Tank Removal and Site Assessment

ARCO Products Company

ARCO Facility 4473

Everett, Washington

Prepared for
ARCO Products Company
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1 INTRODUCTION

1.1 Background

EMCON Northwest, Inc., was retained by ARCO Products Company to observe the removal of underground storage tanks at ARCO Facility 4473 located in Everett, Washington. Our services included completing a site assessment checklist, as required by the Washington State Department of Ecology (Ecology) under Chapter 173-360 Washington Administrative Code (WAC).

The tasks completed under the current scope of work consisted of:

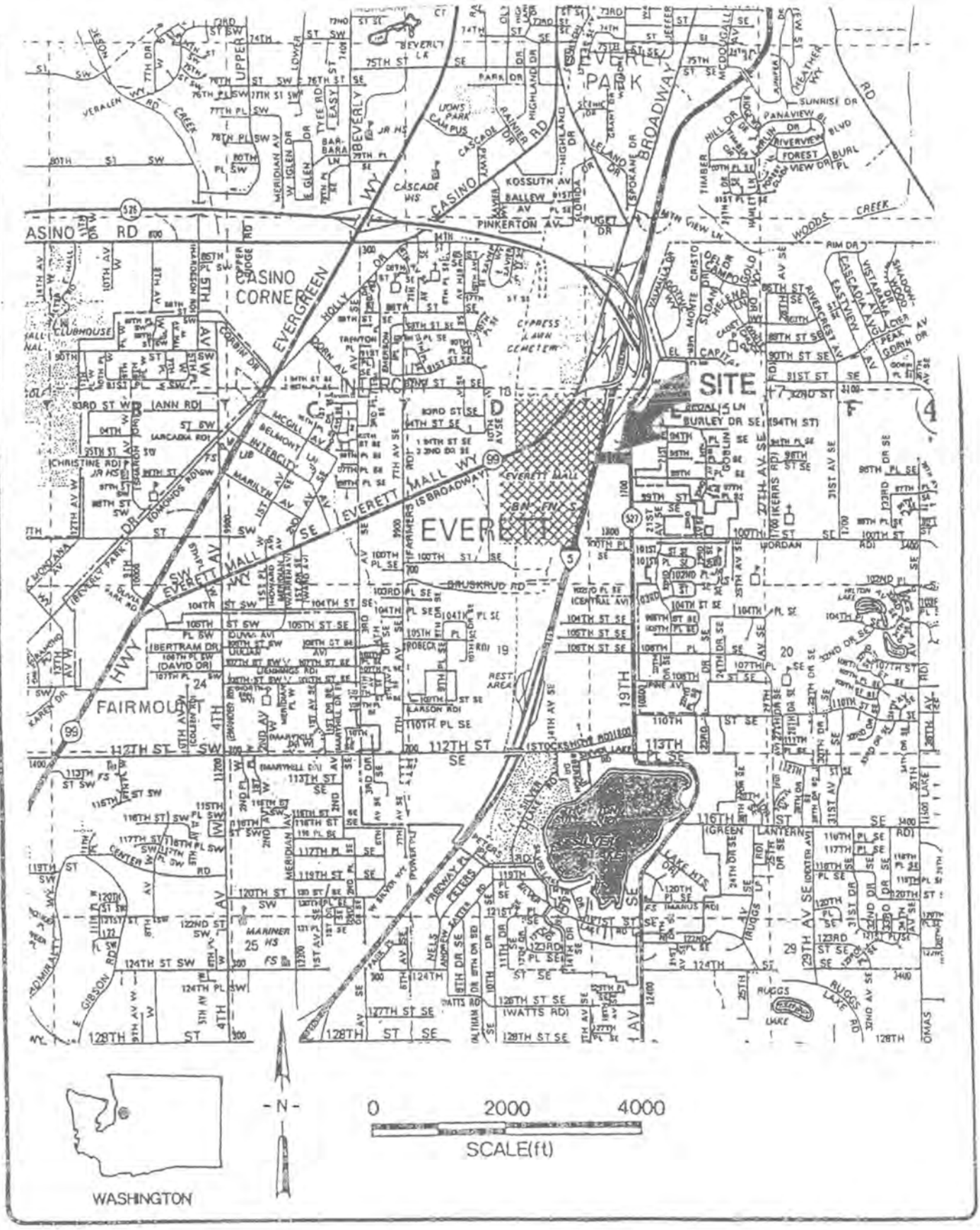
- observing the removal of four underground storage tanks and associated product lines
- monitoring and screening excavated soil for stockpile segregation on-site
- collecting soil samples from the tank excavations, product line trenches, pump island trenches, and stockpiled soil for analyses
- conducting quantitative chemical analyses on selected soil samples
- defining the extent of hydrocarbon-impacted soils in the vicinity of the western pump island by drilling two exploratory soil borings, and collecting and analyzing soil samples
- coordinating and arranging for the disposal of hydrocarbon-impacted stockpiled soils
- interfacing with and reporting to Ecology as required under Chapter 173-340-450 WAC
- compiling and interpreting data

The work was authorized under task order 4473-92-1, dated January 21, 1992, of blanket order 07-002, dated February 4, 1988, between ARCO Products Company and EMCON Associates. All tasks were completed in general accordance with our October 24, 1991, scope of work presented to ARCO Products Company regarding site assessment activities.

1.2 Site Location

ARCO Facility 4473 is located at 9506 19th Avenue Southeast in Everett, Washington (Figure 1). The property is irregularly shaped covering approximately 32,325 square feet. The site is bordered by a motel with an associated asphalt parking area to the south, a restaurant to the north, 19th Avenue Southeast to the east, and Interstate 5 to the west. The project site contains one two-story building located on the eastern portion of the property. An operating restaurant occupies the second level of the building and an inactive retail gasoline station/convenience store occupies the lower level.

The gasoline and waste oil tank complex is located south of the building. There are two unleaded gasoline underground storage tanks (6,000 and 8,000 gallon), one leaded gasoline underground storage tank (8,000 gallon), and one waste oil underground storage tank located on-site. The product lines extend east from the tank complex and angel north toward the two dispensing islands located east of the existing building (Figure 2).


SITE
EVERETT MALL WY
EVERETT
EVERETT PARK
CASINO CORNER
FAIRMOUNT
HWY 99
SCALE(ft)
0
2000
4000
- N -
WASHINGTON

2 PREVIOUS WORK

2.1 Soil Borings

Subsurface soils were investigated by drilling four soil borings (SB-1, SB-2, SB-3, and SB-4) on January 22, 1992 (Figure 2). Prior to drilling activities, underground utilities were located on- and off-site by the respective utilities companies. The borings were drilled to investigate the subsurface conditions in the vicinity of the tank complex and pump islands prior to the tank removal.

The borings were drilled by Holt Testing, Inc., of Puyallup, Washington, using 4-inch-I.D. hollow-stem auger equipment. The borings penetrated to a maximum depth of 31.5 feet below the existing ground surface or until ground water was encountered. Soil boring drill cuttings, approximately 2 cubic yards, were temporarily stockpiled on and covered with plastic pending soil chemistry analytical results. The soil stockpile was located at the southwest corner of the site as shown on Figure 2. The stockpile was transported by T.M. Services Corp., of Arlington, Washington, to Associated Sand and Gravel in Everett, Washington for disposal on February 18 and 19, 1992, in conjunction with the tank removal soil disposal.

2.2 Soil Sampling

Soil samples were collected at 5 foot intervals from borings SB-1, SB-2, SB-3, and SB-4 using 2-inch O.D. x 24-inch split spoon samplers. In addition, one composite soil sample designated SC-1 was collected from the stockpile of drill cuttings. All soil samples were labeled, placed in an iced cooler, and hand delivered under ARCO Products Company chain-of-custody protocol to Columbia Analytical Services, Inc., of Bothell, Washington. Selected samples were analyzed on a 24-hour turnaround basis.

All soil samples were field screened for ionizable organic vapors using an OVM Model 580 photoionization detector (PID) calibrated to 100 parts per million (ppm) isobutylene. Hydrocarbon vapor concentrations as measured

with a PID are useful for indicating relative levels of contamination, but can not be used to evaluate hydrocarbon concentrations with the confidence of laboratory analysis. No indications of the potential presence of petroleum hydrocarbons were in any collected sample or in any drill cuttings. The results of the PID measurements are presented on the soil boring logs (Appendix A) at the respective sample depth intervals.

In general, the subsurface native soils encountered in the four borings below surficial asphalt consisted of very dense, silty sand with gravel. No soil samples were collected below the saturated zone.

2.3 Ground Water

Ground water was encountered in all four borings at depths ranging from 20 to 30 feet below the existing ground surface during drilling activities on January 22, 1992. Ground water depths were approximated based on observations made at the time of drilling. Monitoring wells were not installed due to the high probability of destroying the wells during the scheduled tank removal.

2.4 General Analytical Procedures

Soil analyses were performed by Columbia Analytical Services, Inc., of Bothell, Washington. The analyses quantified the concentrations of benzene, toluene, ethylbenzene, and total xylenes (BTEX) constituents and total volatile petroleum hydrocarbons (TPH-G) by EPA Methods 5030/8020/8015, Modified. Selected soil samples collected from the boring nearest the leaded underground storage tank (SB-3) were also analyzed for total lead by EPA Method 7420. Selected soil samples collected from the boring nearest the waste oil tank location (SB-2) were analyzed for waste oil constituents, including total recoverable petroleum hydrocarbons (TPH-IR) by EPA Method 418.1, polychlorinated biphenyls (PCBs) by EPA Methods 3540/8080, halogenated volatile organic compounds by EPA Methods 5030/8010, and toxicity characteristics leaching procedure (TCLP) for eight metals by EPA Method 1311. Analyses were selected based on Ecology's "Guidance for Remediation of Releases from Underground Storage Tanks," dated July 1991. A description of the petroleum hydrocarbon analytical methods are presented in Appendix B.

2.5 Analytical Results

BTEX and TPH-G were not detected in any of the analyzed soil samples collected from SB-1, SB-2, SB-3, and SB-4 on January 22, 1992. Total recoverable petroleum hydrocarbons were detected at a concentration of 350 mg/kg in the soil sample collected from SB-2 (near the waste oil tank) at an approximate depth of 10 feet below the existing ground surface. No petroleum hydrocarbons were detected in the sample collected from SB-2 at 15 feet below the existing ground surface. The mg/kg units approximate ppm concentrations.

Total lead, at a concentration of 6 mg/kg, was detected in the soil sample collected from SB-3 at a depth of 5 feet below the existing ground surface. Chromium was detected at the method reporting limit (0.01 mg/l) during the TCLP analysis in sample SB-2 collected at a depth of 10 feet below the ground surface. The regulatory limit for chromium is 5.0 mg/l[1]. No PCBs, halogenated volatile organic compounds, or TCLP metals were detected at or above the method reporting limit in the analyzed samples collected from SB-2.

Analytical results of the soil analyses are summarized in Table 1. Copies of the laboratory analytical reports and associated chain-of-custody documentation are presented in Appendix A.

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[1] 40 CFR Part 261, et al., and "Federal Register," March 29, 1990, and June 29, 1990.

Table 1
Summary of Soil Analyses - Preliminary Tank Removal Assessment
ARCO Facility 4473
Everett, Washington

Sample I.D.	Date Sampled	Depth Collected (feet)	Benzene[1] (mg/kg)	Toluene[1] (mg/kg)	Ethyl-benzene[1] (mg/kg)	Total Xylenes[1] (mg/kg)	TPH-G[1] (mg/kg)	Total Lead[2] (mg/kg)	TPH-IR[3] (mg/kg)	PCBs[4] (mg/kg)	Volatile Organics[5] (mg/kg)	TCLP Metals[6] (mg/l)
SB1-2	1-22-92	10	ND	ND	ND	ND	ND	--	--	--	--	--
SB1-3	1-22-92	15	ND	ND	ND	ND	ND	--	--	--	--	--
SB1-4	1-22-92	20	ND	ND	ND	ND	ND	--	--	--	--	--
SB2-2	1-22-92	10	ND	ND	ND	ND	ND	--	350	ND	ND	ND*
SB2-3	1-22-92	15	ND	ND	ND	ND	ND	--	--	--	--	--
SB2-4	1-22-92	20	ND	ND	ND	ND	ND	--	--	--	--	--
SB3-1	1-22-92	5	ND	ND	ND	ND	ND	6	--	--	--	--
SB3-2	1-22-92	10	ND	ND	ND	ND	ND	ND	--	--	--	--
SB3-3	1-22-92	15	ND	ND	ND	ND	ND	ND	--	--	--	--
SB4-1	1-22-92	5	ND	ND	ND	ND	ND	--	--	--	--	--
SB4-2	1-22-92	10	ND	ND	ND	ND	ND	--	--	--	--	--
SB4-3	1-22-92	15	ND	ND	ND	ND	ND	--	--	--	--	--
SS-C	1-22-92	Stockpile	ND	ND	ND	ND	ND	--	--	--	--	--
Method A Cleanup Levels[7]			0.5	40	20	20	100	250	200			

NOTES: mg/kg Approximates parts per million (ppm) concentrations
mg/l Approximates ppm concentrations
ND Not detected at or above Method Reporting Limit
– Not analyzed
* For TCLP analyses, chromium was detected at the reporting limit (0.01 mg/l). The regulatory limit[8] for chromium is 5.0 ppm.

1 BTEX and TPH-G analysis by EPA Methods 5030/8020/8015, Modified
2 Total lead analysis by EPA Method 7420
3 TPH-IR analysis by EPA Method 418.1
4 PCB analysis by EPA Methods 3540/8080
5 Halogenated Volatile Organic Compound analysis by EPA Methods 5030/8010
6 TCLP metals analysis by EPA Method 1311
7 Chapter 173-340 WAC, Model Toxics Control Act, Method A Compliance Cleanup levels - soil, Amended February 1991.
8 40 CFR Part 261, et. al., and "Federal Register," March 29, 1990 and June 29, 1990.

3 TANK REMOVAL ACTIVITIES

3.1 Tank Removal Observations

Removal of the underground storage tanks, product dispensers, and product lines from the property was completed by T.M. Services Corp., of Arlington, Washington, between February 3 and February 10, 1992. The removals were completed by overexcavating around each tank or piping, and extracting the respective component. Prior to tank removals, the product lines were disconnected and the contents drained into containers. Absorbent materials were placed in each supply line to collect any residual fluids. Dry ice was placed into the tanks to displace air and hydrocarbon vapors. The tanks were inspected by Mr. Allan Vroman of the Everett Fire Department on February 5, 1992, prior to removal. Information on the tanks is provided in Table 2.

Table 2

Characteristics of Underground Storage Tanks
ARCO Facility 4473
Everett, Washington

Estimated Tank Capacity (gallond)	Construction Materials	Tank Contents[1]
6,000	Steel	Unleaded
8,000	Steel	Unleaded
8,000	Steel	Regular Leaded
550	Steel	Waste Oil

[1] Based on information provided by ARCO Products Company

The gasoline tanks were removed on February 5 and 6, 1992, and the waste oil tank was removed on February 6, 1992. All of the tanks appeared to be in good condition. No visible holes or corrosion were observed on the exterior.

3.2 Soil Sampling

Soil samples were collected from the tank excavations and product line trenches in accordance with Ecology's "Guidance for Site Checks and Site Assessments for Underground Storage Tanks," dated February 1991. Selected soils in the areas of excavation and stockpiled soils were field screened for the presence of volatile organic vapors using PID. Hydrocarbon vapor concentrations as measured with a PID are useful for indicating relative levels of contamination, but can not be used to evaluate hydrocarbon concentrations with the confidence of laboratory analysis. The intent of the analysis is to qualitatively compare samples and assist in sample selection for chemical analysis.

Soil samples were collected from the product line trenches in undisturbed soil using a decontaminated stainless steel spoon. Due to safety considerations, soil samples from within the excavations were obtained from soils recovered from the excavator bucket. Samples taken from the excavator bucket were collected from the least disturbed and most representative soils. To minimize the potential of cross-contamination, every effort was made to collect a sample from soils which had not come in direct contact with the excavator bucket. Sampling equipment was decontaminated prior to collecting each sample. The decontamination process included a non-phosphatic soap wash followed by a deionized water rinse. All samples were placed in labeled laboratory-prepared sample jars and stored in a cooler with ice. Samples were transported under ARCO Products Company chain-of-custody protocol to Columbia Analytical Services, Inc., of Bothell, Washington. Sample locations and descriptions are shown on Figures 3 and 4.

Selected soil samples were laboratory composited to increase the area sampled while minimizing the number of analyses. The laboratory composited samples were combined by Columbia Analytical Services, Inc., from soil samples collected at discrete locations.

3.3 Gasoline Tank Excavation

The gasoline tanks were removed on February 5 and 6, 1992. The gasoline tank excavation extended to a maximum depth of approximately 14 feet below the existing ground surface. The final dimensions of the tank excavation were approximately 14 by 56 feet. Backfill surrounding the tanks consisted of a brown, silty coarse sand. The native soil encountered was an extremely dense, gray, silty sand with gravel. The gasoline tanks appeared to be in good condition with no evidence of corrosion, leaks, or holes.

Soil samples were obtained from the walls and floor of the excavation on February 6, 1992. Two discrete soil samples (SWGTW and SEGTW) were collected from the southern sidewall at a depth of approximately 10 feet below the existing ground surface. SWGTW and SEGTW were composited in the laboratory and analyzed as one sample. Two discrete soil samples (NWGTW and NEGTW) were also collected from the northern sidewall at a depth of approximately 10 feet below the ground surface. NWGTW and NEGTW were composited in the laboratory and analyzed as one sample. Due to the configuration of the underground storage tanks, an additional discrete soil sample was collected from the northern sidewall (NMIDGTW). Discrete soil samples were collected from the west sidewall (WGTW) and the east sidewall (EGTW) as approximate depths of 10 feet below the ground surface. Discrete soil samples, WGTB, CNTRGTB, and EGTB, were collected from the bottom of the gasoline tank complex at approximate depths of 14, 14, and 13 feet below the existing ground surface, respectively. Ground water was not encountered during the gasoline tank removal activities.

3.4 Waste Oil Tank Excavation

The waste oil tank was removed on February 6, 1991. The excavation was approximately 9.5 by 9 feet and extended to the gasoline tank complex on the south. The soil observed around the waste oil tank consisted of the native silty sand with gravel. The tank appeared to be in good condition upon its removal with on obvious holes or evidence of leakage or corrosion.

Soil samples were collected from the waste oil tank excavation on February 6, 1992. Discrete soil samples (NWOTW, WWOTW, and EWOTW) were collected from each existing sidewall at approximate depths of 5, 6, and 4 feet below the existing ground surface, respectively. A discrete soil sample (WOTB) was also collected on the bottom of the waste oil tank excavation at a depth of 6 feet below the existing ground surface. Ground water was not encountered during the waste oil tank removal activities.

3.5 Eastern Pump Island and Product Line Trenches

The fuel dispensers from the eastern pump island were removed on February 3, 1992. The pump island was left intact. The product lines were removed on February 10 and 11, 1992. The trench excavations under the eastern pump island extended to a depth of 5 feet below the existing ground surface and the trench excavation for the product line extended to a depth of 3.5 below existing ground surface. One discrete soil sample was

collected from under each pump location (samples EPUMPN and EPUMPS) and composited as one sample in the laboratory. One discrete soil sample was collected from under each joint in the product lines located between the eastern and western pump islands (samples NPIPET and SPIPET) and composited as one sample in the laboratory. An additional discrete soil sample was collected from under the angle-joint in the product lines located between the pump islands and the tank complex (sample ANGPIPE).

3.6 Western Pump Island

The fuel dispensers from the western pump island were removed on February 3, 1992. The pump island was left intact. The original trenches under the western pump island extended to a depth of approximately 4 feet below the existing ground surface. Field screening with a PID on February 11, 1992, showed elevated concentrations of volatile organic vapors present at the base of the excavation. PID readings were 920 ppm on the north end of the pump island and 1,600 ppm on the south end. The hydrocarbon-impacted soils were overexcavated; however, during the overexcavation, the southern column footing for the building became exposed and all work was stopped. The extent of the overexcavation was 5 to 6 feet below the existing ground surface. Field screening with a PID at the extent of the overexcavation indicated volatile organic vapors were detected in concentrations of 320 ppm for the south end of the pump island, and 130 for the north end of the pump island. Discrete soil samples were collected from under each product dispenser location (samples WPUMPS and WPUMPN) on February 12, 1992.

A licensed EMCON Northwest, Inc., civil engineer arrived on-site on February 18, 1992, to assess the situation. Upon the engineer's recommendation, excavation under the western pump island was discontinued and backfill was placed around the exposed footing. The soil samples collected from under the western pump island on February 12, 1992, were submitted to the laboratory on February 18, 1992. The discrete samples were composited in the laboratory and analyzed as one sample.

3.7 Stockpiled Soil Sampling

Excavated soils from around the gasoline tanks were segregated from those excavated from around the waste oil tank. The soils removed from the gasoline tank excavation were further segregated by placing those soils that were overlying the tanks separate from the soils underlying the tanks. Soils were also field screened with a PID prior to stockpiling.

Approximately 340 cubic yards of soil was removed from the gasoline tank excavation, product line trenches, and from under the pump islands. Stockpile samples GTSS-1, GTSS-2, GTSS-3, and GTSS-4 were collected from approximately 250 cubic yards of soil removed from above and around the gasoline tanks in the excavation. Stockpile sample GTSS-5 was collected from approximately 90 cubic yards of soil removed from below the gasoline tanks and the bottom of the excavation.

Approximately 60 cubic yards of soil were removed from the waste oil tank excavation. Soil sample WOSS was collected and analyzed for waste oil parameters. Stockpile soil sampling was performed in accordance to Ecology's "Guidance for Remediation of Releases from Underground Storage Tanks," dated July 1991. Stockpile sample locations are presented on Figure 3.

4 QUANTITATIVE CHEMISTRY ANALYSES

4.1 General Analytical Procedures

Soil analyses were performed by Columbia Analytical Services, Inc., of Bothell, Washington. Soil samples collected from the gasoline tank excavation, gasoline stockpile, product line trenches, and pump island locations were analyzed for BTEX constituents and TPH-G by EPA Methods 5030/8020/8015 Modified, and total lead by EPA Method 7420. The gasoline stockpile samples were also analyzed for TPH-IR by EPA Method 418.1.

Soil samples collected from the waste oil tank excavation and waste oil stockpile were analyzed for waste oil constituents including TPH-IR by EPA Method 418.1, PCBs by EPA Methods 3540/8080, volatile organic compounds by EPA Method 8240, and TCLP for eight metals by EPA Method 1311. All analyses were selected based on Ecology's "Guidance for Remediation of Releases from Underground Storage Tanks," dated July 1991. A description of the petroleum hydrocarbon analytical methods are presented in Appendix B.

4.2 Volatile and Semivolatile Fuel Hydrocarbon, and TPH-IR Analyses

TPH-IR were not detected in any of the submitted soil samples. BTEX and TPH-G was also not detected in any submitted sample from the gasoline tank excavation, product line trenches, and from under the eastern pump island. BTEX constituents were detected in the samples collected from under the western pump island, but in concentrations less than the MTCA cleanup level. TPH-G exceeded MTCA cleanup levels for the laboratory composited samples (WPUMPN and WPUMPS) collected from under the western pump island. Benzene was not detected in any sample submitted for analysis. Table 3 presents a summary of the soil analytical results. Copies of the laboratory analytical reports and associated chain-of-custody documentation are presented in Appendix D.

Table 3

Summary of Soil Analyses - Tank Removal Assessment
ARCO Facility 4473
Everett, Washington

Sample I.D.	Sample Location	Depth (feet)	Date	Benzene(1) (mg/kg)	Toluene(1) (mg/kg)	Ethyl-benzene(1) (mg/kg)	Total Xylenes(1) (mg/kg)	TPH-Gasoline(1) (mg/kg)	TPH-Diesel/ (Other)(2) (mg/kg)	TPH-IR(3) (mg/kg)	Total Lead(4) (mg/kg)
GASOLINE TANK EXCAVATION SAMPLES											
NWGTW (C)*	Sidewall-NW	10	2-6-92								
NEGTW (C)*	Sidewall-NE	10	2-6-92	ND	ND	ND	ND	ND	–	–	ND
SWGTW (C)*	Sidewall-SW	10	2-6-92								
SEGTW (C)*	Sidewall-SE	10	2-6-92	ND	ND	ND	ND	ND	–	–	ND
NMIDGTW	Sidewall-Ctr.	10	2-6-92	ND	ND	ND	ND	ND	–	–	ND
WGTW	Sidewall-W	10	2-6-92	ND	ND	ND	ND	ND	–	–	ND
EGTW	Sidewall-E	10	2-6-92	ND	ND	ND	ND	ND	–	–	ND
WGTB	Bottom-W	14	2-6-92	ND	ND	ND	ND	ND	–	–	ND
EGTB	Bottom-E	13	2-6-92	0.09	ND	ND	ND	ND	–	–	ND
CNTRGTB	Bottom-Ctr.	14	2-6-92	ND	ND	ND	ND	ND	–	–	ND
WASTE OIL TANK EXCAVATION SAMPLES											
NWOTW	Sidewall-N	5	2-6-92	–	–	–	–	–	–	ND	–
WWOTW	Sidewall-W	6	2-6-92	–	–	–	–	–	–	ND	–
EWOTW	Sidewall-E	4	2-6-92	–	–	–	–	–	–	ND	–
WOTB	Bottom-Ctr.	9	2-6-92	–	–	–	–	–	–	ND	–
PRODUCT LINES AND PUMP ISLAND TRENCH SAMPLES											
NPIPET (C)*	Joint-N	3	2-10-92								
SPIPET (C)*	Joint-S	3	2-11-92	ND	ND	ND	ND	ND	–	–	ND
ANGPIPE	Joint-Ang.	2.5	2-10-92	ND	ND	ND	ND	ND	–	–	ND
EPUMPN	E-Pump, N. (C)*	3.5	2-10-92								
EPUMPS	E-Pump, S. (C)*	4.8	2-12-92	ND	ND	ND	ND	ND	–	–	ND
WPUMPN	W-Pump, N. (C)*	5	2-12-92								
WPUMPS	W-Pump, S. (C)*	6	2-12-92	ND	0.09	0.31	3.46	174	–	–	10
STOCKPILE SAMPLES											
GTSS-1	Gasoline	NA	2-7-92	ND	ND	ND	ND	ND	–	ND	5
GTSS-2	Gasoline	NA	2-7-92	ND	0.15	0.31	3.03	146	–	83	ND
GTSS-3	Gasoline	NA	2-7-92	ND	ND	ND	ND	ND	–	25	ND
GTSS-4	Gasoline	NA	2-7-92	ND	ND	ND	0.07	6	–	ND	ND
GTSS-5	Gasoline	NA	2-7-92	ND	ND	ND	0.07	14	–	1200	6
WOSS	Waste Oil	NA	2-7-92	–	–	–	–	–	1300 (Oil)	1000	–
ECOLOGY MTCA METHOD A CLEANUP CRITERIA (5)				0.5	40	20	20	100	200 (100)	100	250

NOTES:
mg/kg approximates parts per million (ppm) concentrations
ND Not detected at or above the method reporting limit
– Not analyzed
* Sample composited in the laboratory

(1) BTEX and TPH as gasoline analysis by EPA Methods 5030/8020/8015 Modified
(2) TPH as diesel/other analysis by EPA Methods 3550/8015 Modified
(3) TPH-IR analysis by EPA Method 418.1
(4) Total lead analysis by EPA Method 7420
(5) Chapter 173-340 WAC, Model Toxics Control Act, Method A cleanup levels - soil, amended February 1991

4.3 Total Lead, Volatile Organic Compounds, PCBs, and TCLP Metals Analyses

Ecology MTCA Method A cleanup levels were not exceeded for total lead in soil for any sample submitted for analysis. PCBs and TCLP metals were not detected in any sample. The data validation report for the volatile organic compound analysis (EPA Method 8240) is included in Appendix D.

5 SOIL DISPOSAL

5.1 Non-Contaminated Stockpiled Soils

Utilizing statistical methods, as outlined in Appendix E of Ecology's "Guidance for Remediation of Releases from Underground Storage Tanks," dated July 1991, the analytical results for samples GTSS-1, GTSS-2, GTSS-3, and GTSS-4 were below MTCA Method A Cleanup levels for soil. On February 18, 1992, T.M. Services, Corp., transported the 250 cubic yard gasoline stockpile from the site to Associated Sand and Gravel, in Everett, Washington, for disposal. The small 2-cubic yard stockpile from the preliminary tank removal assessment was also disposed.

