

NORTHWEST GEOLOGICAL SERVICES, INC.

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12 December 1994

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MAY 7 1996

Attention: Mr. Steve Hill

Subject: Results of Additional Sampling and Analyses
Longview City Laundry and Cleaners Site

NORTHWEST REGION

Dear Steve:

The purpose of this letter is to summarize the results of the additional work conducted at the Longview City Laundry and Cleaners Site on NW Nela St. The work consisted of:

- * installation of 3 monitoring wells (MW-1, -2 and -3);
- * analyses of soil samples collected during drilling;
- * sampling and analyses of water from the three wells;
- * measurement of water levels in the three new wells and two wells at the Marathon site (B-8 and B-14); and
- * review and preliminary interpretation of the results.

The work and results are discussed in the following sections.

Drilling, Sampling, and Well Installation

Field work at the Longview City Laundry and Cleaners (LCL&C) was performed in cooperation with the City of Portland. Work was conducted under the QA/QC procedures approved by DEQ for the Marathon U.S. Realties Inc. Remedial Investigation (NGS, 1989). The work included drilling three borings, soil sampling and analysis, installation of monitoring wells in the borings, well development, water level measurements, surveying, and ground water sampling and analysis. Figures 1 and 2 show approximate well locations and ground water elevations. Logs of the borings are included in Appendix A, together with logs from the 1992 borings B-201 and B-202.

Drilling was performed by GeoTech Explorations under contract to the City of Portland. Tom Pfeiffer of the City of Portland supervised the drilling. Surveying and some well development were also performed by or under the direction of the City.

James Pyne with Northwest Geological Services, Inc. (NGS), observed the drilling, assisted with soil sampling and logged the borings. During drilling, NGS monitored the samples and borings for volatile organic emissions with a GasTech. Pyne

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also assisted with installation of the three wells, developed one well, and collected the ground water samples. NGS delivered the soil and water samples to Coffey Laboratories in Portland, Oregon for analyses.

MW-1 - Monitoring well MW-1 was drilled to a depth of 35.5 ft near the northwest corner of the site on 11 November 1994. Continuous soil sampling was attempted in the upper 12 feet of the boring, with wider spaced sampling below 12 feet. The boring encountered 5 feet of silty fill, beginning immediately below the asphalt paving. Sandy dredge fill was found between depths of 5 and 31.2 feet. The dredge sand rests on a deposit of clayey silt alluvium.

No landfill or ash deposits were encountered in MW-1, and no evidence of hydrocarbons were observed during drilling. Samples from depths of 10½-12 ft and 15-16½ ft were submitted for analyses for hydrocarbons.

A 2" diameter piezometer was installed in MW-1 on 11 November 1994, upon completion of the boring. The installation details are noted on the log (Appendix A). Water in MW-1 was first noted at approximately 14.6 ft below ground surface when drilled. Depth to water was 13.21 ft in the well on 14 November 1994, and 12.99 ft. on 23 November 1994.

MW-2 - Monitoring well MW-2 was drilled to a depth of 31.5 feet near the northeast corner of the building on 12 November 1994. It is about 40 ft northwest of B-201 (drilled in 1992a). Continuous soil sampling was attempted in the upper 15 feet of the boring, but sample recovery was poor. The boring encountered about 4 feet of surficial fill underlain by mixed ash and landfill debris to a depth of 29 feet. This fill contains an abundance of ash, glass and metal fragments, and wood debris. Heavy oil product (diesel, as discussed below) was found near the ground water surface at a depth of about 18 feet in the ash and landfill debris. Clayey silt alluvium underlies the ash and landfill debris. Samples from depths of 5½-6 ft, 11-11½ ft and 19-19.3 ft were submitted for analyses for hydrocarbons.

A 2" diameter piezometer was installed in MW-2 on 12 November 1994, upon completion of the boring. The installation details are noted on the log (Appendix A). The depth to water in MW-2 was approximately 18 ft when drilled. By 23 November 1994, the SWL was at a depth of 14.1 ft.

MW-3 - Monitoring well MW-3 was drilled to a depth of 36.5 ft at the southwest corner of the property on 14 November 1994. The boring encountered asphalt pavement, base rock, and construction fill to a depth of 8 feet. Mixed ash and landfill debris extended from 8 to 20 feet, and dredge fill was found between 20 and 35 feet. Silty clay alluvium was found below 35 feet. The boring encountered no hydrocarbons at the ground water

surface. However, some old and weathered hydrocarbon was found at a depth of 20 feet, in the top of the dredge fill. Samples from depths of 13-14 ft, 15½-17 ft, 22½-24 ft and 32-33½ ft were submitted for analyses for hydrocarbons.

A 2" diameter piezometer was installed in MW-3 on 14 November upon completion of the boring. The installation details are noted on the log (Appendix A). The depth to water in MW-3 was approximately 14 ft when drilled. On 23 November 1994, the SWL was at a depth of approximately 13.8 ft.

Well Development

Well development was performed by hand bailing. About 70 gallons were removed from MW-1 on 14 November 1994 by NGS. The City bailed 50 gallons from MW-3 on 17 November and 50 gallons from MW-2 on 28 November 1994. The water bailed from MW-2 was placed in a drum to retain the free hydrocarbon product floating on the ground water surface.

Ground Water Levels

Ground water measurements were made by NGS from the three site wells and from two wells on the Marathon site (identified as B-8 and B-14, NGS, 1990b) on 23 and 28 November 1994. The 28 November measurements were made just prior to sampling MW-1 through MW-3. Figures 1 and 2 show the ground water elevations and gradients found. Depths to ground water were also measured during drilling (11 through 14 November 1994).

The 23 and 28 November measurements show a relatively flat gradient (Figures 1 and 2). The flow is generally away from the former City Landfill, and is similar to the winter (wet season) flow directions measured previously at the Marathon site (NGS, 1992b). At LCL&C, flow appears to be from the east-south-east to the west-northwest (ie., both the Nudelman and Marathon sites are upgradient).

At the nearby Marathon site, the gradient in the main part of the former City landfill has been observed to swing from a southwest flow during the dry season (generally June through October) to a west to north-northwest flow during the wet season (NGS, 1990a). This gradient change is consistent with the changes in water levels observed in the wells between 11 to 13 November 1994 (when the wells were drilled) and 23 November (after elevations were surveyed).

The water levels measured during drilling are not precise because of the disturbance from drilling. However, they provide an indication of what the gradient was before the heavy fall rains began (1.73 inches of rain fell from 12 through 23 November 1994). The measurements during drilling (11 to 13 November 1994) suggest that the static water level (SWL) elevations in MW-1 and

MW-3 were about 20 ft, and that MW-3 was about 17 to 18 ft. Even though these elevations are imprecise, they are different enough from those measured later to suggest that, before the heavy rains, the gradient was nearly opposite that observed on 23 and 28 November 1994.

Results of Chemical Analyses

As discussed previously, nine samples of soil and three samples of ground water were analyzed for hydrocarbons (Oregon DEQ HCID). Additionally, the ground water four samples of soil were analyzed for volatile organics (EPA 624) and polynuclear aromatic hydrocarbons (PAH by EPA 627). Duplicate samples of soil and ground water were analyzed. Travel and decon blanks were also analyzed for the ground water samples. Analyses were done by Coffey Laboratories, using DEQ and/or EPA approved procedures. Results are summarized in Table 1, which includes results from the 1992 samples for comparison. Lab reports, HCID chromatograms, and custody records are included in Appendix A.

No hydrocarbons or volatiles were detected in the soil samples or ground water sample from MW-1.

No hydrocarbons or volatile organics were detected in the soil sample from just above the water table in MW-3 (MW-3/5), or in the ground water sample from MW-3. Diesel range hydrocarbons were detected in two samples from below the water table in MW-3. The hydrocarbons were found in both the landfill debris (at 15½-17 ft) and the top of the underlying dredge fill (22½-24 ft). The sample of landfill debris from MW-3 contained 4,800 mg/kg TPH-D and consisted of fragments of black wood, metal, and glass in a matrix of sandy, silty ash. The top of the dredge fill in MW-3 contained some landfill material. Soil sample MW-3/9 consisted primarily of fine to medium sand, but also contained abundant glass and metal fragments and had a sheen of hydrocarbon. Field screening with the GasTech indicated that the MW-3 samples contained few or no volatile constituents.

In MW-2, diesel-range hydrocarbons were detected in a shallow soil sample (MW-2/2); however, no hydrocarbons were detected in the soil sample from just above the water table (MW-2/5). All samples below the water table contained abundant hydrocarbon. However, free, floating product was present at the water table, so some of the hydrocarbon in the soil samples from 22½-24 ft and 25-26½ ft may have been carried down by the auger.

Analysis of a representative soil sample (MW-2/8) found 18,000 mg/kg diesel, as well as volatile organics and polynuclear aromatic hydrocarbons characteristic of both diesel and gasoline (see Table 1). The ground water sample from MW-2 also contained diesel through gasoline range hydrocarbons and BTEX, but no polynuclear aromatic hydrocarbons (see Table 1 and Appendix A, 2 December 1994 letter from Coffey Labs).

Interpretation

The work done at LCL&C in 1992 (NGS report dated 1 July 1992a) included the drilling and sampling of two borings. They were located near the southeast corner of the LCL&C building (B-202) and in the northeast part of the site, near the buildings on the adjacent Nudelman property (B-202, see Figure 1). The sampling and analyses of these borings found:

- * landfill debris, incinerator ash, and mixed ash and debris characteristic of the former City landfill;
- * no detectable hydrocarbons in soil samples collected above the water table; and
- * large concentrations of diesel and mineral spirits in ground water, and in the soil at and below the water table in the north boring (B-201), and a much lesser amount of diesel in the ground water from the south boring (B-202).

The presence of volatile organics (BTEX) in the soil sample from B-201, and the HCID chromatogram of the sample, indicate that the mineral spirits were fresh, and that the diesel was weathered, but much more fresh, than hydrocarbons typically found in the old City landfill.^[1] Gasoline was not detected in any of the samples. Because the "old" hydrocarbons, characteristic of the former landfill, have been largely stripped of volatile and water-soluble organics, it was concluded that the diesel and mineral spirits originated from a recent release. Because the soils above the water table were free of hydrocarbons, it was also concluded that the release had migrated to LCL&C both as floating product and as soluble organics in the ground water. Information from monitoring the water levels at the adjacent Marathon site suggested that the gradient was from the east in winter, and northeast in summer. The recent water levels, samples, and analyses are consistent with, and support, these earlier interpretations and conclusions.

LCL&C has not stored mineral spirits, gasoline, kerosene or diesel on site, nor have its tenants.^[2] There are no UST's on the property at present, nor are there any indications that there have ever been USTs on the property. There are no floor

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1. The "old" diesel-range hydrocarbons in the landfill were characterized in the Removal Plan/Removal Report for the Marathon Site (NGS, 1989). The "old" hydrocarbons are readily distinguished by field screening with a GasTech calibrated to hexane. The GasTech headspace measurements of the old hydrocarbons are below 40 to 50 ppm. The weathered diesel in B-201, B-202 and MW-1 had headspace measurements greater than 500 ppm.
 2. In our 1992 Phase 2 study, we opined that a previous tenant, Harcross Chemical could have stored and sold paint solvents. We have been assured by Mr. Charles Cota broker for LCL&C, and Mr. Howard Brune, trustee for LCL&C, that Harcross sold and stored only packages of dry, powdered chemicals and paint pigment.

drains in the LCL&C building, and the building is downgradient of the hydrocarbons found in the soil and ground water. Consequently, there is no logical source of hydrocarbons from the known past and present uses of the LCL&C building, and no reasonable pathway from the building to the hydrocarbon-contaminated soil and ground water.

The entire site is covered by the building or asphaltic concrete pavement. The pavements are sloped to catch basins that drain to drywells. The catchbasins and drywells are north and south of the LCL&C property. The locations of the catch basins are crossgradient and downgradient from the hydrocarbons found in MW-2, B-201 and B-202. The other new wells, MW-1 and MW-3 are much closer to, and some of the year, downgradient of, the catchbasins. In our experience, releases that were large enough to migrate upgradient or cross gradient from one of the catch basins to MW-2, B-201 and B-202 would have also spread downgradient and impacted the water and soils in MW-1 and MW-2. Consequently, releases to the catch basins are not a credible source for the hydrocarbons.

It could be argued that the diesel and mineral spirits found in 1992 originated from releases at the truck terminal that occupied the property until 1966. Aerial photos indicate that the part of the terminal at LCL&C was gravel paved. Thus releases of hydrocarbons from trucks parked at the terminal could have penetrated into soils of the former landfill. However, there are several observations that contradict this argument.

First, the wet season gradient calculated from measurements in the new wells at LCL&L is as previously inferred: from the direction of The Nudelman and Marathon properties towards LCL&C. Second, hydrocarbons have been found only in the ground water beneath the upgradient, eastern, part of the site (ie., MW-2, B-201, B-202). Contamination of soil by relatively fresh hydrocarbons (see footnotes 1 and 2) is likewise limited to the east part of the site, and to soils at or below the water table. If the hydrocarbons in B-201, B-202 and MW-2 resulted from a surface release at the site, there should be some evidence of the release in soil above the water table. However, the soil above the water shows no evidence of such a release.

The wells and borings at LCL&C are fairly widely spaced, so it could be argued that the studies simply missed a large zone of hydrocarbon contamination (presumably from the former truck terminal) above the water table. This argument has little credence, because if such a release were present, it would have been present more than 26 years; since before the LCL&C building was built and the site paved in 1966. The landfill soils are relatively permeable, so a surface release large enough to produce the contamination observed in B-201 and MW-1 would reach the water table in a short time (a few days to weeks). The ground water velocity in the relatively permeable incinerator ash is on

the order of 3 ft per week during the wet season (Marathon RI, section 3.5.5; NGS, 1990a). The wet season lasts about 20 weeks. Thus, a release from the former truck terminal would have migrated several hundred feet by now.

As discussed above, water levels indicate the wet season gradient is from east-southeast to west-northwest. The floating product and water soluble fractions at and near MW-2 (and B-201 and B-201) must move towards MW-1 at least several weeks of the year. Consequently, if a release from the former truck terminal produced the hydrocarbons now present in MW-2, these same hydrocarbons should -- after more than 26 wet seasons -- be found in MW-1. Yet, hydrocarbons have not been found in MW-1.

The gradient changes in the area would also cause a hydrocarbon plume to spread laterally. This spread, combined with the southwest dry-season gradient, should cause the hydrocarbons found in MW-2 to move towards MW-3. After more than 26 years, they should have reached MW-3; however, like MW-1, the ground water in MW-3 has no detectable hydrocarbons.

The evolving composition of the hydrocarbons also argues strongly for an offsite source. As noted previously, MW-2 is located about 40 ft northwest of B-201. MW-2 is downgradient from the hydrocarbon found in B-201 throughout the wet season. If the diesel or mineral spirits in B-201 originated from a pre-1966 release at the truck terminal formerly located at LCL&C, one should find the same hydrocarbons in MW-2 as found previously in B-201. This is not the case.

The HCID chromatograms of the April 1992 sample from B-201 clearly shows distinct peaks for diesel and mineral spirits. The diesel chromatogram peak extends from C₁₄ to C₂₈, is centered about C₂₁, and lacks the sharp, periodic peaks characteristic of fresh product (eg. Appendix B, compare B-201/W1 and B-202/W1/W2 with the gas/diesel standard B-105/23). The mineral spirit peaks are numerous and similar to those for fresh product (compare Appendix B, B-201/W1 with the mineral spirit standard in the C₆ to C₁₂ range). The volatile organic analyses found benzene, toluene, ethylbenzene and xylene indicating that at least some of the hydrocarbon in the water was fresh enough to retain volatile constituents (see Table 1).

The sample of ground water collected from MW-2 in November 1994 was quite different from the sample collected 40 ft upgradient in April 1992 from B-201. The MW-2 sample contained hydrocarbons that range from C₆ to beyond C₂₈. This range includes products from the light end of gasoline through mineral spirits, kerosene and diesel. Coffey Laboratories compared the HCID chromatograms (Appendix B) and concluded that the hydrocarbons in MW-2 are: 1) a mixture of severely weathered diesel (and breakdown products of diesel), gasoline, mineral spirits,

and kerosene; and 2) are different than those found in B-201 in 1992.

Conclusions

There are several observations that indicate offsite releases were the source of the hydrocarbons found in B-201, B-202 and MW-1 at the LCL&C property. These are:

- 1) ^{MW-2} The lack of a source for the diesel, kerosene, mineral spirits and gasoline, the lack of logical pathways to the ground water at LCL&C, and the lack of hydrocarbons in the wells nearest the catchbasins, preclude releases from the building, or to the catchbasins as source for the hydrocarbons at and near MW-2.
- 2) The lack of contamination in shallow soils, the ground water gradient and velocity, and the lack of contamination in ground water in MW-1 and MW-3 preclude an old release at the former truck terminal as the source of the hydrocarbons.
- 3) The changes in the composition of the hydrocarbons, the lack of hydrocarbons in soil above the water table, and the ground water gradient all indicate migration of the hydrocarbons to LCL&C from elsewhere.

Recommendations

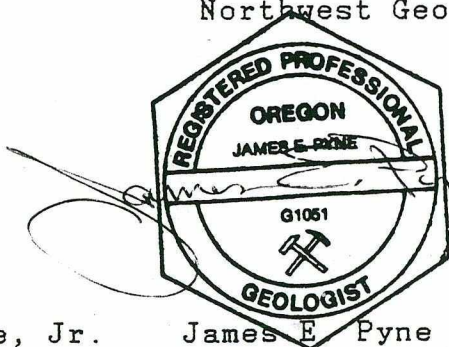
In our opinion, continued monitoring could refine our knowledge of gradient fluctuations, but would not significantly alter our conclusions that the release migrated to LCL&C from elsewhere. Likewise, if future sampling were to detect hydrocarbons in MW-1 or MW-2 it could aid in identification of the off site source, but it would not change the conclusion that the source was and is offsite.

If you have questions about our report or conclusions, please call us.

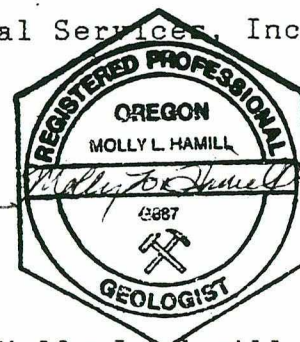
Yours very truly,
Northwest Geological Services, Inc.



C.F. (Rick) Kienle, Jr.
Vice President



James E. Pyne
Vice President



Molly L. Hamill
President

References

Northwest Geological Services, Inc., 1990a, Focused Remedial Investigation, Marathon U.S. Realities, Inc.'s Facility at 2615 - 2619 N.W. Industrial Street, Portland, OR: report to Oregon Department of Environmental Quality, Environmental Cleanup Division, Vol. 1, 17 January.

_____, 1990b, Removal Plan/Removal Report; Marathon Property, 2615-2619 N.W. Industrial, Portland, OR - Removal of Hydrocarbons: report to Oregon Department of Environmental Quality, Environmental Cleanup Division, 23 October.

_____, 1992a, Potential Soil and Ground Water Contamination 2737 N.W. Nela Street, Building D, Phase 2 Investigation: prepared for Mr. Howard Brune, Longview City Laundry & Cleaners, 1 July.

_____, 1992b, Ground Water Monitoring: April 1990 - July 1992, Marathon U.S. Realities, Inc.'s Facility at 2615 -2619 N.W. Industrial, Portland, OR: prepared for Marathon U.S. Realities, 30 July.

TABLE 1: LONGVIEW CITY LAUNDRY AND CLEANERS - ADDITIONAL PHASE 2
Purgable Halocarbons, Aromatics, PAH, HClD and PCBs - Soil

Location	Sample #	Date	Depth (feet)	Benzene	Toluene	Ethyl-benzene	Total Xylene	sec-Butyl-benzene	Isopropyl-benzene	4-Iso-propyl-toluene	Methylene chloride	n-Propyl-benzene	1,2,4-Tri-methyl-benzene	1,3,5-Tri-methyl-benzene	m/p-Xylene	o-Xylene	HClD	Gasoline	Diesel	Mineral Spirits	Naph-thalene	Fluor-anthene	Phenan-threne	PCB Aroclor 1260
B-201	1B	13-Apr-92	5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1
B-201	2B	13-Apr-92	10.5	<0.2	<0.2	<0.2	<0.2	-	-	-	<0.2	-	-	-	-	-	-	<10	<25	<35	-	-	-	<0.1
B-201	3B	13-Apr-92	16.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<600	3200	<1500	-	-	-	4.0 (trace)
B-201	5B	13-Apr-92	25.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<60	850	460	-	-	-	<0.1
B-201	7A	13-Apr-92	35.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	<25	<35	-	-	-	-
B-202	3B	13-Apr-92	15.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<60	200	<200	-	-	-	<0.1
B-202	6B	13-Apr-92	27.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<60	300	<200	-	-	-	-
B-202	7A	13-Apr-92	30.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<60	300	<200	-	-	-	<0.1
B-202	8A	13-Apr-92	33.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	<25	<35	-	-	-	-
MW-1	7	11-Nov-94	10.5-12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-
MW-1	8	11-Nov-94	15.0-16.5	<0.2	<0.2	<0.2	-	<0.8	<0.2	<0.8	<0.2	<0.8	<0.2	<0.8	<0.2	<0.2	ND	-	-	-	<0.2	-	-	-
MW-2	2	12-Nov-94	5.5-6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	diesel	-	2000	-	-	-	-	-
MW-2	5	12-Nov-94	11.0-11.5	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-
MW-2	8	12-Nov-94	19.0-19.3	1.7	2.1	3.9	-	0.8	0.5	2.0	<0.2	1.0	16	3.5	22	6.1	diesel & gas	18000	-	-	21	12	7.2	-
	8 dupe																				21	11		
MW-3	5	14-Nov-94	13.0-14.0	<0.2	0.2	<0.2	-	<0.8	<0.2	<0.8	<0.2	<0.8	<0.2	<0.8	<0.2	<0.2	ND	-	-	-	<0.2	<0.15	<0.15	-
MW-3	7	14-Nov-94	15.5-17.0	-	-	-	-	-	-	-	-	-	-	-	-	-	diesel	-	4800	-	-	-	-	-
MW-3	9	14-Nov-94	22.5-24.0	-	-	-	-	-	-	-	-	-	-	-	-	-	diesel	-	500	-	-	-	-	-
MW-3	13	14-Nov-94	32.0-33.5	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	-	-	-	-	-	-	-

Purgable Halocarbons, Aromatics, PAH, HClD and PCBs - Ground Water

Location	Sample #	Date	Depth (feet)	Benzene	Toluene	Ethyl-benzene	Total Xylene	sec-Butyl-benzene	Isopropyl-benzene	4-Iso-propyl-toluene	Methylene chloride	n-Propyl-benzene	1,2,4-Tri-methyl-benzene	1,3,5-Tri-methyl-benzene	m/p-Xylene	o-Xylene	HClD	Gasoline	Diesel	Mineral Spirits	Naph-thalene	Fluor-anthene	Phenan-threne	PCB Aroclor 1260
B-201	W1	13-Apr-92	17.3	74	5.2	20	76	-	-	-	<0.2	-	-	-	-	-	-	<600	40000	6800	-	-	-	<4.0
B-202	W1	13-Apr-92	17.3	1.2	<0.2	<0.2	0.8	-	-	-	<0.2	-	-	-	-	-	-	<600	12000	<2500	-	-	-	<4.0
B-202	W2	13-Apr-92	17.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15000	-	-	-	-	-
MW-1	W1	28-Nov-94		<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	<0.5	<0.5	ND	-	-	-	<15	<1.5	<5	-
MW-2	W1	28-Nov-94		730	230	36	-	-	-	-	-	-	-	-	140	170	gas - 2400 ppb 56 diesel & gas	(12000)?	-	-	<200ND	<20ND	<50ND	-
MW-2	dupe			810	270	44	-	-	-	-	-	-	-	-	170	170	63 diesel & gas	(13000)?	-	-	-	-	-	-
MW-3	W1	28-Nov-94		<0.5	<0.5	<0.5ND	-	-	-	-	-	-	-	-	<0.5	<0.5	ND	-	-	-	<15	<1.5	<5	-

- NOTES: 1. All concentrations for soil in mg/kg; for ground water in ug/l)
2. "<" followed by number denotes below stated detection limit
3. "-" denotes not tested for parameter listed.
4. See laboratory reports for analysis method.
5. No organic compounds other than those listed were found in the soil or water samples.

