**Technologies**, Inc.
560 Naches Avenue SW, Suite 101 Renton, WA 98055 (206)228-8335

Chain of Custody

DATE 10/14/91 PAGE 1 OF 1

LABORATORY NUMBER: 9110-185

PROJECT MANAGER: Charles S. Lindsay
COMPANY: GEI
ADDRESS: 8410 154th Ave NE
Redmond, WA
PHONE: 861-6000 SAMPLED BY: CSL

SAMPLE DISPOSAL INSTRUCTIONS

☒ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	8010 Halogenated Volatiles	8020 Aromatic Volatiles	8020 BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	8080 PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	EP TOX Metals (8) EP EXT	Priority Pollutant Metals (13)	TCLP ONLY: 8080 Pesticide (4)	TCLP ONLY: 8240 ZH-EXT	TCLP ONLY: 8270	TCLP ONLY: 8150 Herbicides (2)	TCLP ONLY: Metals (8)	Composite for 10/12		NUMBER OF CONTAINERS
911012-1	10/12/91	1230	Soil	1												X												X		2
911012-2	↓	1230	↓	2												X												X		2
911012-3		1230		3												X												X		2
911012-4	↓	1230	↓	4												X												X		2

PROJECT INFORMATION	
PROJECT NUMBER: 0161-205-R04	
PROJECT NAME: Unocal/Coupeville	
PURCHASE ORDER NUMBER:	
ONGOING PROJECT? YES ☒ NO ☐	

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	8
COC SEALS/INTACT? Y/N/NA	Y
RECEIVED GOOD COND./COLD	Y
RECEIVED VIA:	Courier

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☐ 2WKS (RUSH) ☐ 24HR ☒ 48 HRS ☐ 72 HRS ☐ 1 WK

GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS:
Fax results to Chuck Lindsay
Composite 2 jars of each before running

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Time: Charles S. Lindsay 0745	Signature: Time:	Signature: Time:
Printed Name: Date: Charles S. Lindsay 10/15	Printed Name: Date:	Printed Name: Date:
Company: GEI	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time: 1000A	Signature: Time:	Signature: Time:
Printed Name: Date: V. PENNICK 10/14-91	Printed Name: Date:	Printed Name: Date:
Company: ATI-WA	Company:	Analytical Technologies, Inc.

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B – 100

AnalyticalTechnologies,Inc.

ATI I.D. # 9110-185

GENERAL CHEMISTRY QUALITY CONTROL

CLIENT : GEOENGINEERS, INC. SAMPLE MATRIX : SOIL
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL/COUPEVILLE

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
PETROLEUM HYDROCARBONS	mg/Kg	9110-183-21	8	8	0	260	250	100

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

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D. # 9110-185

GENERAL CHEMISTRY RESULTS

CLIENT	: GEOENGINEERS, INC.	DATE EXTRACTED	: 10/14/91
PROJECT #	: 0161-205-R04	DATE ANALYZED	: 10/14/91
PROJECT NAME	: UNOCAL/COUPEVILLE	MATRIX	: SOIL
		UNITS	: mg/Kg

ATI I.D. #	CLIENT I.D.	PETROLEUM HYDROCARBONS
9110-185	REAGENT BLANK	<5
9110-185-1	911012-1	260
9110-185-2	911012-2	180
9110-185-3	911012-3	230
9110-185-4	911012-4	49

Analytical Technologies, Inc.

ATI I.D. # 9110-185

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

ANALYSIS	TECHNIQUE	REFERENCE	LAB
PETROLEUM HYDROCARBONS	IR	EPA 418.1	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. # 9110-185

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
9110-185-1	911012-1	10/12/91	SOIL
9110-185-2	911012-2	10/12/91	SOIL
9110-185-3	911012-3	10/12/91	SOIL
9110-185-4	911012-4	10/12/91	SOIL

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	4

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. 560 Naches Avenue, S.W., Suite 101, Renton, WA 98055, (206) 228-8335

ATI I.D. # 9110-185

GeoEngineers

OCT 17 1991

Routing CSL

File

October 15, 1991

GeoEngineers
8410-154th Ave N.E.
Redmond, WA 98052

Attention : Charles S. Lindsay

Project Number : 0161-205-R04

Project Name : Unocal - Coupeville

On October 14, 1991, Analytical Technologies, Inc1, received 4 soil 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.

Bob A. Olsiewski
Project Manager

Frederick W. Grothkopp
Laboratory Manager

FWG/hal/cn

AnalyticalTechnologies,Inc.
560 Naches Avenue SW, Suite 101 Renton,WA 98055 (206)228-8335

VOA/D2

Chain of Custody

DATE 10/2/91 PAGE 1 OF 1

LABORATORY NUMBER: 9110-040

PROJECT MANAGER: Chuck Lindsay
COMPANY: GEI
ADDRESS: Redmond, WA
PHONE: 861-6000 SAMPLED BY: CAH

SAMPLE DISPOSAL INSTRUCTIONS
☒ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	8010 Halogenated Volatiles	8020 Aromatic Volatiles	8020 BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	8080 PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	EP TOX Metals (8) EP EXT	Priority Pollutant Metals (13)	TCLP ONLY: 8080 Pesticide (4)	TCLP ONLY: 8240 ZH-EXT	TCLP ONLY: 8270	TCLP ONLY: 8150 Herbicides (2)	TCLP ONLY: Metals (8)	COMPOSITE		NUMBER OF CONTAINERS
911002-1	10/2/91	1240	Soil	-1												X		X											X		2
911002-2	↓	1245	↓	2												X													X		2
911002-3	↓	1250	↓	3			X									X		X											X		2
911002-4	↓	1230	↓	4												X													X		2
911002-5	↓	1235	↓	5												X		X											X		2
911002-6	↓	1300	↓	6			X									X													X		2

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJECT NUMBER:	0161-205-R04	TOTAL NUMBER OF CONTAINERS	12
PROJECT NAME:	Unocal Conconville	COC SEALS/INTACT? Y/N/NA	Y/Y
PURCHASE ORDER NUMBER:		RECEIVED GOOD COND./COLD	Y/Y
ONGOING PROJECT?	YES ☒ NO ☐	RECEIVED VIA: COURIER	✓

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS
TAT: (NORMAL) ☐ 2WKS (RUSH) ☐ 24HR ☐ 48 HRS ☐ 72 HRS ☒ 1 WK
GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS:
Composite both Sample Jars prior to analysis.

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: [signature] Time: 1700	Signature: Time:	Signature: Time:
Printed Name: Craig H[...] Date: 10/2/91	Printed Name: Date:	Printed Name: Date:
Company: GEI	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: [signature] Time: 1010A	Signature: Time:	Signature: Time:
Printed Name: V PENNICK Date: 10-3-91	Printed Name: Date:	Printed Name: Date:
Company: ATI	Company:	Analytical Technologies, Inc.

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AnalyticalTechnologies,Inc.

ATI I.D. # 9110-040

GENERAL CHEMISTRY QU[illegible] CONTROL

CLIENT : GEOENGINEERS, INC.
PROJECT # : 0161-205-R04
PROJECT NAME : UNOCAL - COUPEVILLE

[illegible]NALYZED : 10/05/91
: SOIL
: %

PARAMETER	ATI I.D.	SAMPL[illegible] RESULT	[illegible]	[illegible]	SPIKED RESULT	SPIKE ADDED	% REC
MOISTURE	9110-050-11	21	21	0	N/A	N/A	N/A

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

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$