5.2 Contaminated Stockpiled Soils

Approximately 60 cubic yards of waste oil-impacted soils (sample WOSS) and 90 cubic yards of gasoline-impacted soils (sample GTSS-5) were disposed of by Rabanco Regional Landfill Company (Rabanco) on March 13, 1992. The soils were picked-up and transported off-site to Rabanco's transfer station by J. Harper Trucking, a contractor to Rabanco. The soils will be transported from the transfer station to Rabanco's landfill (Roosevelt Regional Landfill) in Roosevelt, Washington.

6 SITE ASSESSMENT

6.1 Ecology Reporting Requirements

Based on our review of the analytical results for the laboratory composited soil samples (WPUMPN and WPUMPS) collected under the western pump island, no Ecology MTCA Method A cleanup levels were exceeded for BTEX; however, Ecology MTCA Method A cleanup levels were exceeded for TPH-G at a concentration of 174 mg/kg. In accordance to Chapter 173-340-450 WAC of MTCA, a 24-hour notification of a confirmed release was made to Ecology's Northwest Regional Office on February 20, 1992. A follow-up 20-day status report was given on March 11, 1992.

6.2 Additional Drilling

To define the extent of the contamination beneath the western pump island, two exploratory borings were drilled on February 28, 1992. Drilling was performed by GeoBoring and Development, Inc., of Puyallup, Washington, using a low-clearance drilling rig. A low-clearance drilling rig was necessary since the pump islands are located directly beneath the second story of the building. Prior to drilling activities, utilities were located in the vicinity of the proposed borings by Locating Inc., of Issaquah, Washington. National Concrete Cutting, Inc., of Auburn, Washington, was also contracted to cut 12-inch cores through the adjacent concrete slab in order to access the subsurface soils.

Boring locations were based on underground utilities and accessibility of the drilling rig. Boring B-1 was located west of the pump island to determine the lateral extent of contamination. Boring B-2 was drilled within one foot of the western pump island on the east side to determine vertical extent of the contamination. Both borings were drilled to a maximum depth of 8 feet below the ground surface using 3.25-inch hollow stem auger equipment. Soil samples were collected at 5 and 8 feet below the ground surface using a 2-inch I.D. split spoon sampler driven with a 140-pound hammer. Soil samples were transferred from the split spoon samplers to labeled, laboratory glass sample jars using a decontaminated stainless steel spoon.

The decontamination procedure included using a non-phosphatic soap wash followed by a deionized water rinse. All samples were field screened using a PID. Samples B1-10 and B2-9 were placed in a cooler with ice and transported under ARCO Products Company chain-of-custody protocol to Columbia Analytical Services, Inc., of Bothell, Washington. Selected samples were analyzed for BTEX and TPH-G by EPA Methods 5030/8020/ 8015 Modified.

Due to the extreme denseness of the native soils, drilling was very slow and sample recovery was poor. During the drilling of B-2, the drill rig broke-down and we were forced to terminate the boring at 8 feet below the ground surface. We were able to collect a sample at depth, however, the representativeness is questionable due to the apparent carry-over in the sampler. Boring locations are shown on Figure 4 and boring logs are included in Appendix E.

6.3 Analytical Data

Based on our review of the analytical data, sample B1-10 was below Ecology MTCA Method A cleanup levels for BTEX and TPH-G in soil. Sample B2-9 was below Ecology MTCA Method A cleanup levels of BTEX in soil; however, TPH-G was at a concentration of 155 mg/kg. Table 4 presents a summary of the analytical results for the boring samples collected on February 28, 1992. Appendix E presents the laboratory analytical report and chain-of-custody.

Table 4

Summary of Soil Analyses - Site Assessment
ARCO Facility 4473
Everett, Washington

Sample I.D.	Location	Depth (feet)	Date	Benzene (mg/Kg)	Toluene (mg/Kg)	Ethyl-Benzene (mg/Kg)	Total Xylenes (mg/Kg)	TPH-G (mg/Kg)
B1-10	B-1	8	2-28-92	ND	0.10	0.08	0.70	15
B2-9*	B-2	8	2-28-92	0.41	5.11	2.01	11.1	155
Ecology Method A Cleanup Levels**				0.5	40	20	20	100

* Sample representativeness questionable due to possible carry-over in sampler.
** Washington Department of Ecology Model Toxics Control Act (Ch. 173-340 WAC)

6.4 Extent of Contamination

Since the contaminated soils encountered beneath the western pump island could not be removed without jeopardizing the integrity of the building's foundation, it was left in place. Samples collected from borings drilled on February 28, 1992, showed that Ecology MTCA Method A cleanup levels were not exceeded for soils west of the western pump island. Sample data shows that the contamination is limited to the area under the western pump island. Based on the nature of the native soils on-site, it is estimated that the hydrocarbon-impacted soils do not extend beyond 10 feet below the ground surface; therefore, we estimate the volume of hydrocarbon-impacted soils left in place beneath the western pump island to be approximately 10 cubic yards. Based on the preliminary tank removal assessment conducted on January 22, 1992, ground water is approximately 20 to 30 feet below the ground surface.

7 CONCLUSIONS

Based on field observations made during tank removal and site assessment activities during January and February 1992, and our review of the soil analytical data, we conclude the following:

- The subsurface native soils underlying the surficial asphalt consists of extremely dense, silty sands with gravel.

- Ground water was not encountered during tank removal during the month of February 1992. During the preliminary tank removal assessment on January 22, 1992, ground water was encountered at approximately 20 to 30 feet below the ground surface.

- Based on our review of the analytical data for selected soil samples collected on January 22, 1992, Ecology MTCA Method A cleanup levels were exceeded for TPH-IR (EPA Method 418.1) in only one soil sample collected from boring SB-2 at an approximate depth of 10 feet below the existing ground surface. Boring SB-2 was located nearest the waste oil tank.

- Based on our review of the analytical results for selected soil samples collected during the tank removal assessment, February 6 through 12, 1992, Ecology MTCA Method A cleanup criteria were exceeded for TPH-G in a composited soil sample collected from beneath the western pump island at a depth of 6 feet below the existing ground surface. Benzene was not detected in any sample submitted for analysis during the tank removal.

- Ecology's Northwest Regional Office was notified of the confirmed release on February 20, 1992. A follow-up 20-day status report was given on March 10, 1992. All reporting was made in accordance to Chapter 173-340-450 WAC.

- Overexcavation of contaminated soils beneath the western pump island resulted in the exposure of one column footing for the building. Based on the recommendations made by a licensed civil

engineer, further excavation was discontinued. The excavation was also partially backfilled with pea gravel.

- Additional drilling and soil sampling, performed on February 28, 1992, showed that no contamination was present west of the western pump island. Due to the breakdown of the drilling equipment, no subsurface soil samples could be collected at depth in the vicinity of sample WPUMPS to determine a vertical extent.

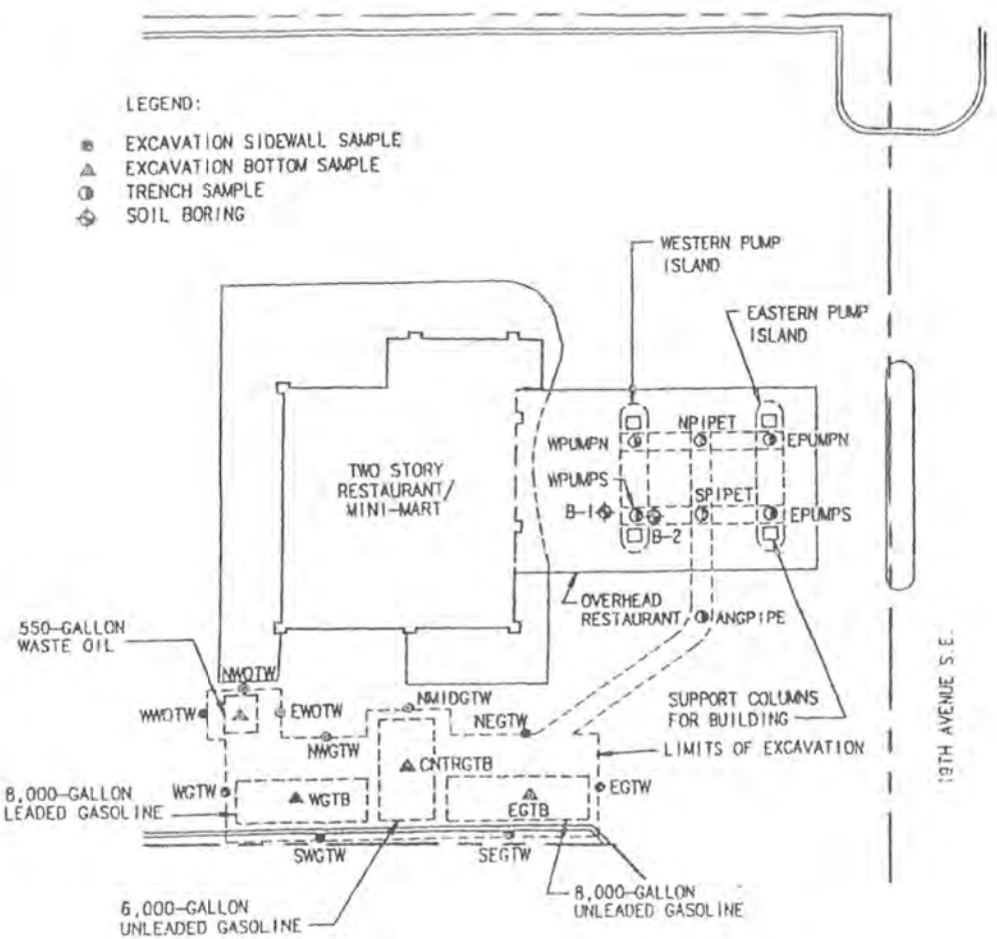
- Based on the nature of the native soils, we do not estimate that the hydrocarbon-impacted soils extend beyond 10 feet below the ground surface. Based on this assumption, we estimate the volume of hydrocarbon-impacted soils left in place around the column footings to be approximately 10 cubic yards.

- Stockpiled soils that were less than Ecology MTCA Method A Cleanup levels (approximately 250 cubic yards) were transported by T.M. Services, Corp., to Associated Sand and Gravel in Everett, Washington on February 18, 1992, for disposal. The small stockpile of drilling cuttings accumulated on January 22, 1992, were also disposed of at Associated Sand and Gravel. Soils that were above MTCA Method A cleanup levels (approximately 150 cubic yards) were picked up and transported to Roosevelt Regional Landfill by Rabanco of Seattle, Washington.

8 LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.



SOIL SAMPLE I.D.	SAMPLE LOCATION DESCRIPTION
WGTB	Discrete sample from beneath leaded gasoline tank ~ 14 feet below ground surf
CNTRGTB	Discrete sample from beneath unleaded gasoline tank ~ 14 feet below ground su
EGTB	Discrete sample from beneath unleaded gasoline tank ~ 13 feet below ground su
WGTW	Discrete sample from west wall of gasoline tank excavation ~ 10 feet below gro
EGTW	Discrete sample from east wall of gasoline tank excavation ~ 10 feet below gro
NWIDGTW	Discrete sample from north wall of gasoline tank excavation ~ 10 feet below gr
NWGTW/NEGTW	Discrete samples from north wall of gasoline tank excavation ~ 10 feet below g surface, composited in the lab.
SWGTW/SEGTW	Discrete samples from south wall of gasoline tank excavation ~ 10 feet below g surface, composited in the lab.
NWOTW	Discrete sample from north wall of waste oil tank excavation ~ 5 feet below gr
WWOTW	Discrete sample from west wall of waste oil tank excavation ~ 6 feet below gro
EWOTW	Discrete sample from east wall of waste oil tank excavation ~ 4 feet below gro
WOTB	Discrete sample from beneath waste oil tank ~ 9 feet below ground surface
ANGPIPE	Discrete sample from beneath product line angle joint ~ 2.5 feet below ground s
NPIPET/SPIPET	Discrete samples from beneath product line joints ~ 3 feet below ground surface composited in the lab.
EPUMPN/EPUMPS	Discrete samples from beneath east product dispensers ~ 3.5 and 4.8 feet below surface, composited in the lab.
WPUMPN/WPUMPS	Discrete samples from beneath west product dispensers ~ 5 and 6 feet below grou surface
B-1	Boring sample collected at 8 feet below ground surface, sample designated B1-1
B-2	Boring sample collected at 8 feet below ground surface, sample designated B2-8

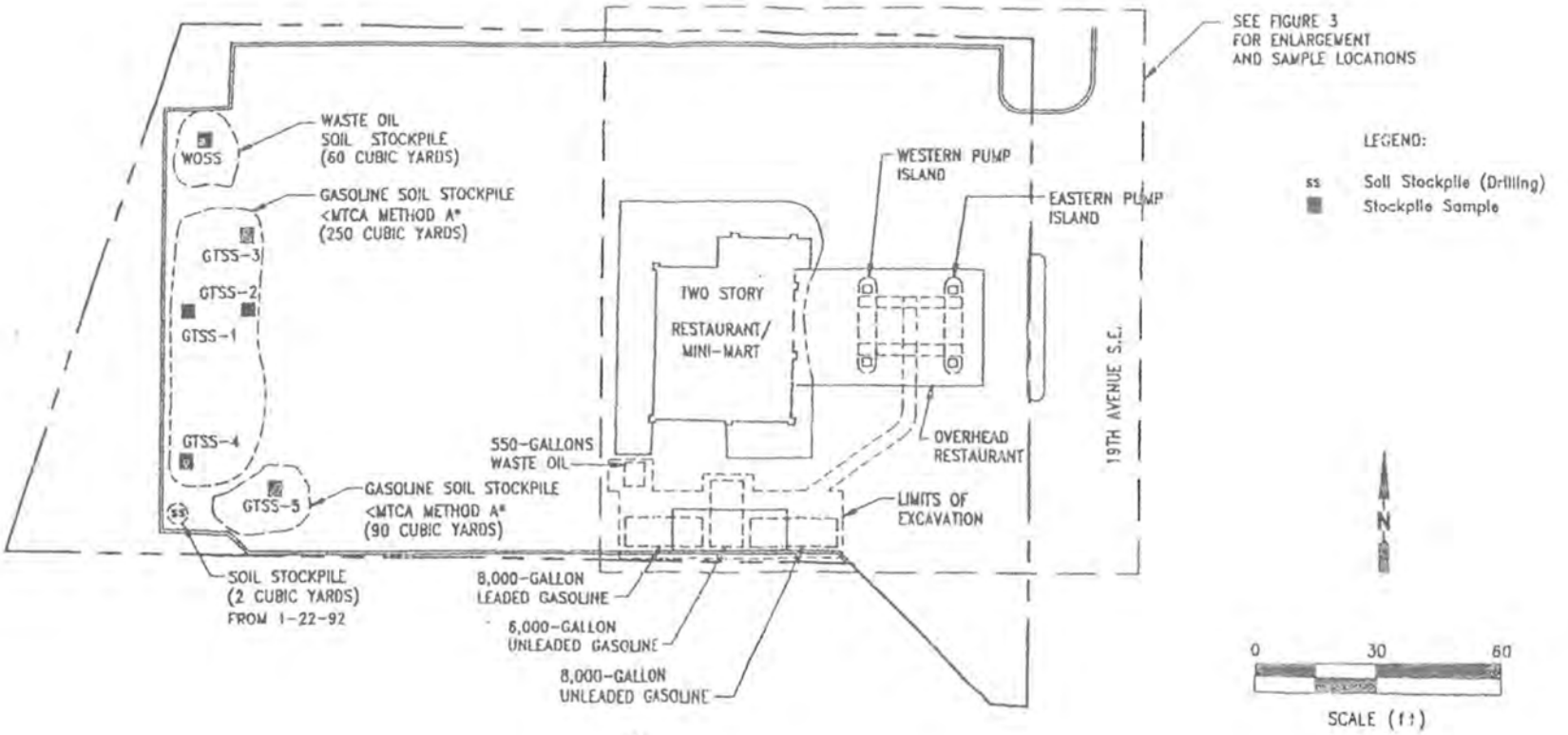
0 20 40

SCALE (ft)

EMCON Northwest, Inc.

DATE 3-92
DWN. MLP
REV.
APPR. RSV
PROJECT NO. T3360.01

Figure 4
ARCO FACILITY 4473
EVERETT, WASHINGTON
EXCAVATION SAMPLES AND BORING LO



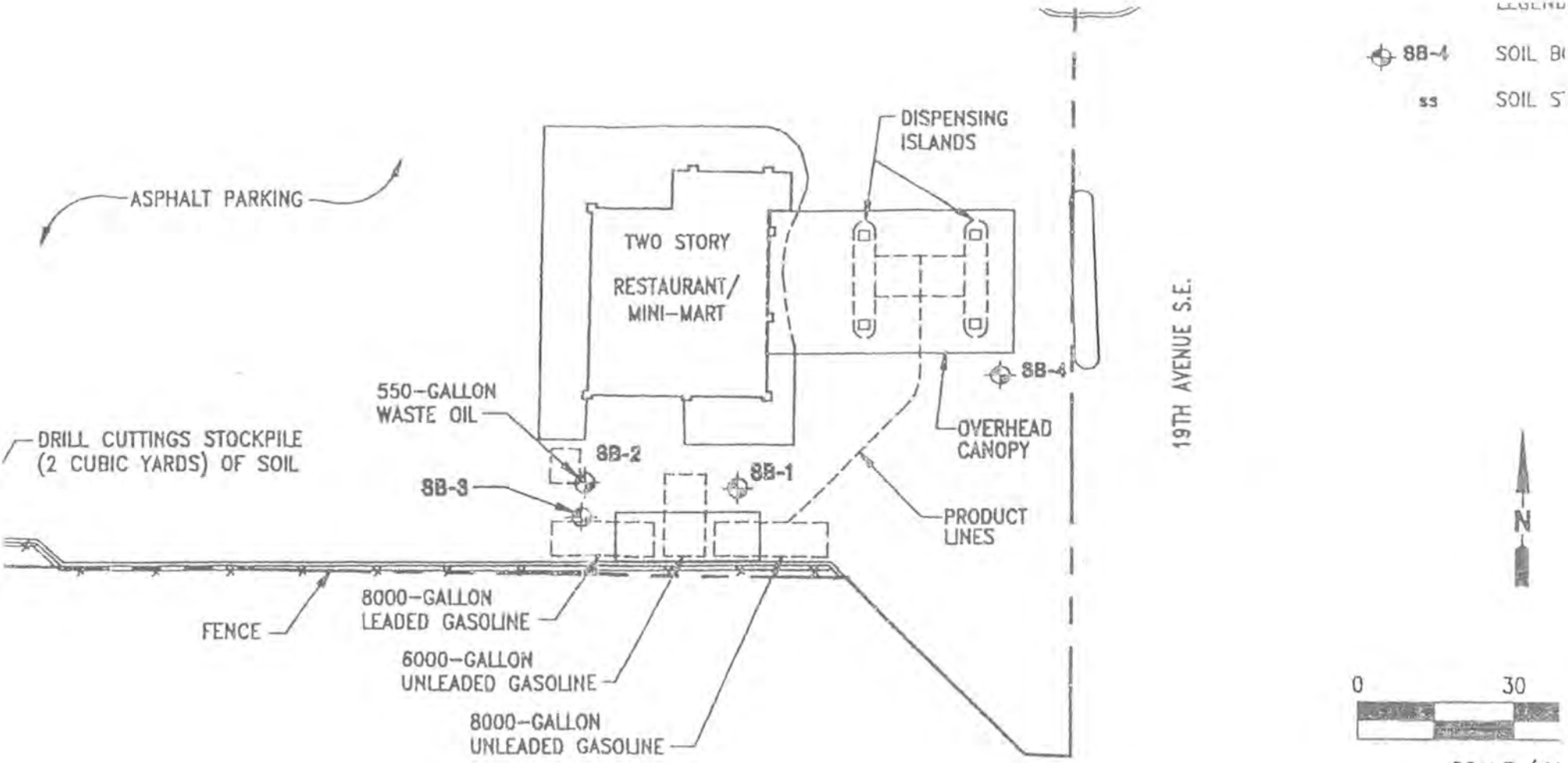
* NOTE:
WASHINGTON STATE DEPARTMENT OF ECOLOGY'S MODEL TOXICS CONTROL ACT (MTCA) METHOD A CLEANUP LEVELS FOR SOIL (CH. 173-340 WAC).

DATE 3/92
DWN. MLP
REV.
APPR. KSV
PROJECT NO. T3360.01

Figure 3
ARCO FACILITY 4473
EVERETT, WASHINGTON
STOCKPILE SAMPLE LOCATIONS

ICON
west, Inc.

ARCO T330065 3/27/92



NOTE: BASE MAP FROM ARCO PRODUCTS COMPANY
REVISED BY EMCON NORTHWEST, INC. 2/92

DATE	2/92
DWN.	MLP
REV.	
APPR.	KSV
PROJECT NO.	T3360.01

Figure
ARCO FACILI
EVERETT,
SITE MAP AND BORI

ARCO T3300C4 3-27-92

Appendix A

PRELIMINARY TANK REMOVAL ASSESSMENT
BORING LOGS AND ANALYTICAL CHEMISTRY DATA

Sample Descriptions

Classification of soils in this report is based on visual field observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless stated. Visual-manual classification methods of ASTM D 2488 were used as an identification guide. Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL		GROUP NAME
COARSE GRAINED SOILS More than 50% retained on No. 200 Sieve.	GRAVEL More than 50% of coarse fraction retained on No. 4 sieve.	CLEAN GRAVEL	GW		Well-graded gravel, fine to coarse gravel
			GP		Poorly-graded gravel
		GRAVEL WITH FINES	GM		Silty gravel
			GC		Clayey gravel
	SAND More than 50% of coarse fraction passes No. 4 sieve.	CLEAN SAND	SW		Well-graded sand, fine to coarse sand
			SP		Poorly-graded sand
		SAND WITH FINES	SM		Silty sand
			SC		Clayey sand
FINE GRAINED SOILS More than 50% passes No. 200 sieve.	SILT AND CLAY Liquid limit less than 50.	INORGANIC	ML		Silt
			CL		Clay
		ORGANIC	OL		Organic silt, organic clay
	SILT AND CLAY Liquid limit 50 or more.	INORGANIC	MH		Silt of high plasticity, elastic silt
			CH		Clay of high plasticity, fat clay
		ORGANIC	OH		Organic clay, organic silt
HIGHLY ORGANIC SOILS			PT		Peat

DENSITY/CONSISTENCY

SAND or GRAVEL		SILT or CLAY	
Density	Standard Penetration Resistance in Blows/Foot	Consistency	Standard Penetration Resistance in Blows/Foot
Very loose	0 - 4	Very soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Medium stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very dense	>50	Very stiff	15 - 30
		Hard	>30

MOISTURE

Modifier	Description
Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

MINOR CONSTITUENTS

Modifier	Estimated Percentage
Trace	< 5
Few	5 - 10
Little	10 - 25
Some	25 - 45

emcon Northwest, Inc.

DATE 3-91
DWN. TB
APPR.
REVIS.
PROJECT NO. 1.00

Figure A-1

SOIL CLASSIFICATION SYSTEM

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4473 - Predrill	BORING NO.	SB- 1
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	1 OF 2
DRILLED BY	Holt Testing, Inc.	REFERENCE ELEV.	NA
DRILL METHOD	4" H.S.A.	TOTAL DEPTH	27.00'
LOGGED BY	Kim Vik	DATE COMPLETED	01/22/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								0 to 0.3 foot: ASPHALT.
								0.3 to 25.7 feet: SILTY SAND (SM), light gray brown, fine to coarse, some fines, little fine to coarse subrounded gravel, trace cobbles, damp, very dense. (TILL).
SB-1	0	19-35-50/5.5"		5				
SB-2	0	17-50/4"		10				@ 10.0 feet: Moist.
SB-3	0	47-43-50/3"		15				
				20				

REMARKS

(1) SB = Split barrel samplers, 2-inch I.D., 24-inches and 18-inches long. (2) PID = Photoionization detector. (3) Blow counts do not represent SPT results. (4) ATD = At the time of drilling.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4473 - Predrill	BORING NO.	SB-1
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	2 OF 2
DRILLED BY	Holt Testing, Inc.	REFERENCE ELEV.	NA
DRILL METHOD	4" H.S.A.	TOTAL DEPTH	27.00'
LOGGED BY	Kim Vik	DATE COMPLETED	01/22/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
SB-4	0	21-50/5.5						
SB-5	0	13-26-38	ATD ▽	25				@ 25.0 feet: Wet.
								25.7 to 26.4 feet: SAND (SP), gray, coarse, few fine to medium, little fine subrounded gravel, trace fines, wet, very dense.
								26.4 to 27.0 feet: SILTY SAND (SM), light gray brown, fine to medium, few fines, trace fine gravel, wet, very dense.
				30				Total depth drilled = 25.0 feet. Total depth sampled = 27.0 feet.
								BORING ABANDONMENT DETAILS 0 to 0.5 foot: Concrete. 0.5 to 1.5 feet: Bentonite chips, hydrated with potable water. 1.5 to 27.0 feet: Bentonite-cement grout.
				35				
				40				

REMARKS
(1) SB = Split barrel samplers, 2-inch I.D., 24 inches and 18-inches long. (2) PID = Photoionization detector. (3) Blow counts do not represent SPT results. (4) ATD = At the time of drilling.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4473 - Predrill	BORING NO.	SB- 2
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	1 OF 2
DRILLED BY	Holt Testing, Inc.	REFERENCE ELEV.	NA
DRILL METHOD	4" H.S.A.	TOTAL DEPTH	31.50'
LOGGED BY	Kim Vik	DATE COMPLETED	01/22/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								0 to 0.3 foot: ASPHALT.
								0.3 to 16.2 feet: SILTY SAND (SM), light gray brown, slightly mottled, fine to coarse, some fines, little fine to coarse subrounded gravel, trace cobbles, damp, very dense. No noticeable hydrocarbon-like odors. (TILL).
SB-1	0	11-16-24		5				
SB-2	0	12-13-35		10				@ 10.0 feet: Slightly more gravelly, damp to moist.
SB-3	0	15-30-50/6"		15				@ 15.0 feet: Moist.
								16.2 to 20.0 feet: SILTY SAND (SM), light gray brown, fine to medium, little fines, few fine gravel, moist to wet, very dense.
				20				

REMARKS
(1) SB = Split barrel sampler, 2-inch I.D., 18-inches long. (2) PID = Photoionization detector. (3) Blow counts do not represent SPT results. (4) ATD = At the time of drilling.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4473 - Predrill	BORING NO.	SB- 2
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	2 OF 2
DRILLED BY	Holt Testing, Inc.	REFERENCE ELEV.	NA
DRILL METHOD	4" H.S.A.	TOTAL DEPTH	31.50'
LOGGED BY	Kim Vik	DATE COMPLETED	01/22/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
SB-4	0	18-15/4.5"						20.0 to 31.5 feet: SILTY SAND (SM), light gray brown, fine to coarse, some fines, little fine to coarse subrounded gravel, trace cobbles, moist, very dense.
SB-5	0	42-50/15"		25				@ 25.0 feet: No recovery.
SB-6	0	19-22-24	ATD ▽	30				@ 30.8 feet: Becoming sandier, wet.
								Total depth drilled = 30.0 feet. Total depth sampled = 31.5 feet. BORING ABANDONMENT DETAILS 0 to 0.5 foot: Concrete. 0.5 to 1.5 feet: Bentonite chips, hydrated with potable water. 1.5 to 31.5 feet: Bentonite-cement grout.
				35				
				40				

REMARKS
(1) SB = Split barrel sampler, 2-inch I.D., 18-inches long. (2) PID = Photoionization detector. (3) Blow counts do not represent SPT results. (4) ATD = At the time of drilling.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4473 - Predrill	BORING NO.	SB-3
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	1 OF 2
DRILLED BY	Holt Testing, Inc.	REFERENCE ELEV.	NA
DRILL METHOD	4" H.S.A.	TOTAL DEPTH	20.50'
LOGGED BY	Kim Vik	DATE COMPLETED	01/22/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								0 to 0.3 foot: ASPHALT.
								0.3 to 13.0 feet: COARSE SAND (SP), gray brown, fine to coarse, some rounded fine gravel, few fines, damp, loose. No noticeable hydrocarbon-like odors. (FILL).
SB-1	0	3-3-3		5				
SB-2	0	1-1-1		10				@ 10.0 feet: Damp.
								13.0 to 20.0 feet: SILTY SAND (SM), gray brown, fine to medium, trace coarse, some fines, few fine to coarse gravel, trace cobbles, damp, very dense. No noticeable odors. (TILL).
SB-3	0	17-50/5"		15				
			ATD	20				

REMARKS
(1) SB = Split barrel sampler, 2-inch I.D., 18-inches long. (2) PID = Photoionization detector. (3) Blow counts do not represent SPT results. (4) ATD = At the time of drilling.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4473 - Predrill	BORING NO.	SB- 3
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	2 OF 2
DRILLED BY	Holt Testing, Inc.	REFERENCE ELEV.	NA
DRILL METHOD	4" H.S.A.	TOTAL DEPTH	20.50'
LOGGED BY	Kim Vik	DATE COMPLETED	01/22/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
SB-4	0	13-50/5"		25 30 35 40				@ 20.0 feet: Sandier, wet. Total depth drilled = 20.0 feet. Total depth sampled = 20.5 feet. BORING ABANDONMENT DETAILS 0 to 0.5 foot: Concrete. 0.5 to 1.5 feet: Bentonite chips, hydrated with potable water. 1.5 to 20.5 feet: Bentonite-cement grout.