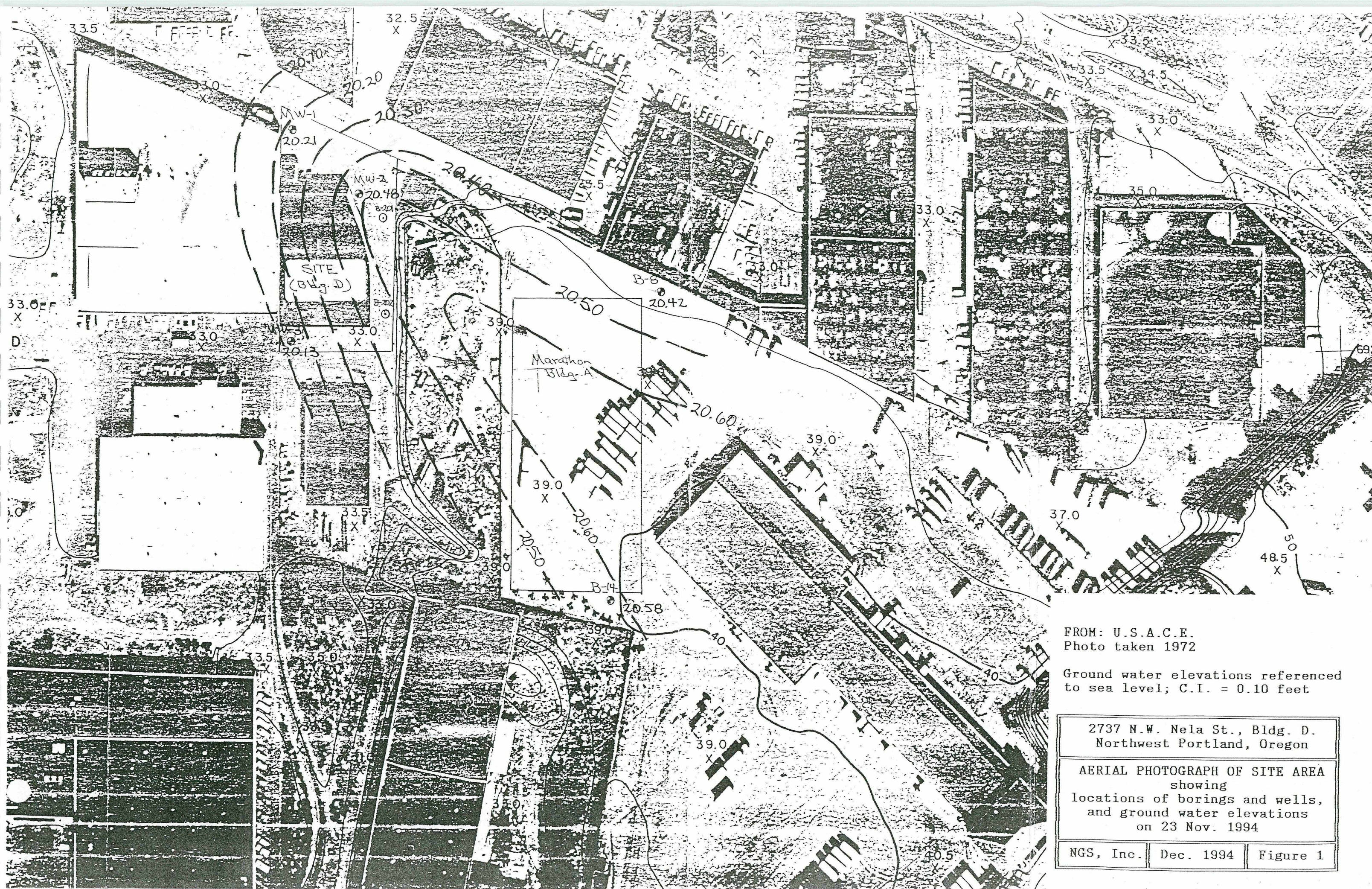
APPENDIX A

WELL LOGS

ORIGINAL LABORATORY REPORTS

CHROMATOGRAMS

WATER LEVEL MAPS



FROM: U.S.A.C.E.
Photo taken 1972

Ground water elevations referenced
to sea level; C.I. = 0.10 feet

2737 N.W. Nela St., Bldg. D.
Northwest Portland, Oregon

AERIAL PHOTOGRAPH OF SITE AREA
showing
locations of borings and wells,
and ground water elevations
on 23 Nov. 1994

NGS, Inc. | Dec. 1994 | Figure 1

PROJECT <u>Longview City Laundry and Cleaners</u>		JOB # <u>162-1-1</u>		SHEET <u>1</u> OF <u>2</u>		
CLIENT			DRILLER <u>Geotech Explorations</u>			
MEGR. DESIGNATION OF DRILL RIG <u>Cantero 150 Hollow Stem Auger</u>			location sketch			
BIT <u>HSA</u> SIZE <u>7 1/4 OD; 3 1/4 ID</u>						
LOCATION (coordinates) ELEVATION						
TOTAL DEPTH <u>36.5'</u>	FT. CORE <u>0</u>	FT. SOIL <u>36.5'</u>				
DEPTH WATER <u>17.3' (est)</u>		INSPECTOR(S) <u>R. Kienle / J. Pyne</u>		DATE STARTED <u>13 April 1992</u>	DATE COMPLETED <u>13 April 1992</u>	
DEPTH (ft)	GRAPHIC LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	SAMP #	REC RQD	BOX #	REMARKS
		Asphalt pavement over gravel base 0 to 1.0'				09:01 Began drilling
		Gravel and ash in cuttings 1.0 to 5.0'				
5	Mixed Ash + Landfill Debris	Brown ash with gravel and some landfill debris (brick, asphalt); moist	09:13 B-201/1 6/10/B	10"		pH = 8.11 GTA at 10' = 45 ppm Jar spl / 1A 5.2 to 5.5' " " / 1B 5.5 to 5.8' bag spl 5.0 to 5.2'
10	Ash	Red-brown med to fine ash w/ some gravel to 10.5'; wet	09:27 B-201/2 2/10/12	14"		GTA at 10' = 45 ppm pH = 5.12 GTA at 11.5' = 200 ppm GTS = 30 ppm Jar spl / 2A 10.2 to 10.5' " " / 2B 10.5 to 11.0' bag spl 10.0 to 10.2'
15	Mixed Ash + Landfill Debris	Red-brown landfill debris mixed w/ ash 15.0 to 16.0'; wet Grades w/ heavy oil at 16.0' Ground water at 17.3' (on rods)	09:38 B-201/3 10/33/23	16"		pH = 7.91 GTA = 25 ppm; GTS = 15 ppm Jar spl / 3A 15.5 to 16.0' " " / 3B 16.0 to 16.3' bag spl 15.0 to 15.5'
20		Dark grey silty fine sand; oily - 3" of fine ash at base of sample	09:50 B-201/4 5/13/20	11"		pH = 9.0 GTS = 45 ppm Jar spl. / 4A 20.0 to 20.3' " " / 4B 20.3 to 20.6' bag spl 20.6 to 20.9'
25						GTA at 25' = 450 ppm

PROJECT			JOB #		SHEET OF	
Longview City Laundry and Cleaners			162-1-1		2 2	
CLIENT			INSPECTOR(S)			
			R. Kientle / J. Pyne			
DEPTH (ft)	GRAPHIC LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	SAMP #	REC RQD	BOX #	REMARKS
25	Mixed Ash and Landfill Debris	Black fine to med. ash w/ landfill debris (metal scraps, wood); trace oil (looks and smells oily)	10:10 B-201/5 4/16/8	8"		pH = 8.86 GTA = 250 ppm Jar spl /5A 25.0 to 25.3' " " /5B 25.3 to 25.6' no bag spl.
30	Dredge Fill	Dark grey medium sand w/ some fine ash; oily	11:06 B-201/6 11/20 fin 10"	16"		prim to sampling B-201/6, the hole went 3.5'; actual sample drive was 26.5 to 28.0' pH = 8.2 GTS = 125 ppm Jar spl /6A 30.0 to 30.5' " " /6B 30.5 to 31.0' bag spl 31.0 to 31.3'
35	Alluvium	Grades with some fine to med rounded gravel below 35.0'	11:33 B-201/7 9/6	13"		pH = 8.05 GTS = 15 ppm Jar spl /7A 35.5 to 35.9' " " /7B 35.9 to 36.0' bag spl 35.4 to 35.5'
40		Boring completed at 36.5'				
		Ground water sample collected for lab. analyses				
		Initial soil test program:				
		Sample /1B: PCB.				
		" /2B: PCB, metals, mod 8015 and 8010-8020				
		" /3A: metals				
		" /3B: PCB; mod 8015				
		" /5B: PCB; mod 8015				
		" /7A: mod 8015				

PROJECT <u>Longview City Laundry and Cleaners</u>		JOB # <u>162.1-1</u>		SHEET OF <u>1 2</u>		
CLIENT			DRILLER <u>Geotech Explorations</u>			
MEGR. DESIGNATION OF DRILL RIG <u>Contero 150 Hollow Stem Auger</u>			location sketch			
BIT SIZE <u>HSA 7 1/4 OD ; 3 1/4 ID</u>						
LOCATION (coordinates) ELEVATION						
TOTAL DEPTH <u>34.0</u>	FT. CORE <u>0</u>	FT. SOIL <u>34.0</u>				
DEPTH WATER <u>14.1 (est)</u>		INSPECTOR(S) <u>R. Kienle / J. Pyne</u>		DATE STARTED <u>13 April 1992</u>	DATE COMPLETED <u>13 April 1992</u>	
DEPTH (ft)	GRAPHIC LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	SAMP #	REC RQD	BOX #	REMARKS
		Asphalt pavement over gravel base 0 to 1.0'				
5		Brown ash and gravel w/ fragments of brick and concrete 1.0 to 5.0'				
		Grey, red, & brown mixed ash and land fill debris (brick, wood, rock) dump	13:50 B-202/1	12"		pH = 8.8 GTA = 240 ppm; GTS = <10 ppm Jar spl 1/A 5.0 to 5.3' " " 1/B 5.3 to 5.6' bag " 5.6 to 6.0'
10		Red to black and white incinerator ash with traces of metal and brick	13:57 B-202/2	16"		pH = 8.4 GTA = 50 ppm; GTS = <10 ppm Jar spl 1/2A 10.5 to 10.9' " " 1/2B 10.9 to 11.3' bag " 10.0 to 10.5'
15		Red fine to med. ash with zones of tan ash, and some brick and white mineral	14:04 B-202/3	12"		pH = 7.8 GTA = <10 ppm; GTS = <20 ppm Jar spl 1/3A 15.4 to 15.7' " " 1/3B 15.7 to 16.0' bag " 15.0 to 15.4'
20		Dark grey medium ash with fragments of white, grey, and red ash	14:23 B-202/4	12"		pH = 8.7 GTA = 0 Jar spl 1/4A 20.0 to 20.3' " " 1/4B 20.3 to 20.6' bag " 20.6 to 21.0'
25						

PROJECT			JOB #		SHEET OF	
Longview City Laundry and Cleaners			162.1-1		2 2	
CLIENT			INSPECTOR(S)			
DEPTH (ft)	GRAPHIC LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	SAMP #	REC RQD	BOX #	REMARKS
25	Ash	Dark grey medium ash, trace of oil	14:32 B-202/5 25/25	0"		pH = 8.84; GTA = 500 ppm; 6% LEL Jar spl /6A 27.0 to 27.3' " " /6B 27.3 to 27.6' bag " 27.6 to 27.75
			14:45 B-202/6 14/26/30	3"		
30	Alluvium	Black medium ash w/ frags. of wood and rock, oily	14:58 B-202/7 13/8/7	18"		pH = 8.70; GTA = 0 GTA = 14% LEL Jar spl /7A 30.3 to 30.7' " " /7B 31.2 to 31.5' bag " 30.7 to 31.0'
		Greenish-grey clayey silt w/ trace of metal fragments at top; grades clean downward; trace of fine sand; soft	16:00 B-202/8 11/14/19	18"		
35		Boring completed at 34.0' Water sample taken for lab analyses Initial soil test program: Pl. /2B = metals " /3B = PCB, metals, mod 8015 " /6B = mod 8015 " /7A = PCB, metals, mod 8015, and 8010-8020 " /8A = mod 8015				pH = 7.85 Jar spl /8A 33.2 to 33.6' " " /8B 33.6 to 34.0' bag " 32.8 to 33.2'

PROJECT				JOB #			SHEET		OF		
Longview City Laundry & Cleaners							1		2		
CLIENT				INSPECTOR(s)							
				J. Rume / T. Pfeiffer							
DEP. (ft)	LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	EL.	SPL# RUN	%REC %RQD	BOX #	K TEST	REMARKS			
							Sample taken				
0											
				</							

PROJECT				JOB #		SHEET		OF	
Longview City Laundry & Cleaners						2		2	
CLIENT				INSPECTOR(S)					
DEP. (ft)	LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	EL.	SPL#	%REC %RQD	BOX #	K TEST	REMARKS	
30		Dk grey ftn. sand as above	sp1 13	5/5/13	18"/18"		jar bag	pH = 7.52 ; GT = ?	
		Dk grey fine sandy silt grading to clayey silt w/ fine organic debris	sp1 14	7/9/13	18"/18"		bag	pH = 7.45 GT = 45 ppm	
35			sp1 15	7/4/13	18"/13"		jar bag	pH = 7.48 GT = 60 ppm	
		Completed at 35.5 feet on 12 November 1994 Piezometer Installation: bentonite 30.5 to 31.5' sand 31.5 to 30.0' 20' x 2" screen from 30.0 to 10.0' top of sand pack at 8.0' bentonite seal from 8.0 to 5.0' cement slurry 5.0 to 1.0' concrete from 1.0 to 0.0' (concrete around flush mounted well cover is 8" thick) water level at 13.16' below top of PVC at 09:05 hrs on 12 Nov 94 bailed 50 gal at 15:00 hrs on 12 Nov 94 water level at 13.21' below top of PVC at 09:28 hrs on 14 Nov 94 bailed additional 20 gal from well on 14 Nov for a total of 70 gal to date Well sampled for laboratory analysis on 20 Nov. 94							
		GT = Gastector readings on soil samples in plastic bag							

elev. = 34.6'

12 Nov. 94

PROJECT		JOB #			SHEET OF	
Longview City Laundry & Cleaners					1	1
CLIENT			INSPECTOR(S)			
			J. Pyne / T. Pfeiffer			
DEPTH (ft)	GRAPHIC LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	SAMP #	REC RQD	BOX #	REMARKS
0		Asphalt surface				
	fill	0.2' asphalt over crushed stone w/ a matrix of silty sand (fill)				
	fill	Dk brown fine sandy silt w/ some clay and rock frags.	spl 1	18/0	5/3/1	no recovery - rock on bit (used split spoon)
5		Block paper(?) ash w/ glass frags and landfill debris; large ceramic frags at 5.0'	spl 2	12/6		5.5-6.0' 1 jar spl; 1 bag spl. GT=45
		Dk brn to grey f. silt w/ some clay, metal frags & landfill debris	spl 3	18/3	5/2/2	bag spl only GT=25
			spl 4	18/3	6/12/17	bag spl only GT=0
10	Mixed Ash & Landfill Debris	brick and concrete frags in a matrix of dk brn silty sand to sandy silt; metal frags	spl 5	18/15	13/17/16	1 jar spl 11.0 ft 11.5' 1 bag spl GT=0
		Red sand to coarse gravel-size brick frags. w/ some gravel	spl 6	18/3	10/11/12	1 bag spl GT=35
15		lt brn silty sand w/ some fine gravel	spl 7	12/2	13/48	1 bag spl GT=25
						Auger plug dry at 18'
GW V		lt grey to black ash w/ metal and glass frags; abundant hydrocarbon (fuel product on top of gravel & water; gw estimated at 18.5' - very strong diesel odor	spl 8	18/15	12/9/30	1 jar spl 19.0 ft 19.3' GT at top of auger = 500+
20		not distinction at 22.5' - down samples - no sample retained	spl 9	2"/0"	40	no recovery no GT
25		black silty sand w/ some gravel - abundant hydrocarbon (followed down the drill from 18.5') - Abundant hydrocarbon	spl 10	18/2	13/9/8	bag spl no GT
30		Dk Grey Clayey Silt w/ fine organic debris (alluvium)	spl 11	18/16	19/3/5	bag spl no GT jar spl 31.0 ft 31.2'
		Completed at 31.5' on 12 Nov. 94				

(over)

MW-2

Piezo Installation:

buttonite 31.5 to 29.0'

sand 29.0 to 28.0'

15' screen from 29 to 13 feet

top of sand pack at 11 feet

buttonite seal 11 to 8 feet

cement slurry 8 to 1 foot

piezocore in concrete 1' to surface

2" piezo; flush mount

City Portland developed MW-2 by
bailing 50 gal into a steel drum on
28 Nov, 94

Well was sampled for laboratory
analysis on 28 Nov. 94

REV. 34-19'

14 Nov 94

PROJECT Longview City Laundry & Cleaners				JOB #		SHEET OF 1 2		
CLIENT				INSPECTOR(s)				
DEP. (ft)	LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	EL.	SPL# RUN	REC LOG	BOX #	TEST	REMARKS
0		Asphalt surface						Began drilling at 09:22 hrs on 14 Nov. 94 at SW corner of site
	Asphalt base	2 1/2" of asphaltic concrete underlain by coarse crushed rock (2-4" size) in matrix of silty sand & sandy silt						
5	Fill	Dark grey silty f-c sand and sandy-silt w/ some gravel		spl 1	18/0	4/4/3		no recovery - base rock in bit
				spl 2	18/0	3/4/4	GT=10	base rock following auger down - no recovery
		base of fill at 8' (estimated)		spl 3	18/0	4/3/2		1 bag spl from auger flt. no recovery
2	Mixed Ash & landfill Debris	Rust brown to black silty sand w/ abundant land fill debris (glass, metal, ash):		spl 4	18/6	10/7/7		1 Jan spl
7	Ash	Mottled rust brown & black silty sand size frags of ash, w/ some glass frags (wrt)		spl 5	18/12	7/4/16	GT=35	1 Jan; 1 bag spl - water level estimated at 14 feet
15	Mixed Ash & landfill Debris	Black wood fragments, metal, glass in a matrix of sandy silt (ash).		spl 6	18/6	4/3/3	GT=40	1 bag spl only
				spl 7	18/8	2/5/6		1 Jan spl only
20								
	Dredge fill	Top of dredge fill at 20' ± dk grey f-mel sand w/ abundant glass & metal frags; Old hydrocarbon sheen on sample		spl 8	18/3		GT=30	1 bag spl only
				spl 9	18/12	5/4/5	GT=25	1 Jan; 1 bag spl
25				spl 10	18/0			no recovery
				spl 11	18/0	1/6/6		no recovery
30								

PROJECT				JOB #		SHEET OF		
CLIENT				INSPECTOR(s)				
DEP. (ft)	LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	EL.	SPL# RUN	%REC %RQD	BOX #	K TEST	REMARKS
30	Dredge Fill	dark gray fine to med sand w/ trace of silt		spl 12	18/18	4/4/7	GT=200	1 bag spl
				spl 13	12/18	3/3/6	GT=130	1 bag; 1 jar spl
35	Alluvium	dk gray clayey silt w/ fine organic debris		spl 14	18/18	2/3/5	GT=130	1 jar; 1 bag spl
		Boring completed at 36.5' on 14 Nov. 94						
		Piezometer Installation: bentonite from 36.5 to 34.0' sand from 34.0 to 30.0' 20' x 2" well screen from 30.0 to 10.0' top of sand pack at 7.5' bentonite seal from 7.5 to 4.5' cement slurry from 4.5 to 2.0' concrete from 2.0 to 0.0' flush mounted well cover						
		Well was developed by City of Portland & by boring 50 gal on 17 Nov. 94						
		water level measured at 13.83' at 14:06 hrs on 23 Nov 94 and 13.78' on 28 Nov 94						
		water sampled for laboratory analysis on 28 Nov. 94						



Report Date: December 2, 1994
Job Number: 941128AJ
PO Number: None Provided
Project No: None Provided
Project Name: Longview City Laundry & Cleaners

Attention: Rick Kienle
NW Geological Services, Inc.
2505 NE 42nd Ave.
Portland, OR 97213

Analytical Narrative

The samples were received on 11/28/94 by Coffey Laboratories, Inc. (CLI) Sample Reception personnel under strict chain of custody protocol. The following information was provided at the time of sample reception:

Laboratory Sample ID	Field Identification	Matrix	Collection Date	Collection Time
941128AJ-1	MW-1	Ground Water	11/28/94	0955
941128AJ-2	MW-2	Ground Water	11/28/94	1300
941128AJ-3	MW-2D	Ground Water	11/28/94	1310
941128AJ-4	MW-3	Ground Water	11/28/94	1055
941128AJ-5	DB-1	Deionized Water	11/28/94	1025
941128AJ-6	VOC Travel Blank	Deionized Water	NP	NP

The recommended holding time for each batch of analyses was in accordance with the data quality objectives as specified in the CLI Quality Assurance Plan unless otherwise noted.

Acceptable precision and accuracy were achieved for all analyses associated with this work order as demonstrated by the recoveries of the quality control samples analyzed concurrently with each batch.

The data submitted in this report is for the sole and exclusive use of the above-named client. All samples associated with the work order will be retained a maximum of 15 days from the report date or until the maximum holding time expires. All results pertain only to samples submitted.

Thank you for allowing Coffey Laboratories to be of service to you. If you have questions or need further assistance, please do not hesitate to call our Customer Services Department.

Sincerely,

Rona A. Klueh
Technical Director

RAK/atc

COFFEY LABORATORIES, INC.