REMARKS
(1) SB = Split barrel sampler, 2-inch I.D., 18-inches long. (2) PID = Photoionization detector. (3) Blow counts do not represent SPT results. (4) ATD = At the time of drilling.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4473 - Predrill	BORING NO.	SB- 4
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	1 OF 2
DRILLED BY	Holt Testing, Inc.	REFERENCE ELEV.	NA
DRILL METHOD	4" H.S.A.	TOTAL DEPTH	21.50'
LOGGED BY	Kim Vik	DATE COMPLETED	01/22/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								0 to 0.3 foot: ASPHALT.
								0.3 to 21.5 feet: SILTY SAND (SM), gray brown, fine to coarse, some fines, little fine to coarse gravel, trace cobbles, damp, very dense. No noticeable hydrocarbon-like odors. (TILL).
SB-1	0	15-24-46		5				
SB-2	0	13-33-15/4.5"		10				@ 10 feet: Moist.
SB-3	0	15-27-50/5"		15				
				20				

REMARKS
(1) SB = Split barrel sampler, 2-inch I.D., 18-inches long. (2) PID = Photoionization detector. (3) Blow counts do not represent SPT results. (4) ATD = At the time of drilling.

LOG OF EXPLORATORY BORING

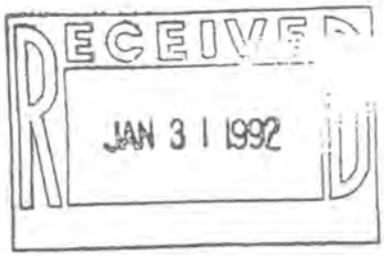
PROJECT NAME	ARCO 4473 - Predrill	BORING NO.	SB- 4
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	2 OF 2
DRILLED BY	Holt Testing, Inc.	REFERENCE ELEV.	NA
DRILL METHOD	4" H.S.A.	TOTAL DEPTH	21.50'
LOGGED BY	Kim Vik	DATE COMPLETED	01/22/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
SB-4	0	7-31-28						@ 20 feet: Slightly more coarse, sandier, wet.
								Total depth drilled = 20.0 feet. Total depth sampled = 21.5 feet. BORING ABANDONMENT DETAILS 0 to 0.5 foot: Concrete. 0.5 to 1.5 feet: Bentonite chips, hydrated with potable water. 1.5 to 21.5 feet: Bentonite-cement grout.

REMARKS
(1) SB = Split barrel sampler, 2-inch I.D., 18-inches long. (2) PID = Photoionization detector. (3) Blow counts do not represent SPT results. (4) ATD = At the time of drilling.

Columbia Analytical Services, Inc.

January 30, 1992



Kim Vik
Sweet-Edwards/EMCON, Inc.
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO #4473 - Everett/Task Order #4473-92-1

Dear Kim:

Enclosed are the results of the samples submitted to our Bothell laboratory on January 23, 1992. For your reference, this work has been assigned our service request number B920036.

All analyses were performed in accordance with both Washington State Department of Ecology Accreditation procedures and our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Michael C. Higgins
Project Manager

MCH/bdr

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Work Order #:	B920036

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		SS-C	Method Blank
Lab Code:		B0036-13	B0036-MB
Date Analyzed:		01/23/92	01/23/92
Analyte	MRL		
Benzene	0.05	ND	ND
Toluene	0.05	ND	ND
Ethylbenzene	0.05	ND	ND
Total Xylenes	0.05	ND	ND
TPH as Gasoline	1	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by_____ Date_____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Date Analyzed:	01/24/92
		Work Order #:	B920036

Total Recoverable Petroleum Hydrocarbons
SM Method 5520E/EPA Method 418.1
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
SB2-2	B0036-4	25	350
Method Blank	B0036-MB	25	ND

SM *Standard Methods for the Examination of Water and Wastewater*, 17th Ed., 1989
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920131

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Date Analyzed:	01/23/92
		Work Order #:	B920036

Total Lead
EPA Method 7420
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
SB3-1	B0036-7	5	6
SB3-2	B0036-8	5	ND
SB3-3	B0036-9	5	ND
Method Blank	B0036-MB	5	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920131

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Work Order #:	B920036

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		SB1-2	SB1-3	SB1-4
Lab Code:		B0036-1	B0036-2	B0036-3
Date Analyzed:		01/23/92	01/23/92	01/23/92
Analyte	MRL			
Benzene	0.05	ND	ND	ND
Toluene	0.05	ND	ND	ND
Ethylbenzene	0.05	ND	ND	ND
Total Xylenes	0.05	ND	ND	ND
TPH as Gasoline	1	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920131

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Work Order #:	B920036

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		SB2-2	SB2-3	SB2-4
Lab Code:		B0036-4	B0036-5	B0036-6
Date Analyzed:		01/23/92	01/23/92	01/23/92
Analyte	MRL			
Benzene	0.05	ND	ND	ND
Toluene	0.05	ND	ND	ND
Ethylbenzene	0.05	ND	ND	ND
Total Xylenes	0.05	ND	ND	ND
TPH as Gasoline	1	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by_____ Date_____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Work Order #:	B920036

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		SB3-1	SB3-2	SB3-3
Lab Code:		B0036-7	B0036-8	B0036-9
Date Analyzed:		01/23/92	01/23/92	01/23/92
Analyte	**MRL**			
Benzene	0.05	ND	ND	ND
Toluene	0.05	ND	ND	ND
Ethylbenzene	0.05	ND	ND	ND
Total Xylenes	0.05	ND	ND	ND
TPH as Gasoline	1	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by_____Date_____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Work Order #:	B920036

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		SB4-1	SB4-2	SB4-3
Lab Code:		B0036-10	B0036-11	B0036-12
Date Analyzed:		01/23/92	01/23/92	01/23/92
Analyte	MRL			
Benzene	0.05	ND	ND	ND
Toluene	0.05	ND	ND	ND
Ethylbenzene	0.05	ND	ND	ND
Total Xylenes	0.05	ND	ND	ND
TPH as Gasoline	1	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by_____ Date_____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Work Order #:	B920036

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		SS-C	Method Blank
Lab Code:		B0036-13	B0036-MB
Date Analyzed:		01/23/92	01/23/92
Analyte	MRL		
Benzene	0.05	ND	ND
Toluene	0.05	ND	ND
Ethylbenzene	0.05	ND	ND
Total Xylenes	0.05	ND	ND
TPH as Gasoline	1	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by_____ Date_____

APPENDIX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

Client: Sweet-Edwards/EMCON, Inc.
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 01/23/92
Date Extracted: 01/23/92
Date Analyzed: 01/24/92
Work Order #: B920036

QA/QC Report
Matrix Spike Summary
Total Recoverable Petroleum Hydrocarbons
SM Method 5520E/EPA Method 418.1
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Batch QC	B0031-2MS	25	1000	200	1000	80	75-125
Batch QC	B0031-2DMS	25	1100	200	1100	82	75-125

SM *Standard Methods for the Examination of Water and Wastewater*, 17th Ed., 1989
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by WM Date 920131

COLUMBIA ANALYTICAL SERVICES, INC.

Client: Sweet-Edwards/EMCON, Inc.
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Extracted: 01/23/92
Date Analyzed: 01/24/92
Work Order #: B920036

QA/QC Report
Laboratory Control Sample
Total Recoverable Petroleum Hydrocarbons
EPA Method 418.1
mg/Kg (ppm)
Dry Weight Basis

Sample Name: Laboratory Control Sample

Analyte	Spike Level	Spike Result	Percent Recovery	EPA Acceptance Criteria
TPH	800	722	90	-

Approved by _____ Date 920131

COLUMBIA ANALYTICAL SERVICES, INC.

Client: Sweet-Edwards/EMCON, Inc.
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 01/23/92
Work Order #: B920036

QA/QC Report
Matrix Spike Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: SB3-3
Lab Code: B0036-9

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Lead	5	47	ND	54	115	60-130

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by MWH Date 920131

COLUMBIA ANALYTICAL SERVICES, INC.

Client: Sweet-Edwards/EMCON, Inc.
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 01/23/92
Work Order #: B920036

QA/QC Report
Duplicate Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: SB3-3
Lab Code: B0036-9

Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Lead	7420	5	6	ND	–	--

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Mch Date 920131

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Date Analyzed:	01/23/92
		Work Order #:	B920036

QA/QC Report
Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name	Lab Code	Percent Recovery 4-Bromofluorobenzene
SB1-2	B0036-1	109
SB1-3	B0036-2	121
SB1-4	B0036-3	119
SB2-2	B0036-4	118
SB2-3	B0036-5	118
SB2-4	B0036-6	122
SB3-1	B0036-7	124
SB3-1	B0036-7MS	129
SB3-1	B0036-7DMS	129
SB3-2	B0036-8	124
	CAS Acceptance Criteria	50-130

TPH Total Petroleum Hydrocarbons

Approved by _____ Date 920131

Columbia Analytical Services, Inc.

February 21, 1992

ORIGINAL IN PROJECT FILING
RECEIVED
FEB 25 1992

Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO 4473 - Everett/Task Order #4473-91-1

Dear Kim:

Enclosed are the results of the samples submitted to our Bothell laboratory on February 11, 1992. Preliminary results were given on February 13, 1992. For your reference, this work has been assigned our service request number B920072.

All analyses were performed in accordance with both Washington State Department of Ecology Accreditation procedures and our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Michael C. Higgins
Project Manager

MCH/bdr

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/11/92
Project:	ARCO 4473 - Everett	Date Extracted:	02/12/92
Sample Matrix:	Soil	Work Order #:	B920072

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		ANGPIPE	NPIPET, SPIPET, Comp	Method Blank
Lab Code:		B0072-9	B0072-13	B0072-MB
Date Analyzed:		02/12/92	02/12/92	02/12/92
Analyte	MRL			
Benzene	0.05	ND	ND	ND
Toluene	0.05	ND	ND	ND
Ethylbenzene	0.05	ND	ND	ND
Total Xylenes	0.05	ND	ND	ND
TPH as Gasoline	1	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 9202 21

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/11/92
Project:	ARCO 4473 - Everett	Date Extracted:	02/12/92
Sample Matrix:	Soil	Date Analyzed:	12/92/92
		Work Order #:	B920072

Total Lead
EPA Method 7420
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
ANGPIPE	B0072-9	5	ND
NPIPET, SPIPET Comp	B0072-13	5	ND
Method Blank	B0072-MB	5	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920221

APPENDIX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO 4473	Date Extracted:	02/14/92
Sample Matrix:	Soil	Date Analyzed:	02/15/92
		Work Order #:	B920066

Hydrocarbon Scan
EPA Methods 3550/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Gasoline	Diesel	Other*
WOSS	B0066-1	10	ND	ND	1,300
Method Blank	B0066-MB	10	ND	ND	ND

MRL Method Reporting Limit
* Quantitated using 30-wt. motor oil as a standard. The MRL for this product is four times the listed MRL.
ND None Detected at or above the method reporting limit

Approved by _____ Date 920221

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO 4473	Date Extracted:	02/11/02
Sample Matrix:	Soil	Date Analyzed:	02/12/92
		Work Order #:	B920066

Total Recoverable Petroleum Hydrocarbons
SM Method 5520E/EPA Method 418.1
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
WOSS	B0066-1	25	1,000
GTSS-1	B0066-2	25	ND
GTSS-2	B0066-3	25	83
GTSS-3	B0066-4	25	25
GTSS-4	B0066-5	25	ND
GTSS-5	B0066-6	25	1,200
Method Blank	B0066-MB	25	ND

SM *Standard Methods for the Examination of Water and Wastewater*, 17th Ed., 1989
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920221

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO 4473	Date Extracted:	02/10/92
Sample Matrix:	Soil	Work Order #:	B920066

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		GTSS-1	GTSS-2
Lab Code:		B0066-2	B0066-3
Date Analyzed:		02/11/92	02/11/92
Analyte	**MRL**		
Benzene	0.05	ND	ND
Toluene	0.05	ND	0.15
Ethylbenzene	0.05	ND	0.31
Total Xylenes	0.05	ND	3.03
TPH as Gasoline	1	ND	146

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920221

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO 4473	Date Extracted:	02/10/92
Sample Matrix:	Soil	Work Order #:	B920066

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		Method Blank
Lab Code:		B0066-MB
Date Analyzed:		02/10/92
Analyte	MRL	
Benzene	0.05	ND
Toluene	0.05	ND
Ethylbenzene	0.05	ND
Total Xylenes	0.05	ND
TPH as Gasoline	1	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 2/02/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Received: 02/07/92
Work Order #: B920066

QA/QC Report
Duplicate Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: GTSS-1
Lab Code: B0066-2

Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Lead	7420	5	5	6	5.5	18

MRL Method Reporting Limit

Approved by _____ Date 920221

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Received: 02/07/92
Date Extracted: 02/14/92
Date Analyzed: 02/15/92
Work Order #: B920066

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Hydrocarbon Scan
EPA Methods 3550/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name: WOSS
Lab Code: B0066-1

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria	Relative Percent Difference
Diesel	165	151	ND	142	124	86	82	45-120	5

ND None Detected at or above the method reporting limit

Approved by _____ Date 920221

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Extracted: 02/14/92
Date Analyzed: 02/15/92
Work Order #: B920066

QA/QC Report
Laboratory Control Sample
Hydrocarbon Scan
EPA Methods 3550/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name: Laboratory Control Sample

Analyte	Spike Level	Spike Result	Percent Recovery	EPA Acceptance Criteria
Diesel	200	212	106	-

Approved by _____ Date 970221

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Received: 02/07/92
Date Extracted: 02/10/92
Date Analyzed: 02/11/92
Work Order #: B920066

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
BTEX
EPA Methods 5030/8020
mg/Kg (ppm)
Dry Weight Basis

Sample Name: GTSS-3
Lab Code: B0066-4

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria	Relative Percent Difference
Benzene	0.858	0.810	ND	0.716	0.533	83	66	39-150	23
Toluene	0.858	0.810	ND	0.735	0.550	86	68	46-148	23
Ethylbenzene	0.858	0.810	ND	0.727	0.541	85	67	32-160	24

ND None Detected at or above the method reporting limit

Approved by _____ Date 920221

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/23/92
Sample Matrix:	Soil	Date Analyzed:	01/23/92
		Work Order #:	B920036

QA/QC Report
Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name	Lab Code	Percent Recovery 4-Bromofluorobenzene
SB3-3	B0036-9	118
SB4-1	B0036-10	96
SB4-2	B0036-11	100
SB4-3	B0036-12	119
SS-C	B0036-13	124
Method Blank	B0036-MB	128
	CAS Acceptance Criteria	50-130

TPH Total Petroleum Hydrocarbons

Approved by _____ Date 970131

COLUMBIA ANALYTICAL SERVICES, INC.

Client: Sweet-Edwards/EMCON, Inc.
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 01/23/92
Date Extracted: 01/23/92
Date Analyzed: 01/23/92
Work Order #: B920036

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name: SB3-1
Lab Code: B0036-7

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria	Relative Percent Difference
Benzene	0.833	0.853	ND	0.774	0.771	92.9	90.4	39-150	3
Toluene	0.833	0.853	ND	0.805	0.805	96.6	94.4	46-148	2
Ethylbenzene	0.833	0.853	ND	0.805	0.808	96.6	94.7	32-160	2

TPH Total Petroleum Hydrocarbons
ND None Detected at or above the method reporting limit

Approved by _____ Date 920131

Columbia Analytical Services inc.



January 29, 1992

Kim Vik
Sweet-Edwards/EMCON, Inc.
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO #4473 - Everett/Project #T33-60.02/B920036

Dear Kim:

Enclosed are the results of the rush sample submitted to our lab on January 23, 1992. Preliminary results were transmitted via facsimile on January 27 and 28, 1992. For your reference, these analyses have been assigned our work order number K920478B.

All analyses were performed in accordance with our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Colin B. Elliott
Senior Project Chemist

CBE/tlt

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	**Date Received:**	01/23/92
Project:	ARCO #4473 - Everett	**Date TCLP Performed:**	01/27/92
Sample Matrix:	Soil	**Date Analyzed:**	01/28/92
		Work Order #:	K920478B

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

				Sample Name:	SB2-2	Method Blank
				Lab Code:	K0478-1	K0478-MB
Analyte	**Method**	**MRL**	**Regulatory Limit***			
Arsenic	3010/6010	0.1	5.0		ND	ND
Barium	3010/6010	0.5	100		ND	ND
Cadmium	3010/6010	0.01	1.0		ND	ND
Chromium	3010/6010	0.01	5.0		0.01	ND
Lead	3010/6010	0.05	5.0		ND	ND
Mercury	7470	0.001	0.2		ND	ND
Selenium	3010/6010	0.1	1.0		ND	ND
Silver	3010/6010	0.01	5.0		ND	ND

MRL Method Reporting Limit
* From 40 CFR Part 261, et al., and *Federal Register*, March 29, 1990 and June 29, 1990
ND None Detected at or above the method reporting limit

Approved by Chris Elliott Date 1/29/92

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/27/92
Sample Matrix:	Soil	Work Order #:	K920478B

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		SB2-2	Method Blank
Lab Code:		K0478-1	K0478-MB
Date Analyzed:		01/27/92	01/27/92
Analyte	**MRL**		
Dichlorodifluoromethane (Freon 12)	0.1	ND	ND
Chloromethane	0.1	ND	ND
Vinyl Chloride	0.05	ND	ND
Bromomethane	0.05	ND	ND
Chloroethane	0.05	ND	ND
Trichlorofluoromethane (Freon 11)	0.05	ND	ND
1,1-Dichloroethene	0.05	ND	ND
Trichlorotrifluoroethane (Freon 113)	0.05	ND	ND
Methylene Chloride	0.2	ND	ND
trans-1,2-Dichloroethene	0.05	ND	ND
cis-1,2-Dichloroethene	0.05	ND	ND
1,1-Dichloroethane	0.05	ND	ND
Chloroform	0.05	ND	ND
1,1,1-Trichloroethane (TCA)	0.05	ND	ND
Carbon Tetrachloride	0.05	ND	ND
1,2-Dichloroethane	0.05	ND	ND
Trichloroethene (TCE)	0.05	ND	ND
1,2-Dichloropropane	0.05	ND	ND
Bromodichloromethane	0.05	ND	ND
2-Chloroethyl Vinyl Ether	0.5	ND	ND
trans-1,3-Dichloropropene	0.05	ND	ND
cis-1,3-Dichloropropene	0.05	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND
Tetrachloroethene (PCE)	0.05	ND	ND
Dibromochloromethane	0.05	ND	ND
Chlorobenzene	0.05	ND	ND
Bromoform	0.05	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	*0.08
1,3-Dichlorobenzene	0.1	ND	ND
1,4-Dichlorobenzene	0.1	ND	ND
1,2-Dichlorobenzene	0.1	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Suspected laboratory contamination

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Sweet-Edwards/EMCON, Inc.	**Date Received:**	01/23/92
Project:	ARCO #4473 - Everett	**Date Extracted:**	01/26/92
Sample Matrix:	Soil	**Date Analyzed:**	01/27/92
		Work Order #:	K920478B

QA/QC Report
Surrogate Recovery Summary
Polychlorinated Biphenyls (PCBs)
EPA Methods 3540/8080

Sample Name	Lab Code	Percent Recovery Decachlorobiphenyl
SB2-2	K0478-1	114
Method Blank	K0478-MB	122
	CAS Acceptance Criteria	66-132

Approved by Chris Elliott Date 1/29/92

ARCO Products Company

Division of AtlanticRichfieldCompany

Task Order No. 4473-92-1

Chain of Custody

ARCO Facility no. 4473	City (Facility) EVERETT	Project manager (Consultant) KIM VIK	Laboratory name: Columbia Analytical Services (CAS)
ARCO engineer: Roy Thun	Telephone no. (ARCO) (213) 486-1293	Telephone no. (Consultant) (206) 485-8000	Fax no. (Consultant) (206) 486-9766
Consultant name: Sweet-Edwards/EMCON, Inc.	Address (Consultant) 18912 N. Creek Parkway, Suite 210, Bothell, WA 98011		Contract number

Method of shipment: Hand delivered

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA 8020/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TRH EPA 418.1/SM5520E	EPA 601/8010 Vol. ORG.	EPA 8240/8260	EPA 8250/8270	TCLP 8 Metals ☐ Mass ☒ VOA ☐ (+3H)	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☒ Total	PCB's (EPA 8080)
SB1-2		1	X			X		1-22-92	9:16		X										
SB1-3		1	X			X		1-22-92	9:20		X										
SB1-4		1	X			X		1-22-92	9:36		X										
SB2-2		3	X			X		1-22-92	11:07		X			X	X			X			X
SB2-3		3	X			X		1-22-92	11:13		X										
SB2-4		3	X			X		1-22-92	11:20		X										
SB3-1		1	X			X		1-22-92	14:10		X									X	
SB3-2		1	X			X		1-22-92	14:17		X									X	
SB3-3		1	X			X		1-22-92	14:23		X									X	
SB4-1		1	X			X		1-22-92	15:32		X										
SB4-2		1	X			X		1-22-92	15:45		X										
SB4-3		1	X			X		1-22-92	15:53		X										
SS-C		1	X			X		1-22-92	16:29		X										
SB1-1		1	X			X		1-22-92	8:50												
SB2-1		1	X			X		1-22-92	10:55												

Special detection Limit/reporting: N/A

Special QA/QC: N/A

Remarks:
SE/E Job # T33-60.02
* Hold extra samples
GAS/BTEX & TOTAL LEAD - 24 HR.
ALL OTHERS - AS.

Lab number: B92-0036

Turnaround time
- Priority Rush 1 Business Day ☒
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

Condition of sample:

Temperature received:

	Date	Time	Received by	Date	Time
Relinquished by sampler: Kim Vik	1-23-92	9:21			
Relinquished by			Received by		
Relinquished by			Received by laboratory	920123	0915

ARCO Environmental Engineering: Pink copy — Consultant

Appendix B

LABORATORY MEASUREMENT OF PETROLEUM HYDROCARBONS

LABORATORY MEASUREMENT OF PETROLEUM HYDROCARBONS

Laboratory measurement of petroleum hydrocarbons can be classified into two general types of analyses:

- Non-specific (methods that seek to quantify either the total amount of petroleum hydrocarbons or some fraction of the total in general terms)
- Specific (methods that measure individual organic compounds or that provide analyte identification)

Figure B-1 summarizes petroleum hydrocarbons of particular interest and relates them to the analytical procedures discussed below.

B.1 Total Recoverable Petroleum Hydrocarbons (EPA Method 418.1)

Total recoverable petroleum hydrocarbons by infrared spectrometry (TPH-IR) by EPA Method 418.1 is the most common non-specific analysis of petroleum hydrocarbons. TPH-IR, as its name implies, measures the total volume of petroleum hydrocarbons recoverable from a soil or water sample. Because the method is not compound specific, it is known to have a low recovery for gasoline, and it is susceptible to a significant positive or negative bias depending on the sample matrix. Analyte-specific tests using gas chromatography techniques give more reliable quantitative results and are often preferred.

Method 418.1 is not applicable to the measurement of low boiling fractions (e.g., volatile solvents or gasoline) that can volatilize at temperatures below 70°C. This represents a theoretical lower limit of C-6 (i.e., a hydrocarbon chain containing six carbon atoms). However, for practical purposes, C-10 may be a more reliable lower limit of quantitation.

The higher boiling (semi-volatile) fraction quantified by Method 418.1 can also be limited by their solubility in the extraction solvent. The solvent used in TPH-IR extraction is a fluorochlorocarbon (freon 113), which has less

solvating strength than the solvents (e.g., methylene chloride) used for extraction of TPH in other analytical procedures. Heavier petroleum hydrocarbons may contain significant fractions which are not extractable with freon. The solubility of petroleum hydrocarbons, combined with the complexity of the sample matrix (such as a soil containing higher percentages of longer chained hydrocarbons) may result in a practicable upper hydrocarbon limit of C-30.

Polar hydrocarbons (e.g., waxes and fats) are selectively removed in the Method 418.1 analytical procedure using a silica gel cleanup. However, samples with high organic backgrounds, such as woodwaste, peat, or organic soil, may result in a high bias value due to the presence of the non-polar hydrocarbon matrix. A low bias can occur in a sample with high concentrations of petroleum hydrocarbons because the TPH infrared (IR) spectrum may undergo a chemical shift. In addition, the use of the silica gel to remove polar interferences will remove complex aromatic compounds and other hydrocarbons containing chlorine, sulfur, and nitrogen, which can also result in a low bias. This method also requires calibration with a reference oil consisting of 25 percent aromatic TPH. This can lead to significant bias if a sample approaches 0 percent or 100 percent TPH as aromatic compounds.

B.2 Total Volatile or Semivolatile Fuel Hydrocarbons (EPA Method 8015 Modified)

Two categories of TPH can be analyzed using Method 8015M:

- Volatile compounds
- Semivolatile compounds

Method 8015M specifically measures volatile (C-4 to C-12) or semivolatile (C-10 to C-40) petroleum hydrocarbons using a gas chromatograph (GC) instrument. In select cases, hydrocarbons up to C-60 can be measured. The reason Method 8015M carries the designation "M" (Modified) is that the method has been adapted to measure petroleum hydrocarbons.

B.2.1 Volatile TPH Analysis (TPH-G)

Analysis of volatile hydrocarbons, such as gasoline and solvents, can be performed using methods which minimize volatile loss by eliminating the extraction process. This is accomplished by introducing the analytes to the GC using either a purge-and-trap (EPA Method 5030) or the headspace

method (EPA Method 3810). As in other GC methods, a unique fingerprint representing the suite of compounds present in the petroleum hydrocarbon matrix is obtained. Other features of the TPH-G analysis are the same as those described below for semivolatiles.

The key difference between the volatile and semivolatile methods is that, like Method 418.1, the semivolatile analysis (described in the next section) will give a low result if the sample contains volatile TPH (e.g., gasoline). In some instances, gasoline content may be determined using the Method 8015M semivolatile extract. However, due to losses of volatile TPH (i.e., benzene, toluene, ethylbenzene, and total xylenes [BTEX]), the determination of gasoline may be biased, but will adequately serve as a screening method for gasoline products. If the analytes are known to be gasoline derivatives, the volatile analysis should be used. If, however, both gasoline and diesel are present, TPH analysis by volatile and semivolatile methods should be employed.

B.2.2 Semivolatile TPH Analysis (TPH-D)

The analysis of semivolatile hydrocarbons employs soxhlet extraction (Method 3540) or sonication (EPA Method 3550) in soil, and liquid-liquid extraction (EPA Method 3510 or 3520) in water using methylene chloride. Analysis of the extracted sample is performed using a GC equipped with a flame ionization detector (FID). The FID is considered a universal detector since it does not significantly discriminate between hydrocarbon species. The method is specific for boiling point ranges and the analyst has the ability to select the region (i.e., the carbon number or range of numbers) of the gas chromatogram on which to base the final quantitation of total petroleum hydrocarbons present.

Method 8015M does not specifically allow for the cleanup of non-petroleum hydrocarbon interferences (using silica gel), as does Method 418.1. However, the analyst can select a range of hydrocarbons on which to base the quantitation which is most representative of the sample. For this reason, the method is often considered more representative of the true value of the petroleum hydrocarbons in the sample. The gas chromatogram, or GC fingerprint, represents the unique suite of compounds associated with the type of petroleum present in the sample, and may be used for identification as well as quantitation.

B.3 Volatile Aromatic Hydrocarbons - BTEX (EPA Method 8020)

EPA Method 8020 is a specific hydrocarbon analysis used to detect benzene, toluene, ethylbenzene, and total xylenes (BTEX), the major aromatic compounds of interest in gasoline. As with the Method 8015M volatile analysis, the Method 8020 analytes are introduced into the GC using either a purge-and-trap (EPA Method 5030) or the headspace screening method (EPA Method 3810). Typical of other GC methods, a unique fingerprint representing the suite of compounds present in the petroleum hydrocarbon matrix is obtained, and the individual BTEX compounds can be identified and quantified.

Simultaneous analyses of TPH-G and BTEX (EPA Methods 8015M/volatile and Method 8020) can be accomplished by introducing the purge-and-trap fraction into a photoionization detector (PID) to quantify low concentrations of BTEX, and then into a flame ionization detector to quantify the volatile TPH.

B.4 Volatile Organic Compound Analysis (EPA Method 8240)

EPA Method 8240 is used to determine the concentrations of volatile organic compounds in a variety of solid waste matrices. Table B-1 indicates the compounds that may be analyzed by this method. Method 8240 utilizes gas chromatography (GC) and mass spectrometry (MS) to detect volatile organic compounds that have boiling points below 200 degrees centigrade and that are insoluble or slightly soluble in water, whereby the analytes are introduced into the GC using direct injection or purge-and-trap (Method 5030). Ground water samples must be analyzed using Method 5030. The components are separated via the GC and detected using a MS.

The purge-and-trap process introduces an inert gas through the solution at ambient temperature, by which the volatile components are transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column which traps the volatile components. Following purging, the sorbent column is heated and backflushed with inert gas to desorb the components, which are detected with a mass spectrometer.

Interferences occur when samples become contaminated by diffusion of volatile organics (particularly chlorofluorocarbons and methylene chloride) through the sample container septum during shipment and storage. A field sample blank prepared from reagent water and carried through sampling

Table B-1

Halogenated Volatile Organics (EPA Methods 5030/8010)
Volatile Organic Compounds (EPA Methods 5030/8420)
mg/kg (ppm)
Dry Weight Basis

Analyte	Method Reporting Limit
Dichlorodifluoromethane (Freon 12)	0.1
Chloromethane	0.1
Vinyl Chloride	0.05
Bromomethane	0.05
Chloroethane	0.05
Trichlorofluoromethane (Freon 11)	0.05
1,1-Dichloroethene	0.05
Trichlorotrifluoroethane (Freon 113)	0.05
Methylene Chloride	0.2
trans-1,2-Dichloroethene	0.05
cis-1,2-Dichloroethene	0.05
1,1-Dichloroethane	0.05
Chloroform	0.05
1,1,1-Trichloroethane (TCA)	0.05
Carbon Tetrachloride	0.05
1,2-Dichloroethane	0.05
Trichloroethene (TCE)	0.05
1,2-Dichloropropane	0.05
Bromodichloromethane	0.05
2-Chloroethyl Vinyl Ether	0.5
trans-1,3-Dichloropropene	0.05
cis-1,3-Dichloropropene	0.05
1,1,2-Trichloroethane	0.05
Tetrachloroethene (PCE)	0.05
Dibromochloromethane	0.05
Chlorobenzene	0.05
Bromoform	0.05
1,1,2,2-Tetrachloroethane	0.05
1,3-Dichlorobenzene	0.1
1,4-Dichlorobenzene	0.1
1,3-Dichlorobenzene	0.1

and subsequent storage and handling can serve as a check on such contamination.

B.5 Halogenated Volatile Organic Analysis (EPA Method 8010)

EPA Method 8010 is used to determine the concentrations of various volatile halogenated organic compounds. The same compounds that are analyzed in EPA Method 8240, may also be analyzed with EPA Method 8010 (Table B-1). Method 8010 utilized gas chromatography (GC) to detect halogenated volatile organic compounds, whereby the analytes are introduced into the GC using direct injection on purge-and-trap (Method 5030). Ground water samples must be analyzed using Method 5030. A temperature program is used in the GC to separate the organic compounds, with detection achieved by a halogen-specific detector (HSD).

Method 8010 provides an optical gas chromatographic column that may be helpful in resolving the analytes from interferences that may occur and for analyte confirmation. Interferences occur when samples become contaminated by diffusion of volatile organics (particularly chlorofluorocarbons and methylene chloride) through the sample container septum during shipment and storage. A field sample blank prepared from reagent water and carried through sampling and subsequent storage and handling can serve as a check on such contamination.

B.6 Polychlorinated Biphenyl Analysis (EPA Method 8080)

Method 8080 is used to determine the concentration of polychlorinated biphenyls (PCBs) and various organochlorine pesticides. The method utilizes gas chromatographic (GC) conditions to detect part per billion (ppb) levels of the specific analyte. Following appropriate sample extraction techniques, both neat and diluted organic liquids (Method 3580, Waste Dilution) may be analyzed by direct injection. The analysis for PCBs in soils employs soxhlet extraction (EPA Method 3540) or sonication (EPA Method 3550). The sample is injected into the GC using the solvent flash technique, and compounds in the GC effluent are detected by an electron capture detector (ECD) or a halogen-specific detector (HSD).

The sensitivity of Method 8080 usually depends on the level of interferences rather than on instrumental limitations. If interferences prevent detection of the analytes, Method 8080 may also be performed on samples that have undergone cleanup. Method 3620, Florisil Column Cleanup, by itself or

followed by Method 3660, Sulfur cleanup, may be used to eliminate interferences in the analysis.

B.7 Toxicity Characteristic Leaching Procedure - Metals (EPA Method 1311)

Toxicity Characteristic Leaching Procedure (TCLP) for the eight priority pollutant metals utilizes EPA Method 1311 extraction procedures, as outlined in the Toxicity Characteristics Revisions of 40 CFR Part 261, dated March 29, 1990. The TCLP extract is then analyzed using EPA Method 6010 for the metals arsenic, barium, cadmium, chromium, lead, selenium, and silver, and EPA Method 7470 for mercury.

Method 6010 utilizes inductively coupled plasma-atomic emission spectroscopy (ICP) to determine trace elements including metals in solution. Detection limits, sensitivity, and optimum ranges of the metals will vary with the matrices and model of spectrometer. The method measures element-emitted light by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. The spectra are dispersed by a grating spectrometer, and the intensities of the lines are monitored by photomultiplier tubes.

Spectral interferences are caused by: (1) overlap of a spectral line from another element; (2) unresolved overlap of molecular band spectra; (3) background contribution from continuous or recombination phenomena; and (4) stray light from the line emission of high-concentration elements. These interferences should be recognized and appropriate corrections made.

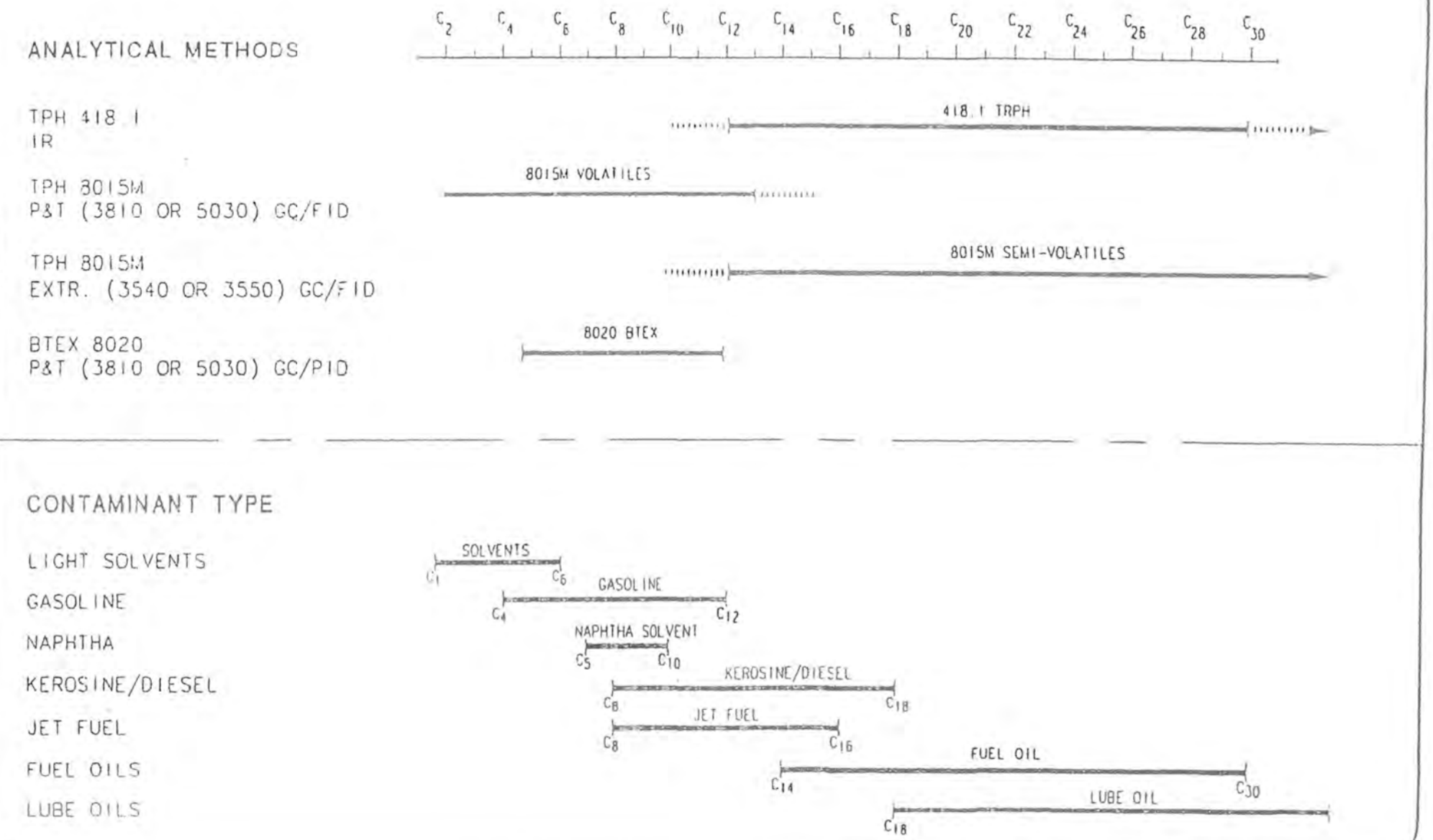
Method 7470 is a cold-vapor atomic absorption procedure approved for determining the concentration of mercury in mobility-procedure extracts, aqueous wastes, and ground water. All samples must be subject to an appropriate dissolution step prior to analysis. The cold-vapor atomic absorption technique is based on the absorption of radiation at 253.7-nm by mercury vapor. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance (high peak) is measured as a function of mercury concentration.

B.8 Total Lead (EPA Method 7420)

EPA Method 7420 is a direct aspiration, atomic absorption technique used to detect lead. This analysis is performed when leaded gasoline has been stored at a site.

Figure B-1

PETROLEUM HYDROCARBON RANGES



CADD FILE MISC \CAS-1\1-8-91

Appendix C

TANK REMOVAL ASSESSMENT
ANALYTICAL CHEMISTRY DATA

Columbia Analytical Services, Inc.

February 19, 1992

RECEIVED
FEB 20 1992
ORIGINAL IS IN PROJECT FILING

Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO 4473 - Everett/Task Order #4473-91-1

Dear Kim:

Enclosed are the results of the samples submitted to our Bothell laboratory on February 7, 1992. Preliminary results were given on February 10 and 11, 1992. For your reference, this work has been assigned our service request number B920065.

All analyses were performed in accordance with both Washington State Department of Ecology Accreditation procedures and our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Michael C. Higgins
Project Manager

MCH/bdr

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO 4473	Date Extracted:	02/07/92
Sample Matrix:	Soil	Work Order #:	B920065

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		WGTB	SEGTW, SWGTW Comp	NEGTW, NWGTW Comp
Lab Code:		B0065-1	B0065-4	B0065-7
Date Analyzed:		02/07/92	02/07/92	02/07/92
Analyte	MRL			
Benzene	0.05	ND	ND	ND
Toluene	0.05	ND	ND	ND
Ethylbenzene	0.05	ND	ND	ND
Total Xylenes	0.05	ND	ND	ND
TPH as Gasoline	1	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920220

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO 4473	Date Extracted:	02/07/92
Sample Matrix:	Soil	Work Order #:	B920065

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		WGTW	EGTW	EGTB
Lab Code:		B0065-8	B0065-9	B0065-10
Date Analyzed:		02/07/92	02/07/92	02/07/92
Analyte	MRL			
Benzene	0.05	ND	ND	0.09
Toluene	0.05	ND	ND	ND
Ethylbenzene	0.05	ND	ND	ND
Total Xylenes	0.05	ND	ND	ND
TPH as Gasoline	1	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 92020

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO 4473	Date Extracted:	02/07/92
Sample Matrix:	Soil	Work Order #:	B920065

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		CNTRGTB	NMIDGTW	Method Blank
Lab Code:		B0065-11	B0065-12	B0065-MB
Date Analyzed:		02/07/92	02/07/92	02/07/92
Analyte	MRL			
Benzene	0.05	ND	ND	ND
Toluene	0.05	ND	ND	ND
Ethylbenzene	0.05	ND	ND	ND
Total Xylenes	0.05	ND	ND	ND
TPH as Gasoline	1	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920220

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Received: 02/07/92
Date Extracted: 02/07/92
Date Analyzed: 02/07/92
Work Order #: B920065

Total Lead
EPA Method 7420
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
WGTB	B0065-1	5	ND
SEGTW,SWGTW Comp	B0065-4	5	ND
NEGTW,NWGTW Comp	B0065-7	5	ND
WGTW	B0065-8	5	ND
EGTW	B0065-9	5	ND
EGTB	B0065-10	5	ND
CNTRGTB	B0065-11	5	ND
NMIDGTW	B0065-12	5	ND
Method Blank	B0065-MB	5	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920220

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO 4473	Date Extracted:	02/07/92
Sample Matrix:	Soil	Date Analyzed:	02/10/92
		Work Order #:	B920065

Total Recoverable Petroleum Hydrocarbons
SM Method 5520E/EPA Method 418.1
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
WOTB	B0065-13	25	ND
WWOTW	B0065-14	25	ND
EWOTW	B0065-15	25	ND
NWOTW	B0065-16	25	ND
Method Blank	B0065-MB	25	ND

SM *Standard Methods for the Examination of Water and Wastewater*, 17th Ed., 1989
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920220

APPENDIX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Received: 02/07/92
Date Extracted: 02/07/92
Date Analyzed: 02/07/92
Work Order #: B920065

QA/QC Report
Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name	Lab Code	Percent Recovery 4-Bromofluorobenzene
WGTB	B0065-1	93
WGTB	B0065-1MS	116
WGTB	B0065-1DMS	104
SEGTW,SWGTW Comp	B0065-4	97
NEGTW,NWGTW Comp	B0065-7	68
WGTW	B0065-8	124
EGTW	B0065-9	96
EGTB	B0065-10	102
CNTRGTW	B0065-11	100
NMIDGTW	B0065-12	123
Method Blank	B0065-MB	104
	CAS Acceptance Criteria	50-130

TPH Total Petroleum Hydrocarbons

Approved by _____ Date 2/20/20

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Received: 02/07/92
Date Extracted: 02/07/92
Date Analyzed: 02/07/92
Work Order #: B920065

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
BTEX
EPA Methods 5030/8020
mg/Kg (ppm)
Dry Weight Basis

Sample Name: WGTB
Lab Code: B0065-1

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria	Relative Percent Difference
Benzene	0.870	0.876	ND	0.718	0.643	83	73	39-150	13
Toluene	0.870	0.876	ND	0.739	0.662	85	76	46-148	11
Ethylbenzene	0.870	0.876	ND	0.736	0.664	85	76	32-160	11

ND None Detected at or above the method reporting limit

Approved by _____ Date 920220

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Received: 02/07/92
Work Order #: B920065

QA/QC Report
Duplicate Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: EGTW
Lab Code: B0065-9

Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Lead	7420	5	ND	ND	–	–

MRL Method Reporting Limit

Approved by [signature] Date 920220

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Received: 02/07/92
Work Order #: B920065

QA/QC Report
Matrix Spike Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: EGTW
Lab Code: B0065-9

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Lead	5	50	ND	53	106	60-130

MRL Method Reporting Limit

Approved by [signature] Date 920220

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Extracted: 02/07/92
Date Analyzed: 02/10/92
Work Order #: B920065

QA/QC Report
Laboratory Control Sample
Total Recoverable Petroleum Hydrocarbons
EPA Method 418.1
mg/Kg (ppm)
Dry Weight Basis

Sample Name: Laboratory Control Sample

Analyte	Spike Level	Spike Result	Percent Recovery	EPA Acceptance Criteria
TRPH	800	768	90	85-115

Approved by _____ Date 920220

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473
Sample Matrix: Soil

Date Received: 02/07/92
Date Extracted: 02/07/92
Date Analyzed: 02/10/92
Work Order #: B920065

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Total Recoverable Petroleum Hydrocarbons
SM Method 5520E/EPA Method 418.1
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
EWOTW	B0065-15MS	25	719	ND	673	94	75-125
EWOTW	B0065-15DMS	25	726	ND	665	92	75-125

SM *Standard Methods for the Examination of Water and Wastewater*, 17th Ed., 1989
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920220

Columbia Analytical Services inc.

February 19, 1992

RECEIVED
FEB 20 1992
ORIGINAL IS IN PROJECT FILING

Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO #4473 - Everett/Project #T3360.01/B920065

Dear Kim:

Enclosed are the results of the rush samples submitted to our lab on February 7, 1992. Preliminary results were transmitted via facsimile on February 14, 1992. For your reference, these analyses have been assigned our work order number K9208288.

All analyses were performed in accordance with our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Colin B. Elliott
Senior Project Chemist

CBE/tlt

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date TCLP Performed:	02/12/92
Sample Matrix:	Soil	Date Analyzed:	02/14/92
		Work Order #:	K920828B

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

			Sample Name:	WOTB	WWOTW
			Lab Code:	K0828-1	K0828-2
Analyte	**Method**	**MRL**	**Regulatory Limit***		
Arsenic	3010/6010	0.1	5.0	ND	ND
Barium	3010/6010	0.5	100	ND	ND
Cadmium	3010/6010	0.01	1.0	ND	ND
Chromium	3010/6010	0.01	5.0	ND	ND
Lead	3010/6010	0.05	5.0	ND	ND
Mercury	7470	0.001	0.2	ND	ND
Selenium	3010/6010	0.1	1.0	ND	ND
Silver	3010/6010	0.01	5.0	ND	ND

MRL Method Reporting Limit
* From 40 CFR Part 261, et al., and *Federal Register*, March 29, 1990 and June 29, 1990
ND None Detected at or above the method reporting limit

Approved by Glen Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date TCLP Performed:	02/12/92
Project:	ARCO #4473 - Everett	Date Analyzed:	02/14/92
Sample Matrix:	Soil	Work Order #:	K920828B

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

		Sample Name:		Method Blank
		Lab Code:		K0828-MB
Analyte	**Method**	**MRL**	**Regulatory Limit***	
Arsenic	3010/6010	0.1	5.0	ND
Barium	3010/6010	0.5	100	ND
Cadmium	3010/6010	0.01	1.0	ND
Chromium	3010/6010	0.01	5.0	ND
Lead	3010/6010	0.05	5.0	ND
Mercury	7470	0.001	0.2	ND
Selenium	3010/6010	0.1	1.0	ND
Silver	3010/6010	0.01	5.0	ND

MRL Method Reporting Limit
* From 40 CFR Part 261, et al., and *Federal Register*, March 29, 1990 and June 29, 1990
ND None Detected at or above the method reporting limit

Approved by Chris Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date Extracted:	02/11/92
Sample Matrix:	Soil	Work Order #:	K920828B

Polychlorinated Biphenyls (PCBs)
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		WOTB	WWOTW	EWOTW
Lab Code:		K0828-1	K0828-2	K0828-3
Date Analyzed:		02/14/92	02/14/92	02/14/92
Analyte	MRL			
Aroclor 1016	1	ND	ND	ND
Aroclor 1221	1	ND	ND	ND
Aroclor 1232	1	ND	ND	ND
Aroclor 1242	1	ND	ND	ND
Aroclor 1248	1	ND	ND	ND
Aroclor 1254	1	ND	ND	ND
Aroclor 1260	1	ND	ND	ND
Total Aroclors	1	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Edie Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date Extracted:	02/11/92
Sample Matrix:	Soil	Work Order #:	K9208288

Polychlorinated Biphenyls (PCBs)
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		NWOTW	Method Blank
Lab Code:		K0828-4	K0828-MB
Date Analyzed:		02/14/92	02/14/92
Analyte	**MRL**		
Aroclor 1016	1	ND	ND
Aroclor 1221	1	ND	ND
Aroclor 1232	1	ND	ND
Aroclor 1242	1	ND	ND
Aroclor 1248	1	ND	ND
Aroclor 1254	1	ND	ND
Aroclor 1260	1	ND	ND
Total Aroclors	1	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Ann Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 02/07/92
Work Order #: K920828B

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		WOTB	WWOTW	EWOTW
Lab Code:		K0828-1	K0828-2	K0828-3
Date Analyzed:		02/12/92	02/12/92	02/12/92
Analyte	MRL			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	*49	*46	*29
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	ND	ND	**270
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	21	39	57
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Possible laboratory contamination
** Result is from the analysis of a diluted sample performed on February 13, 1992.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

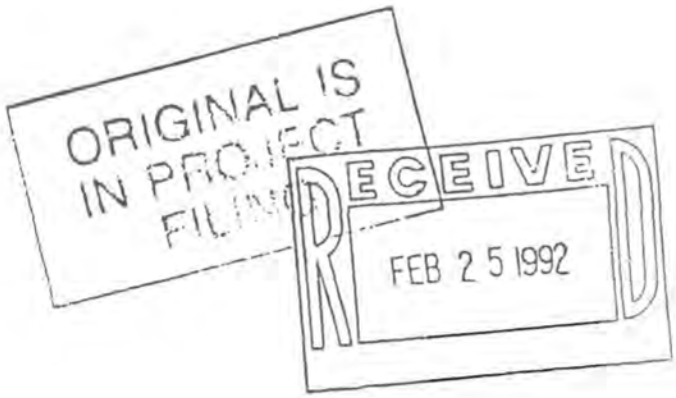
Date Received: 02/07/92
Work Order #: K920828B

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		NWOTW	Method Blank	Method Blank
Lab Code:		K0828-4	K0828-MB	K0828-MB
Date Analyzed:		02/12/92	02/12/92	02/13/92
Analyte	MRL			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	*29	ND	ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	135	ND	ND
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	26	ND	ND
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Possible laboratory contamination

Columbia Analytical Services, Inc.



February 19, 1992

Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO #4473 - Everett/Project #T3360.01/B920066

Dear Kim:

Enclosed are the results of the rush sample submitted to our lab on February 7, 1992. Preliminary results were transmitted via facsimile on February 14, 1992. For your reference, these analyses have been assigned our work order number K920831B.

All analyses were performed in accordance with our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Colin B. Elliott
Senior Project Chemist

CBE/das

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO 4473	Date Extracted:	02/14/92
Sample Matrix:	Soil	Date Analyzed:	02/14/92
		Work Order #:	B920066

Total Lead
EPA Method 7420
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
GTSS-1	B0066-2	5	5
GTSS-2	B0066-3	5	ND
GTSS-3	B0066-4	5	ND
GTSS-4	B0066-5	5	ND
GTSS-5	B0066-6	5	8
Method Blank	B0066-MB	5	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920221

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date Extracted:	02/11/92
Sample Matrix:	Soil	Work Order #:	K920831B

Polychlorinated Biphenyls (PCBs)
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		WOSS	Method Blank
Lab Code:		K0831-1	K0831-MB
Date Analyzed:		02/14/92	02/14/92
Analyte	MRL		
Aroclor 1016	1	ND	ND
Aroclor 1221	1	ND	ND
Aroclor 1232	1	ND	ND
Aroclor 1242	1	ND	ND
Aroclor 1248	1	ND	ND
Aroclor 1254	1	ND	ND
Aroclor 1260	1	ND	ND
Total Aroclors	1	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Colin Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 02/07/92
Work Order #: K920828B

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		NWOTW	Method Blank	Method Blank
Lab Code:		K0828-4	K0828-MB	K0828-MB
Date Analyzed:		02/12/92	02/12/92	02/13/92
Analyte	MRL			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	°29	ND	ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	135	ND	ND
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	26	ND	ND
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
[illegible] laboratory contamination

Analytical Report

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 02/07/92
Work Order #: K920831B

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		WOSS	Method Blank	Method Blank
Lab Code:		K0831-1	K0831-MB	K0828-MB
Date Analyzed:		02/12/92	02/12/92	02/13/92
Analyte	MRL			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	*18	ND	ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	76	ND	ND
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	14	ND	ND
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Possible laboratory contamination.

Approved by Colin Ellwitt Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date TCLP Performed:	02/12/92
Sample Matrix:	Soil	Date Analyzed:	02/14/92
		Work Order #:	K920831B

Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

				Sample Name:	WOSS	Method Blank
				Lab Code:	K0831-1	K0831-MB
Analyte	Method	MRL	Regulatory Limit*			
Arsenic	3010/6010	0.1	5.0		ND	ND
Barium	3010/6010	0.5	100		ND	ND
Cadmium	3010/6010	0.01	1.0		ND	ND
Chromium	3010/6010	0.01	5.0		ND	ND
Lead	3010/6010	0.05	5.0		ND	ND
Mercury	7470	0.001	0.2		ND	ND
Selenium	3010/6010	0.1	1.0		ND	ND
Silver	3010/6010	0.01	5.0		ND	ND

MRL Method Reporting Limit
* From 40 CFR Part 261, et al., and *Federal Register*, March 29, 1990 and June 29, 1990
ND None Detected at or above the method reporting limit

Approved by Alan Elliott Date 2/19/92

APPENDIX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date Extracted:	02/11/92
Sample Matrix:	Soil	Date Analyzed:	02/14/92
		Work Order #:	K920831B

QA/QC Report
Surrogate Recovery Summary
Polychlorinated Biphenyls (PCBs)
EPA Methods 3540/8080

Sample Name	Lab Code	Percent Recovery Decachlorobiphenyl
WOSS	K0831-1	114
Batch QC	K0828-4MS	118
Batch QC	K0828-4DMS	131
Method Blank	K0831-MB	118
	CAS Acceptance Criteria	66-132

Approved by Chris Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Extracted: 02/11/92
Date Analyzed: 02/14/92
Work Order #: K920831B

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Polychlorinated Biphenyls (PCBs)
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name: Batch QC
Lab Code: K0828-4

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	EPA Acceptance Criteria	Relative Percent Difference
Aroclor 1254	1.29	1.42	ND	1.38	1.63	107	115	29-131	7

ND None Detected at or above the method reporting limit

Approved by Colin Ellwitt Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 02/07/92
Date Analyzed: 02/12/92
Work Order #: K9208318

QA/QC Report
Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)

Sample Name	Lab Code	Percent Recovery		
		1,2-Dichloroethane - D_4	Toluene - D_8	4-Bromofluorobenzene
WOSS	K0831-1	96	101	87
Method Blank	K0831-MB	93	100	87
EPA Acceptance Criteria		70-121	81-117	74-121

Approved by Colin Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Analyzed: 02/13/92
Work Order #: K920831B

QA/QC Report
Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)

Sample Name	Lab Code	Percent Recovery		
		1,2-Dichloroethane - D_4	Toluene - D_8	4-Bromofluorobenzene
Batch QC	K0828-2MS	94	100	87
Batch QC	K0828-2DMS	92	101	86
Method Blank	K0828-MB	90	99	85
EPA Acceptance Criteria		70-121	81-117	74-121

Approved by John Ellrott Date 2/19/92

Columbia Analytical Services, Inc.