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 2 of 11

Lab Sample ID: 941128AJ-1

Field ID: MW-1

Date/Time: 11/28/94 0955

Matrix: Ground Water

EPA Category: Volatile Organics

Parameter	Method	Detection Limit	Analytical Result	Units
Benzene	EPA 8260	0.5	ND	µg/L
Ethylbenzene	EPA 8260	0.5	ND	µg/L
Toluene	EPA 8260	0.5	ND	µg/L
m,p-Xylene	EPA 8260	0.5	ND	µg/L
o-Xylene	EPA 8260	0.5	ND	µg/L

EPA Category: Hydrocarbon Scan of water by modified EPA Method 8015, GC/FID.

Parameter	Detection Limit	Sample Results	Units
Gasoline	50	ND	µg/L
Diesel	100	ND	µg/L
Kerosine	100	ND	µg/L
Mineral Spirits	100	ND	µg/L
Jet Fuel	100	ND	µg/L

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 3 of 11

Lab Sample ID: 941128AJ-1

Field ID: MW-1

Date/Time: 11/28/94 0955

Matrix: Ground Water

Analysis Performed: Polynuclear Aromatic Hydrocarbons in water by EPA Method 8310, HPLC.

Compound	Detection Limit	Laboratory Blank	Sample Results
Acenaphthene	15	ND	ND
Acenaphthylene	15	ND	ND
Anthracene	5.0	ND	ND
Benzo(a)anthracene	0.15	ND	ND
Benzo(b)fluoranthene	0.15	ND	ND
Benzo(k)fluoranthene	0.15	ND	ND
Benzo(g,h,i)perylene	0.75	ND	ND
Benzo(a)pyrene	0.75	ND	ND
Chrysene	1.5	ND	ND
Dibenzo(a,h)anthracene	1.5	ND	ND
Fluoranthene	1.5	ND	ND
Fluorene	15	ND	ND
Indeno(1,2,3-c,d)pyrene	0.75	ND	ND
Naphthalene	15	ND	ND
Phenanthrene	5.0	ND	ND
Pyrene	5.0	ND	ND

Results expressed as $\mu\text{g/L}$ unless otherwise noted.

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 4 of 11

Lab Sample ID: 941128AJ-2

Field ID: MW-2

Date/Time: 11/28/94 1300

Matrix: Ground Water

EPA Category: Volatile Organics

Parameter	Method	Detection Limit	Analytical Result	Units
Benzene	EPA 8260	14	730	µg/L
Ethylbenzene	EPA 8260	0.5	45.	µg/L
Toluene	EPA 8260	5.	220	µg/L
m,p-Xylene	EPA 8260	5.	140	µg/L
o-Xylene	EPA 8260	5.	58.	µg/L

EPA Category: Hydrocarbon Scan of water by modified EPA Method 8015, GC/FID.

Parameter	Detection Limit	Sample Results	Units
Gasoline	50	2400	µg/L
Diesel	100	ND	µg/L
Kerosine	100	ND	µg/L
Mineral Spirits	100	ND	µg/L
Jet Fuel	100	ND	µg/L

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 5 of 11

Lab Sample ID: 941128AJ-2

Field ID: MW-2

Date/Time: 11/28/94 1300

Matrix: Ground Water

Analysis Performed: Polynuclear Aromatic Hydrocarbons in water by EPA Method 8310, HPLC.

Compound	Detection Limit	Laboratory Blank	Sample Results
Acenaphthene	200	ND	ND
Acenaphthylene	200	ND	ND
Anthracene	50	ND	ND
Benzo(a)anthracene	2.0	ND	ND
Benzo(b)fluoranthene	2.0	ND	ND
Benzo(k)fluoranthene	2.0	ND	ND
Benzo(g,h,i)perylene	7.5	ND	ND
Benzo(a)pyrene	7.5	ND	ND
Chrysene	20	ND	ND
Dibenzo(a,h)anthracene	20	ND	ND
Fluoranthene	20	ND	ND
Fluorene	200	ND	ND
Indeno(1,2,3-c,d)pyrene	10	ND	ND
Naphthalene	200	ND	ND
Phenanthrene	50	ND	ND
Pyrene	50	ND	ND

Results expressed as $\mu\text{g/L}$ unless otherwise noted.

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 6 of 11

Lab Sample ID: 941128AJ-3

Field ID: MW-2D

Date/Time: 11/28/94 1310

Matrix: Ground Water

EPA Category: Volatile Organics

Parameter	Method	Detection Limit	Analytical Result	Units
Benzene	EPA 8260	14	810	µg/L
Ethylbenzene	EPA 8260	0.5	44.	µg/L
Toluene	EPA 8260	5.	270	µg/L
m,p-Xylene	EPA 8260	5.	170	µg/L
o-Xylene	EPA 8260	5.	68.	µg/L

EPA Category: Hydrocarbon Scan of water by modified EPA Method 8015, GC/FID.

Parameter	Detection Limit	Sample Results	Units
Gasoline	50	2800	µg/L
Diesel	100	ND	µg/L
Kerosine	100	ND	µg/L
Mineral Spirits	100	ND	µg/L
Jet Fuel	100	ND	µg/L

ND means none detected at or above the detection limit listed.

COFFEY LABORATORIES, INC.

12423 N.E. Whitaker Way • Portland, OR • 97230 • (503) 254-1794 • FAX (503) 254-1452



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 7 of 11

Lab Sample ID: 941128AJ-3

Field ID: MW-2D

Date/Time: 11/28/94 1310

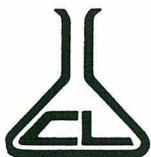
Matrix: Ground Water

Analysis Performed: Polynuclear Aromatic Hydrocarbons in water by EPA Method 8310, HPLC.

Compound	Detection Limit	Laboratory Blank	Sample Results
Acenaphthene	200	ND	ND
Acenaphthylene	200	ND	ND
Anthracene	50	ND	ND
Benzo(a)anthracene	2.0	ND	ND
Benzo(b)fluoranthene	2.0	ND	ND
Benzo(k)fluoranthene	2.0	ND	ND
Benzo(g,h,i)perylene	7.5	ND	ND
Benzo(a)pyrene	7.5	ND	ND
Chrysene	20	ND	ND
Dibenzo(a,h)anthracene	20	ND	ND
Fluoranthene	20	ND	ND
Fluorene	200	ND	ND
Indeno(1,2,3-c,d)pyrene	10	ND	ND
Naphthalene	200	ND	ND
Phenanthrene	50	ND	ND
Pyrene	50	ND	ND

Results expressed as $\mu\text{g/L}$ unless otherwise noted.

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 8 of 11

Lab Sample ID: 941128AJ-4

Field ID: MW-3

Date/Time: 11/28/94 1055

Matrix: Ground Water

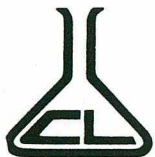
EPA Category: Volatile Organics

Parameter	Method	Detection Limit	Analytical Result	Units
Benzene	EPA 8260	0.5	ND	µg/L
Ethylbenzene	EPA 8260	0.5	ND	µg/L
Toluene	EPA 8260	0.5	ND	µg/L
m,p-Xylene	EPA 8260	0.5	ND	µg/L
o-Xylene	EPA 8260	0.5	ND	µg/L

EPA Category: Hydrocarbon Scan of water by modified EPA Method 8015, GC/FID.

Parameter	Detection Limit	Sample Results	Units
Gasoline	50	ND	µg/L
Diesel	100	ND	µg/L
Kerosine	100	ND	µg/L
Mineral Spirits	100	ND	µg/L
Jet Fuel	100	ND	µg/L

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 9 of 11

Lab Sample ID: 941128AJ-4

Field ID: MW-3

Date/Time: 11/28/94 1055

Matrix: Ground Water

Analysis Performed: Polynuclear Aromatic Hydrocarbons in water by EPA Method 8310, HPLC.

Compound	Detection Limit	Laboratory Blank	Sample Results
Acenaphthene	15	ND	ND
Acenaphthylene	15	ND	ND
Anthracene	5.0	ND	ND
Benzo(a)anthracene	0.15	ND	ND
Benzo(b)fluoranthene	0.15	ND	ND
Benzo(k)fluoranthene	0.15	ND	ND
Benzo(g,h,i)perylene	0.75	ND	ND
Benzo(a)pyrene	0.75	ND	ND
Chrysene	1.5	ND	ND
Dibenzo(a,h)anthracene	1.5	ND	ND
Fluoranthene	1.5	ND	ND
Fluorene	15	ND	ND
Indeno(1,2,3-c,d)pyrene	0.75	ND	ND
Naphthalene	15	ND	ND
Phenanthrene	5.0	ND	ND
Pyrene	5.0	ND	ND

Results expressed as $\mu\text{g/L}$ unless otherwise noted.

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 10 of 11

Lab Sample ID: 941128AJ-5

Field ID: DB-1

Date/Time: 11/28/94 1025

Matrix: Deionized Water

EPA Category: Volatile Organics

Parameter	Method	Detection Limit	Analytical Result	Units
Benzene	EPA 8260	0.5	ND	µg/L
Ethylbenzene	EPA 8260	0.5	ND	µg/L
Toluene	EPA 8260	0.5	0.8	µg/L
m,p-Xylene	EPA 8260	0.5	0.8	µg/L
o-Xylene	EPA 8260	0.5	ND	µg/L

EPA Category: Hydrocarbon Scan of water by modified EPA Method 8015, GC/FID.

Parameter	Detection Limit	Sample Results	Units
Gasoline	50	ND	µg/L
Diesel	100	ND	µg/L
Kerosine	100	ND	µg/L
Mineral Spirits	100	ND	µg/L
Jet Fuel	100	ND	µg/L

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941128AJ

Page Number: 11 of 11

Lab Sample ID: 941128AJ-5

Field ID: DB-1

Date/Time: 11/28/94 1025

Matrix: Deionized Water

Analysis Performed: Polynuclear Aromatic Hydrocarbons in water by EPA Method 8310, HPLC.

Compound	Detection Limit	Laboratory Blank	Sample Results
Acenaphthene	15	ND	ND
Acenaphthylene	15	ND	ND
Anthracene	5.0	ND	ND
Benzo(a)anthracene	0.15	ND	ND
Benzo(b)fluoranthene	0.15	ND	ND
Benzo(k)fluoranthene	0.15	ND	ND
Benzo(g,h,i)perylene	0.75	ND	ND
Benzo(a)pyrene	0.75	ND	ND
Chrysene	1.5	ND	ND
Dibenzo(a,h)anthracene	1.5	ND	ND
Fluoranthene	1.5	ND	ND
Fluorene	15	ND	ND
Indeno(1,2,3-c,d)pyrene	0.75	ND	ND
Naphthalene	15	ND	ND
Phenanthrene	5.0	ND	ND
Pyrene	5.0	ND	ND

Results expressed as $\mu\text{g/L}$ unless otherwise noted.

ND means none detected at or above the detection limit listed.



Report Date: December 7, 1994
Job Number: 941128AJ
Project Name: Longview City Laundry &
Cleaners

Attention: Rick Kienle
NW Geological Services, Inc.
2505 NE 42nd Ave.
Portland, OR 97213

Dear Rick:

As per our telephone conversation, I am providing an estimated total petroleum hydrocarbons result for the following samples:

Laboratory Sample ID	Field Identification	Matrix	Collection Date	Collection Time
941128AJ-2	MW-2	Ground Water	11/28/94	1300
941128AJ-3	MW-2D	Ground Water	11/28/94	1310

Using various gasoline and diesel standards, I calculated an estimate of the total hydrocarbon content for the waters collected from MW-2/1. Since the samples contain unidentifiable and unmatchable hydrocarbon species, the calculations were based upon total integrated area of samples and standard mixtures. The results were as follows:

<u>Sample</u>	<u>Total Petroleum Hydrocarbons</u>
MW-2/1	12,000 mg/L
MW-2D/1	13,000 mg/L

These values should only be used as rough estimates. Please feel free to call me should you have any questions.

Sincerely,

Richard D. Reid
Customer Services Director

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Mr. Rick Kienle
Northwest Geological Services, Inc.
2505 NE 42nd Ave.
Portland, OR 97213

December 2, 1994
Doc #L41202A.RDR

RE: Longview City Laundry and Cleaners

Dear Rick:

As per your instruction, I have examined and compared the HCID chromatograms for groundwaters for MW-2 collected on April 13, 1992 and November 28, 1994. My observations are as follows:

The tests performed in each case characterize the presence of hydrocarbons covering the hydrocarbon range of approximately C8 through C30. Common hydrocarbon mixtures such as gasoline, mineral spirits, kerosene, various diesels, and heavier bunker oils can be seen on these chromatograms. The chromatogram from April, 1992 showed two very distinct areas of activity:

- 1) Minerals Spirits (C9-C12), and
- 2) Diesel Range Organics (DRO: Range C14-C28).

It was obvious that there was no gasoline present and the DRO peaks were characteristic of weathered product, i.e., there were no periodic sharp spikes similar to those found in fresh material.

The hydrocarbons found in the more recent samples were found to be much more complex. Unlike the previous chromatogram, the areas of activity were not distinct. Characteristics included:

- 1) Significant activity in the gasoline range (C8-C10),
 - 2) Activity in the Mineral Spirits Range (C9-C13) is present but not distinct,
 - 3) Strong "spiked" activity in the kerosene range (C11-C15), and
 - 4) Severely weathered peaks in the DRO area (C14-C28).
- 5/994

Although there are literally hundreds of sharp peaks in the range of C8 to C28 which make individual product identification nearly impossible, there are five very strong peaks in the C8-C10 range which are characteristic in retention time and relative intensity of fresh gasoline. The presence of gasoline is confirmed by the presence of BTXE by EPA 8260. Where we previously found distinct and easily delineated mineral spirits peaks, peaks are present but blended in with other hydrocarbons, thus preventing an exact identification. The other hydrocarbons found in this range appear to be breakdown products from the strong weathered diesel peak previously seen in the C14-C28 range of the April, 1992 sample.

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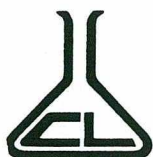


With the exception of the addition of gasoline contamination not previously seen, the water in MW-2 appears to be undergoing natural decomposition.

Please feel free to call me should you have any questions or require any additional information.

Sincerely,

Richard D. Reid
Customer Services Director



Report Date: November 29, 1994
Job Number: 941115H
PO Number: None Provided
Project No: None Provided
Project Name: Longview City Laundry &
Cleaners
Reopened Report: 12/08/94

Attention: Rick Kienle
NW Geological Services, Inc.
2505 NE 42nd Ave.
Portland, OR 97213

Analytical Narrative

The samples were received on 11/15/94 by Coffey Laboratories, Inc. (CLI) Sample Reception personnel under strict chain of custody protocol. The following information was provided at the time of sample reception:

Laboratory Sample ID	Field Identification	Matrix	Collection Date	Collection Time
941115H-1	MW-1/7	Soil	11/11/94	1058
941115H-2	MW-1/8	Soil	11/11/94	1115
941115H-3	MW-2/2	Soil	11/12/94	0859
941115H-4	MW-2/5	Soil	11/12/94	0952
941115H-5	MW-2/8	Soil	11/12/94	1033
941115H-6	MW-3/5	Soil	11/14/94	1040
941115H-7	MW-3/7	Soil	11/14/94	1101
941115H-8	MW-3/9	Soil	11/14/94	1124
941115H-9	MW-3/13	Soil	11/14/94	1230

The recommended holding time for each batch of analyses was in accordance with the data quality objectives as specified in the CLI Quality Assurance Plan unless otherwise noted.

EPA 8260: Sample #7 was extracted nine (9) days after the method holding time had expired.

Acceptable precision and accuracy were achieved for all analyses associated with this work order as demonstrated by the recoveries of the quality control samples analyzed concurrently with each batch.

The data submitted in this report is for the sole and exclusive use of the above-named client. All samples associated with the work order will be retained a maximum of 15 days from the report date or until the maximum holding time expires. All results pertain only to samples submitted.

Thank you for allowing Coffey Laboratories to be of service to you. If you have questions or need further assistance, please do not hesitate to call our Customer Services Department.

Sincerely,

Rona A. Klueh
Technical Director

RAK/atc

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Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 2 of 24

Lab Sample ID: 941115H-1

Field ID: MW-1/7

Date/Time: 11/11/94 1058

Matrix: Soil

Analysis Performed: TPH-HCID Qualitative Scan for Hydrocarbons, by GC/FID.

Summary of Qualitative Screening Test:

	Sample Results
Gasoline detected by TPH-HCID	
Gasoline not detected by TPH-HCID	✓
Diesel detected by TPH-HCID	
Diesel not detected by TPH-HCID	✓
Hydrocarbons heavier than C28 detected	
Recommended further analysis	
TPH-G	
TPH-D	
TPH-418.1	
None	✓
Surrogate Recovery %	84



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 3 of 24

Lab Sample ID: 941115H-2

Field ID: MW-1/8

Date/Time: 11/11/94 1115

Matrix: Soil

Analysis Performed: TPH-HCID Qualitative Scan for Hydrocarbons, by GC/FID.

Summary of Qualitative Screening Test:

	Sample Results
Gasoline detected by TPH-HCID	
Gasoline not detected by TPH-HCID	✓
Diesel detected by TPH-HCID	
Diesel not detected by TPH-HCID	✓
Hydrocarbons heavier than C28 detected	
Recommended further analysis	
TPH-G	
TPH-D	
TPH-418.1	
None	✓
Surrogate Recovery %	99



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 4 of 24

Lab Sample ID: 941115H-2

Field ID: MW-1/8

Date/Time: 11/11/94 1115

Matrix: Soil

Analysis Performed: Volatile Organics in Soil by EPA 8260, GC/MS.

Parameter	Detection Limit	Laboratory Blank	Sample Results
Benzene	0.2	ND	ND
Bromobenzene	0.2	ND	ND
Bromochloromethane	0.2	ND	ND
Bromodichloromethane	0.2	ND	ND
Bromoform	0.2	ND	ND
Bromomethane	0.2	ND	ND
n-Butylbenzene	0.2	ND	ND
sec-Butylbenzene	0.8	ND	ND
tert-Butylbenzene	0.2	ND	ND
Carbon tetrachloride	0.2	ND	ND
Chlorobenzene	0.2	ND	ND
Chloroethane	0.8	ND	ND
Chloroform	0.2	ND	ND
Chloromethane	0.2	ND	ND
2-Chlorotoluene	0.2	ND	ND
4-Chlorotoluene	0.2	ND	ND
1,2-Dibromo-3-chloropropane	0.2	ND	ND
Dibromochloromethane	0.2	ND	ND
1,2-Dibromoethane	0.2	ND	ND
Dibromomethane	0.2	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND
1,3-Dichlorobenzene	0.2	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND
Dichlorodifluoromethane	0.2	ND	ND
1,1-Dichloroethane	0.2	ND	ND
1,2-Dichloroethane	0.2	ND	ND
1,1-Dichloroethene	0.8	ND	ND
cis-1,2-Dichloroethene	0.2	ND	ND
trans-1,2-Dichloroethene	0.2	ND	ND

Results expressed as mg/Kg.

ND means none detected at or above the detection limit.



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 5 of 24

Lab Sample ID: 941115H-2

Field ID: MW-1/8

Date/Time: 11/11/94 1115

Matrix: Soil

Analysis Performed: Volatile Organics in Soil by EPA 8260, GC/MS.

Parameter	Detection Limit	Laboratory Blank	Sample Results
1,2-Dichloropropane	0.2	ND	ND
1,3-Dichloropropane	0.2	ND	ND
2,2-Dichloropropane	0.2	ND	ND
1,1-Dichloropropene	0.2	ND	ND
Ethylbenzene	0.2	ND	ND
Hexachlorobutadiene	0.2	ND	ND
Isopropylbenzene	0.2	ND	ND
4-Isopropyltoluene	0.8	ND	ND
Methylene chloride	0.2	ND	ND
n-Propylbenzene	0.8	ND	ND
Naphthalene	0.2	ND	ND
Styrene	0.8	ND	ND
1,1,1,2-Tetrachloroethane	0.2	ND	ND
1,1,2,2-Tetrachloroethane	0.2	ND	ND
Tetrachloroethene	0.2	ND	ND
Toluene	0.2	ND	ND
1,2,3-Trichlorobenzene	0.2	ND	ND
1,2,4-Trichlorobenzene	0.2	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND
1,1,2-Trichloroethane	0.2	ND	ND
Trichloroethene	0.2	ND	ND
Trichlorofluoromethane	0.2	ND	ND
1,2,3-Trichloropropane	0.2	ND	ND
1,2,4-Trimethylbenzene	0.2	ND	ND
1,3,5-Trimethylbenzene	0.8	ND	ND
Vinyl chloride	0.2	ND	ND
m/p-Xylene	0.2	ND	ND
o-Xylene	0.2	ND	ND

Results expressed as mg/Kg.

ND means none detected at or above the detection limit.



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 6 of 24

Lab Sample ID: 941115H-3

Field ID: MW-2/2

Date/Time: 11/12/94 0859

Matrix: Soil

Analysis Performed: TPH-HCID Qualitative Scan for Hydrocarbons, by GC/FID.

Summary of Qualitative Screening Test:

	Sample Results
Gasoline detected by TPH-HCID	
Gasoline not detected by TPH-HCID	✓
Diesel detected by TPH-HCID	✓
Diesel not detected by TPH-HCID	
Hydrocarbons heavier than C28 detected	
Recommended further analysis	
TPH-G	
TPH-D	✓
TPH-418.1	
None	
Surrogate Recovery %	130



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 7 of 24

Lab Sample ID: 941115H-3

Field ID: MW-2/2

Date/Time: 11/12/94 0859

Matrix: Soil

Analysis Performed: TPH-D, by the Oregon DEQ Method, Capillary GC/FID.

<u>Parameter</u>	<u>Detection Limit</u>	<u>Sample Results</u>
Diesel	50	2000
Surrogate Recovery (%)		85

Results expressed as mg/kg unless otherwise noted.



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 8 of 24

Lab Sample ID: 941115H-4

Field ID: MW-2/5

Date/Time: 11/12/94 0952

Matrix: Soil

Analysis Performed: TPH-HCID Qualitative Scan for Hydrocarbons, by GC/FID.

Summary of Qualitative Screening Test:

	Sample Results
Gasoline detected by TPH-HCID	
Gasoline not detected by TPH-HCID	✓
Diesel detected by TPH-HCID	
Diesel not detected by TPH-HCID	✓
Hydrocarbons heavier than C28 detected	
Recommended further analysis	
TPH-G	
TPH-D	
TPH-418.1	
None	✓
Surrogate Recovery %	118



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 9 of 24

Lab Sample ID: 941115H-5

Field ID: MW-2/8

Date/Time: 11/12/94 1033

Matrix: Soil

Analysis Performed: TPH-HCID Qualitative Scan for Hydrocarbons, by GC/FID.