February 21, 1992

ORIGINAL IS IN PROJECT FILING

RECEIVED
FEB 25 1992

Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO 4473/Task Order #4473-91-1

Dear Kim:

Enclosed are the results of the samples submitted to our Bothell laboratory on February 7, 1992. Preliminary results were given on February 13 and 14, 1992. For your reference, this work has been assigned our service request number B920066.

All analyses were performed in accordance with both Washington State Department of Ecology Accreditation procedures and our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Michael C. Higgins
Project Manager

MCH/bdr

ARCO Facility no: 4473 | City (Facility): EVERETT, WA | Project manager (Consultant): KIM VIK | Laboratory name: COLUMBIA ANALYTICAL S

ARCO engineer: MR. ROY THUN | Telephone no. (ARCO): (213) 486-1793 | Telephone no. (Consultant): (206) 485-5000 | Fax no. (Consultant): (206) 486-9766 | Contract number:

Consultant name: EMCON NORTHWEST, INC. | Address (Consultant): 18912 NORTH CREEK PKWY SUITE 210 BOTHELL, WA

Method of shipment: HAND DELIVERED

Sample I.D.	Lab no	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☒ VOA ☐ Semi ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☒	PCB'S EPA 8080
WOSS		3	X			X		2-7-92	11:15					X		X		X	X		X
GTSS-1		4	X			X		2-7	11:45		X			X						X	
GTSS-2		4	X			X		2-7	12:05		X			X						X	
GTSS-3		4	X			X		2-7	12:20		X			X						X	
GTSS-4		4	X			X		2-7	12:42		X			X						X	
GTSS-5		4	X			X		2-7	13:05		X			X						X	

Special detection Limit/reporting: N/A

Special QA/QC: N/A

Remarks: SE/E JOB # T336001 HOLD 2 8 OZ JARS FOR EACH GTSS SAMPLE. ~~24 HOUR TURNAR~~

Lab number: K92-0831 B92-006C

Turnaround time

- Priority Rush 1 Business Day ✓
- Rush 2 Business Days
- Expedited ASAP 5 Business Days
- Standard 10 Business Days

Condition of sample:

Temperature received:

Relinquished by sampler	Date	Time	Received by
	2-7-92	4:17 PM	Barbara D. Logan 02/07/92 1630
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory / Date / Time
			2-11-92 / 0900

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPC 3292 (2-91)

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Analyzed: 02/13/92
Work Order #: K9208318

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb)
Dry Weight Basis

Sample Name: Batch QC
Lab Code: K0828-2

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	EPA Acceptance Criteria	Relative Percent Difference
1,1-Dichloroethene	68	67	ND	39	46	*57	69	59-172	19
Trichloroethene	68	67	ND	69	78	101	116	62-137	14
Chlorobenzene	68	67	ND	74	82	109	122	60-133	11
Toluene	68	67	ND	69	80	101	119	59-139	16
Benzene	68	67	ND	63	74	93	110	66-142	17

ND None Detected at or above the method reporting limit
* Outside acceptance limits because of matrix effects. This sample was analyzed a second time and again produced unacceptable recovery values. The results from the initial analysis are reported.

Approved by Glen Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date TCLP Performed:	02/12/92
Sample Matrix:	Soil	Date Analyzed:	02/14/92
		Work Order #:	K920831B

QA/QC Report
Matrix Spike Summary
Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

Sample Name: WOSS
Lab Code: K0831-1

Analyte	Method	Spike Level	MRL	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Arsenic	3010/6010	5.0	0.1	ND	5.2	104	75-125
Barium	3010/6010	5.0	0.5	ND	5.5	110	75-125
Cadmium	3010/6010	1.0	0.01	ND	0.93	93	75-125
Chromium	3010/6010	5.0	0.01	ND	4.88	98	75-125
Lead	3010/6010	5.0	0.05	ND	4.66	93	75-125
Mercury	7470	0.01	0.001	ND	0.009	90	75-125
Selenium	3010/6010	1.0	0.1	ND	1.2	120	75-125
Silver	3010/6010	1.0	0.01	ND	0.95	95	75-125

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Colin Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date TCLP Performed:	02/12/92
Sample Matrix:	Soil	Date Analyzed:	02/14/92
		Work Order #:	K9208318

QA/QC Report
Duplicate Summary
Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

Sample Name: WOSS
Lab Code: K0831-1

Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Arsenic	3010/6010	0.1	ND	ND	ND	--
Barium	3010/6010	0.5	ND	ND	ND	--
Cadmium	3010/6010	0.01	ND	ND	ND	--
Chromium	3010/6010	0.01	ND	ND	ND	--
Lead	3010/6010	0.05	ND	ND	ND	--
Mercury	7470	0.001	ND	ND	ND	--
Selenium	3010/6010	0.1	ND	ND	ND	--
Silver	3010/6010	0.01	ND	ND	ND	--

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Chris Ellis Date 2/19/92

APPENDIX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	**Date Received:**	02/07/92
Project:	ARCO #4473 - Everett	**Date TCLP Performed:**	02/12/92
Sample Matrix:	Soil	**Date Analyzed:**	02/14/92
		Work Order #:	K920828B

QA/QC Report
Duplicate Summary
Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

Sample Name: WOTB
Lab Code: K0828-1

Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Arsenic	3010/6010	0.1	ND	ND	ND	--
Barium	3010/6010	0.5	ND	ND	ND	--
Cadmium	3010/6010	0.01	ND	ND	ND	--
Chromium	3010/6010	0.01	ND	ND	ND	--
Lead	3010/6010	0.05	ND	ND	ND	--
Mercury	7470	0.001	ND	ND	ND	--
Selenium	3010/6010	0.1	ND	ND	ND	--
Silver	3010/6010	0.01	ND	ND	ND	--

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Glen Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date TCLP Performed:	02/12/92
Sample Matrix:	Soil	Date Analyzed:	02/14/92
		Work Order #:	K920828B

QA/QC Report
Matrix Spike Summary
Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

Sample Name: WOTB
Lab Code: K0828-1

Analyte	Method	Spike Level	MRL	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Arsenic	3010/6010	5.0	0.1	ND	5.2	104	75-125
Barium	3010/6010	5.0	0.5	ND	5.6	112	75-125
Cadmium	3010/6010	1.0	0.01	ND	0.92	92	75-125
Chromium	3010/6010	5.0	0.01	ND	4.91	98	75-125
Lead	3010/6010	5.0	0.05	ND	4.68	94	75-125
Mercury	7470	0.01	0.001	ND	0.008	80	75-125
Selenium	3010/6010	1.0	0.1	ND	1.1	110	75-125
Silver	3010/6010	1.0	0.01	ND	0.95	95	75-125

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Chris Ellis Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	**Date Received:**	02/07/92
Project:	ARCO #4473 - Everett	**Date Extracted:**	02/11/92
Sample Matrix:	Soil	**Date Analyzed:**	02/14/92
		Work Order #:	K920828B

QA/QC Report
Surrogate Recovery Summary
Polychlorinated Biphenyls (PCBs)
EPA Methods 3540/8080

Sample Name	Lab Code	Percent Recovery Decachlorobiphenyl
WOTB	K0828-1	108
WWOTW	K0828-2	115
EWOTW	K0828-3	124
NWOTW	K0828-4	127
NWOTW	K0828-4MS	118
NWOTW	K0828-4DMS	131
Method Blank	K0828-MB	118
	CAS Acceptance Criteria	66-132

Approved by Alan Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	**Date Received:**	02/07/92
Project:	ARCO #4473 - Everett	**Date Extracted:**	02/11/92
Sample Matrix:	Soil	**Date Analyzed:**	02/14/92
		Work Order #:	K9208288

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Polychlorinated Biphenyls (PCBs)
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name: NWOTW
Lab Code: K0828-4

	Spike Level		Sample	Spike Result		Percent Recovery			
Analyte	MS	DMS	Result	MS	DMS	MS	DMS	EPA Acceptance Criteria	Relative Percent Difference
Aroclor 1254	1.29	1.42	ND	1.38	1.63	107	115	29-131	7

ND None Detected at or above the method reporting limit

Approved by Chris Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	**Date Received:**	02/07/92
Project:	ARCO #4473 - Everett	**Date Analyzed:**	02/12/92
Sample Matrix:	Soil	**Work Order #:**	K920828B

QA/QC Report
Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)

Sample Name	Lab Code	Percent Recovery		
		1,2-Dichloroethane - D_4	Toluene - D_8	4-Bromofluorobenzene
WOTB	K0828-1	97	101	86
WWOTW	K0828-2	95	102	87
EWOTW	K0828-3	95	103	86
NWOTW	K0828-4	95	101	88
Method Blank	K0828-MB	93	100	87
EPA Acceptance Criteria		70-121	81-117	74-121

Approved by Alan Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	**Date Received:**	02/07/92
Project:	ARCO #4473 - Everett	**Date Analyzed:**	02/13/92
Sample Matrix:	Soil	**Work Order #:**	K920828B

QA/QC Report
Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)

Sample Name	Lab Code	Percent Recovery		
		1,2-Dichloroethane - D_4	Toluene - D_8	4-Bromofluorobenzene
WWOTW	K0828-2MS	94	100	87
WWOTW	K0828-2DMS	92	101	86
Method Blank	K0828-MB	90	99	85
EPA Acceptance Criteria		70-121	81-117	74-121

Approved by Chris Elliott Date 2/19/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 02/07/92
Date Analyzed: 02/13/92
Work Order #: K9208288

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb)
Dry Weight Basis

Sample Name: WWOTW
Lab Code: K0828-2

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	EPA Acceptance Criteria	Relative Percent Difference
1,1-Dichloroethene	68	67	ND	39	46	*57	69	59-172	19
Trichloroethene	68	67	ND	69	78	101	116	62-137	14
Chlorobenzene	68	67	ND	74	82	109	122	60-133	11
Toluene	68	67	ND	69	80	101	119	59-139	16
Benzene	68	67	ND	63	74	93	110	66-142	17

ND None Detected at or above the method reporting limit
* Outside acceptance limits because of matrix effects. This sample was analyzed a second time and again produced unacceptable recovery values. The results from the initial analysis are reported.

Approved by Glenn Elliott Date 2/19/92

cility no. 4413 | City (Facility) EVERETT, WA | Project manager (Consultant) KIM VIK | Laboratory name COLUMBIA ANALYTICAL SERV.

gineer MR. ROY THUN | Telephone no. (ARCO) (213) 486-1293 | Telephone no. (Consultant) 206-485-5000 | Fax no. (Consultant) (206)-486-9766 | Contract number

l name EMCON NORTHWEST, INC. | Address (Consultant) 18912 NORTH CREEK PKWY SUITE 210, BOTHELL, WA | Method of shipment: Hand Delivered

Lab no.	Container no.	Matrix: Soil	Water	Other	Preservation: Ice	Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☒		
3		2	X			X		2-6-92	1210		X								X		
N		1	X			X		2-6	1317		X								X	COMP-	
W		2	X			X		2-6	1235		X								X	OSITE	
N		2	X			X		2-6	1315		X								X	COMPO-	
N		2	X			X		2-6	1255		X								X	SITE	
N		2	X			X		2-6	1240		X								X		
N		2	X			X		2-6	1335		X								X		
3		2	X			X		2-6	1320		X								X		
R		2	X			X		2-6	1355		X								X		
D		1	X			X		2-6	1415		X								X		

Special detection Limit/reporting: N/A

Special QA/QC: N/A

Remarks: SE/E JOB # T336001 24 HOUR TURNAROUND HOLD 8 OZ. JARS

Lab number: R92082F B92-0065

of sample:

Temperature received:

ed by sampler: JOHN DERTRAND | Date: 2-7-92 | Time: 9:50 AM | Received by: Barbara D. Regan

ed by | Date | Time | Received by: Barbara D. Regan

ed by | Date | Time | Received by laboratory: CAS/Bothell | Date: 02-07-92 | Time: 1000

Turnaround time

- Priority Rush 1 Business Day ☒
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

(2-91)

Received 2-11-92 0800 Lana Gehr CAS

T.C.U. (Facility) - VOL. 1 (...) (Consultant) ...

Engineer: MR. ROY THUN | Telephone no. (ARCO): (213) 486-1293 | Telephone no. (Consultant): (206) 485-5000 | Fax no. (Consultant): (206) 486-9766

Consultant name: EMCON NORTHWEST, INC. | Address (Consultant): 18912 NORTH CREEK PKWY SUITE 210, BOTHELL, WA

COL. DIV. ANALYTICAL SERV.

Contract number:

Method of shipment: Hand Delivered

Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☑ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	PCB's 8080 EPA 8080
B	3	X			X		2-6-92	1550					X		X			X		X
W	3	X			X		2-6	1530					X		X			X		X
W	3	X			X		2-6	1615					X		X			X		X
W	3	X			X		2-6	1555					X		X			X		X

Change to TCLP Metals per Kim Y/B 02/10/92 BY

Special detection Limit/reporting: N/A

Special QA/QC: N/A

Remarks: SE/E JOB# T336001 HOLD JARS

Lab number: R92-0828 B92-0065

Turnaround time

- Priority Rush 1 Business Day or ASAP ☒
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

n of sample:

Temperature received:

shed by sample: JOHN BERTRAND	Date: 2-7-92	Time: 9.50 AM	Received by: Barbara D. Logan
shed by: Barbara D. Logan	Date: 02-07-92	Time: 1550	Received by: Barbara D. Regan
ished by: Barbara D. Regan	Date:	Time:	Received by laboratory: ARS/Bothell; Date: 02-07-92; Time: 1000

on: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
92 (2-91)

Received 2-11-92 09W Lauren Jacobs CAS

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/11/92
Date Extracted: 02/12/92
Date Analyzed: 02/12/92
Work Order #: B920072

QA/QC Report
Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name	Lab Code	Percent Recovery 4-Bromofluorobenzene
ANGPIPE	B0072-9	120
ANGPIPE	B0072-9MS	104
ANGPIPE	B0072-9DMS	113
NPIPET,SPIPET Comp	B0072-13	99
Method Blank	B0072-MB	99
	CAS Acceptance Criteria	50-130

TPH Total Petroleum Hydrocarbons

Approved by _____ Date 2/20/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/11/92
Date Extracted: 02/12/92
Date Analyzed: 02/12/92
Work Order #: B920072

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
BTEX
EPA Methods 5030/8020
mg/Kg (ppm)
Dry Weight Basis

Sample Name: ANGPIPE
Lab Code: B0072-9

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria	Relative Percent Difference
Benzene	0.897	0.867	ND	0.635	0.695	71	80	39-150	12
Toluene	0.897	0.867	ND	0.674	0.730	75	84	46-148	11
Ethylbenzene	0.897	0.867	ND	0.666	0.718	74	83	32-160	11

ND None Detected at or above the method reporting limit

Approved by _____ Date 920221

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/11/92
Work Order #: B920072

QA/QC Report
Duplicate Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: ANGPIPE
Lab Code: B0072-9

Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Lead	7420	5	ND	ND	–	–

MRL Method Reporting Limit

Approved by _____ Date 920221

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/11/92
Work Order #: B920072

QA/QC Report
Matrix Spike Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: ANGPIPE
Lab Code: B0072-9

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Lead	5	46	ND	53	115	60-130

MRL Method Reporting Limit

Approved by _____ Date 920221

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 4473-41-1

Chain of Custody

ARCO Facility no. 4473 | City (Facility) EVERETT, WA (2,3) | Project manager (Consultant) KIM VIK | Laboratory name COLUMBIA ANALYTICAL SERV

ARCO engineer MR. ROY THUN | Telephone no. (ARCO) 485-8293 | Telephone no. (Consultant) (206) 485-5000 | Fax no. (Consultant) (206) 486-9766 | Contract number

Consultant name EMCON NORTHWEST, INC. | Address (Consultant) 18912 North Creek Pkwy, Suite 210, BOTHELL, WA

Method of shipment: Hand Delivered

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 8020/EPA 8020	BTEX/TPH EPA M8020/8020/8015	TPH Modified 8015 Gas / Diesel	Oil and Grease 413.1 / 413.2	TPH EPA 418.1/M8015	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals / VOA / Semis	CAM Metals EPA 6010/7000 TTLC / STLC	Lead Org./DHS / Lead EPA 7420/7421	PCB's EPA 8080
NOTB		3	X			X		2-10-92	0955	<HOLD>			X	X		X		X			X
NWOTW		3	X			X		2-10-92	1010	<HOLD>			X	X		X		X			X
NWOTW		3	X			X		2-10-92	1040	<HOLD>				X		X		X			X
WWOTW		3	X			X		2-10-92	1100	<HOLD>				X		X		X			X
STSS-6		4	X			X		2-10-92	1205	<HOLD>											
STSS-7		4	X			X		2-10-92	1300	<HOLD>											
STSS-8		4	X			X		2-10-92	1320	<HOLD>											
NPIPET		1	X			X		2-10-92	1605	<HOLD>											
NGAPE		1	X			X		2-10-92	1615		X									X	
EPUMP*		1	X			X		2-10-92	1635	<HOLD>											
SPIPET		1	X			X		2-11-92	1045	<HOLD>											
SASPIP		1	X			X		2-11-92	0945	<HOLD>											

Special detection Limit/reporting: N/A

Special QA/QC: N/A

Remarks: SE/E JOB # T336001

24-hour on Gas/BTEX, total lead & 418.1 ASAP on all others

Lab number: B92-0072

Turnaround time

- Priority Rush 1 Business Day: [X]
- Rush 2 Business Days: [ ]
- Expedited 5 Business Days: [ ]
- Standard 10 Business Days: [ ]

Condition of sample:

Temperature received:

	Date	Time		Date	Time
Relinquished by sampler	2-11-92	1410	Received by		
Relinquished by			Received by		
Relinquished by			Received by laboratory		

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

PC-3292 (2-91)

Columbia Analytical Services inc.



February 26, 1992

Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO 4473 - Everett/Task Order #4473-91-1

Dear Kim:

Enclosed are the results of the samples submitted to our Bothell laboratory on February 14, 1992. Preliminary results were given on February 18 and 19, 1992. For your reference, this work has been assigned our service request number B920082.

All analyses were performed in accordance with both Washington State Department of Ecology Accreditation procedures and our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Michael C. Higgins
Project Manager

MCH/bdr

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/14/92
Project:	ARCO 4473 - Everett	Date Extracted:	02/14/92
Sample Matrix:	Soil	Work Order #:	B920082

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		EPUMPN, EPUMPS-Comp	Method Blank
Lab Code:		B0082-1	B0082-2
Date Analyzed:		02/14/92	02/14/92
Analyte	**MRL**		
Benzene	0.05	ND	ND
Toluene	0.05	ND	ND
Ethylbenzene	0.05	ND	ND
Total Xylenes	0.05	ND	ND
TPH as Gasoline	1	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920226

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/14/92
Project:	ARCO 4473 - Everett	Date Extracted:	02/14/92
Sample Matrix:	Soil	Date Analyzed:	02/14/92
		Work Order #:	B920082

Total Lead
EPA Method 7420
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
EPUMPS,EPUMPN-Comp	B0082-2	5	ND
Method Blank	B0082-MB	5	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920226

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/14/92
Work Order #: B920082

QA/QC Report
Matrix Spike Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: Batch QC
Lab Code: B0066-2

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Lead	5	46	5	54	107	60-130

MRL Method Reporting Limit

Approved by [signature] Date 920226

Division of AtlanticRichfieldCompany

Task Order No. 1115-41-1

Chain of Custody

:O Facility no. 4473	City (Facility) EVERETT, WA.	Project manager (Consultant) KIM VIK	Laboratory name COLUMBIA ANALYTICAL SERV.
:O engineer MR. ROY THUN	Telephone no. (ARCO) (213) 486-1293	Telephone no (Consultant) (206) 485-5000	Fax no. (Consultant) (206)-486-9766
sultant name EMCON NORTHWEST, INC.	Address (Consultant) 18912 North Creek Pkwy, Suite 210, BOTHELL, WA		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Semi Metals ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☒		
MPS		1	X			X		2-12-92	1155		X									X		

Method of shipment: Hand Delivered

Special detection Limit/reporting: N/A

Special QA/QC: N/A

Remarks: SE/E JOB # T336001 COMPOSITE WITH SAMPLE EPUMAN FROM 2-10-92

Lab number: B91-0082

Turnaround time

- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

ion of sample:

Temperature received:

	Date	Time		Date	Time
uished by sampler	2-14-92	845AM	Received by Barbara W. Logan	02/14/92	0845
uished by	Date	Time	Received by		
uished by	Date	Time	Received by laboratory	Date	Time

ion: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

92 (2-91)

Columbia Analytical Services, Inc.

February 27, 1992

RECEIVED
FEB 28 1992
ORIGINAL IS IN PROJECT FILING

Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO 4473 - Everett/Task Order #4473-91-1

Dear Kim:

Enclosed are the results of the samples submitted to our Bothell laboratory on February 19, 1992. Preliminary results were given on February 20, 1992. For your reference, this work has been assigned our service request number B920086.

All analyses were performed in accordance with both Washington State Department of Ecology Accreditation procedures and our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Michael C. Higgins
Project Manager

MCH/bdr

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/19/92
Project:	ARCO 4473 - Everett	Date Extracted:	02/19/92
Sample Matrix:	Soil	Work Order #:	B920086

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		WPUMPN, WPUMPS-Comp	Method Blank
Lab Code:		B0086-3	B0086-MB
Date Analyzed:		02/19/92	02/19/92
Analyte	MRL		
Benzene	0.05	ND	ND
Toluene	0.05	0.09	ND
Ethylbenzene	0.05	0.31	ND
Total Xylenes	0.05	3.46	ND
TPH as Gasoline	1	174	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920228

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/19/92
Project:	ARCO 4473 - Everett	Date Extracted:	02/20/92
Sample Matrix:	Soil	Date Analyzed:	02/20/92
		Work Order #:	B920086

Total Lead
EPA Method 7420
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
WPUMPN,WPUMPS-Comp	B0086-3	5	10
Method Blank	B0086-MB	5	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920228

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	Date Received:	02/19/92
Project:	ARCO 4473 - Everett	Date Extracted:	02/19/92
Sample Matrix:	Soil	Date Analyzed:	02/19/92
		Work Order #:	B920086

QA/QC Report
Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name	Lab Code	Percent Recovery 4-Bromofluorobenzene
WPUMPN,WPUMPS-Comp	B0086-3	79
Method Blank	B0086-MB	105
	CAS Acceptance Criteria	50-130

TPH Total Petroleum Hydrocarbons

Approved by _____ Date 4/20/28

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/19/92
Date Extracted: 02/19/92
Date Analyzed: 02/19/92
Work Order #: B920086

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
BTEX
EPA Methods 5030/8020
mg/Kg (ppm)
Dry Weight Basis

Sample Name: Batch QC
Lab Code: B0088-1

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria	Relative Percent Difference
Benzene	0.837	0.818	ND	0.379	0.448	45	55	39-150	20
Toluene	0.837	0.818	ND	0.398	0.470	48	57	46-148	17
Ethylbenzene	0.837	0.818	ND	0.411	0.484	49	59	32-160	19

ND None Detected at or above the method reporting limit

Approved by _____ Date 920228

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/19/92
Work Order #: B920086

QA/QC Report
Duplicate Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: Batch QC
Lab Code: B0074-7

Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Lead	7420	5	ND	ND	--	--

MRL Method Reporting Limit

Approved by _____ Date 920225

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/19/92
Work Order #: B920086

QA/QC Report
Matrix Spike Summary
Total Lead
mg/Kg (ppm)
Dry Weight Basis

Sample Name: Batch QC
Lab Code: B0074-7

Analyte	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Lead	5	58	ND	67	116	60-130

MRL Method Reporting Limit

Approved by _____ Date 920228

ARCO Products Company

Division of AtlanticRichfieldCompany

Chain of Custody

Task Order No. 4473 - 91-1

ARCO Facility no. 4473	City (Facility) EVERETT, WA.	Project manager (Consultant) KIM VIK	Laboratory name COLUMBIA ANALYTICAL SER
ARCO engineer Mr. ROY THUN	Telephone no. (ARCO) (213) 486-1277	Telephone no. (Consultant) (206) - 485-5000	Fax no. (Consultant) (206) - 486-9766
Consultant name EMCON, NORTHWEST, INC.	Address (Consultant)		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☒	
WPUMPN		1	X			X		2-12	1615		X		COMPOSITE PLEASE						X	X	
WPUMPS		1	X			X		2-12	1530		X								X	X	

Method of shipment: HAND DELIVERED

Special detection Limit/reporting: N/A

Special QA/QC: N/A

Remarks: SE/E JOB# T336001 24 HOUR RUSH

Lab number: B9L-0086

Turnaround time

- Priority Rush 1 Business Day: X
- Rush 2 Business Days: ☐
- Expedited 5 Business Days: ☐
- Standard 10 Business Days: ☐

ndition of sample:

Temperature received:

	Date	Time		Date	Time
linquished by sampler	2-18-92	400PM	Received by		
linquished by			Received by		
inquished by			Received by laboratory	2-18-92	1611

ribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date Extracted:	01/26/92
Sample Matrix:	Soil	Work Order #:	K920478B

Polychlorinated Biphenyls (PCBs)
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		SB2-2	Method Blank
Lab Code:		K0478-1	K0478-MB
Date Analyzed:		01/27/92	01/27/92
Analyte	**MRL**		
Aroclor 1016	1	ND	ND
Aroclor 1221	1	ND	ND
Aroclor 1232	1	ND	ND
Aroclor 1242	1	ND	ND
Aroclor 1248	1	ND	ND
Aroclor 1254	1	ND	ND
Aroclor 1260	1	ND	ND
Total Aroclors	1	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Chris Elliott Date 1/29/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Sweet-Edwards/EMCON, Inc.	Date Received:	01/23/92
Project:	ARCO #4473 - Everett	Date TCLP Performed:	01/27/92
Sample Matrix:	Soil	Date Analyzed:	01/28/92
		Work Order #:	K920478B

QA/QC Report
Matrix Spike Summary
Toxicity Characteristic Leaching Procedure (TCLP)
EPA Method 1311
Metals
mg/L (ppm) in TCLP Extract

Sample Name: SB2-2
Lab Code: K0478-1

Analyte	Method	Spike Level	MRL	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Arsenic	3010/6010	5.0	0.1	ND	5.2	102	75-125
Barium	3010/6010	5.0	0.5	ND	5.7	114	75-125
Cadmium	3010/6010	1.0	0.01	ND	0.99	99	75-125
Chromium	3010/6010	5.0	0.01	0.01	5.06	101	75-125
Lead	3010/6010	5.0	0.05	ND	4.87	97	75-125
Mercury	7470	0.01	0.001	ND	0.010	100	75-125
Selenium	3010/6010	1.0	0.1	ND	1.1	110	75-125
Silver	3010/6010	1.0	0.01	ND	0.99	99	75-125

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Lim Elliott Date 1/29/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Sweet-Edwards/EMCON, Inc.	**Date Received:**	01/23/92
Project:	ARCO #4473 - Everett	**Date Extracted:**	01/27/92
Sample Matrix:	Soil	**Date Analyzed:**	01/27/92
		Work Order #:	K920478B

QA/QC Report
Surrogate Recovery Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	Lab Code	Percent Recovery 1,4-Dichlorobutane
SB2-2	K0478-1	*134
Method Blank	K0478-MB	**131
	CAS Acceptance Criteria	50-130

* Outside acceptance limits because of matrix interferences. The gas chromatogram showed nontarget components that interfered with the analysis. The sample was not reanalyzed.

** Outside acceptance limits. Since no target analytes were detected in the sample, it was the laboratory's opinion that the elevated percent recovery does not significantly impact the data. The sample was not reanalyzed.

Approved by Colin Elliott Date 1/29/92

ARCO Facility no. 4473 | City (Facility) EVERETT, WA | Project manager (Consultant) KIM VIK | Laboratory name COLUMBIA ANALYTICAL SE

ARCO engineer MR. ROY THUN | Telephone no. (ARCO) (213) 486-1293 | Telephone no. (Consultant) (206) 485-5000 | Fax no. (Consultant) (206) 486-9766 | Contract number

Consultant name EMCON NORTHWEST, INC. | Address (Consultant) 18912 NORTH CREEK PKWY SUITE 210 BOTHELL, WA | Method of shipment HAND DELIVERED

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☒ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☒	PCB's EPA 8080
WOSS		3	X			X		2-7-92	11:15			X		X		X		X	X		X
GTSS-1		4	X			X		2-7	11:45		X			X						X	
GTSS-2		4	X			X		2-7	12:05		X			X						X	
GTSS-3		4	X			X		2-7	12:20		X			X						X	
GTSS-4		4	X			X		2-7	12:42		X			X						X	
GTSS-5		4	X			X		2-7	13:05		X			X						X	

~~ADDED~~ 3/18 per V. VIK — 48 HR TAT mch

Special detection Limit/reporting: N/A

Special QA/QC: N/A

Remarks: SE/E JOB # T336001 HOLD 2 8 OZ. JARS FOR EACH GTSS SAMPLE. ~~24 HOUR TURNAR~~

Lab number: B92-0060

Condition of sample:

Temperature received:

	Date	Time		Date	Time
Relinquished by sampler	2-7-92	4:17 PM	Received by	Barbara D. Logan	02/07/92 1630
Relinquished by			Received by		
Relinquished by			Received by laboratory		

Turnaround time

- Priority Rush 1 Business Day ☑
- Rush 2 Business Days ☐
- Expedited ASAP 5 Business Days ☐
- Standard 10 Business Days ☐

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

PPC-3292 (2-91)

Appendix D

TANK REMOVAL ASSESSMENT DATA VALIDATION REPORT FOR EPA METHOD 8240 ANALYSIS

DATA VALIDATION SUMMARY
ARCO FACILITY 4473 - Everett, Washington

The Quality Assurance review of results for the volatile organic compound (VOC) analysis of five soil samples collected on February 6 and 7, 1992, at ARCO Facility 4473 has been completed. Samples WOTB, WWOTW, EWOTW, NWOTW, and WOSS were analyzed by Columbia Analytical Services, Inc., of Kelso, Washington.

Data Qualifications

The following comments refer to the laboratory performance in meeting the quality control (QC) guidelines for EPA Method 8240 (USEPA, 1986) VOC analysis of soil samples. The data validation review was performed following procedures in *Laboratory Data Validation Functional Guidelines for Evaluating Organics Analysis* (USEPA, 1988).

Holding Times

All sample analyses were conducted within holding time limits.

Method Blanks

Method blanks were analyzed at the required frequency. A review of the analytical results shows that trichlorotrifluoroethane (Freon 113) was detected in all of the samples at concentrations ranging from 18 µg/kg to 49 µg/kg. Freon 113 was detected in the method blank analyzed on February 12, 1991, at a concentration of 0.8 µg/kg, but was not detected in the method blank analyzed on February 13, 1992. Acetone was detected in three of the five samples at concentrations ranging from 76 µg/kg to 270 µg/kg. Acetone was reported in the method blank analyzed on February 12, 1992, at a concentration of 5.2 µg/kg and in the method blank analyzed on February 13, 1992, at a concentration of 11 µg/kg. Methyl ethyl ketone (MEK) [2-butanone] was detected in all of the samples at concentrations ranging from 14 µg/kg to 57 µg/kg. The method blank analyzed on February 12, 1992, showed a concentration of 4.2 µg/kg MEK

and the method blank analyzed on February 13, 1992, showed a concentration of 1.8 µg/kg MEK.

Freon 113, acetone, and MEK are solvents commonly used by analytical laboratories. Personnel from Columbia Analytical Services, Inc., indicated they have had recurring problems with each of these solvents during their analytical procedures in the past. Columbia Analytical Services, Inc., has made repeated attempts to eliminate the contaminant sources(s). However, the duration and magnitude of the contaminants is highly variable. Laboratory personnel are attempting to provide direct correlations with factors such as wind speed and direction, temperature conditions, and time of day to determine the contaminant sources, but attempts to date have been unsuccessful. In light of these past problems, it appears that the Freon 113, acetone, and MEK data for ARCO Facility 4473 are suspect.

EPA's data review guidelines (USEPA, 1988) use a factor of 10 for determining when a common laboratory contaminant (such as acetone or MEK) that is detected in a method blank should also be reported in associated samples. For both the acetone and MEK concentrations reported in samples, when dilution factors, sample weights, and percent solids are considered, all sample concentrations for these contaminants are less than a factor of 10 greater than the blank concentrations and should be considered not detected.

Freon 113, although reported at only a low concentration in the method blank analyzed on February 12, 1992, and undetected in the method blank analyzed on February 12, 1992, should also be considered not detected in all samples. Samples EWOTW and WWOTW were analyzed on both February 12, 1992, and February 13, 1992, with widely varying results for Freon 113. For both samples, the initial analysis showed Freon 113 at approximately 40 µg/kg, and the second analysis (conducted one day later) showed Freon 113 at a concentration less than 1 µg/kg. Because all of the Freon 113 results reported are from analyses conducted on February 12, 1992, and the same samples and a method blank analyzed one day later show undetected concentrations of Freon 113, it appears that Freon 113 contamination is not due to site sources.

Based on data review guidelines and past experience, an undetected (ND) data qualifier was assigned to all sample results for acetone, MEK (2-butanone), and Freon 113.

Matrix Spike/Matrix Spike Duplicate Results

All matrix spike/matrix spike duplicate results (MS/MSD) compound percent recoveries and relative percent difference (RPD) between MS and MSD percent recoveries were within EPA QC criteria (USEPA, 1986) except for the percent recovery of 1,1-dichloroethene in the MS analysis. The recovery of 1,1-dichloroethene was 57 percent, only 2 percent less than the QC limit. No data qualifiers were assigned to sample results due to the low recovery based on EPA data review guidelines (USEPA, 1988).

Surrogate Recoveries

All sample, blank, and spike sample surrogate recoveries were within QC criteria.

Overall Assessment

The usefulness of the data is based on the criteria in:

- Laboratory Data Validation Functional Guidelines for Evaluating Organics Analysis.

Upon consideration of the data qualifications noted above, the data are acceptable for their intended use. All data qualifiers are as defined by the laboratory.

LIST OF REFERENCES

U.S. Environmental Protection Agency. 1986. Test Methods for Evaluating Solid Waste Physical/Chemical Methods. SW-846. USEPA Office of Solid Waste and Emergency Response, Washington D.C.

U.S. Environmental Protection Agency. 1988. Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses. Prepared for the Hazardous Site Evaluation Division by the USEPA Data Review Work Group.

Columbia Analytical Services Inc.

February 21, 1992



Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: **ARCO #4473 - Everett/Project #T3360.01/B920065**

Dear Kim:

Enclosed is a revised report for the rush samples submitted to our lab on February 7, 1992. For your reference, these analyses have been assigned our work order number K920828B.

Additional information was added to the method blank results for Method 8240. The concentrations of Freon 113, acetone and MEK detected below the Method Reporting Limit (MRL) but above the instrument detection limit have been added to the method blank results.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Colin B. Elliott
Senior Project Chemist

CBE/tlt

Analytical Report

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 02/07/92
Work Order #: K9208288

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		WOTB	WWOTW	EWOTW
Lab Code:		K0828-1	K0828-2	K0828-3
Date Analyzed:		02/12/92	02/12/92	02/12/92
Analyte	MRL			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	*~~49~~ ND	*~~46~~ ND	*~~28~~ ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	ND	ND	**~~270~~ ND
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	~~21~~ ND	~~38~~ ND	~~57~~ ND
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Possible laboratory contamination
** Result is from the analysis of a diluted sample performed on February 13, 1992.

Approved by Alan Elliott Date 2/24/92

Analytical Report

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 02/07/92
Work Order #: K920828B.

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		NWOTW	Method Blank	Method Blank
Lab Code:		K0828-4	K0828-MB	K0828-MB
Date Analyzed:		02/12/92	02/12/92	02/13/92
Analyte	**MRL**			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	~~*29~~ ND	**0.8	ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	~~*135~~ ND	**5.2	**11.0
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	~~* 26~~ ND	**4.2	**1.8
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Possible laboratory contamination
** Concentrations detected below the MRL.

Approved by Chris Elliott Date 2/24/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 02/07/92
Date Analyzed: 02/12/92
Work Order #: K920828B

QA/QC Report
Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)

Sample Name	Lab Code	Percent Recovery		
		1,2-Dichloroethane - D_4	Toluene - D_8	4-Bromofluorobenzene
WOTB	K0828-1	97	101	86
WWOTW	K0828-2	95	102	87
EWOTW	K0828-3	95	103	86
NWOTW	K0828-4	95	101	88
Method Blank	K0828-MB	93	100	87
EPA Acceptance Criteria		70-121	81-117	74-121

Approved by Chris Elliott Date 2/24/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	**Date Received:**	02/07/92
Project:	ARCO #4473 - Everett	**Date Analyzed:**	02/13/92
Sample Matrix:	Soil	**Work Order #:**	K920828B

QA/QC Report
Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)

Sample Name	Lab Code	Percent Recovery		
		1,2-Dichloroethane - D_4	Toluene - D_8	4-Bromofluorobenzene
WWOTW	K0828-2MS	94	100	87
WWOTW	K0828-2DMS	92	101	86
Method Blank	K0828-MB	90	99	85
EPA Acceptance Criteria		70-121	81-117	74-121

Approved by Chris Elliott Date 2/24/92

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	EMCON Northwest	Date Received:	02/07/92
Project:	ARCO #4473 - Everett	Date Analyzed:	02/13/92
Sample Matrix:	Soil	Work Order #:	K9208288

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb)
Dry Weight Basis

Sample Name: WWOTW
Lab Code: K0828-2

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	EPA Acceptance Criteria	Relative Percent Difference
1,1-Dichloroethene	68	67	ND	39	46	*57	69	59-172	19
Trichloroethene	68	67	ND	69	78	101	116	62-137	14
Chlorobenzene	68	67	ND	74	82	109	122	60-133	11
Toluene	68	67	ND	69	80	101	119	59-139	16
Benzene	68	67	ND	63	74	93	110	66-142	17

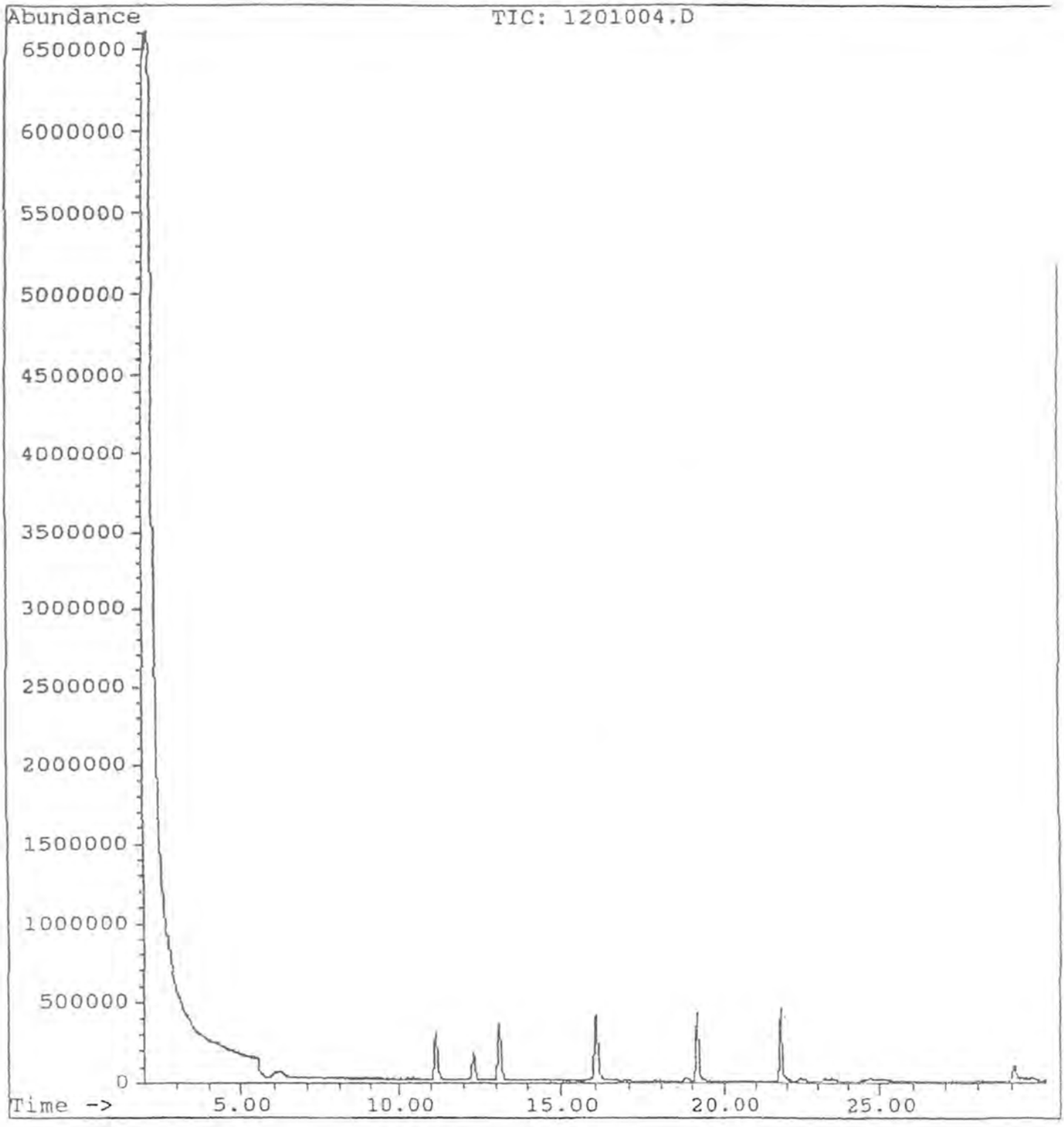
ND None Detected at or above the method reporting limit
* Outside acceptance limits because of matrix effects. This sample was analyzed a second time and again produced unacceptable recovery values. The results from the initial analysis are reported.

Approved by Alan Elliott Date 2/24/92

APPENDIX C

RAW DATA

File: C:\CHEMPC\DATA\1201004.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 4:52 pm
Method File: DIRT8240.M
Sample Name: 0828-1
Misc Info: 4.209 GRAM SOIL
ALS vial: 12



Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1201004.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 4:52 pm
Method File: DIRT8240.M
Sample Name: 50828-1
Misc Info: 4.209 GRAM SOIL
Vial Number: 12

1.28425
X.925 = 1.28535

Quantitation Settings:

Reference Peak Window:	5 Percent
Non-Reference Peak Window:	5 Percent
Correlation Window:	0.03 Minutes
Default Multiplier:	1
Default Sample Amount:	0
Peak Type Decoding:	* -> Time Reference Peak
	m -> Manually re-integrated
	00X -> Compound references ISTD X

#	Compound	Ret Time	Amount	Peak Type
1	DICHLOROFLUOROMETHANE	*****	NOT FOUND *****	001
2	CHLOROMETHANE	*****	NOT FOUND *****	001
3	VINYL CHLORIDE	*****	NOT FOUND *****	001
4	BROMOMETHANE	*****	NOT FOUND *****	001
5	CHLOROETHANE	*****	NOT FOUND *****	001
6	TRICHLOROFLUOROMETHANE	*****	NOT FOUND *****	001
7	TRICHLOROTRIFLUOROETHANE	6.10	37.8 PPB	001m
8	1,1-DICHLOROETHENE	*****	NOT FOUND *****	001
9	ACETONE	6.52	44.0 PPB	001m
10	CARBON DISULFIDE	*****	NOT FOUND *****	001
11	METHYLENE CHLORIDE	7.71	0.5 PPB	001m
12	trans-1,2-DICHLOROETHENE	*****	NOT FOUND *****	001
13	1,1-DICHLOROETHANE	*****	NOT FOUND *****	001!
14	2-BUTANONE (MEK)	10.45	16.1 PPB	001m
15	cis-1,2-DICHLOROETHENE	*****	NOT FOUND *****	001
16	CHLOROFORM	*****	NOT FOUND *****	001
17	BROMOCHLOROMETHANE	11.16	50.0 PPB	*ISTD001!
18	1,1,1-TRICHLOROETHANE	*****	NOT FOUND *****	001
19	CARBON TETRACHLORIDE	*****	NOT FOUND *****	001
20	SURR-1,2-DICHLOROETHANE-D4	12.31	48.5 PPB	001m
21	BENZENE	12.42	0.0 PPB	002#
22	1,2-DICHLOROETHANE	*****	NOT FOUND *****	002
23	1,4-DIFLUOROBENZENE	13.11	50.0 PPB	*ISTD002!
24	TRICHLOROETHENE	*****	NOT FOUND *****	002

Rae

Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

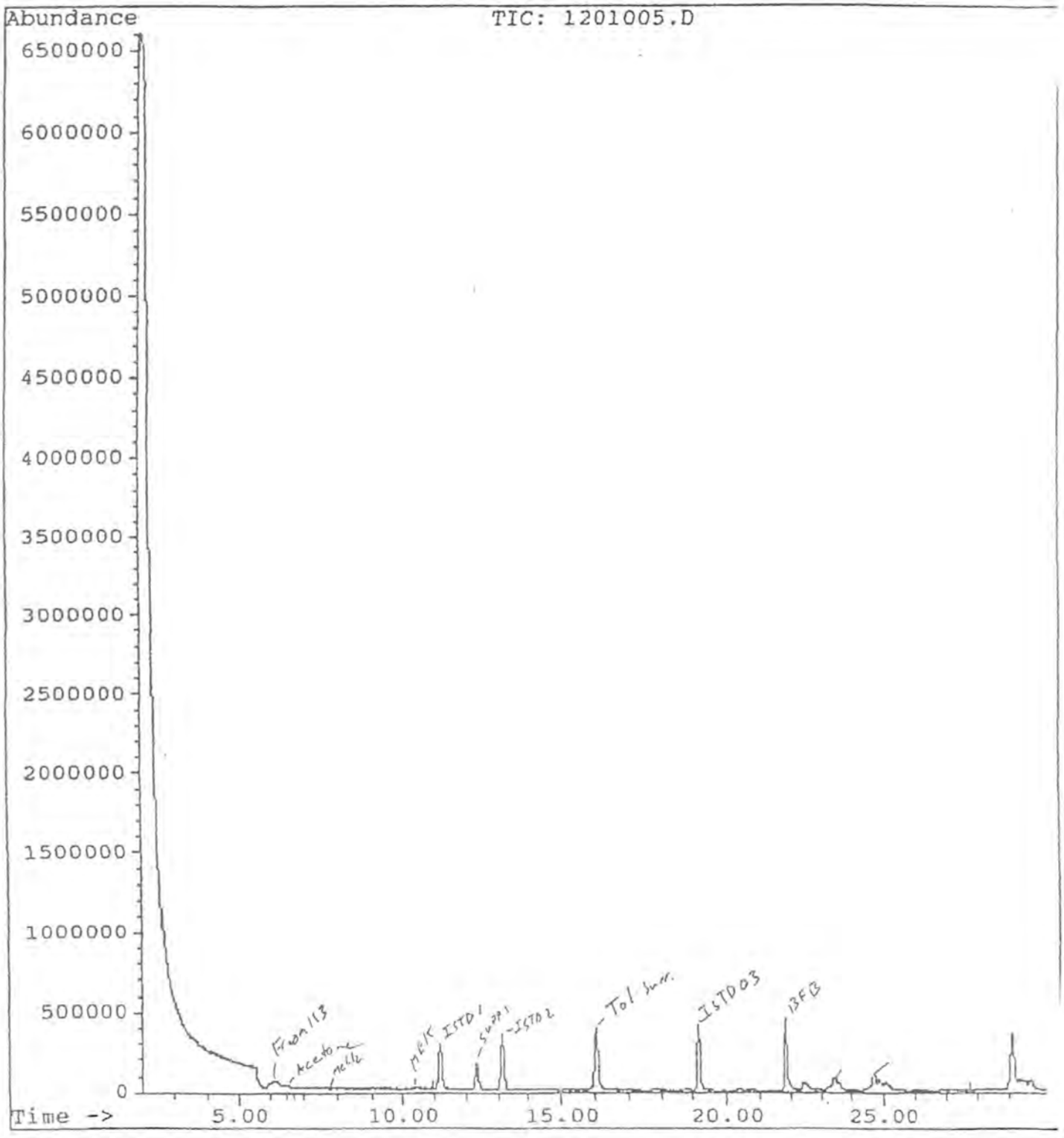
Information from Data File:
File: C:\CHEMPC\DATA\1201004.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 4:52 pm
Method File: DIRT8240.M
Sample Name: 0828-1
Misc Info: 4.209 GRAM SOIL
Vial Number: 12

Pk #	Compound	Ret Time	Amount	Peak Type
25	1,2-DICHLOROPROPANE		***** NOT FOUND *****	002
26	BROMODICHLOROMETHANE		***** NOT FOUND *****	002
27	2-CHLOROETHYL VINYL ETHER		***** NOT FOUND *****	002
28	cis-1,3-DICHLOROPROPENE		***** NOT FOUND *****	002
29	2-HEXANONE	15.97	0.0 PPB	002m
30	SURR-TOLUENE-D8	16.03	50.4 PPB	002
31	TOLUENE		***** NOT FOUND *****	002
32	trans-1,3-DICHLOROPROPENE		***** NOT FOUND *****	002
33	1,1,2-TRICHLOROETHANE		***** NOT FOUND *****	003
34	TETRACHLOROETHENE		***** NOT FOUND *****	003
35	4-METHYL-2-PENTANONE	17.89	0.0 PPB	003m
36	DIBROMOCHLOROMETHANE		***** NOT FOUND *****	003
37	CHLOROBENZENE-D5	19.14	50.0 PPB	*ISTD003
38	CHLOROBENZENE		***** NOT FOUND *****	003
39	P&M XYLENE		***** NOT FOUND *****	003
40	ETHYLBENZENE		***** NOT FOUND *****	003
41	O XYLENE		***** NOT FOUND *****	003
42	STYRENE		***** NOT FOUND *****	003
43	BROMOFORM		***** NOT FOUND *****	003
44	1,1,2,2-TETRACHLOROETHANE		***** NOT FOUND *****	003
45	SURR-BROMOFLUOROBENZENE	21.82	43.2 PPB	003#
46	1,3-DICHLOROBENZENE	24.49	0.0 PPB	003#
47	1,4-DICHLOROBENZENE	24.49	0.0 PPB	003#
48	1,2-DICHLOROBENZENE		***** NOT FOUND *****	003

END OF REPORT
Qualifiers Not Satisfied
! Qualifiers Not Used

RDE
2/14/92

File: C:\CHEMPC\DATA\1201005.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 5:31 pm
Method File: DIRT8240.M
Sample Name: 0828-2
Misc Info: 4.248 GRAM SOIL
ALS vial: 12



Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1201005.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 5:31 pm
Method File: DIRT8240.M
Sample Name: 5 0828-2
Misc Info: 4.248 GRAM SOIL
Vial Number: 12

X .914 = 1.28535 1.28495

Quantitation Settings:

Reference Peak Window:	5 Percent
Non-Reference Peak Window:	5 Percent
Correlation Window:	0.03 Minutes
Default Multiplier:	1
Default Sample Amount:	0
Peak Type Decoding:	* -> Time Reference Peak
	m -> Manually re-integrated
	00X -> Compound references ISTD X

Pk #	Compound	Ret Time	Amount	Peak Type
1	DICHLOROFLUOROMETHANE	***** NOT FOUND *****		001
2	CHLOROMETHANE	***** NOT FOUND *****		001
3	VINYL CHLORIDE	***** NOT FOUND *****		001
4	BROMOMETHANE	***** NOT FOUND *****		001
5	CHLOROETHANE	***** NOT FOUND *****		001
6	TRICHLOROFLUOROMETHANE	***** NOT FOUND *****		001
7	TRICHLOROTRIFLUOROETHANE	6.13	36.1 PPB	001m
8	1,1-DICHLOROETHENE	***** NOT FOUND *****		001
9	ACETONE	6.51	0.0 PPB	001m
10	CARBON DISULFIDE	***** NOT FOUND *****		001
11	METHYLENE CHLORIDE	7.76	0.0 PPB	001#
12	trans-1,2-DICHLOROETHENE	***** NOT FOUND *****		001
13	1,1-DICHLOROETHANE	***** NOT FOUND *****		001!
14	2-BUTANONE (MEK)	10.45	30.6 PPB	001m
15	cis-1,2-DICHLOROETHENE	***** NOT FOUND *****		001
16	CHLOROFORM	***** NOT FOUND *****		001
17	BROMOCHLOROMETHANE	11.18	50.0 PPB	*ISTD001!
18	1,1,1-TRICHLOROETHANE	***** NOT FOUND *****		001
19	CARBON TETRACHLORIDE	***** NOT FOUND *****		001
20	SURR-1,2-DICHLOROETHANE-D4	12.32	47.4 PPB	001m
21	BENZENE	12.43	0.0 PPB	002#
22	1,2-DICHLOROETHANE	***** NOT FOUND *****		002
23	1,4-DIFLUOROBENZENE	13.13	50.0 PPB	*ISTD002!
24	TRICHLOROETHENE	***** NOT FOUND *****		002

Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

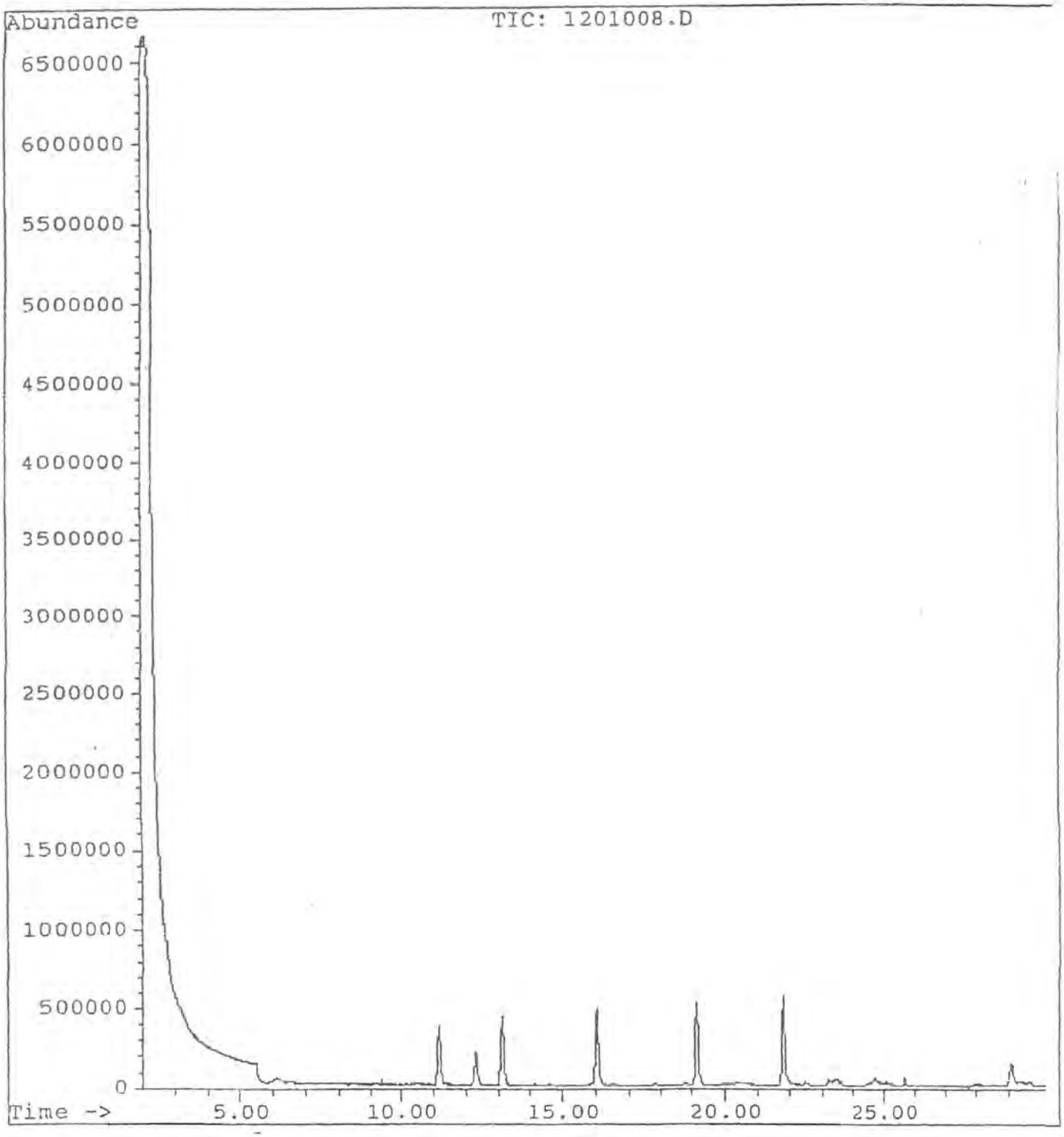
Information from Data File:
File: C:\CHEMPC\DATA\1201005.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 5:31 pm
Method File: DIRT8240.M
Sample Name: 0828-2
Misc Info: 4.248 GRAM SOIL
Vial Number: 12