Summary of Qualitative Screening Test:

	Sample Results
Gasoline detected by TPH-HCID	✓
Gasoline not detected by TPH-HCID	
Diesel detected by TPH-HCID	✓
Diesel not detected by TPH-HCID	
Hydrocarbons heavier than C28 detected	
Recommended further analysis	
TPH-G	
TPH-D	✓
TPH-418.1	
None	
Surrogate Recovery %	NA*

*Surrogate spike recovery could not be calculated because of the concentration of hydrocarbons present.



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 10 of 24

Lab Sample ID: 941115H-5

Field ID: MW-2/8

Date/Time: 11/12/94 1033

Matrix: Soil

Analysis Performed: TPH-D, by the Oregon DEQ Method, Capillary GC/FID.

<u>Parameter</u>	<u>Detection Limit</u>	<u>Sample Results</u>
Diesel	50	18000
Surrogate Recovery (%)		NA*

Results expressed as mg/kg unless otherwise noted.

*Surrogate spike recovery could not be calculated because of the concentration of hydrocarbons present.



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 11 of 24

Lab Sample ID: 941115H-5

Field ID: MW-2/8

Date/Time: 11/12/94 1033

Matrix: Soil

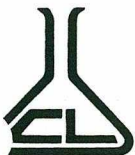
Analysis Performed: Volatile Organics in Soil by EPA 8260, GC/MS.

Parameter	Detection Limit	Laboratory Blank	Sample Results
Benzene	0.2	ND	1.7
Bromobenzene	2.0	ND	ND
Bromochloromethane	0.2	ND	ND
Bromodichloromethane	0.2	ND	ND
Bromoform	0.2	ND	ND
Bromomethane	0.2	ND	ND
n-Butylbenzene	2.8	ND	ND
sec-Butylbenzene	0.2	ND	0.8
tert-Butylbenzene	2.0	ND	ND
Carbon tetrachloride	0.2	ND	ND
Chlorobenzene	0.2	ND	ND
Chloroethane	0.2	ND	ND
Chloroform	0.2	ND	ND
Chloromethane	0.2	ND	ND
2-Chlorotoluene	0.4	ND	ND
4-Chlorotoluene	0.4	ND	ND
Dibromochloromethane	0.2	ND	ND
1,2-Dibromo-3-chloropropane	0.2	ND	ND
1,2-Dibromoethane	0.2	ND	ND
Dibromomethane	0.2	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND
1,3-Dichlorobenzene	0.2	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND
Dichlorodifluoromethane	0.2	ND	ND
1,1-Dichloroethane	0.2	ND	ND
1,2-Dichloroethane	0.2	ND	ND
1,1-Dichloroethene	0.2	ND	ND
cis-1,2-Dichloroethene	0.2	ND	ND
trans-1,2-Dichloroethene	0.2	ND	ND

Results expressed as mg/Kg.

ND means none detected at or above the detection limit.

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Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 12 of 24

Lab Sample ID: 941115H-5

Field ID: MW-2/8

Date/Time: 11/12/94 1033

Matrix: Soil

Analysis Performed: Volatile Organics in Soil by EPA 8260, GC/MS.

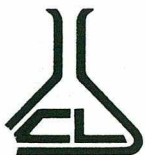
Parameter	Detection Limit	Laboratory Blank	Sample Results
1,2-Dichloropropane	0.2	ND	ND
1,3-Dichloropropane	0.2	ND	ND
2,2-Dichloropropane	0.2	ND	ND
1,1-Dichloropropene	0.2	ND	ND
Ethylbenzene	0.2	ND	3.9
Hexachlorobutadiene	0.2	ND	ND
Isopropylbenzene	0.2	ND	0.5
4-Isopropyltoluene	0.2	ND	2.0
Methylene chloride	0.2	ND	Trace, <0.2
Naphthalene	0.2	ND	21
n-Propylbenzene	0.2	ND	1.0
Styrene	0.2	ND	ND
1,1,1,2-Tetrachloroethane	0.2	ND	ND
1,1,2,2-Tetrachloroethane	3.6	ND	ND
Tetrachloroethene	0.2	ND	ND
Toluene	0.2	ND	2.1
1,2,3-Trichlorobenzene	0.8	ND	ND
1,2,4-Trichlorobenzene	0.8	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND
1,1,2-Trichloroethane	0.2	ND	ND
Trichloroethene	0.2	ND	ND
Trichlorofluoromethane	0.2	ND	ND
1,2,3-Trichloropropane	0.2	ND	ND
1,2,4-Trimethylbenzene	0.2	ND	16
1,3,5-Trimethylbenzene	0.2	ND	3.5
Vinyl chloride	0.2	ND	ND
m/p-Xylene	0.2	ND	22
o-Xylene	0.2	ND	6.1

Results expressed as mg/Kg.

ND means none detected at or above the detection limit.

The less than "<" symbol means none detected at or above the indicated value and represents the detection limit for the method.

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Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 13 of 24

Lab Sample ID: 941115H-5

Field ID: MW-2/8

Date/Time: 11/12/94 1033

Matrix: Soil

Analysis Performed: Polynuclear Aromatic Hydrocarbons in soil by EPA Method 8310, HPLC.

Compound	Detection Limit	Laboratory Blank	Sample Results	Sample Duplicate
Acenaphthene	90	ND	ND	ND
Acenaphthylene	60	ND	ND	ND
Anthracene	30	ND	ND	ND
Benzo(a)anthracene	0.9	ND	ND	ND
Benzo(b)fluoranthene	1.5	ND	ND	ND
Benzo(k)fluoranthene	1.0	ND	ND	ND
Benzo(g,h,i)perylene	2.5	ND	ND	ND
Benzo(a)pyrene	1.0	ND	ND	ND
Chrysene	2.0	ND	ND	ND
Dibenzo(a,h)anthracene	1.5	ND	ND	ND
Fluoranthene	10	ND	12	21
Fluorene	10	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	2.5	ND	ND	ND
Naphthalene	50	ND	ND	ND
Phenanthrene	7.0	ND	7.2	11
Pyrene	9.0	ND	ND	ND

Results expressed as mg/Kg.

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 14 of 24

Lab Sample ID: 941115H-6

Field ID: MW-3/5

Date/Time: 11/14/94 1040

Matrix: Soil

Analysis Performed: TPH-HCID Qualitative Scan for Hydrocarbons, by GC/FID.

Summary of Qualitative Screening Test:

	Sample Results
Gasoline detected by TPH-HCID	
Gasoline not detected by TPH-HCID	✓
Diesel detected by TPH-HCID	
Diesel not detected by TPH-HCID	✓
Hydrocarbons heavier than C28 detected	
Recommended further analysis	
TPH-G	
TPH-D	
TPH-418.1	
None	✓
Surrogate Recovery %	96

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Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 15 of 24

Lab Sample ID: 941115H-6

Field ID: MW-3/5

Date/Time: 11/14/94 1040

Matrix: Soil

Analysis Performed: Volatile Organics in Soil by EPA 8260, GC/MS.

Parameter	Detection Limit	Laboratory Blank	Sample Results
Benzene	0.2	ND	ND
Bromobenzene	0.2	ND	ND
Bromochloromethane	0.2	ND	ND
Bromodichloromethane	0.2	ND	ND
Bromoform	0.2	ND	ND
Bromomethane	0.2	ND	ND
n-Butylbenzene	0.8	ND	ND
sec-Butylbenzene	0.2	ND	ND
tert-Butylbenzene	0.2	ND	ND
Carbon tetrachloride	0.2	ND	ND
Chlorobenzene	0.2	ND	ND
Chloroethane	0.2	ND	ND
Chloroform	0.2	ND	ND
Chloromethane	0.2	ND	ND
2-Chlorotoluene	0.2	ND	ND
4-Chlorotoluene	0.2	ND	ND
Dibromochloromethane	0.2	ND	ND
1,2-Dibromo-3-chloropropane	0.2	ND	ND
1,2-Dibromoethane	0.2	ND	ND
Dibromomethane	0.2	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND
1,3-Dichlorobenzene	0.2	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND
Dichlorodifluoromethane	0.8	ND	ND
1,1-Dichloroethane	0.2	ND	ND
1,2-Dichloroethane	0.2	ND	ND
1,1-Dichloroethene	0.2	ND	ND
cis-1,2-Dichloroethene	0.2	ND	ND
trans-1,2-Dichloroethene	0.2	ND	ND

Results expressed as mg/Kg.

ND means none detected at or above the detection limit.

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Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 16 of 24

Lab Sample ID: 941115H-6

Field ID: MW-3/5

Date/Time: 11/14/94 1040

Matrix: Soil

Analysis Performed: Volatile Organics in Soil by EPA 8260, GC/MS.

Parameter	Detection Limit	Laboratory Blank	Sample Results
1,2-Dichloropropane	0.2	ND	ND
1,3-Dichloropropane	0.2	ND	ND
2,2-Dichloropropane	0.2	ND	ND
1,1-Dichloropropene	0.2	ND	ND
Ethylbenzene	0.2	ND	ND
Hexachlorobutadiene	0.8	ND	ND
Isopropylbenzene	0.2	ND	ND
4-Isopropyltoluene	0.8	ND	ND
Methylene chloride	0.2	ND	ND
Naphthalene	0.8	ND	ND
n-Propylbenzene	0.2	ND	ND
Styrene	0.2	ND	ND
1,1,1,2-Tetrachloroethane	0.2	ND	ND
1,1,2,2-Tetrachloroethane	0.2	ND	ND
Tetrachloroethene	0.2	ND	ND
Toluene	0.2	ND	0.2
1,2,3-Trichlorobenzene	0.8	ND	ND
1,2,4-Trichlorobenzene	0.8	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND
1,1,2-Trichloroethane	0.2	ND	ND
Trichloroethene	0.2	ND	ND
Trichlorofluoromethane	0.2	ND	ND
1,2,3-Trichloropropane	0.2	ND	ND
1,2,4-Trimethylbenzene	0.2	ND	ND
1,3,5-Trimethylbenzene	0.2	ND	ND
Vinyl chloride	0.2	ND	ND
m/p-Xylene	0.2	ND	ND
o-Xylene	0.2	ND	ND

Results expressed as mg/Kg.

ND means none detected at or above the detection limit.

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Analytical Data

NW Geological Services, Inc.

Job Number: 941115H
Page Number: 17 of 24

Lab Sample ID: 941115H-6
Field ID: MW-3/5
Date/Time: 11/14/94 1040
Matrix: Soil

Analysis Performed: Polynuclear Aromatic Hydrocarbons in soil by EPA Method 8310, HPLC.

Compound	Detection Limit	Laboratory Blank	Sample Results
Acenaphthene	1.0	ND	ND
Acenaphthylene	1.0	ND	ND
Anthracene	0.25	ND	ND
Benzo(a)anthracene	0.015	ND	ND
Benzo(b)fluoranthene	0.02	ND	ND
Benzo(k)fluoranthene	0.02	ND	ND
Benzo(g,h,i)perylene	0.03	ND	ND
Benzo(a)pyrene	0.02	ND	ND
Chrysene	0.02	ND	ND
Dibenzo(a,h)anthracene	0.02	ND	ND
Fluoranthene	0.15	ND	ND
Fluorene	0.25	ND	ND
Indeno(1,2,3-c,d)pyrene	0.05	ND	ND
Naphthalene	1.0	ND	ND
Phenanthrene	0.15	ND	ND
Pyrene	0.15	ND	ND

Results expressed as mg/Kg.

ND means none detected at or above the detection limit listed.



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 18 of 24

Lab Sample ID: 941115H-7

Field ID: MW-3/7

Date/Time: 11/14/94 1101

Matrix: Soil

Analysis Performed: TPH-HCID Qualitative Scan for Hydrocarbons, by GC/FID.

Summary of Qualitative Screening Test:

	Sample Results
Gasoline detected by TPH-HCID	
Gasoline not detected by TPH-HCID	✓
Diesel detected by TPH-HCID	✓
Diesel not detected by TPH-HCID	
Hydrocarbons heavier than C28 detected	
Recommended further analysis	
TPH-G	
TPH-D	✓
TPH-418.1	
None	
Surrogate Recovery %	NA*

*Surrogate spike recovery could not be calculated because of the concentration of hydrocarbons present.

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Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 19 of 24

Lab Sample ID: 941115H-7

Field ID: MW-3/7

Date/Time: 11/14/94 1101

Matrix: Soil

Analysis Performed: TPH-D, by the Oregon DEQ Method, Capillary GC/FID.

<u>Parameter</u>	<u>Detection Limit</u>	<u>Sample Results</u>
Diesel	50	4800
Surrogate Recovery (%)		NA*

Results expressed as mg/kg unless otherwise noted.

*Surrogate spike recovery could not be calculated because of the concentration of hydrocarbons present.



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 20 of 24

Lab Sample ID: 941115H-7

Field ID: MW-3/7

Date/Time: 11/14/94 1101

Matrix: Soil

Analysis Performed: Volatile Organics in Soil by EPA 8260, GC/MS.

Parameter	Detection Limit	Laboratory Blank	Sample Results
Benzene	0.2	ND	ND
Bromobenzene	0.2	ND	ND
Bromochloromethane	0.2	ND	ND
Bromodichloromethane	0.2	ND	ND
Bromoform	0.2	ND	ND
Bromomethane	0.2	ND	ND
n-Butylbenzene	0.2	ND	ND
sec-Butylbenzene	0.2	ND	ND
tert-Butylbenzene	0.2	ND	ND
Carbon tetrachloride	0.2	ND	ND
Chlorobenzene	0.2	ND	0.5
Chloroethane	0.2	ND	ND
Chloroform	0.2	ND	ND
Chloromethane	0.2	ND	ND
2-Chlorotoluene	0.2	ND	ND
4-Chlorotoluene	0.2	ND	ND
Dibromochloromethane	0.2	ND	ND
1,2-Dibromo-3-chloropropane	0.2	ND	ND
1,2-Dibromoethane	0.2	ND	ND
Dibromomethane	0.2	ND	ND
1,2-Dichlorobenzene	0.2	ND	1.3
1,3-Dichlorobenzene	0.2	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND
Dichlorodifluoromethane	0.2	ND	ND
1,1-Dichloroethane	0.2	ND	ND
1,2-Dichloroethane	0.2	ND	ND
1,1-Dichloroethene	0.2	ND	ND
cis-1,2-Dichloroethene	0.2	ND	ND
trans-1,2-Dichloroethene	0.2	ND	ND

Results expressed as mg/Kg.

ND means none detected at or above the detection limit.

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Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 21 of 24

Lab Sample ID: 941115H-7

Field ID: MW-3/7

Date/Time: 11/14/94 1101

Matrix: Soil

Analysis Performed: Volatile Organics in Soil by EPA 8260, GC/MS.

Parameter	Detection Limit	Laboratory Blank	Sample Results
1,2-Dichloropropane	0.2	ND	ND
1,3-Dichloropropane	0.2	ND	ND
2,2-Dichloropropane	0.2	ND	ND
1,1-Dichloropropene	0.2	ND	ND
Ethylbenzene	0.2	ND	ND
Hexachlorobutadiene	0.2	ND	ND
Isopropylbenzene	0.2	ND	ND
p-Isopropyltoluene	0.2	ND	ND
Methylene chloride	0.2	ND	ND
Naphthalene	0.2	ND	ND
n-Propylbenzene	0.2	ND	ND
Styrene	0.2	ND	ND
1,1,1,2-Tetrachloroethane	0.2	ND	ND
1,1,2,2-Tetrachloroethane	0.2	ND	ND
Tetrachloroethene	0.2	ND	ND
Toluene	0.2	ND	ND
1,2,3-Trichlorobenzene	0.2	ND	ND
1,2,4-Trichlorobenzene	0.2	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND
1,1,2-Trichloroethane	0.2	ND	ND
Trichloroethene	0.2	ND	ND
Trichlorofluoromethane	0.2	ND	ND
1,2,3-Trichloropropane	0.2	ND	ND
1,2,4-Trimethylbenzene	0.2	ND	ND
1,3,5-Trimethylbenzene	0.2	ND	ND
Vinyl chloride	0.2	ND	ND
m/p-Xylene	0.2	ND	ND
o-Xylene	0.2	ND	ND

Results expressed as mg/Kg.

ND means none detected at or above the detection limit.

Note: The sample was extracted for EPA 8260 nine (9) days after the method holding time had expired.

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Analytical Data

NW Geological Services, Inc.

Job Number: 941115H
Page Number: 22 of 24

Lab Sample ID: 941115H-8
Field ID: MW-3/9
Date/Time: 11/14/94 1124
Matrix: Soil

Analysis Performed: TPH-HCID Qualitative Scan for Hydrocarbons, by GC/FID.

Summary of Qualitative Screening Test:

	Sample Results
Gasoline detected by TPH-HCID	
Gasoline not detected by TPH-HCID	✓
Diesel detected by TPH-HCID	✓
Diesel not detected by TPH-HCID	
Hydrocarbons heavier than C28 detected	
Recommended further analysis	
TPH-G	
TPH-D	✓
TPH-418.1	
None	
Surrogate Recovery %	121



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 23 of 24

Lab Sample ID: 941115H-8

Field ID: MW-3/9

Date/Time: 11/14/94 1124

Matrix: Soil

Analysis Performed: TPH-D, by the Oregon DEQ Method, Capillary GC/FID.

<u>Parameter</u>	<u>Detection Limit</u>	<u>Sample Results</u>
Diesel	50	500
Surrogate Recovery (%)		84

Results expressed as mg/kg unless otherwise noted.



Analytical Data

NW Geological Services, Inc.

Job Number: 941115H

Page Number: 24 of 24

Lab Sample ID: 941115H-9

Field ID: MW-3/13

Date/Time: 11/14/94 1230

Matrix: Soil

Analysis Performed: TPH-HCID Qualitative Scan for Hydrocarbons, by GC/FID.

Summary of Qualitative Screening Test:

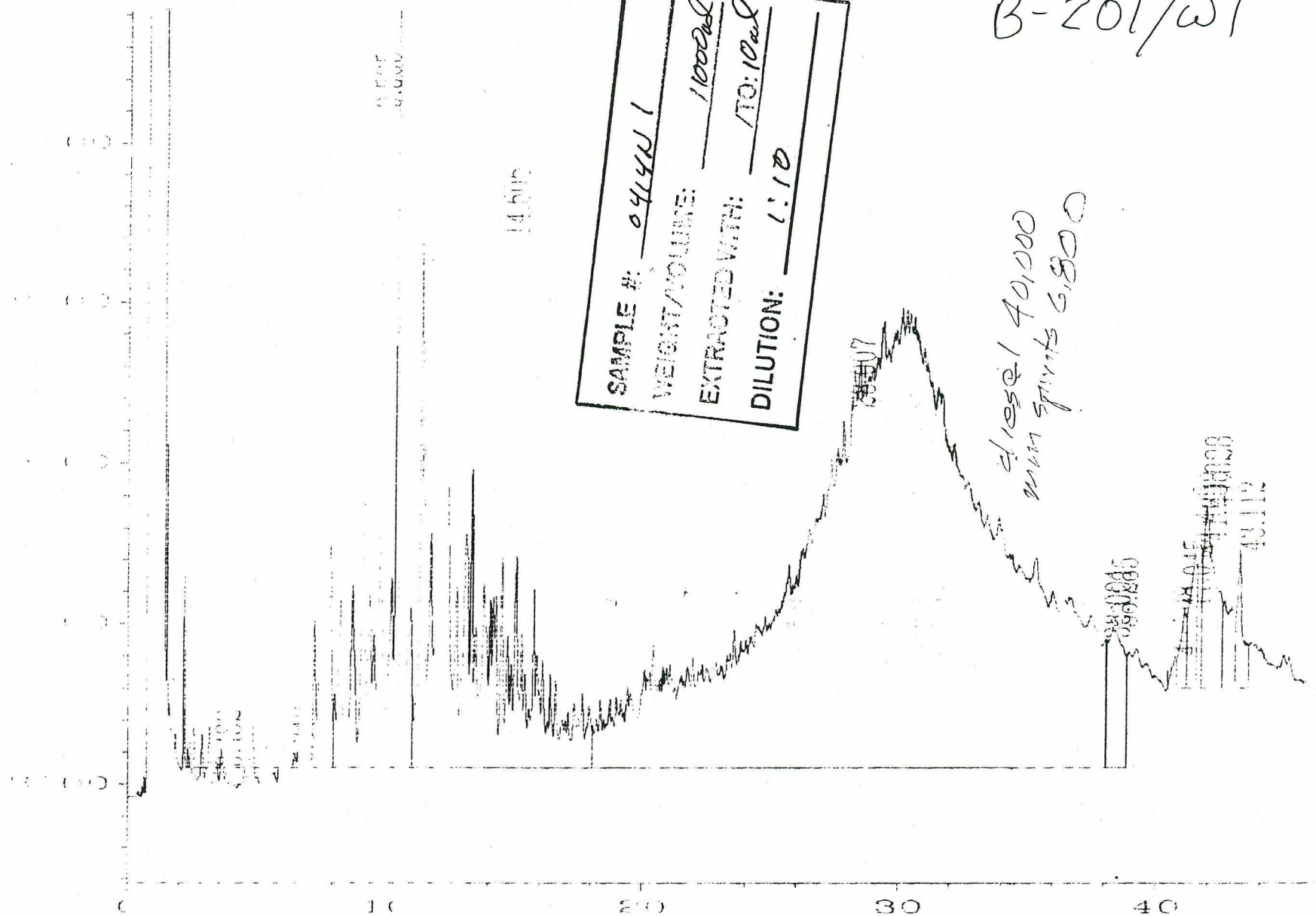
	Sample Results
Gasoline detected by TPH-HCID	
Gasoline not detected by TPH-HCID	✓
Diesel detected by TPH-HCID	
Diesel not detected by TPH-HCID	✓
Hydrocarbons heavier than C28 detected	
Recommended further analysis	
TPH-G	
TPH-D	
TPH-418.1	
None	✓
Surrogate Recovery %	117