Pk #	Compound	Ret Time	Amount	Peak Type
25	1,2-DICHLOROPROPANE	***** NOT FOUND *****		002
26	BROMODICHLOROMETHANE	***** NOT FOUND *****		002
27	2-CHLOROETHYL VINYL ETHER	***** NOT FOUND *****		002
28	cis-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
29	2-HEXANONE	15.91	0.0 PPB	002m
30	SURR-TOLUENE-D8	16.04	50.8 PPB	002
31	TOLUENE	16.20	0.3 PPB	002m
32	trans-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
33	1,1,2-TRICHLOROETHANE	***** NOT FOUND *****		003
34	TETRACHLOROETHENE	***** NOT FOUND *****		003
35	4-METHYL-2-PENTANONE	17.79	0.0 PPB	003m
36	DIBROMOCHLOROMETHANE	***** NOT FOUND *****		003
37	CHLOROBENZENE-D5	19.15	50.0 PPB	*ISTD003
38	CHLOROBENZENE	***** NOT FOUND *****		003
39	P&M XYLENE	19.54	0.0 PPB	003#
40	ETHYLBENZENE	***** NOT FOUND *****		003
41	O XYLENE	***** NOT FOUND *****		003
42	STYRENE	***** NOT FOUND *****		003
43	BROMOFORM	***** NOT FOUND *****		003
44	1,1,2,2-TETRACHLOROETHANE	***** NOT FOUND *****		003
45	SURR-BROMOFLUOROBENZENE	21.82	43.5 PPB	003
46	1,3-DICHLOROBENZENE	***** NOT FOUND *****		003
47	1,4-DICHLOROBENZENE	***** NOT FOUND *****		003
48	1,2-DICHLOROBENZENE	***** NOT FOUND *****		003

END OF REPORT
Qualifiers Not Satisfied
! Qualifiers Not Used

Rar
2/14/92

File: C:\CHEMPC\DATA\1201008.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 7:27 pm
Method File: DIRT8240.M
Sample Name: 0828-3
Misc Info: 4.398 GRAM SOIL
ALS vial: 12



Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1201008.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 7:27 pm
Method File: DIRT8240.M
Sample Name: 5 0828-3
Misc Info: 4.398 GRAM SOIL
Vial Number: 12
x.99 = 1.23762

RR For Acetone MB

Quantitation Settings:

Reference Peak Window:	5 Percent
Non-Reference Peak Window:	5 Percent
Correlation Window:	0.03 Minutes
Default Multiplier:	1
Default Sample Amount:	0
Peak Type Decoding:	* -> Time Reference Peak
	m -> Manually re-integrated
	00X -> Compound references ISTD X

Pk #	Compound	Ret Time	Amount		Peak Type
1	DICHLOROFLUOROMETHANE	*****	NOT FOUND *****		001
2	CHLOROMETHANE	*****	NOT FOUND *****		001
3	VINYL CHLORIDE	*****	NOT FOUND *****		001
4	BROMOMETHANE	*****	NOT FOUND *****		001
5	CHLOROETHANE	*****	NOT FOUND *****		001
6	TRICHLOROFLUOROMETHANE	*****	NOT FOUND *****		001
7	TRICHLOROTRIFLUOROETHANE	6.13	23.2 PPB		001m
8	1,1-DICHLOROETHENE	*****	NOT FOUND *****		001
9	ACETONE	6.53	260.0 PPB	RR	001m
10	CARBON DISULFIDE	*****	NOT FOUND *****		001
11	METHYLENE CHLORIDE	7.71	0.5 PPB		001m
12	trans-1,2-DICHLOROETHENE	*****	NOT FOUND *****		001
13	1,1-DICHLOROETHANE	*****	NOT FOUND *****		001!
14	2-BUTANONE (MEK)	10.47	46.4 PPB		001m
15	cis-1,2-DICHLOROETHENE	*****	NOT FOUND *****		001
16	CHLOROFORM	*****	NOT FOUND *****		001
17	BROMOCHLOROMETHANE	11.16	50.0 PPB		*ISTD001!
18	1,1,1-TRICHLOROETHANE	*****	NOT FOUND *****		001
19	CARBON TETRACHLORIDE	*****	NOT FOUND *****		001
20	SURR-1,2-DICHLOROETHANE-D4	12.32	47.5 PPB		001m
21	BENZENE	*****	NOT FOUND *****		002
22	1,2-DICHLOROETHANE	*****	NOT FOUND *****		002
23	1,4-DIFLUOROBENZENE	13.12	50.0 PPB		*ISTD002!
24	TRICHLOROETHENE	*****	NOT FOUND *****		002

Ra

Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

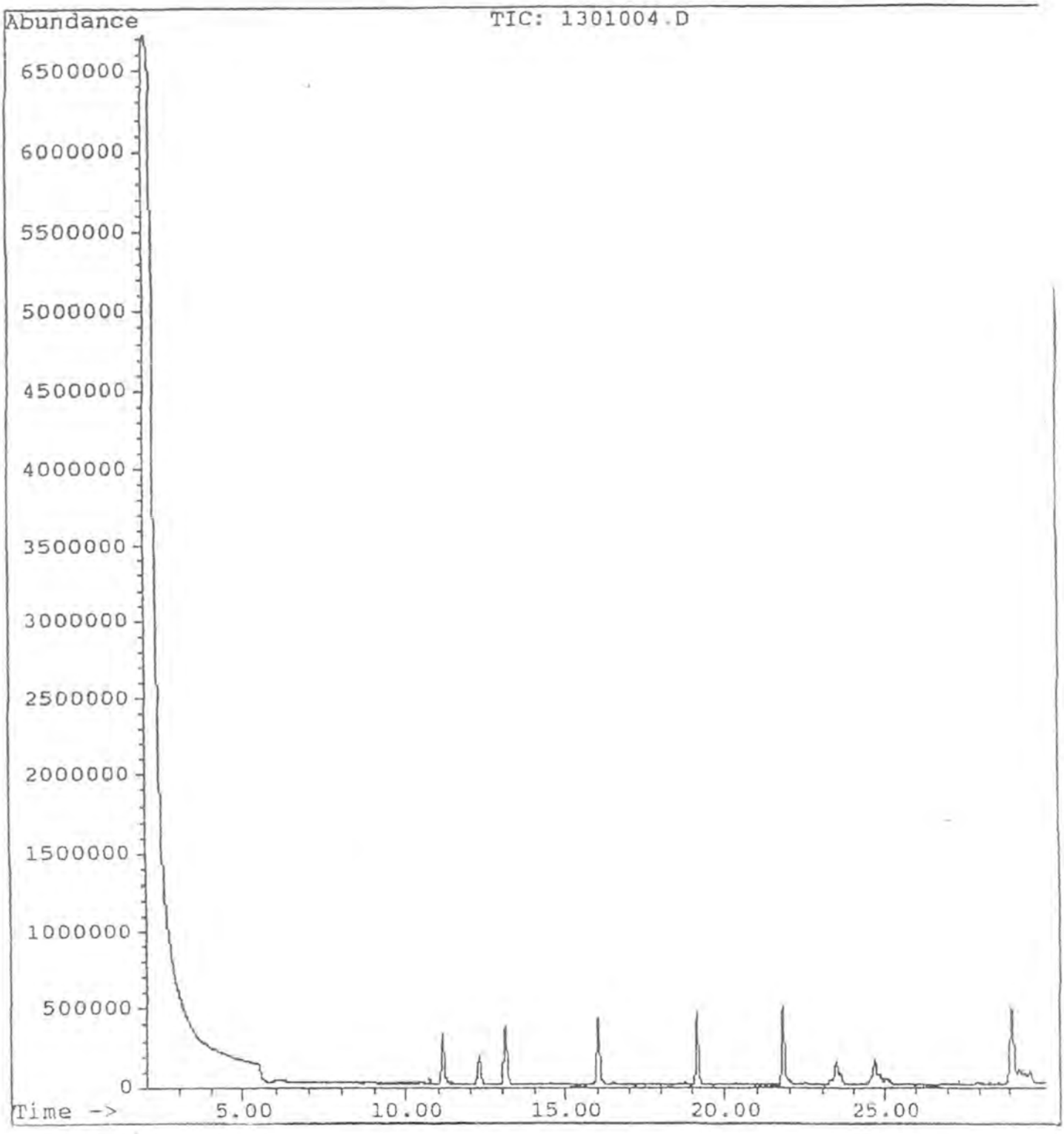
Information from Data File:
File: C:\CHEMPC\DATA\1201008.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 7:27 pm
Method File: DIRT8240.M
Sample Name: 0828-3
Misc Info: 4.398 GRAM SOIL
Vial Number: 12

Pk #	Compound	Ret Time	Amount	Peak Type
25	1,2-DICHLOROPROPANE	***** NOT FOUND *****		002
26	BROMODICHLOROMETHANE	***** NOT FOUND *****		002
27	2-CHLOROETHYL VINYL ETHER	***** NOT FOUND *****		002
28	cis-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
29	2-HEXANONE	16.04	0.0 PPB	002m
30	SURR-TOLUENE-D8	16.04	51.6 PPB	002
31	TOLUENE	16.23	0.0 PPB	002
32	trans-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
33	1,1,2-TRICHLOROETHANE	***** NOT FOUND *****		003
34	TETRACHLOROETHENE	***** NOT FOUND *****		003
35	4-METHYL-2-PENTANONE	17.89	0.0 PPB	003m
36	DIBROMOCHLOROMETHANE	***** NOT FOUND *****		003
37	CHLOROBENZENE-D5	19.15	50.0 PPB	*ISTD003
38	CHLOROBENZENE	***** NOT FOUND *****		003
39	P&M XYLENE	***** NOT FOUND *****		003
40	ETHYLBENZENE	***** NOT FOUND *****		003
41	O XYLENE	***** NOT FOUND *****		003
42	STYRENE	***** NOT FOUND *****		003
43	BROMOFORM	***** NOT FOUND *****		003
44	1,1,2,2-TETRACHLOROETHANE	***** NOT FOUND *****		003
45	SURR-BROMOFLUOROBENZENE	21.81	43.1 PPB	003#
46	1,3-DICHLOROBENZENE	***** NOT FOUND *****		003
47	1,4-DICHLOROBENZENE	***** NOT FOUND *****		003
48	1,2-DICHLOROBENZENE	***** NOT FOUND *****		003

END OF REPORT
Qualifiers Not Satisfied
! Qualifiers Not Used

Rae
2/14/92

File: C:\CHEMPC\DATA\1301004.D
Operator: MARGARET BRASCHER
Date Acquired: 13 Feb 92 3:18 pm
Method File: DIRT8240.M
Sample Name: 0828-3 - Rerun
Misc Info: 2.245 GRAM SOIL RR FOR ACETONE
ALS vial: 13



Calibration Last Updated: Thu Feb 13 12:08:30 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1301004.D
Operator: MARGARET BRASCHER
Date Acquired: 13 Feb 92 3:18 pm
Method File: DIRT8240.M
Sample Name: 0828-3
Misc Info: 5 2.245 GRAM SOIL RR FOR ACETONE
Vial Number: 13
x.919 = 2.42718

Quantitation Settings:

Reference Peak Window:	5 Percent
Non-Reference Peak Window:	5 Percent
Correlation Window:	0.03 Minutes
Default Multiplier:	1
Default Sample Amount:	0
Peak Type Decoding:	* -> Time Reference Peak
	m -> Manually re-integrated
	00X -> Compound references ISTD X

Pk #	Compound	Ret Time	Amount	Peak Type
1	DICHLOROFLUOROMETHANE	*****	NOT FOUND *****	001
2	CHLOROMETHANE	*****	NOT FOUND *****	001
3	VINYL CHLORIDE	*****	NOT FOUND *****	001
4	BROMOMETHANE	*****	NOT FOUND *****	001
5	CHLOROETHANE	*****	NOT FOUND *****	001
6	TRICHLOROFLUOROMETHANE	*****	NOT FOUND *****	001
7	TRICHLOROTRIFLUOROETHANE	6.33	0.4 PPB	001
8	1,1-DICHLOROETHENE	*****	NOT FOUND *****	001
9	ACETONE	6.51	111.0 PPB	001m
10	CARBON DISULFIDE	*****	NOT FOUND *****	001
11	METHYLENE CHLORIDE	*****	NOT FOUND *****	001
12	trans-1,2-DICHLOROETHENE	*****	NOT FOUND *****	001
13	1,1-DICHLOROETHANE	*****	NOT FOUND *****	001!
14	2-BUTANONE (MEK)	10.45	19.9 PPB	001m
15	cis-1,2-DICHLOROETHENE	*****	NOT FOUND *****	001
16	CHLOROFORM	*****	NOT FOUND *****	001
17	BROMOCHLOROMETHANE	11.14	50.0 PPB	*ISTD001!
18	1,1,1-TRICHLOROETHANE	*****	NOT FOUND *****	001
19	CARBON TETRACHLORIDE	*****	NOT FOUND *****	001
20	SURR-1,2-DICHLOROETHANE-D4	12.30	46.6 PPB	001m
21	BENZENE	*****	NOT FOUND *****	002
22	1,2-DICHLOROETHANE	*****	NOT FOUND *****	002
23	1,4-DIFLUOROBENZENE	13.12	50.0 PPB	*ISTD002!
24	TRICHLOROETHENE	*****	NOT FOUND *****	002

Calibration Last Updated: Thu Feb 13 12:08:30 1992
Internal Standard Report - Summary

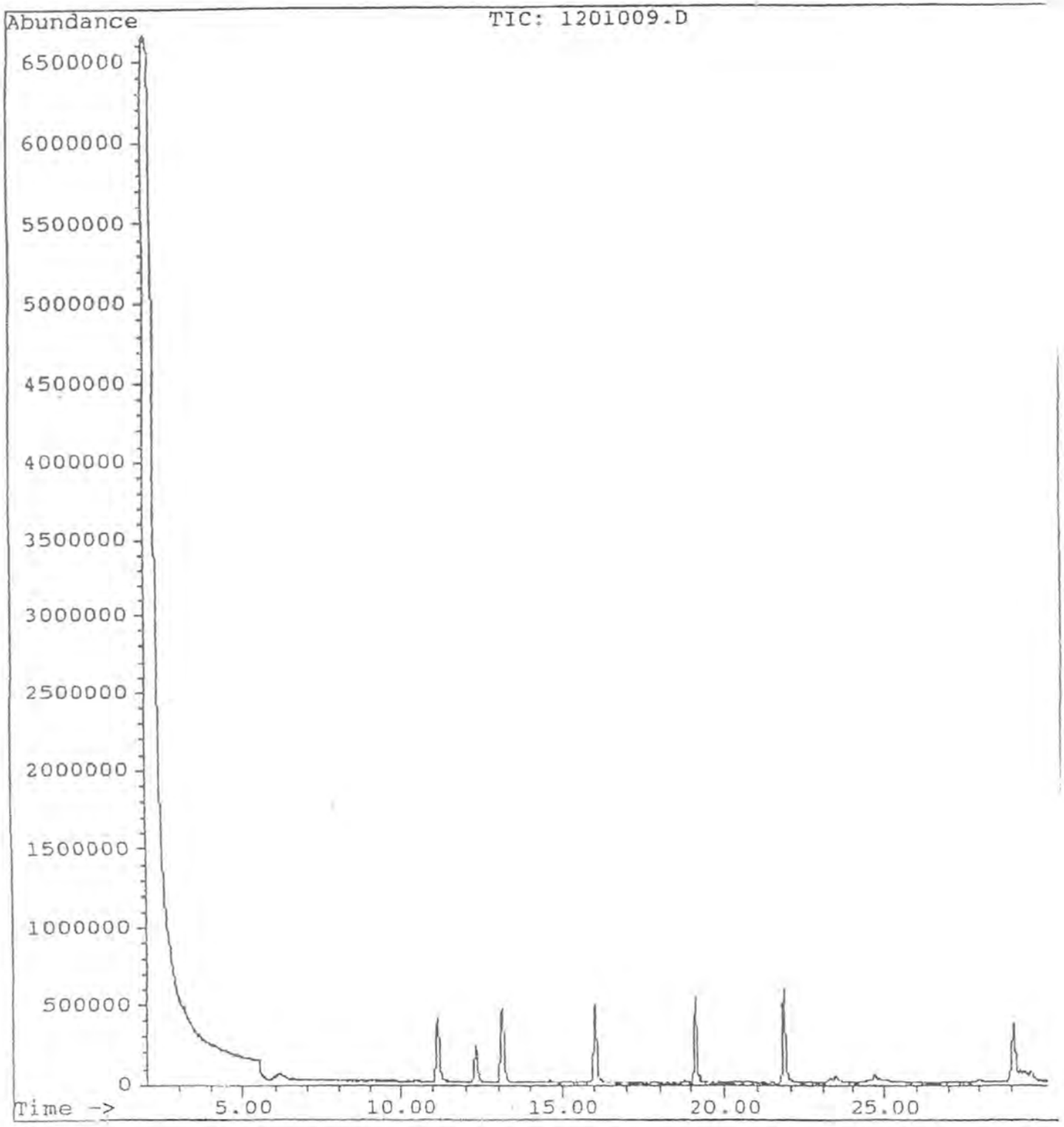
Information from Data File:
File: C:\CHEMPC\DATA\1301004.D
Operator: MARGARET BRASCHER
Date Acquired: 13 Feb 92 3:18 pm
Method File: DIRT8240.M
Sample Name: 0828-3
Misc Info: 2.245 GRAM SOIL RR FOR ACETONE
Vial Number: 13

Pk #	Compound	Ret Time	Amount	Peak Type
25	1,2-DICHLOROPROPANE	*****	NOT FOUND *****	002
26	BROMODICHLOROMETHANE	*****	NOT FOUND *****	002
27	2-CHLOROETHYL VINYL ETHER	*****	NOT FOUND *****	002
28	cis-1,3-DICHLOROPROPENE	*****	NOT FOUND *****	002
29	2-HEXANONE	15.94	0.0 PPB	002m
30	SURR-TOLUENE-D8	16.03	50.9 PPB	002
31	TOLUENE	16.24	0.0 PPB	002#
32	trans-1,3-DICHLOROPROPENE	*****	NOT FOUND *****	002
33	1,1,2-TRICHLOROETHANE	*****	NOT FOUND *****	003
34	TETRACHLOROETHENE	*****	NOT FOUND *****	003
35	4-METHYL-2-PENTANONE	17.78	0.0 PPB	003m
36	DIBROMOCHLOROMETHANE	*****	NOT FOUND *****	003
37	CHLOROBENZENE-D5	19.14	50.0 PPB	*ISTD003
38	CHLOROBENZENE	19.27	0.0 PPB	003#
39	P&M XYLENE	19.51	0.3 PPB	003m
40	ETHYLBENZENE	19.36	0.0 PPB	003m
41	0 XYLENE	*****	NOT FOUND *****	003
42	STYRENE	*****	NOT FOUND *****	003
43	BROMOFORM	*****	NOT FOUND *****	003
44	1,1,2,2-TETRACHLOROETHANE	*****	NOT FOUND *****	003
45	SURR-BROMOFLUOROBENZENE	21.82	44.0 PPB	003
46	1,3-DICHLOROBENZENE	*****	NOT FOUND *****	003
47	1,4-DICHLOROBENZENE	*****	NOT FOUND *****	003
48	1,2-DICHLOROBENZENE	*****	NOT FOUND *****	003

END OF REPORT
Qualifiers Not Satisfied
! Qualifiers Not Used

Rav 2/14/92

File: C:\CHEMPC\DATA\1201009.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 8:05 pm
Method File: DIRT8240.M
Sample Name: 0828-4
Misc Info: 4.364 GRAM SOIL
ALS vial: 12



Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1201009.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 8:05 pm
Method File: DIRT8240.M
Sample Name:
Misc Info: 5/0828-4
4.364 GRAM SOIL
Vial Number: 12
x.931 = 1.23153

Quantitation Settings:

Reference Peak Window:	5 Percent
Non-Reference Peak Window:	5 Percent
Correlation Window:	0.03 Minutes
Default Multiplier:	1
Default Sample Amount:	0
Peak Type Decoding:	* -> Time Reference Peak
	m -> Manually re-integrated
	00X -> Compound references ISTD X

%	#	Compound	Ret Time	Amount	Peak Type
	1	DICHLOROFLUOROMETHANE	***** NOT FOUND *****		001
	2	CHLOROMETHANE	***** NOT FOUND *****		001
	3	VINYL CHLORIDE	***** NOT FOUND *****		001
	4	BROMOMETHANE	***** NOT FOUND *****		001
	5	CHLOROETHANE	***** NOT FOUND *****		001
	6	TRICHLOROFLUOROMETHANE	***** NOT FOUND *****		001
	7	TRICHLOROTRIFLUOROETHANE	6.09	23.7 PPB	001m
	8	1,1-DICHLOROETHENE	***** NOT FOUND *****		001
	9	ACETONE	6.53	109.6 PPB	001m
	10	CARBON DISULFIDE	***** NOT FOUND *****		001
	11	METHYLENE CHLORIDE	***** NOT FOUND *****		001
	12	trans-1,2-DICHLOROETHENE	***** NOT FOUND *****		001
	13	1,1-DICHLOROETHANE	***** NOT FOUND *****		001!
	14	2-BUTANONE (MEK)	10.46	20.9 PPB	001m
	15	cis-1,2-DICHLOROETHENE	***** NOT FOUND *****		001
	16	CHLOROFORM	***** NOT FOUND *****		001
	17	BROMOCHLOROMETHANE	11.16	50.0 PPB	*ISTD001!
	18	1,1,1-TRICHLOROETHANE	***** NOT FOUND *****		001
	19	CARBON TETRACHLORIDE	***** NOT FOUND *****		001
	20	SURR-1,2-DICHLOROETHANE-D4	12.32	47.6 PPB	001m
	21	BENZENE	***** NOT FOUND *****		002
	22	1,2-DICHLOROETHANE	***** NOT FOUND *****		002
	23	1,4-DIFLUOROBENZENE	13.12	50.0 PPB	*ISTD002!
	24	TRICHLOROETHENE	***** NOT FOUND *****		002

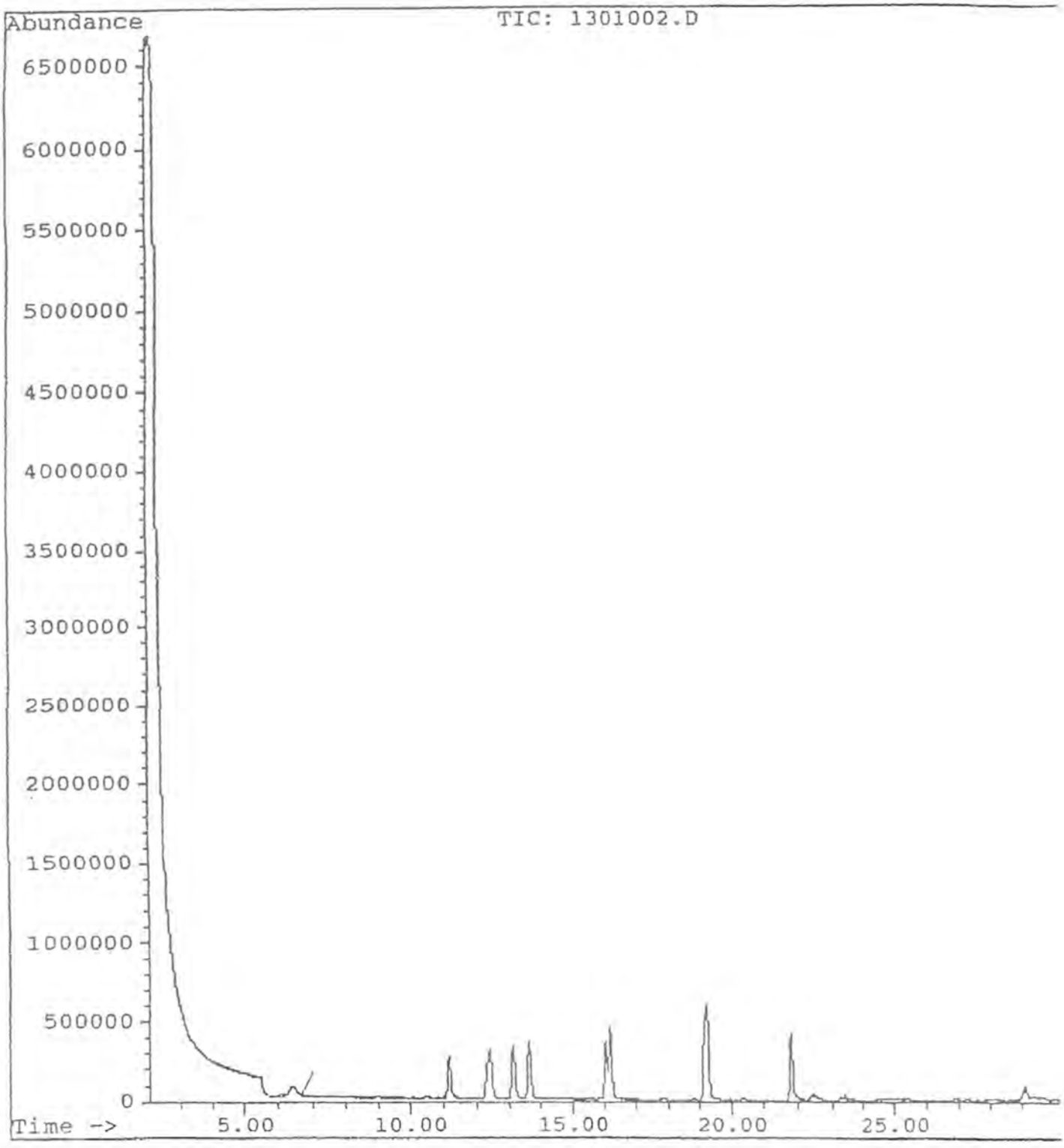
Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1201009.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 8:05 pm
Method File: DIRT8240.M
Sample Name: 0828-4
Misc Info: 4.364 GRAM SOIL
Vial Number: 12

Pk #	Compound	Ret Time	Amount	Peak Type
25	1,2-DICHLOROPROPANE	***** NOT FOUND *****		002
26	BROMODICHLOROMETHANE	***** NOT FOUND *****		002
27	2-CHLOROETHYL VINYL ETHER	***** NOT FOUND *****		002
28	cis-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
29	2-HEXANONE	16.01	0.0 PPB	002m
30	SURR-TOLUENE-D8	16.04	50.6 PPB	002
31	TOLUENE	***** NOT FOUND *****		002
32	trans-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
33	1,1,2-TRICHLOROETHANE	***** NOT FOUND *****		003
34	TETRACHLOROETHENE	***** NOT FOUND *****		003
35	4-METHYL-2-PENTANONE	17.88	0.0 PPB	003m
36	DIBROMOCHLOROMETHANE	***** NOT FOUND *****		003
37	CHLOROBENZENE-D5	19.14	50.0 PPB	*ISTD003
38	CHLOROBENZENE	***** NOT FOUND *****		003
39	P&M XYLENE	***** NOT FOUND *****		003
40	ETHYLBENZENE	***** NOT FOUND *****		003
41	0 XYLENE	***** NOT FOUND *****		003
42	STYRENE	***** NOT FOUND *****		003
43	BROMOFORM	***** NOT FOUND *****		003
44	1,1,2,2-TETRACHLOROETHANE	***** NOT FOUND *****		003
45	SURR-BROMOFLUOROBENZENE	21.82	44.1 PPB	003#
46	1,3-DICHLOROBENZENE	***** NOT FOUND *****		003
47	1,4-DICHLOROBENZENE	***** NOT FOUND *****		003
48	1,2-DICHLOROBENZENE	***** NOT FOUND *****		003