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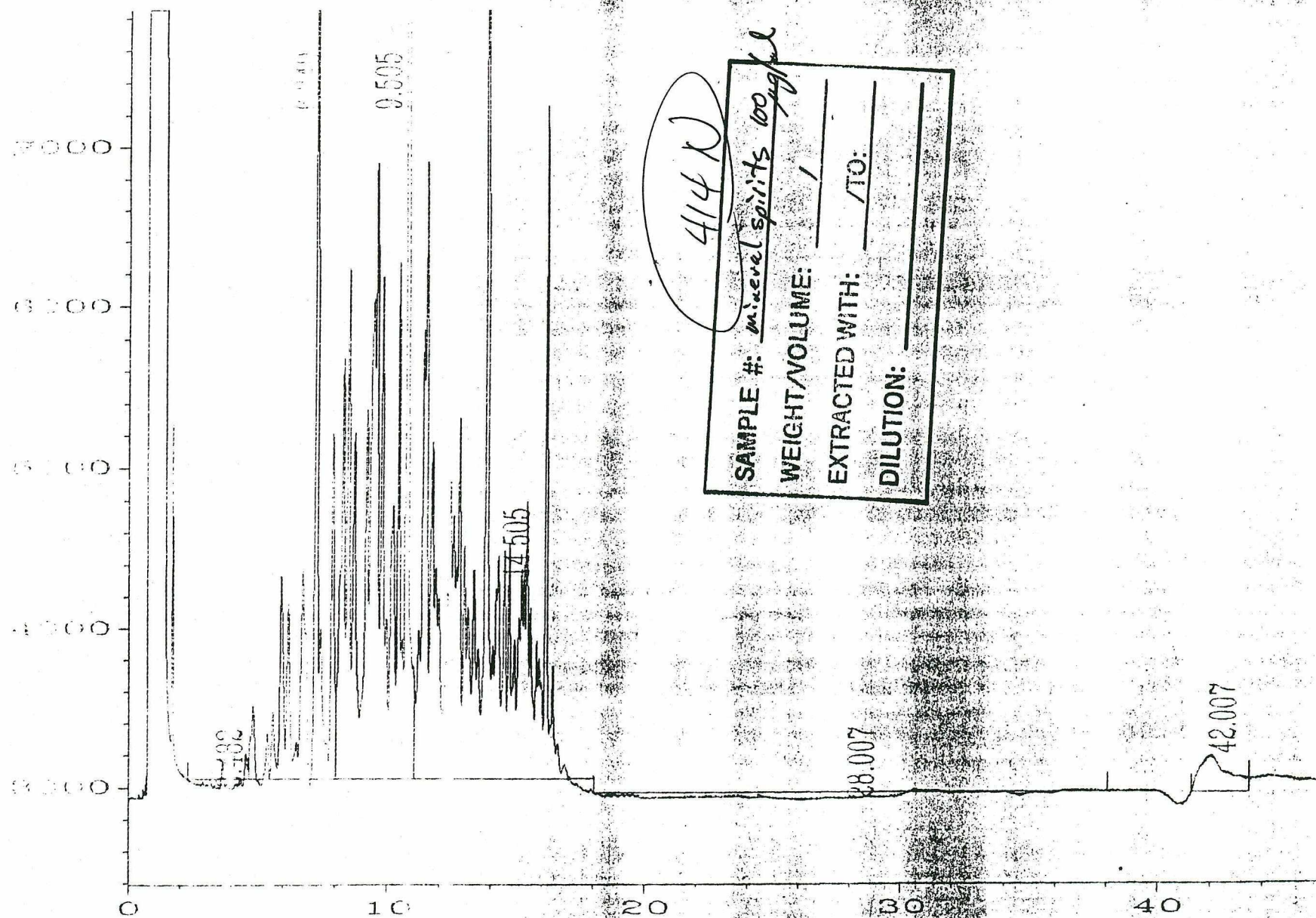
414N1

B-201/W1



SAMPLE #:	0414N1
WEIGHT/VOLUME:	1000ul
EXTRACTED WITH:	10:10ul
DILUTION:	1:10

Fig. 2 in C:\HF\CHART\1 DATA\PH20416\059R0101.D



414 R

SAMPLE #: microl spirits 100%
 WEIGHT/VOLUME: 1
 EXTRACTED WITH: TO:
 DILUTION: _____

Sig. 2 in C:\HFC\EM\1\DATA\TPH20416\056R0101.D

14N

B-202/W1/W2

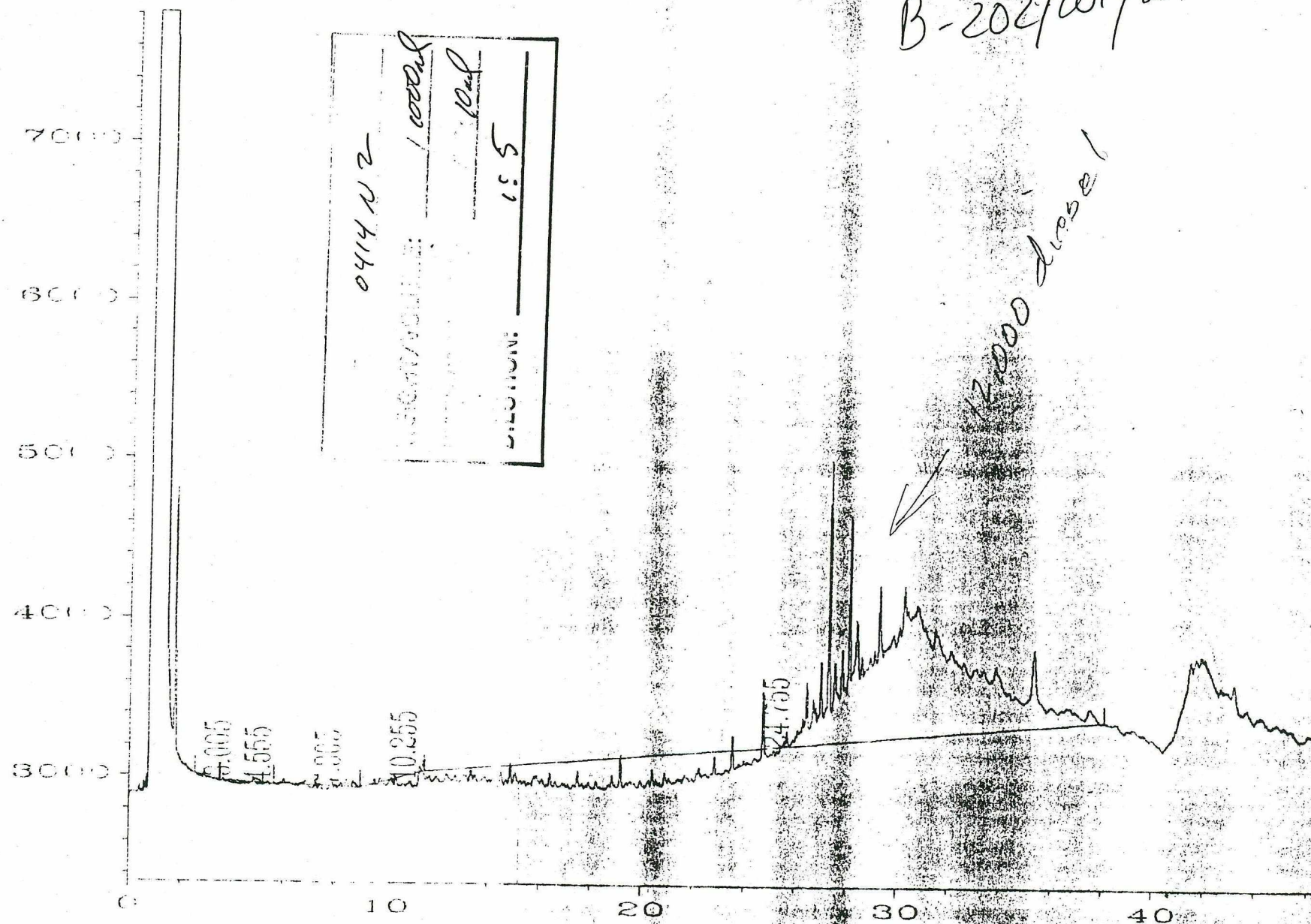


Fig. 2 in C:\HPCHEM\1\DATA\tpH20416\060R0101.D

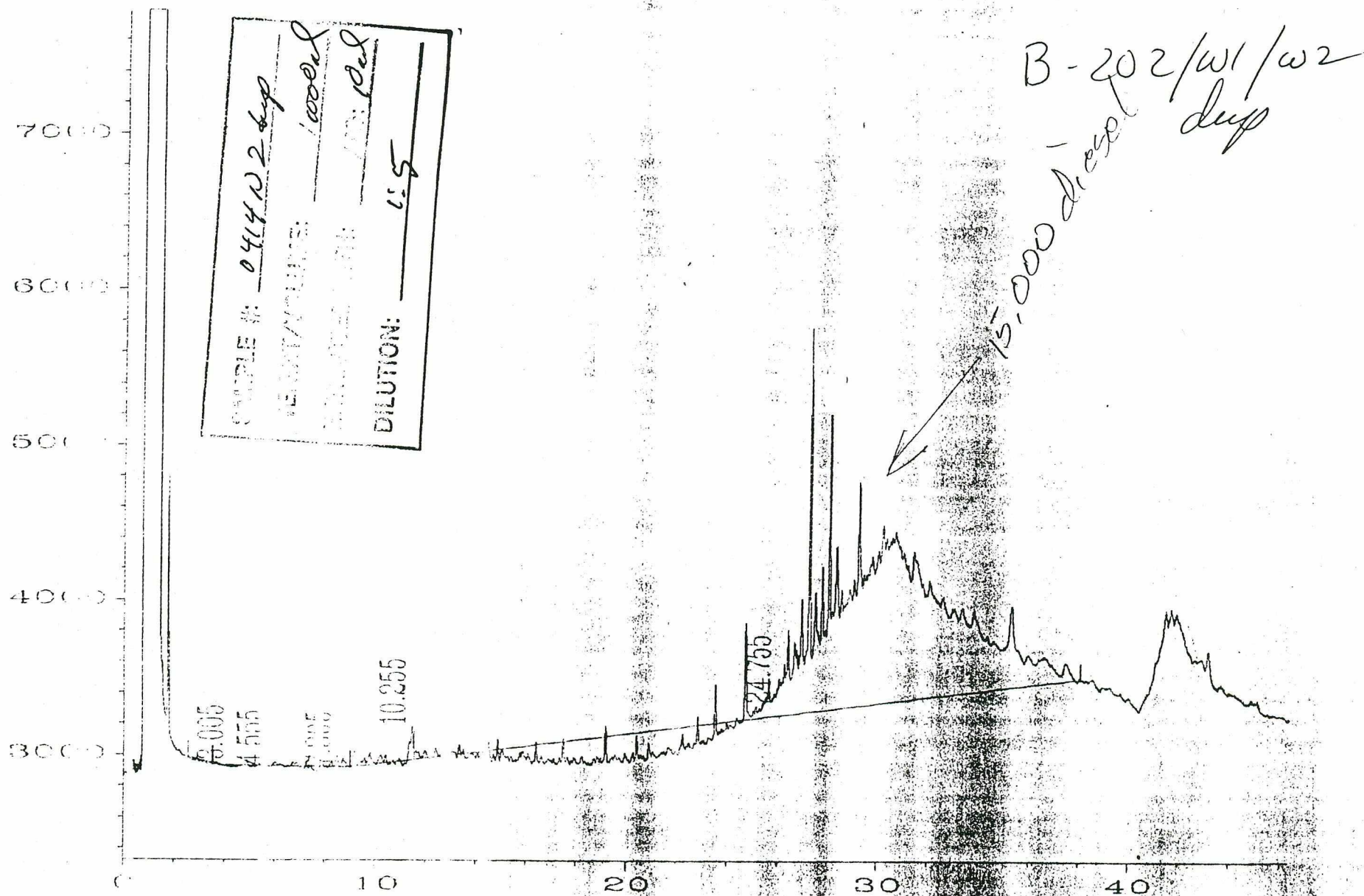
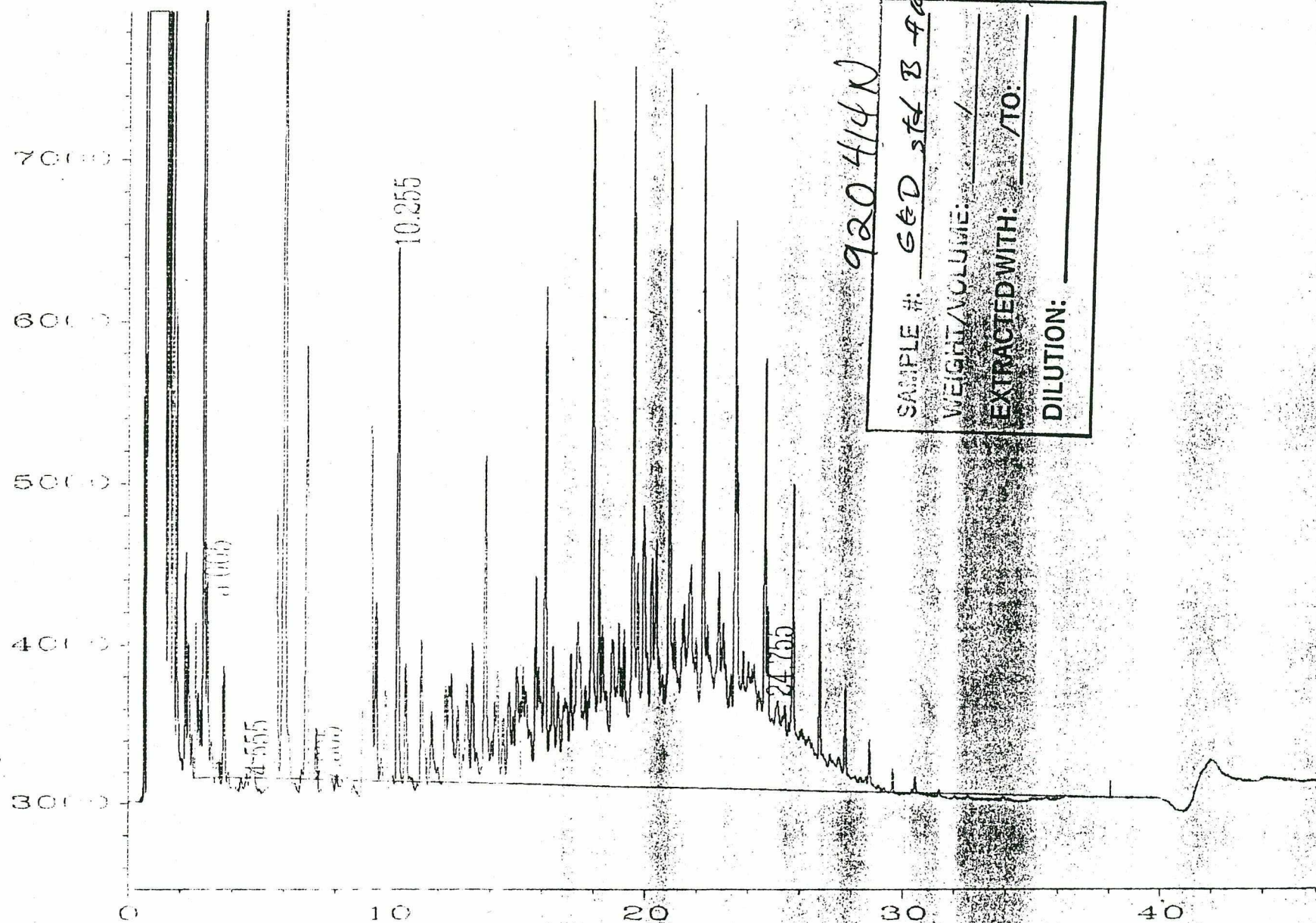


Fig. 2 in C:\HPCF\EM1\DATA\tph20416\061R0101.D



SAMPLE #: GED STD B 905/23

WEIGHT/VOLUME: /

EXTRACTED WITH: / TO:

DILUTION: /

Fig. 2 in C:\HPCHEM\1\DATA\tph20416\052R0101.D

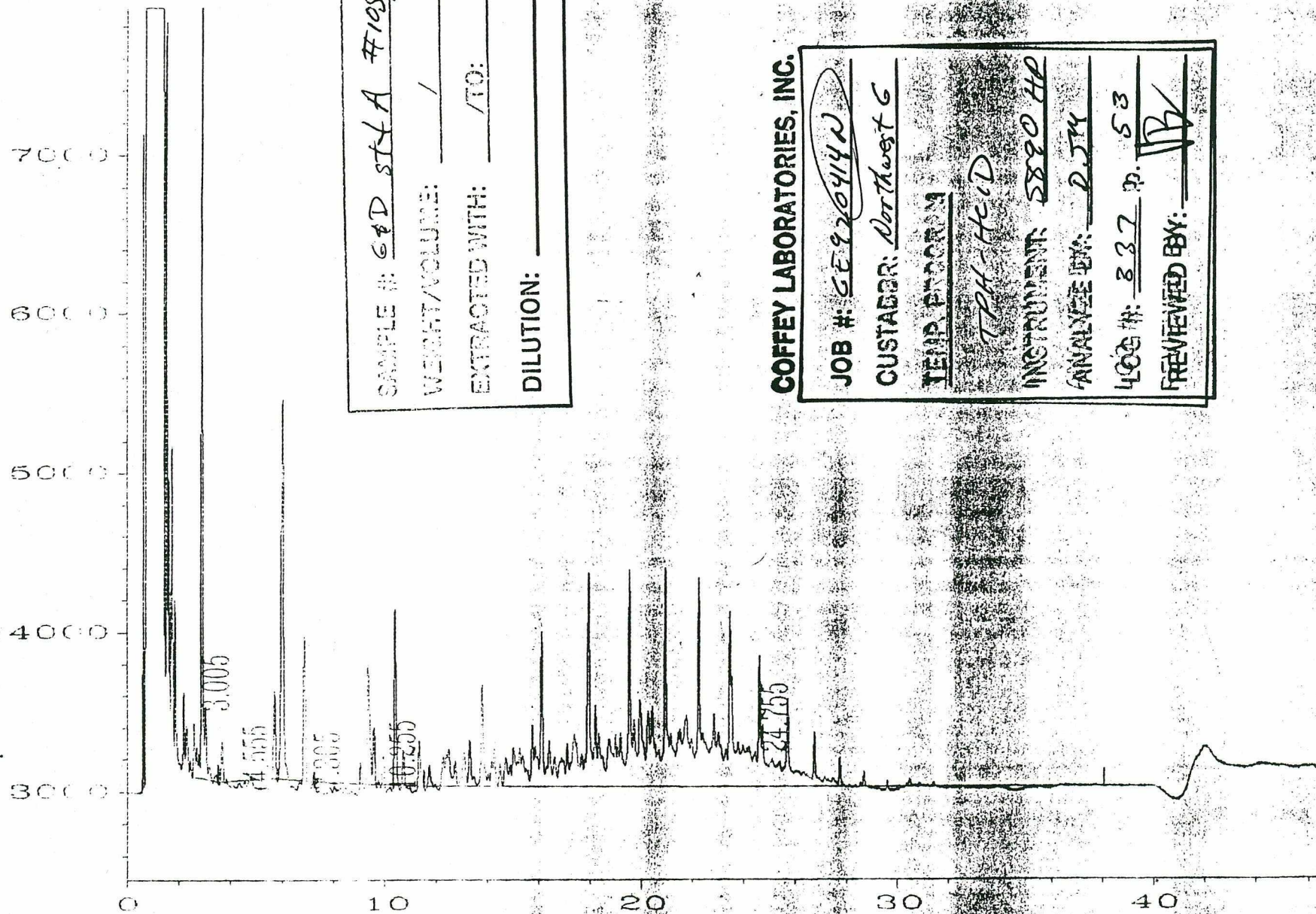


Fig. 2 in C:\HECFEM1\DATA\tph20416\051R0101.D

SAMPLE #: 68D stLA #105/23

WEIGHT/VOLUME: /

EXTRACTED WITH: /TO:

DILUTION:

COFFEY LABORATORIES, INC.

JOB #: CE9204142

CUSTOMER: Northwest C

TEMP PROGRAM

TPH-HeiD

INSTRUMENT: 5880 HP

ANALYST: D.JM

LOG # 837 D. 53

REVIEWED BY: JB

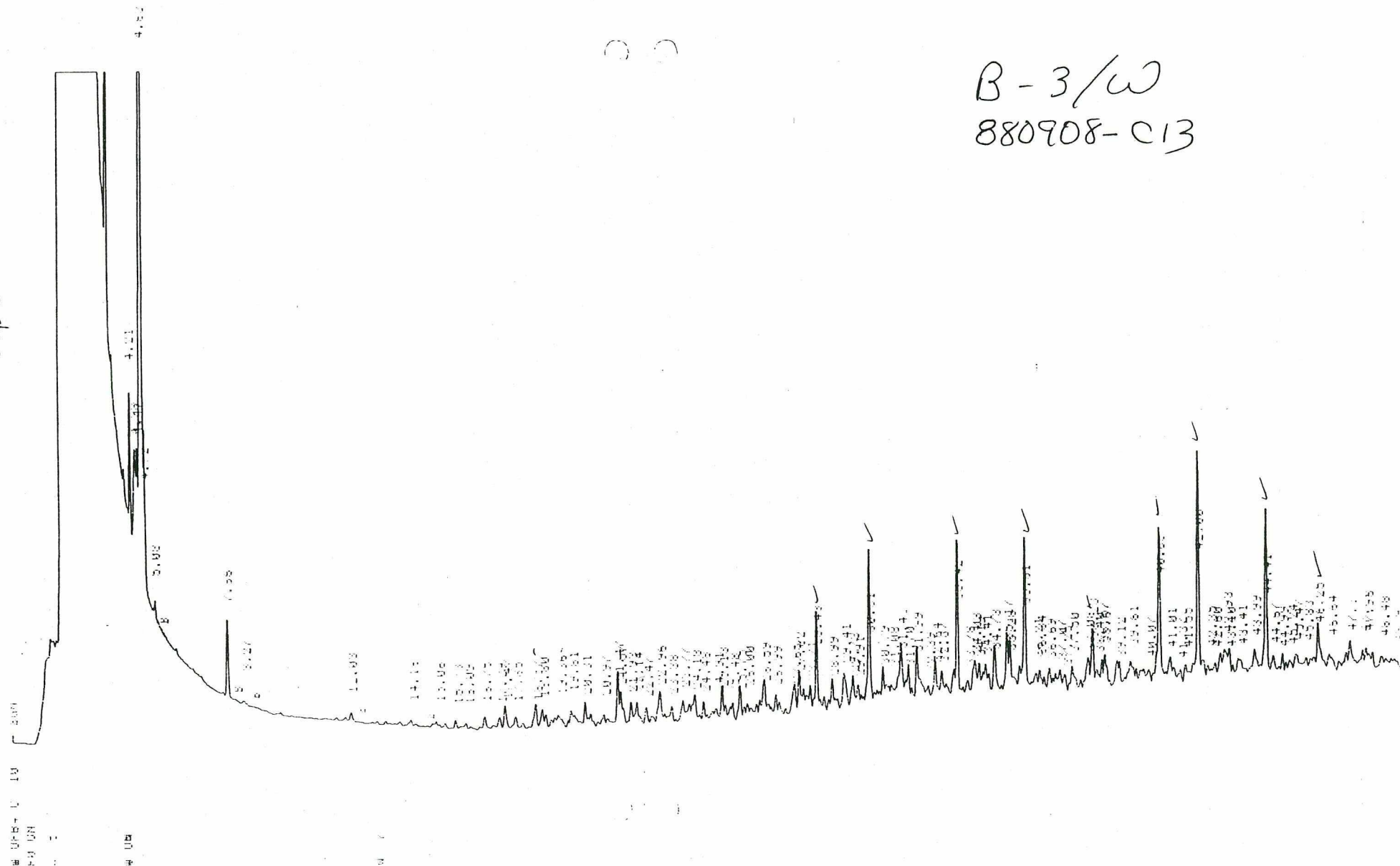
828 7/27/2019 10:47

INJURY TO CIVILIAN

METHOD / HYDROCARBONS SET 1 888888-013 Sample C13

HYDROLYTICALLY STABLE I-SS 1-333333-013

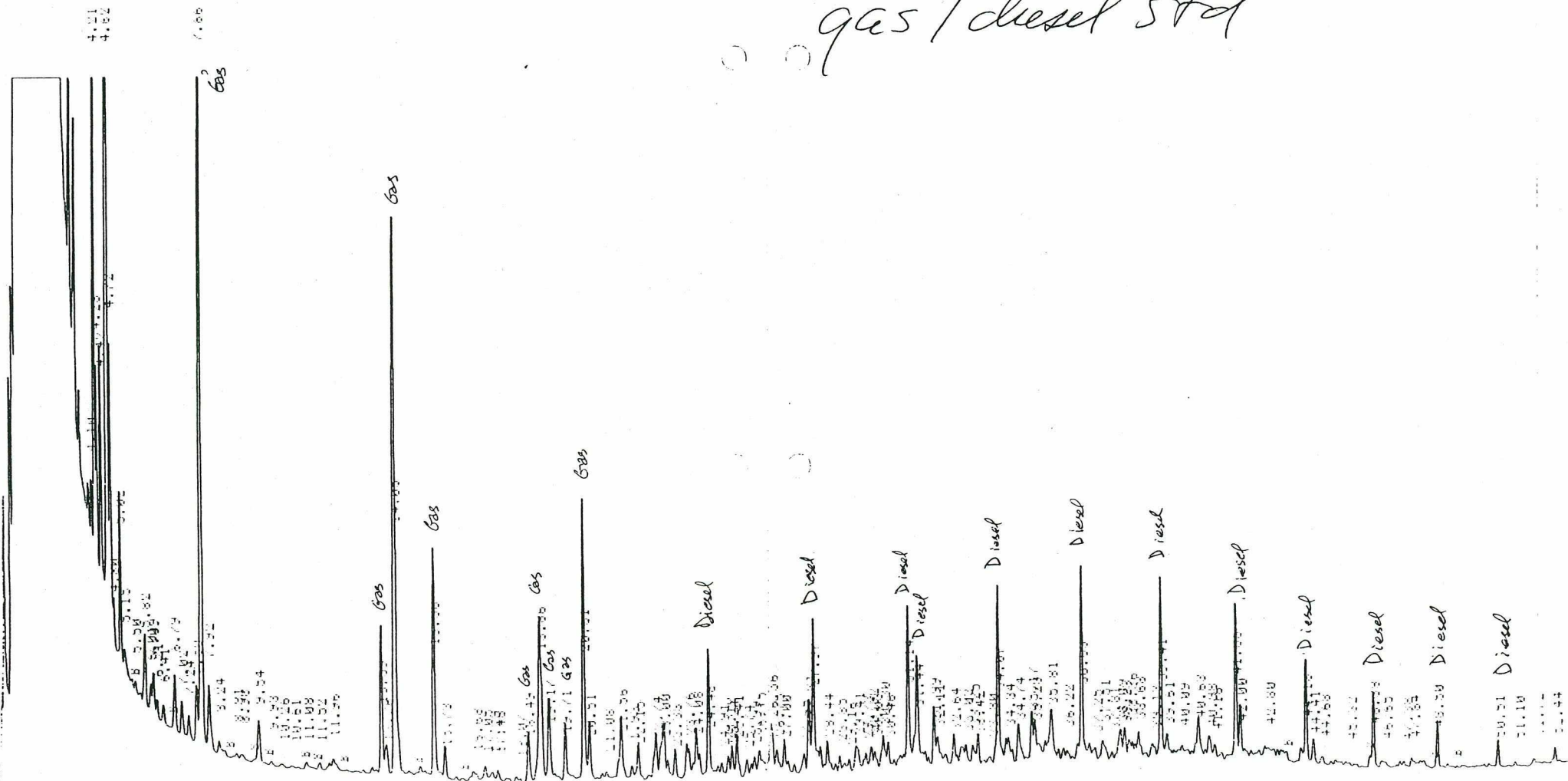
NOTES

 γ_{11} deduction

B-3/w
880908-C13

880908-C13

gas/diesel std



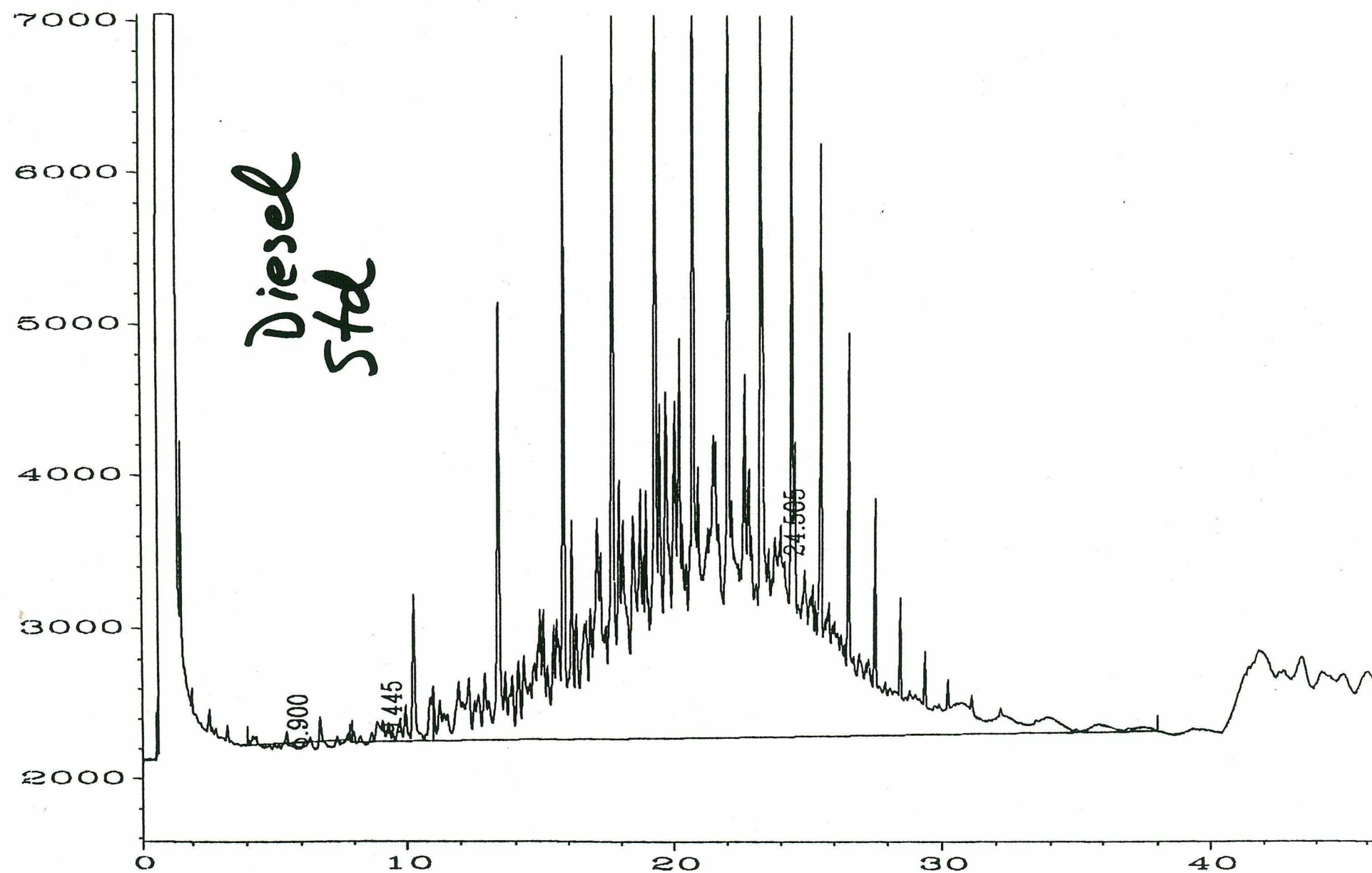
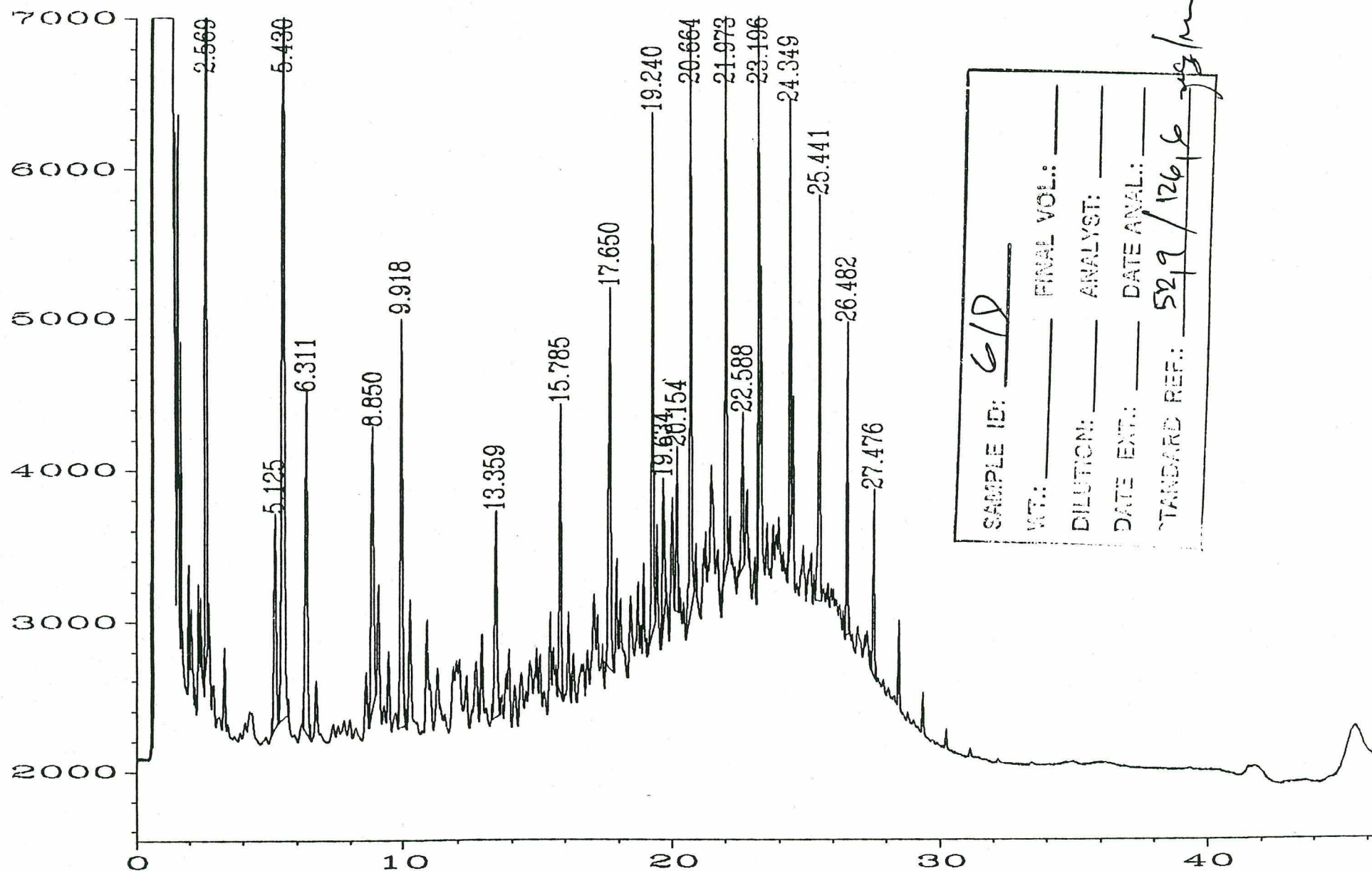
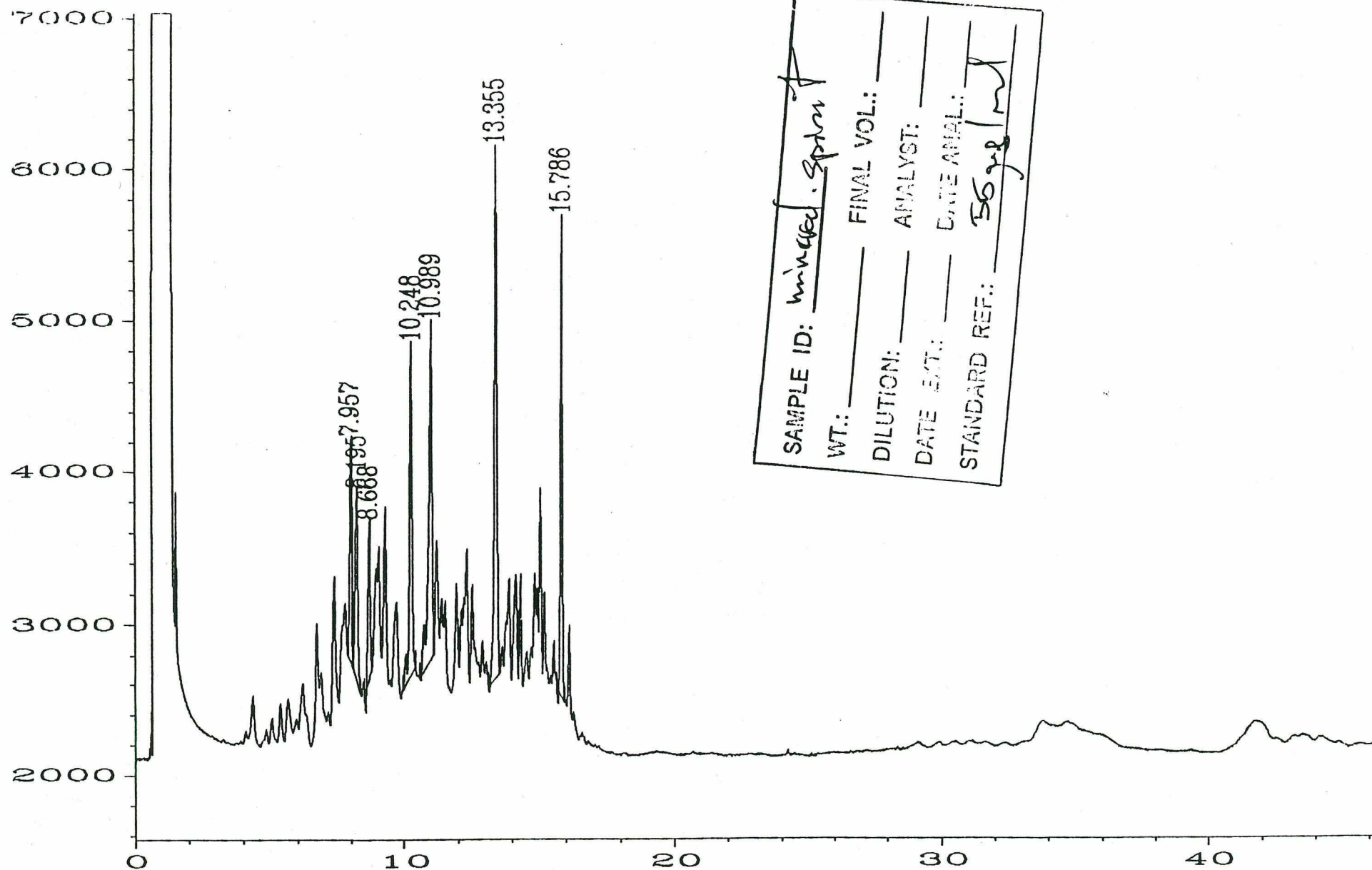


Fig. 2 in N:\DATA\GC\1\DATA\112894\007R0301.D

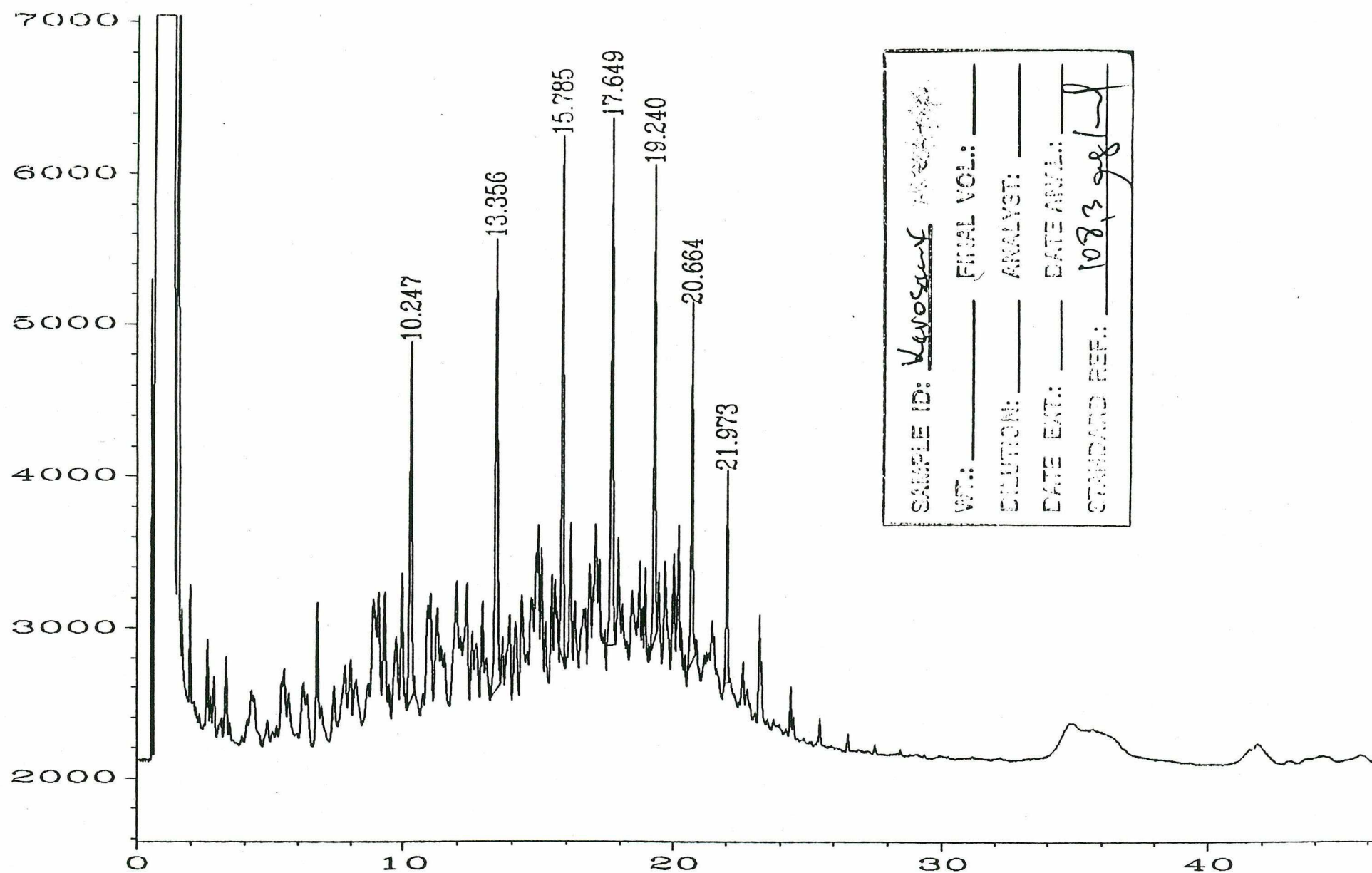


SAMPLE ID: <u>618</u>	
WT: _____	FINAL VOL: _____
DILUTION: _____	ANALYST: _____
DATE EXT: _____	DATE ANAL: _____
STANDARD REF: <u>529/12616</u> <u>g/g/ml</u>	

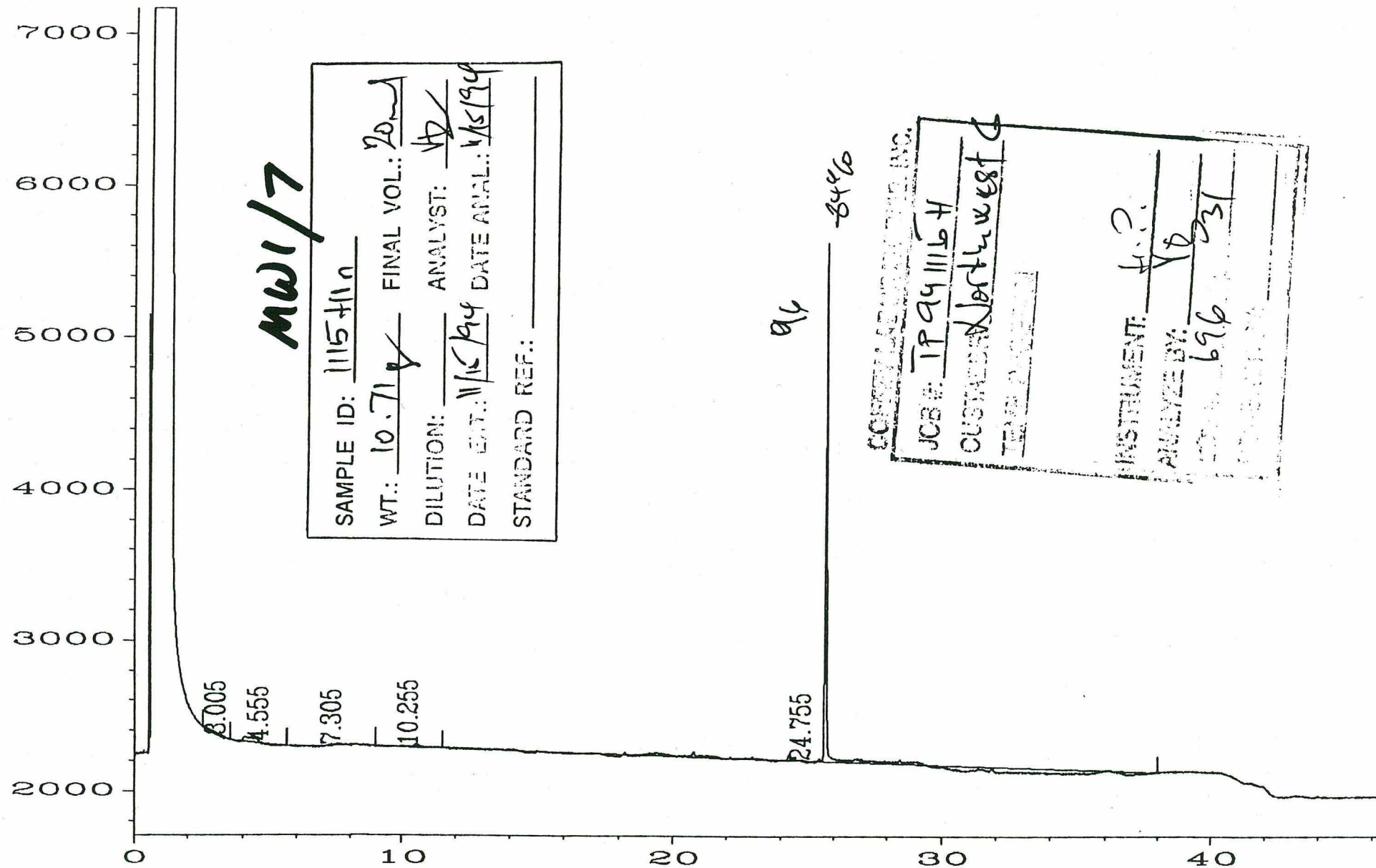
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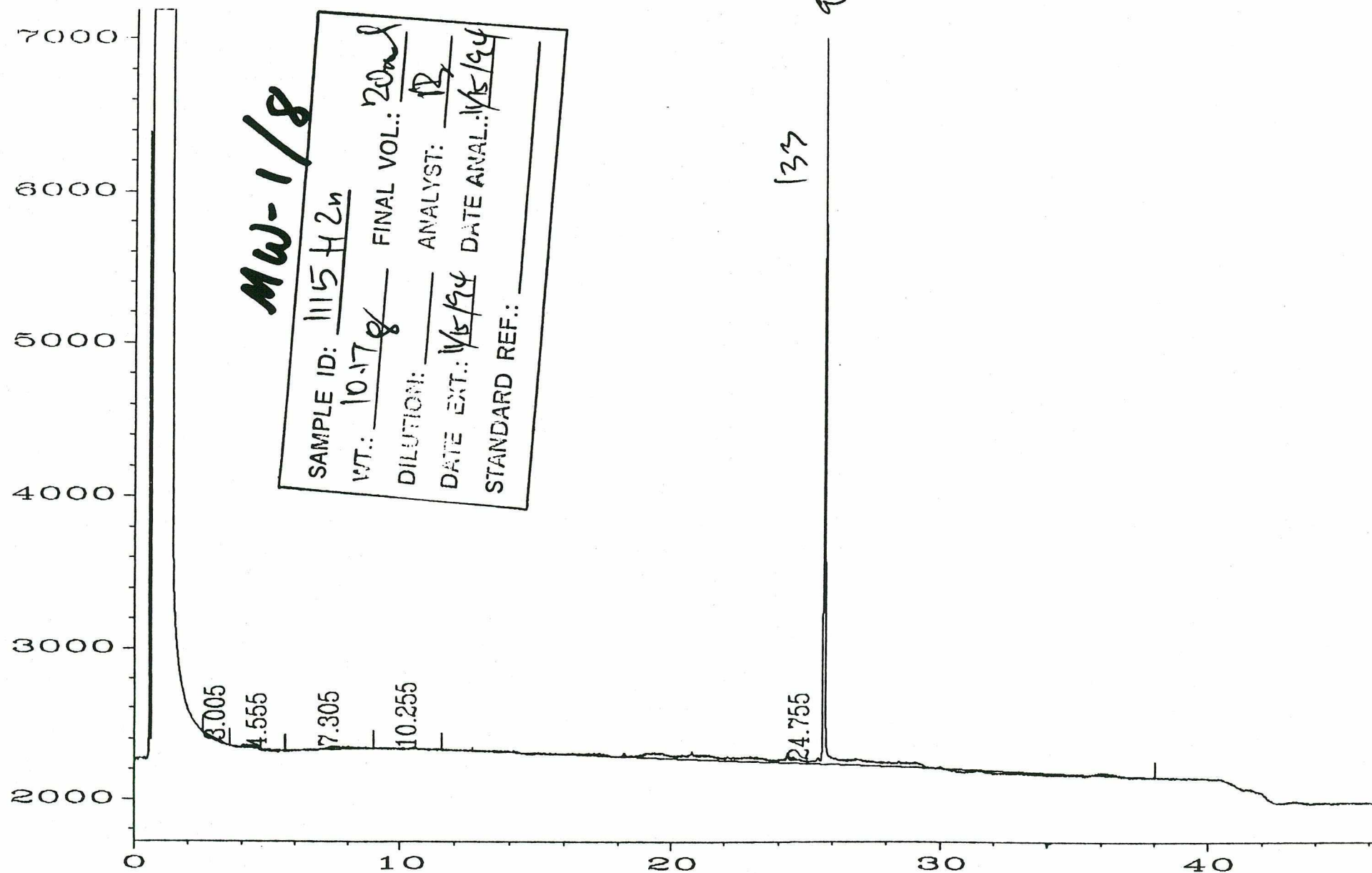
Sig. 2 in N:\DATA\GC\1\DATA\113094\038R0101.D



SAMPLE ID: Xenosant
WT: _____ FINAL VOL: _____
SOLUTION: _____ ANALYST: _____
DATE EXT: _____ DATE ANAL: _____
STANDARD REF: 1083 g/L

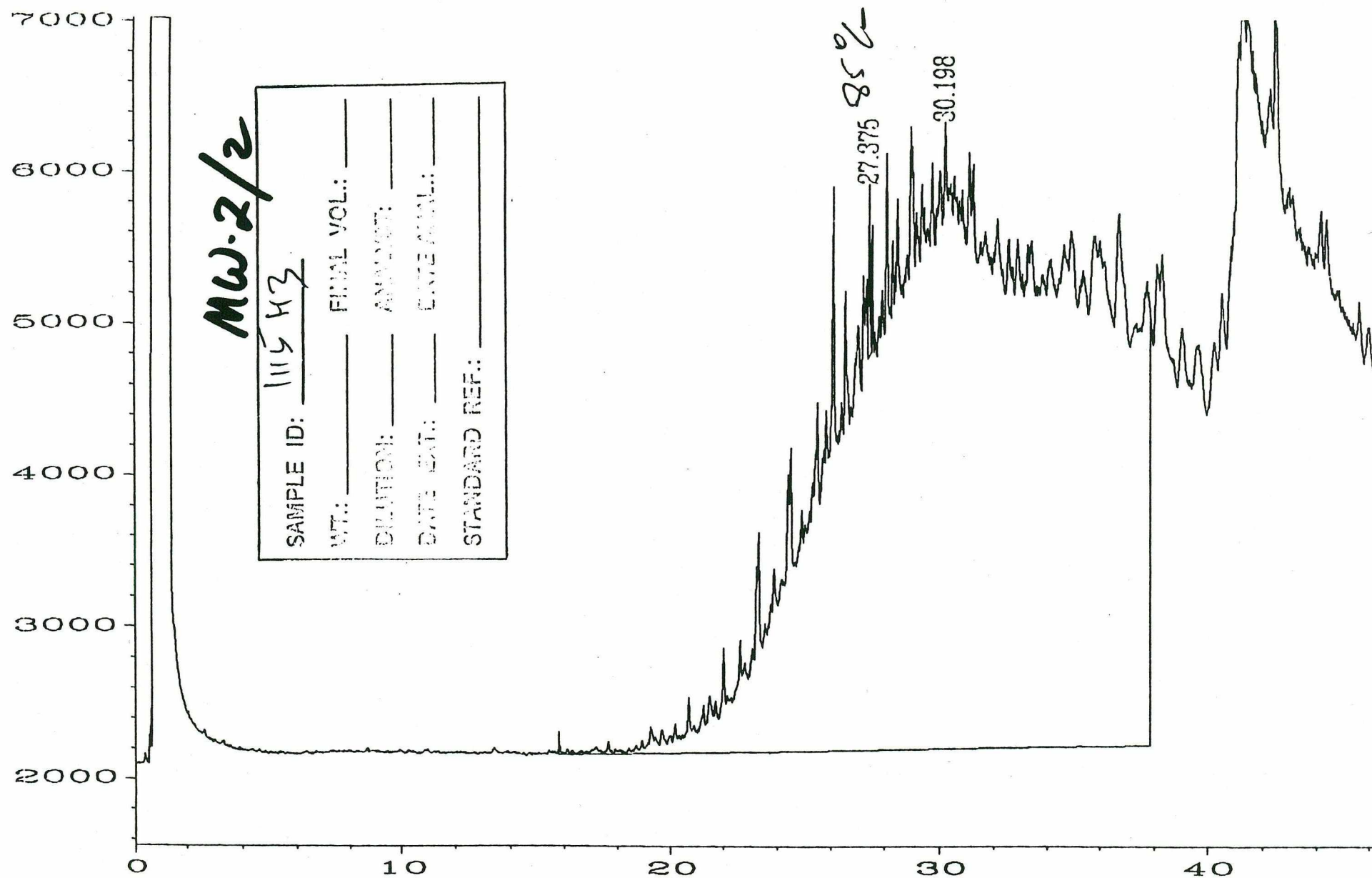


Sig. 2 in N:\DATA\GC\1\DATA\111694\024R0101.D



Sig. 2 in N:\DATA\GC\1\DATA\111694\025R0101.D

user modified



Sig. 2 in N:\DATA\GC\1\DATA\112894\005R0101.D

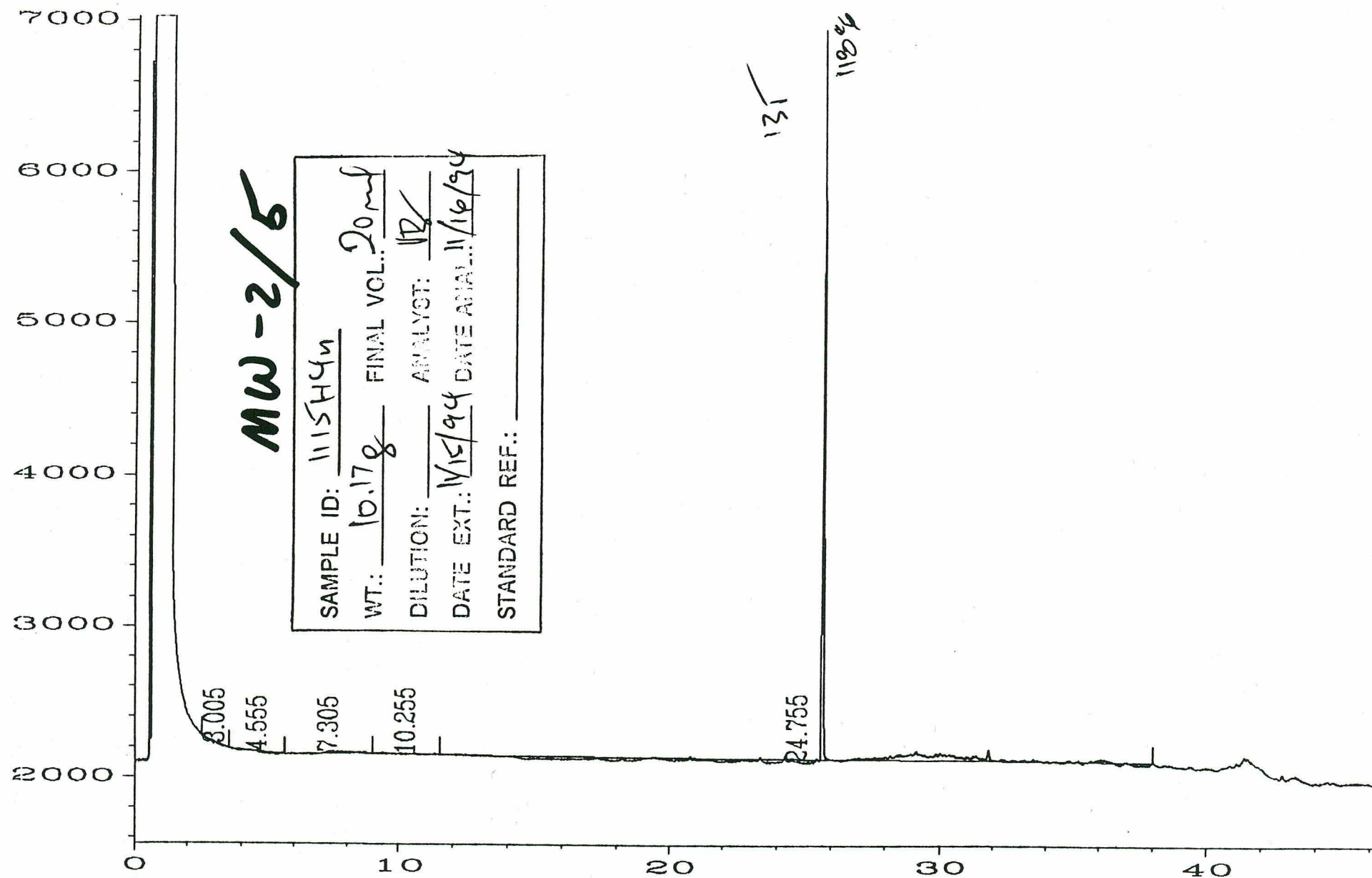
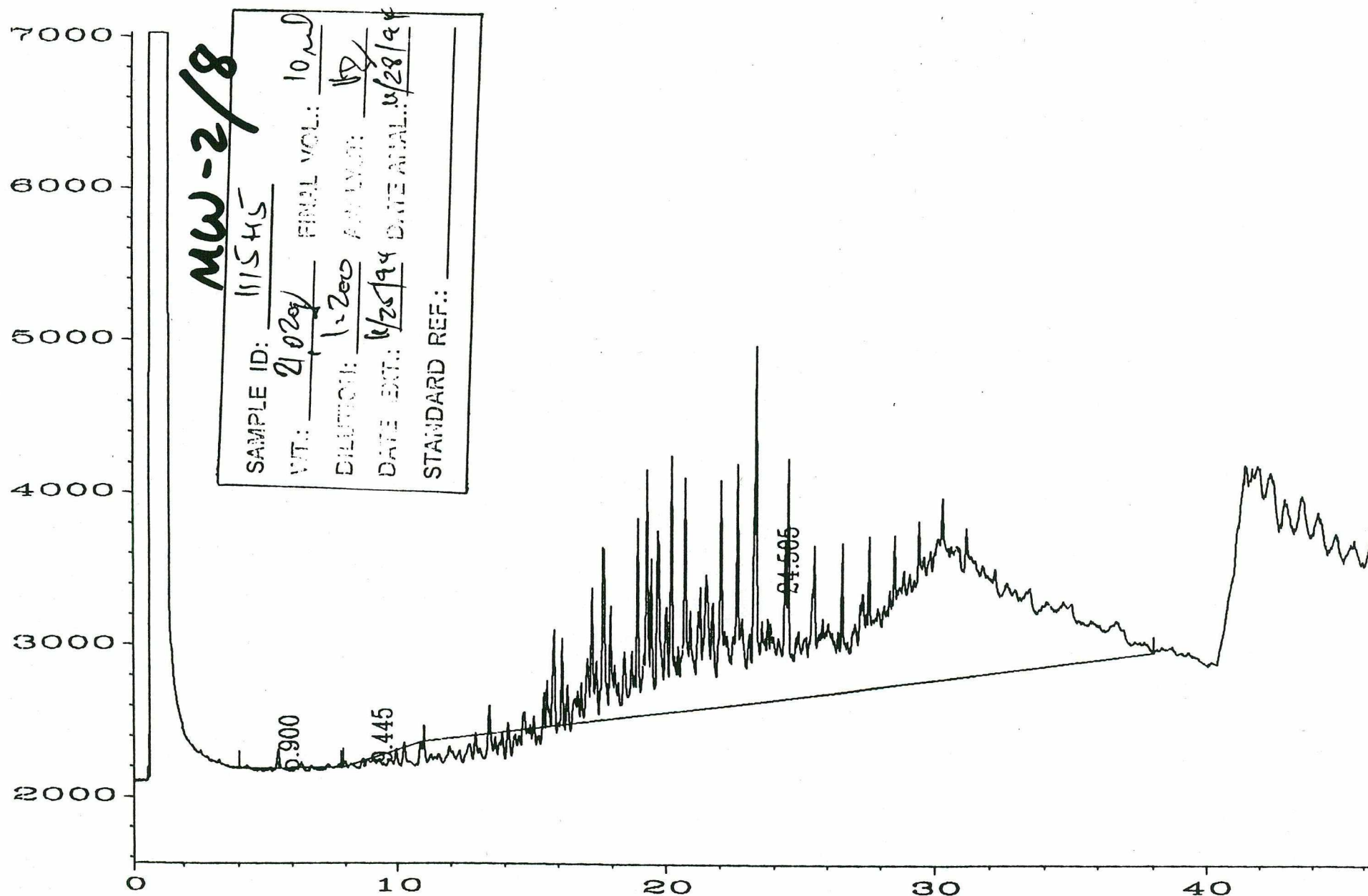
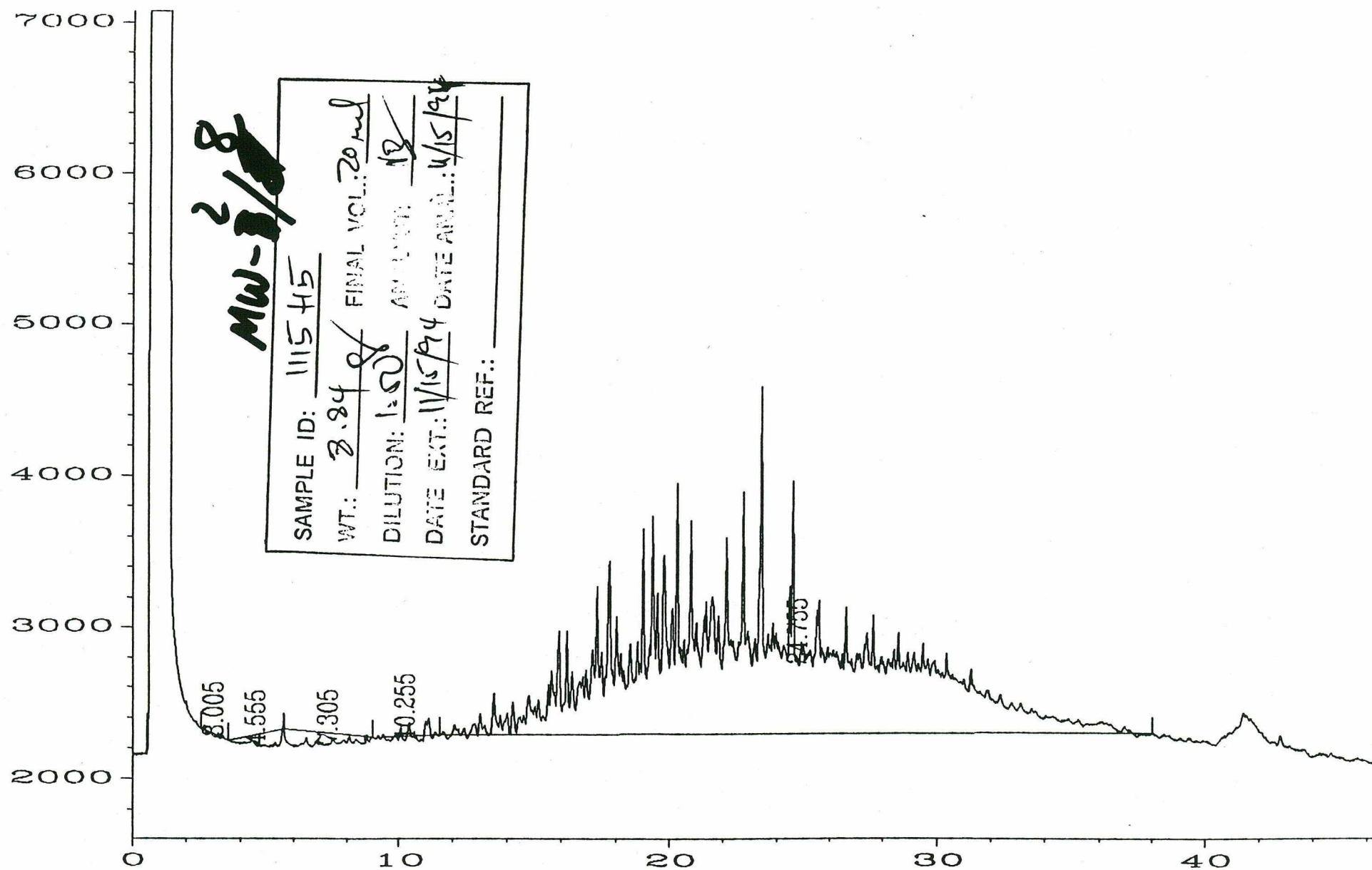


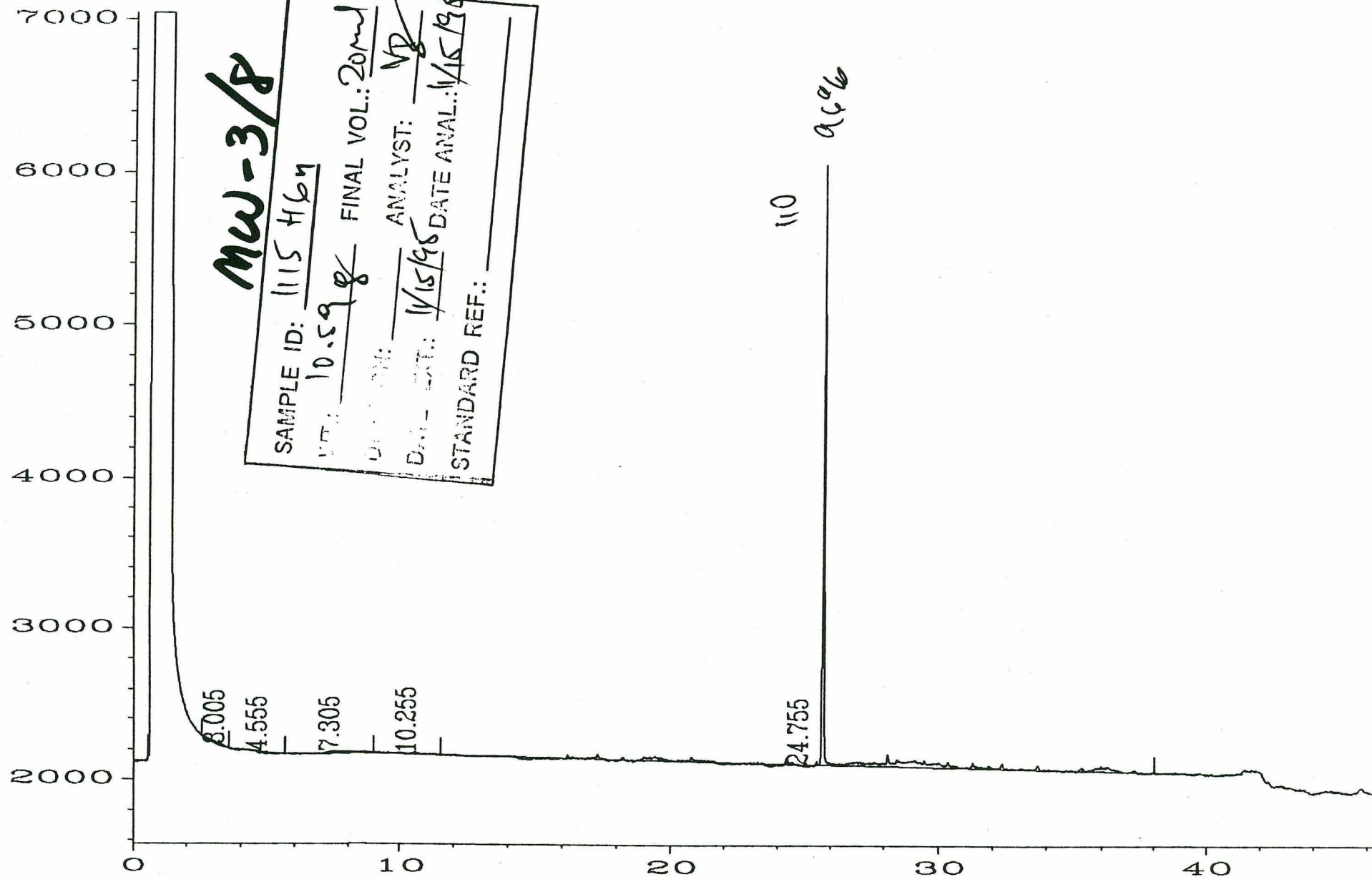
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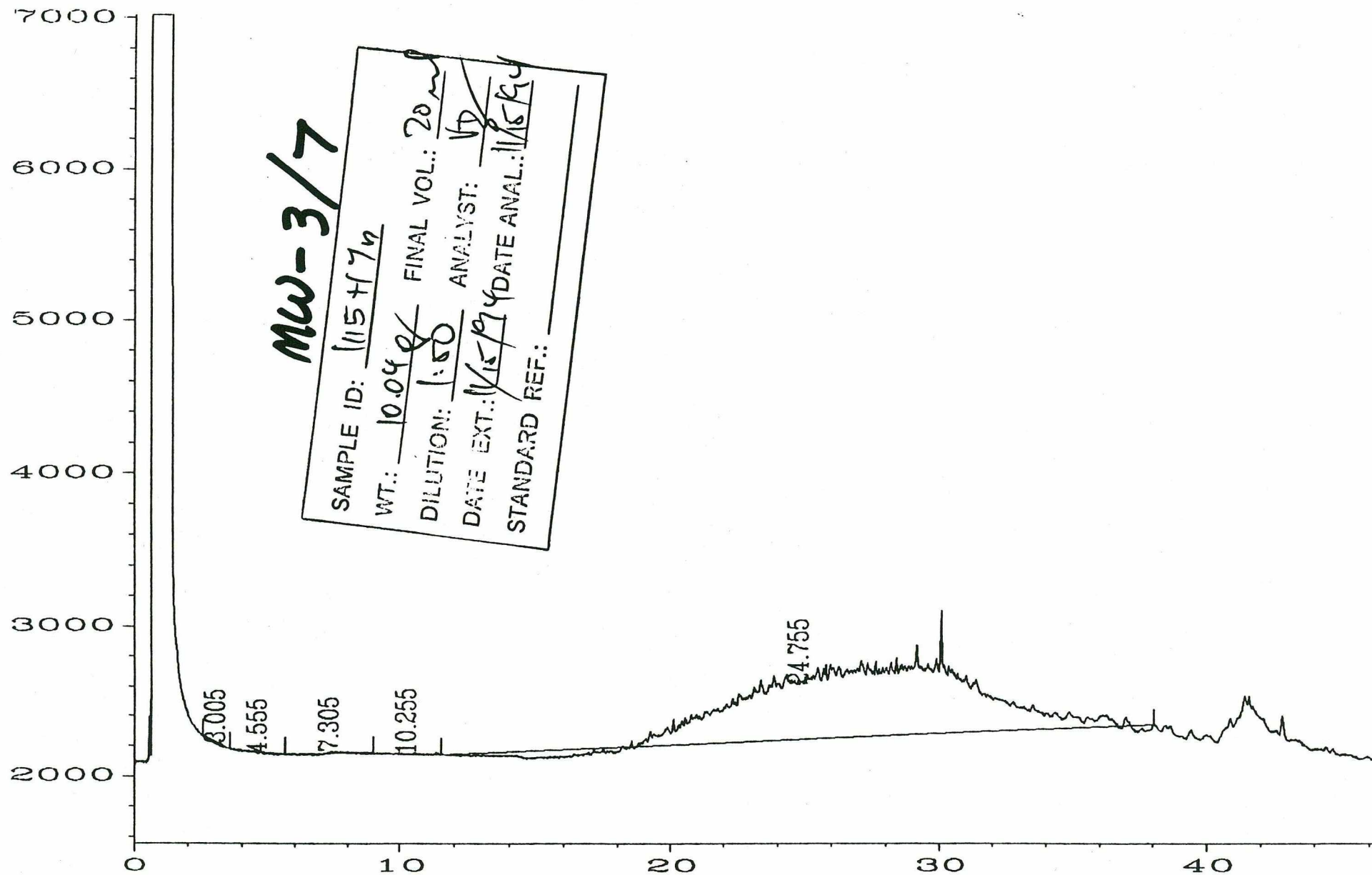
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Sig. 2 in N:\DATA\GC\1\DATA\111694\028R0101.D



Sig. 2 in N:\DATA\GC\1\DATA\111694\029R0301.D



Sig. 2 in N:\DATA\GC\1\DATA\111694\03OR0301.D

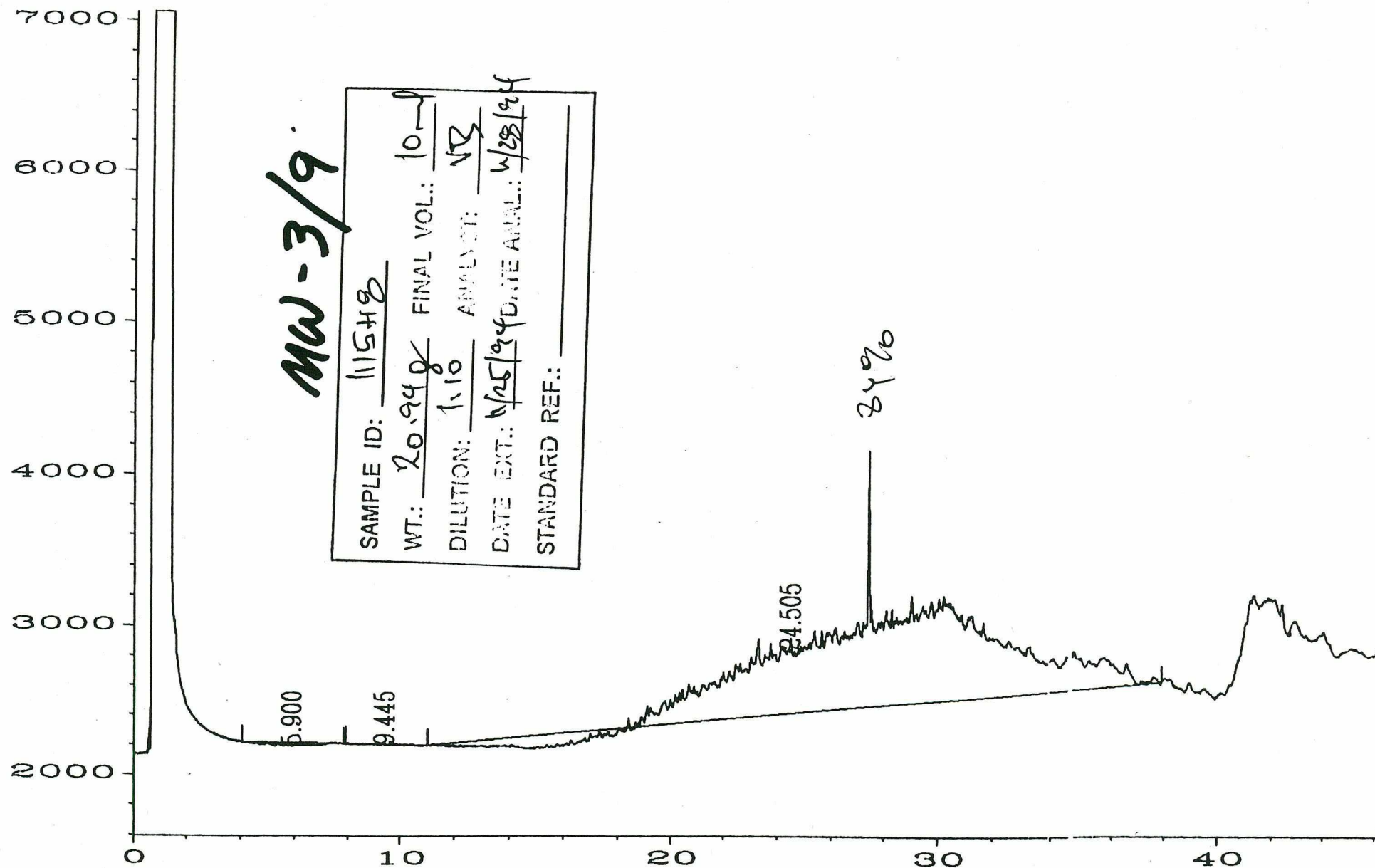
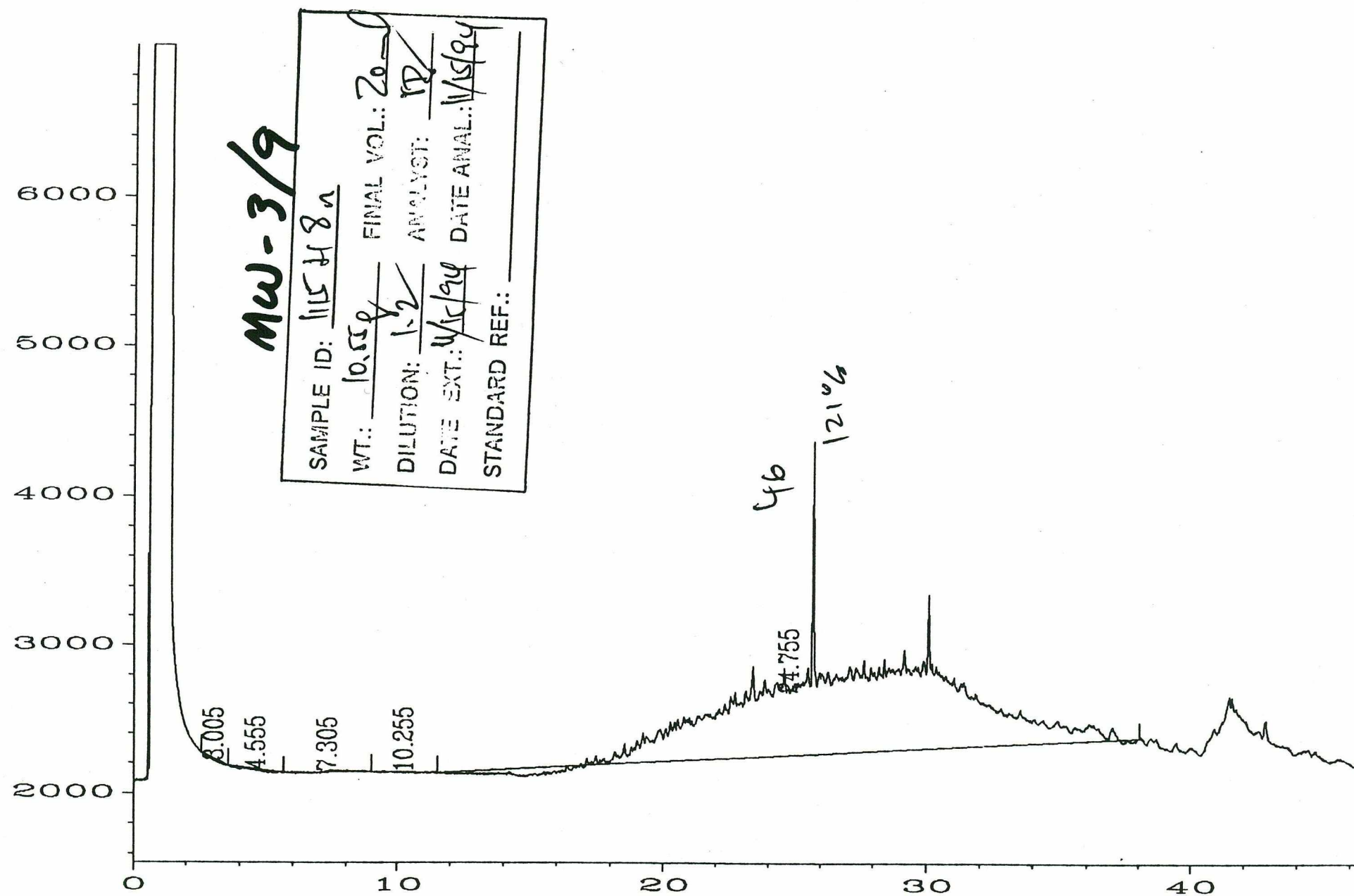
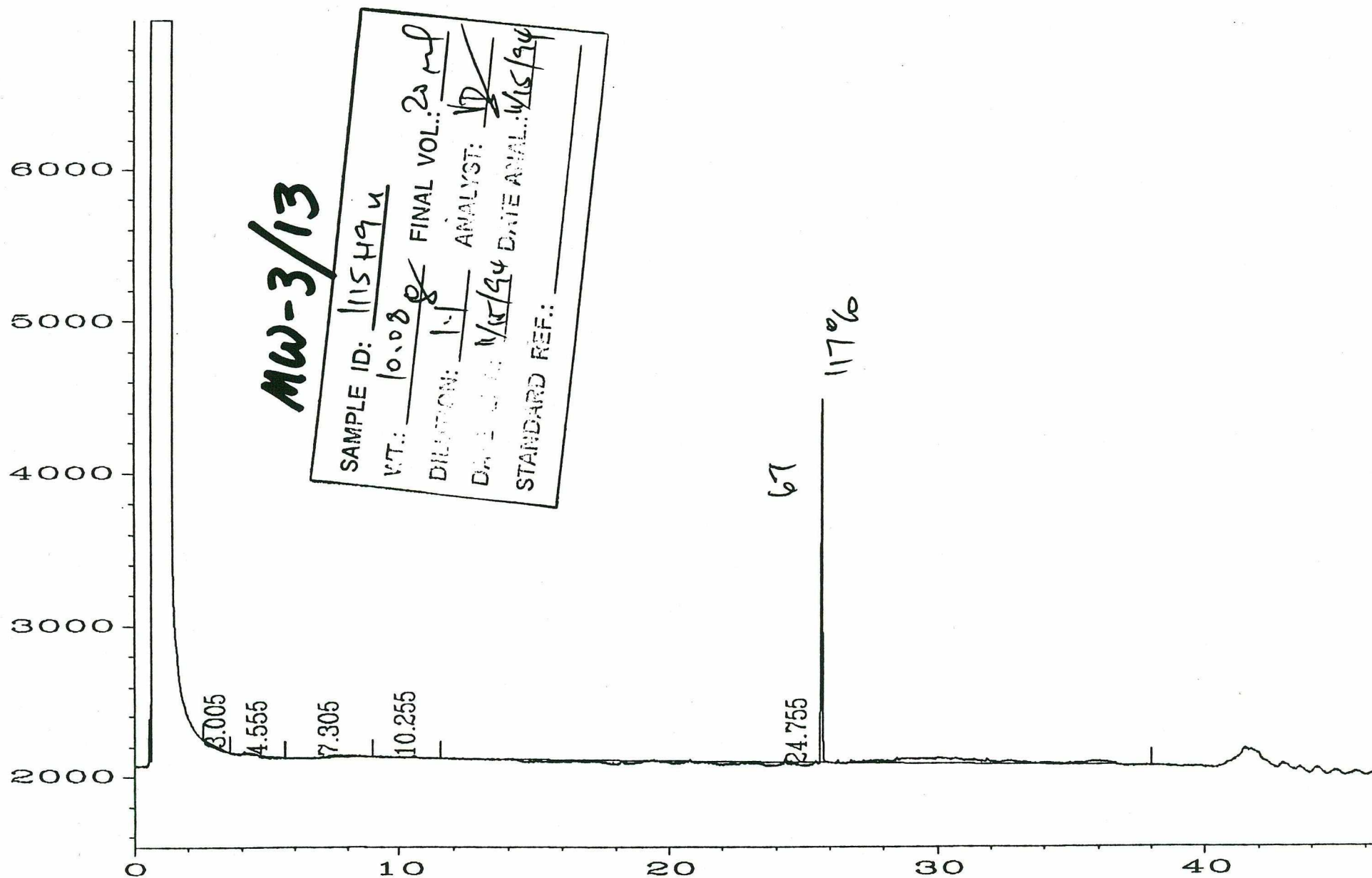


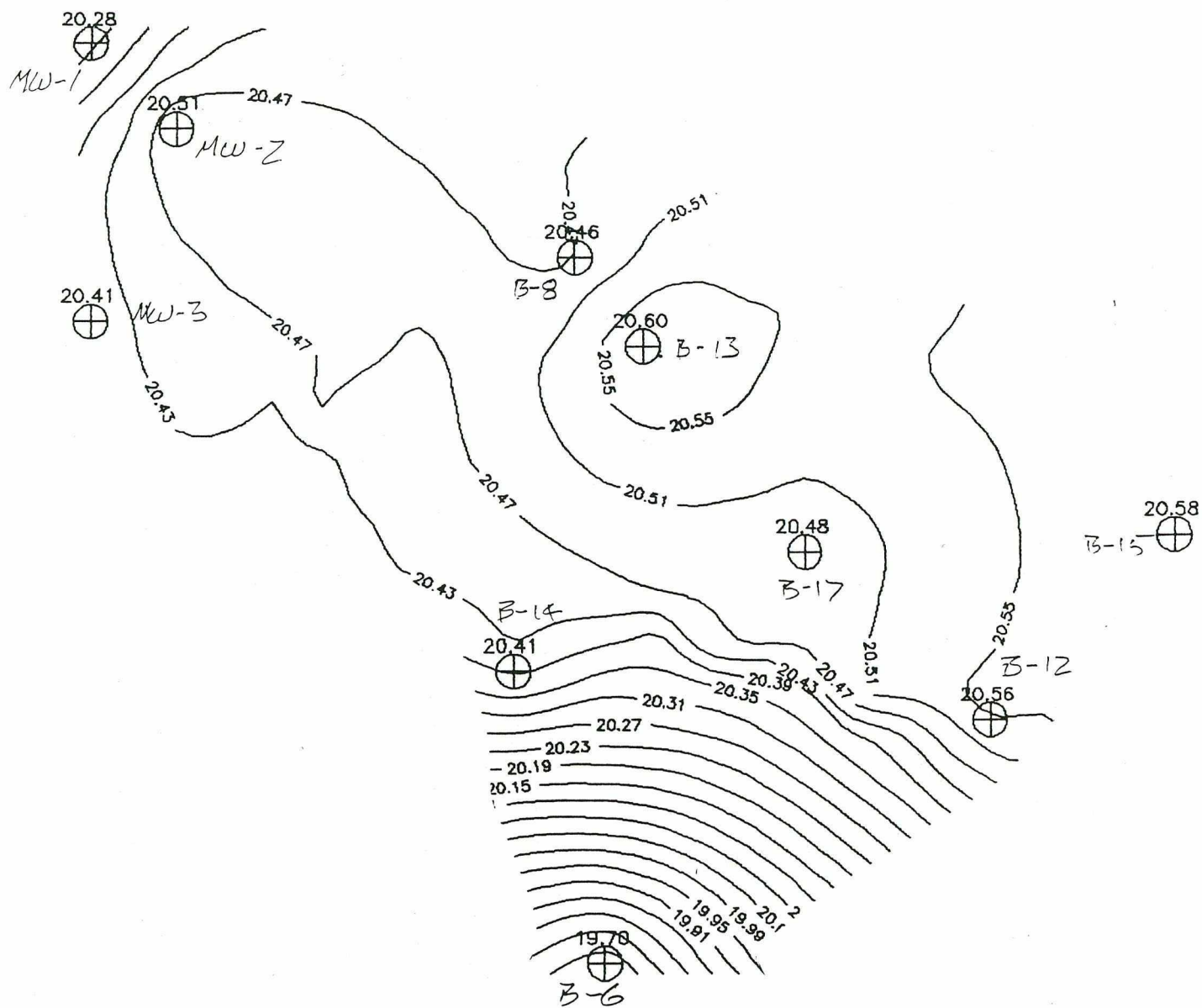
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Sig. 2 in N:\DATA\GC\1\DATA\111694\031R0301.D

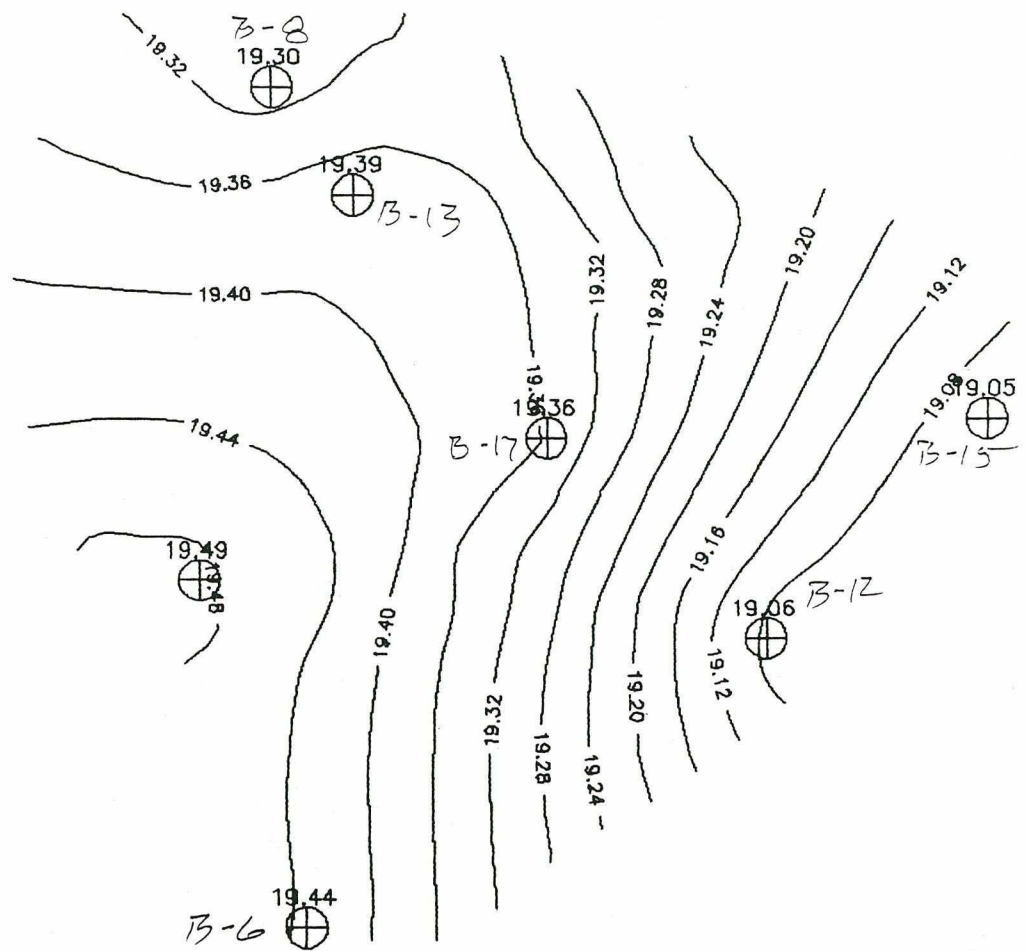


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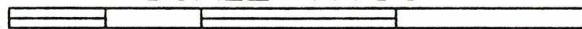


SCALE 1:150

LCL&C - Marathon 28 Nov 94 ground water



SCALE 1:150



LCL&C — Marathon 26 Oct 94 ground water