END OF REPORT
Qualifiers Not Satisfied
! Qualifiers Not Used

File: C:\CHEMPC\DATA\1301002.D
Operator: MARGARET BRASCHER
Date Acquired: 13 Feb 92 2:00 pm
Method File: DIRT8240.M
Sample Name: 0828-2MS
Misc Info: 4.018 GRAM MATRIX SPIKE
ALS vial: 13



Calibration Last Updated: Thu Feb 13 12:08:30 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1301002.D
Operator: MARGARET BRASCHER
Date Acquired: 13 Feb 92 2:00 pm
Method File: DIRT8240.M
Sample Name: 0828-2MS
Misc Info: 5/4.018 GRAM MATRIX SPIKE
Vial Number: 13
X 916 = 1.35890

Quantitation Settings:

Reference Peak Window:	5 Percent
Non-Reference Peak Window:	5 Percent
Correlation Window:	0.03 Minutes
Default Multiplier:	1
Default Sample Amount:	0
Peak Type Decoding:	* -> Time Reference Peak
	m -> Manually re-integrated
	00X -> Compound references ISTD X

Pk #	Compound	Ret Time	Amount	Peak Type
1	DICHLOROFLUOROMETHANE	***** NOT FOUND *****		001
2	CHLOROMETHANE	***** NOT FOUND *****		001
3	VINYL CHLORIDE	***** NOT FOUND *****		001
4	BROMOMETHANE	***** NOT FOUND *****		001
5	CHLOROETHANE	***** NOT FOUND *****		001
6	TRICHLOROFLUOROMETHANE	***** NOT FOUND *****		001
7	TRICHLOROTRIFLUOROETHANE	6.28	0.1 PPB	001
8	1,1-DICHLOROETHENE	6.43	28.8 PPB	001m
9	ACETONE	6.79	3.3 PPB	001#
10	CARBON DISULFIDE	***** NOT FOUND *****		001
11	METHYLENE CHLORIDE	***** NOT FOUND *****		001
12	trans-1,2-DICHLOROETHENE	***** NOT FOUND *****		001
13	1,1-DICHLOROETHANE	***** NOT FOUND *****		001!
14	2-BUTANONE (MEK)	10.45	56.1 PPB	001
15	cis-1,2-DICHLOROETHENE	***** NOT FOUND *****		001
16	CHLOROFORM	***** NOT FOUND *****		001
17	BROMOCHLOROMETHANE	11.16	50.0 PPB	*ISTD001!
18	1,1,1-TRICHLOROETHANE	11.65	0.1 PPB	001#
19	CARBON TETRACHLORIDE	***** NOT FOUND *****		001
20	SURR-1,2-DICHLOROETHANE-D4	12.31	46.9 PPB	001m
21	BENZENE	12.42	46.4 PPB	002
22	1,2-DICHLOROETHANE	12.46	0.1 PPB	002#
23	1,4-DIFLUOROBENZENE	13.13	50.0 PPB	*ISTD002!
24	TRICHLOROETHENE	13.63	50.5 PPB	002#

Calibration Last Updated: Thu Feb 13 12:08:30 1992
Internal Standard Report - Summary

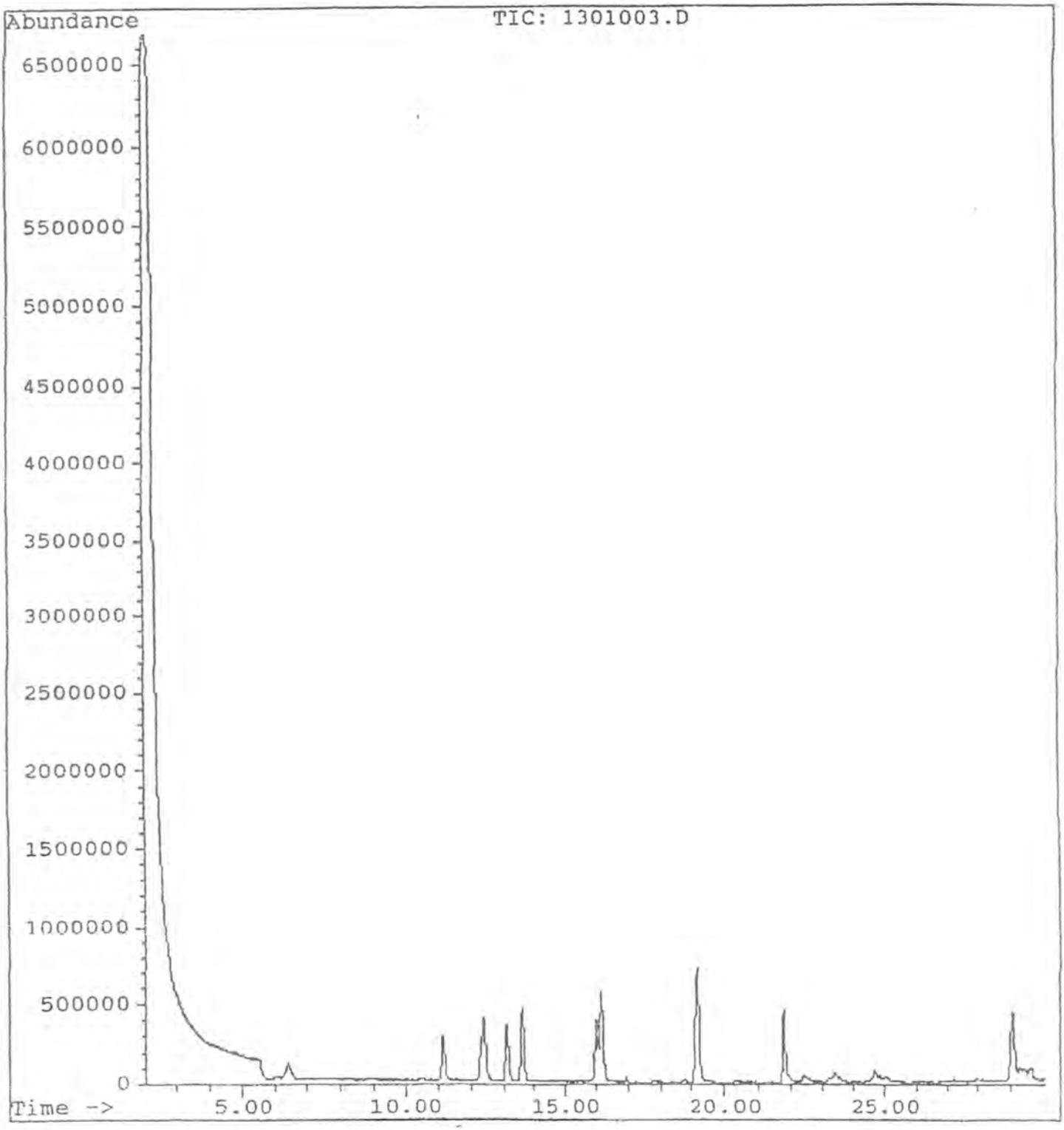
Information from Data File:
File: C:\CHEMPC\DATA\1301002.D
Operator: MARGARET BRASCHER
Date Acquired: 13 Feb 92 2:00 pm
Method File: DIRT8240.M
Sample Name: 0828-2MS
Misc Info: 4.018 GRAM MATRIX SPIKE
Vial Number: 13

Pk #	Compound	Ret Time	Amount	Peak Type
25	1,2-DICHLOROPROPANE	***** NOT FOUND *****		002
26	BROMODICHLOROMETHANE	***** NOT FOUND *****		002
27	2-CHLOROETHYL VINYL ETHER	***** NOT FOUND *****		002
28	cis-1,3-DICHLOROPROPENE	16.20	0.3 PPB	002#
29	2-HEXANONE	16.04	1.2 PPB	002#
30	SURR-TOLUENE-D8	16.03	50.2 PPB	002
31	TOLUENE	16.19	50.9 PPB	002
32	trans-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
33	1,1,2-TRICHLOROETHANE	***** NOT FOUND *****		003
34	TETRACHLOROETHENE	***** NOT FOUND *****		003
35	4-METHYL-2-PENTANONE	18.01	6.9 PPB	003#
36	DIBROMOCHLOROMETHANE	***** NOT FOUND *****		003
37	CHLOROBENZENE-D5	19.15	50.0 PPB	*ISTD003
38	CHLOROBENZENE	19.22	54.2 PPB	003
39	P&M XYLENE	***** NOT FOUND *****		003
40	ETHYLBENZENE	***** NOT FOUND *****		003
41	O XYLENE	***** NOT FOUND *****		003
42	STYRENE	***** NOT FOUND *****		003
43	BROMOFORM	***** NOT FOUND *****		003
44	1,1,2,2-TETRACHLOROETHANE	***** NOT FOUND *****		003
45	SURR-BROMOFLUOROBENZENE	21.81	43.3 PPB	003
46	1,3-DICHLOROBENZENE	***** NOT FOUND *****		003
47	1,4-DICHLOROBENZENE	***** NOT FOUND *****		003
48	1,2-DICHLOROBENZENE	***** NOT FOUND *****		003

END OF REPORT
Qualifiers Not Satisfied
! Qualifiers Not Used

Rae 2/14/92

File: C:\CHEMPC\DATA\1301003.D
Operator: MARGARET BRASCHER
Date Acquired: 13 Feb 92 2:39 pm
Method File: DIRT8240.M
Sample Name: 0828-2DMS
Misc Info: 4.079 GRAM DUP MATRIX SPIKE
ALS vial: 13



Calibration Last Updated: Thu Feb 13 12:08:30 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1301003.D
Operator: MARGARET BRASCHER
Date Acquired: 13 Feb 92 2:39 pm
Method File: DIRT8240.M
Sample Name: 5 0828-2DMS
Misc Info: 4.079 GRAM DUP MATRIX SPIKE
Vial Number: 13
x .916 = 1.33690

Quantitation Settings:

Reference Peak Window:	5 Percent
Non-Reference Peak Window:	5 Percent
Correlation Window:	0.03 Minutes
Default Multiplier:	1
Default Sample Amount:	0
Peak Type Decoding:	* -> Time Reference Peak
	m -> Manually re-integrated
	00X -> Compound references ISTD X

Pk #	Compound	Ret Time	Amount	Peak Type
1	DICHLOROFLUOROMETHANE	***** NOT FOUND *****		001
2	CHLOROMETHANE	***** NOT FOUND *****		001
3	VINYL CHLORIDE	***** NOT FOUND *****		001
4	BROMOMETHANE	***** NOT FOUND *****		001
5	CHLOROETHANE	***** NOT FOUND *****		001
6	TRICHLOROFLUOROMETHANE	***** NOT FOUND *****		001
7	TRICHLOROTRIFLUOROETHANE	6.10	9.6 PPB	001m
8	1,1-DICHLOROETHENE	6.43	34.1 PPB	001m
9	ACETONE	6.74	5.6 PPB	001#
10	CARBON DISULFIDE	***** NOT FOUND *****		001
11	METHYLENE CHLORIDE	7.74	0.0 PPB	001#
12	trans-1,2-DICHLOROETHENE	***** NOT FOUND *****		001
13	1,1-DICHLOROETHANE	***** NOT FOUND *****		001!
14	2-BUTANONE (MEK)	10.45	29.2 PPB	001
15	cis-1,2-DICHLOROETHENE	***** NOT FOUND *****		001
16	CHLOROFORM	***** NOT FOUND *****		001
17	BROMOCHLOROMETHANE	11.15	50.0 PPB	*ISTD001!
18	1,1,1-TRICHLOROETHANE	11.66	0.1 PPB	001#
19	CARBON TETRACHLORIDE	***** NOT FOUND *****		001
20	SURR-1,2-DICHLOROETHANE-D4	12.30	46.1 PPB	001m
21	BENZENE	12.40	55.3 PPB	002
22	1,2-DICHLOROETHANE	12.44	0.1 PPB	002#
23	1,4-DIFLUOROBENZENE	13.12	50.0 PPB	*ISTD002!
24	TRICHLOROETHENE	13.61	58.7 PPB	002#

Calibration Last Updated: Thu Feb 13 12:08:30 1992
Internal Standard Report - Summary

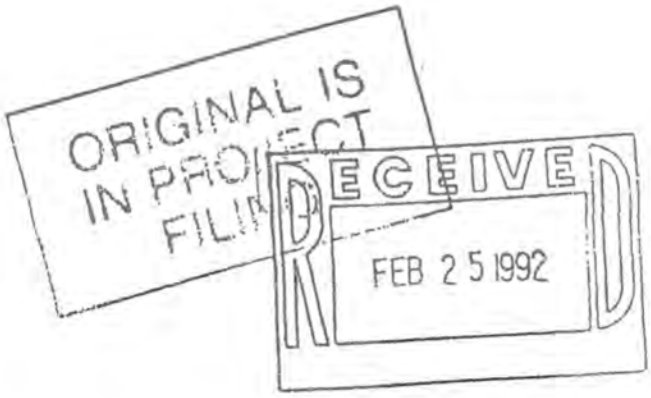
Information from Data File:
File: C:\CHEMPC\DATA\1301003.D
Operator: MARGARET BRASCHER
Date Acquired: 13 Feb 92 2:39 pm
Method File: DIRT8240.M
Sample Name: 0828-2DMS
Misc Info: 4.079 GRAM DUP MATRIX SPIKE
Vial Number: 13

Pk #	Compound	Ret Time	Amount	Peak Type
25	1,2-DICHLOROPROPANE	***** NOT FOUND *****		002
26	BROMODICHLOROMETHANE	***** NOT FOUND *****		002
27	2-CHLOROETHYL VINYL ETHER	***** NOT FOUND *****		002
28	cis-1,3-DICHLOROPROPENE	16.13	0.1 PPB	002#
29	2-HEXANONE	16.02	2.0 PPB	002#
30	SURR-TOLUENE-D8	16.02	50.3 PPB	002
31	TOLUENE	16.18	59.5 PPB	002
32	trans-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
33	1,1,2-TRICHLOROETHANE	***** NOT FOUND *****		003
34	TETRACHLOROETHENE	***** NOT FOUND *****		003
35	4-METHYL-2-PENTANONE	17.99	4.3 PPB	003#
36	DIBROMOCHLOROMETHANE	***** NOT FOUND *****		003
37	CHLOROBENZENE-D5	19.13	50.0 PPB	*ISTD003
38	CHLOROBENZENE	19.21	61.7 PPB	003
39	P&M XYLENE	19.54	0.1 PPB	003#
40	ETHYLBENZENE	***** NOT FOUND *****		003
41	O XYLENE	***** NOT FOUND *****		003
42	STYRENE	***** NOT FOUND *****		003
43	BROMOFORM	***** NOT FOUND *****		003
44	1,1,2,2-TETRACHLOROETHANE	***** NOT FOUND *****		003
45	SURR-BROMOFLUOROBENZENE	21.81	43.1 PPB	003
46	1,3-DICHLOROBENZENE	***** NOT FOUND *****		003
47	1,4-DICHLOROBENZENE	***** NOT FOUND *****		003
48	1,2-DICHLOROBENZENE	***** NOT FOUND *****		003

END OF REPORT
Qualifiers Not Satisfied
! Qualifiers Not Used

Rw
2/14/92

Columbia Analytical Services, Inc.



February 21, 1992

Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO #4473 - Everett/Project #T3360.01/B920066

Dear Kim:

Enclosed is a revised report for the rush sample submitted to our lab on February 7, 1992. Preliminary results were transmitted via facsimile on February 14, 1992. For your reference, these analyses have been assigned our work order number K920831B.

Additional information was added to the method blank results for Method 8240. The concentrations of Freon 113, aceton, and MEK detected below the Method Reporting Limit (MRL) and the instrument detection limit have been added to the method blank results.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Colin B. Elliott
Senior Project Chemist

CBE/das

Analytical Report

Client: EMCON Northwest
Project: ARCO #4473 - Everett
Sample Matrix: Soil

Date Received: 02/07/92
Work Order #: K920831B

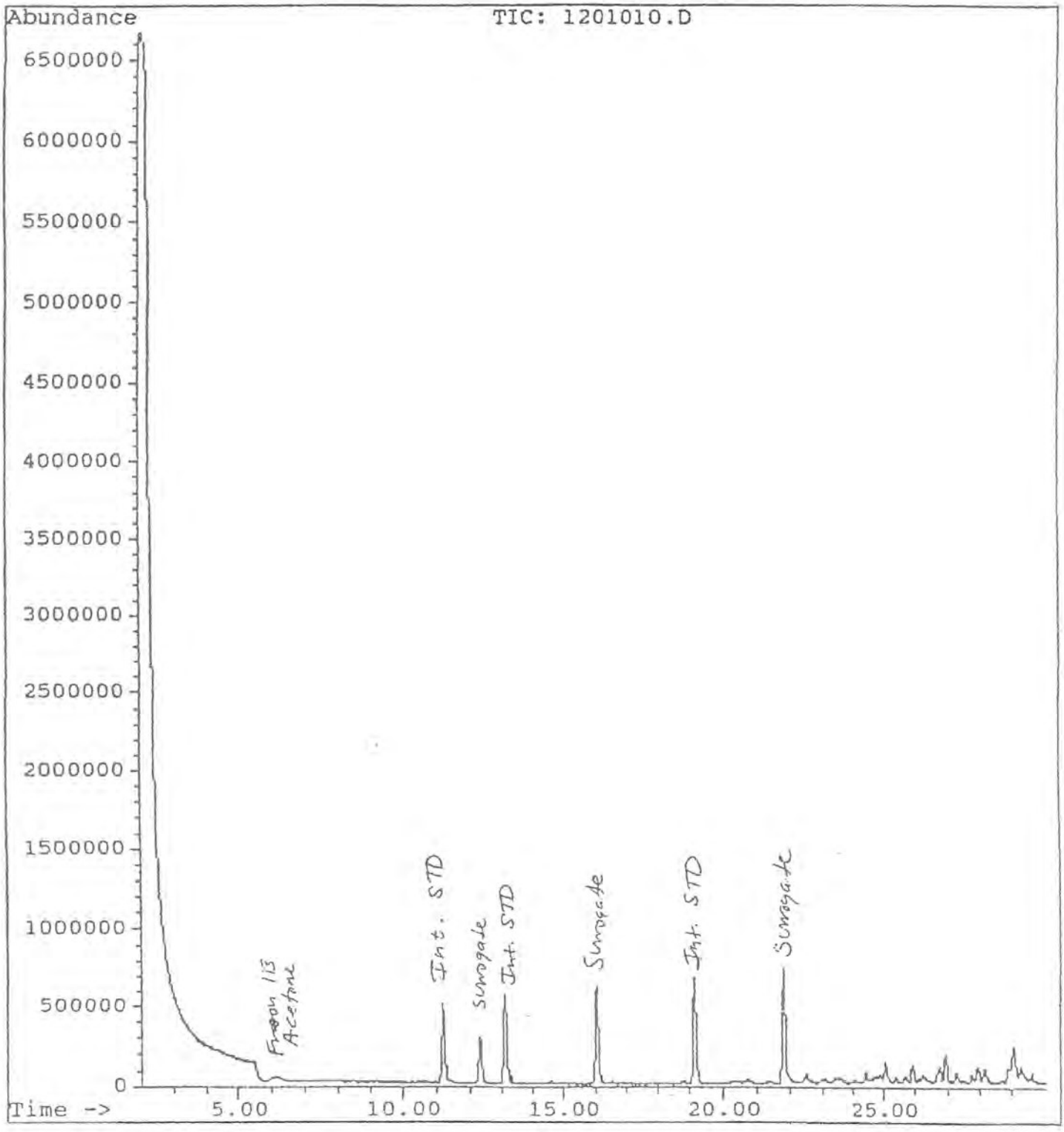
Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		WOSS	Method Blank	Method Blank
Lab Code:		K0831-1	K0831-MB	K0828-MB
Date Analyzed:		02/12/92	02/12/92	02/13/92
Analyte	MRL			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	~~*18~~ ND	**0.8	ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	~~78~~ ND	**5.2	**11.0
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	14 ND	**4.2	**1.8
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Possible laboratory contamination.
** Concentrations detected below the MRL.

Approved by Chris Elliott Date 2/21/92

File: C:\CHEMPC\DATA\1201010.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 8:44 pm
Method File: DIRT8240.M
Sample Name: 0831-1
Misc Info: 4.536 GRAM SOIL
ALS vial: 12



Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1201010.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 8:44 pm
Method File: DIRT8240.M
Sample Name: 5 0831-1
Misc Info: 4.536 GRAM SOIL
Vial Number: 12 f.965 = 1.14155

Quantitation Settings:

Reference Peak Window:	5 Percent
Non-Reference Peak Window:	5 Percent
Correlation Window:	0.03 Minutes
Default Multiplier:	1
Default Sample Amount:	0
Peak Type Decoding:	* -> Time Reference Peak
	m -> Manually re-integrated
	00X -> Compound references ISTD X

Pk #	Compound	Ret Time	Amount	Peak Type
1	DICHLOROFLUOROMETHANE	*****	NOT FOUND *****	001
2	CHLOROMETHANE	*****	NOT FOUND *****	001
3	VINYL CHLORIDE	*****	NOT FOUND *****	001
4	BROMOMETHANE	*****	NOT FOUND *****	001
5	CHLOROETHANE	*****	NOT FOUND *****	001
6	TRICHLOROFLUOROMETHANE	*****	NOT FOUND *****	001
7	TRICHLOROTRIFLUOROETHANE	6.18	15.7 PPB	001m
8	1,1-DICHLOROETHENE	*****	NOT FOUND *****	001
9	ACETONE	6.54	66.2 PPB	001m
10	CARBON DISULFIDE	*****	NOT FOUND *****	001
11	METHYLENE CHLORIDE	*****	NOT FOUND *****	001
12	trans-1,2-DICHLOROETHENE	*****	NOT FOUND *****	001
13	1,1-DICHLOROETHANE	*****	NOT FOUND *****	001!
14	2-BUTANONE (MEK)	10.46	12.4 PPB	001m
15	cis-1,2-DICHLOROETHENE	*****	NOT FOUND *****	001
16	CHLOROFORM	*****	NOT FOUND *****	001
17	BROMOCHLOROMETHANE	11.18	50.0 PPB	*ISTD001!
18	1,1,1-TRICHLOROETHANE	*****	NOT FOUND *****	001
19	CARBON TETRACHLORIDE	*****	NOT FOUND *****	001
20	SURR-1,2-DICHLOROETHANE-D4	12.32	48.1 PPB	001m
21	BENZENE	*****	NOT FOUND *****	002
22	1,2-DICHLOROETHANE	*****	NOT FOUND *****	002
23	1,4-DIFLUOROBENZENE	13.13	50.0 PPB	*ISTD002!
24	TRICHLOROETHENE	*****	NOT FOUND *****	002

Calibration Last Updated: Wed Feb 12 12:41:53 1992
Internal Standard Report - Summary

Information from Data File:
File: C:\CHEMPC\DATA\1201010.D
Operator: MARGARET BRASCHER
Date Acquired: 12 Feb 92 8:44 pm
Method File: DIRT8240.M
Sample Name: 0831-1
Misc Info: 4.536 GRAM SOIL
Vial Number: 12

Pk #	Compound	Ret Time	Amount	Peak Type
25	1,2-DICHLOROPROPANE	***** NOT FOUND *****		002
26	BROMODICHLOROMETHANE	***** NOT FOUND *****		002
27	2-CHLOROETHYL VINYL ETHER	***** NOT FOUND *****		002
28	cis-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
29	2-HEXANONE	16.02	0.0 PPB	002m
30	SURR-TOLUENE-D8	16.04	50.5 PPB	002
31	TOLUENE	***** NOT FOUND *****		002
32	trans-1,3-DICHLOROPROPENE	***** NOT FOUND *****		002
33	1,1,2-TRICHLOROETHANE	***** NOT FOUND *****		003
34	TETRACHLOROETHENE	***** NOT FOUND *****		003
35	4-METHYL-2-PENTANONE	17.97	0.0 PPB	003m
36	DIBROMOCHLOROMETHANE	***** NOT FOUND *****		003
37	CHLOROBENZENE-D5	19.15	50.0 PPB	*ISTD003
38	CHLOROBENZENE	***** NOT FOUND *****		003
39	P&M XYLENE	***** NOT FOUND *****		003
40	ETHYLBENZENE	***** NOT FOUND *****		003
41	0 XYLENE	20.50	0.0 PPB	003#
42	STYRENE	***** NOT FOUND *****		003
43	BROMOFORM	21.79	0.0 PPB	003#
44	1,1,2,2-TETRACHLOROETHANE	21.95	0.0 PPB	003m
45	SURR-BROMOFLUOROBENZENE	21.82	43.4 PPB	003#
46	1,3-DICHLOROBENZENE	***** NOT FOUND *****		003
47	1,4-DICHLOROBENZENE	***** NOT FOUND *****		003
48	1,2-DICHLOROBENZENE	***** NOT FOUND *****		003

END OF REPORT
Qualifiers Not Satisfied
! Qualifiers Not Used

Rae
2/14/92

Appendix E

SITE ASSESSMENT BORING LOGS
AND
ANALYTICAL CHEMISTRY DATA

LOG OF EXPLORATORY BORING

PROJECT NAME	Arco 4473 Site Assessment	BORING NO.	B-1
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	1 OF 1
DRILLED BY	GeoBoring and Dev.	REFERENCE ELEV.	N/A
DRILL METHOD	3.25" ID HS Auger	TOTAL DEPTH	8.30'
LOGGED BY	Kim Vik	DATE COMPLETED	02/28/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6-INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								0 to 0.6 foot: CONCRETE.
								0 to 8.0 feet: SILTY SAND, (SM); light gray, fine to medium, some fines, little fine to coarse subrounded gravel, trace to few cobbles, damp, very dense.
SS/B1-5	0	50/6"		5				
SS/B1-10	0	50/4"						@ 8.0 feet: Refusal.
				10				BORING ABANDONMENT DETAILS 0 to 0.6 foot: Concrete. 0.6 to 8.3 feet: Native backfill mixed with bentonite chips.
				15				
				20				

REMARKS

(1) Blow counts do not represent standard penetration test results. (2) Total drilling time = 3.5 hours. (3) PID = Photoionization detector results. (4) SS = 2-inch I.D. split spoon sampler driven with a 140-lb. hammer.

LOG OF EXPLORATORY BORING

PROJECT NAME	Arco 4473 Site Assessment	BORING NO.	B-2
LOCATION	9506 19th Ave. S.E., Everett, WA	PAGE	1 OF 1
DRILLED BY	GeoBoring and Dev.	REFERENCE ELEV.	N/A
DRILL METHOD	3.25" ID HS Auger	TOTAL DEPTH	8.50'
LOGGED BY	Kim Vik	DATE COMPLETED	02/28/92

SAMPLING METHOD AND NUMBER	PID (in ppm)	BLOWS PER 6-INCHES	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								@ 2.0 feet: Bottom of trench.
								2.0 to 4.0 feet: PEAGRAVEL.
								4.0 to 8.0 feet: SILTY SAND, (SM); light gray, fine to medium, some fines, little fine to coarse subrounded gravel, trace to few cobbles, damp, very dense.
SS/*B2-9	16	30/50-2"		5				@ 8.0 feet: Drill rig breakdown.
				10				BORING ABANDONMENT DETAILS 0 to 2 feet: Open excavation. 2 to 8.5 feet: Native backfill mixed with bentonite chips.
				15				
				20				

REMARKS

(1) Depth measured from ground surface level. First 2.5 feet has been excavated. (2) * Apparent carry over of pea gravel in sampler. (3) Boring terminated at 8.0 feet due to breakdown. (4) SS = 2-inch I.D. split spoon sampler driven with a 140-lb. hammer. (5) PID = Photoionization detector results.

Columbia Analytical Services, Inc.

March 5, 1992



Kim Vik
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: ARCO 4473 - Everett/Project #T33-60.03

Dear Kim:

Enclosed are the results of the samples submitted to our Bothell laboratory on February 28, 1992. Preliminary results were given on March 3, 1992. For your reference, this work has been assigned our service request number B920112.

All analyses were performed in accordance with both Washington State Department of Ecology Accreditation procedures and our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Michael C. Higgins
Project Manager

MCH/bdr

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Received:	02/28/92
Project:	ARCO 4473 - Everett	Date Extracted:	03/02/92
Sample Matrix:	Soil	Work Order #:	B920112

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		B1-10	B2-9	Method Blank
Lab Code:		B0112-1	B0112-2	B0112-MB
Date Analyzed:		03/02/92	03/02/92	03/02/92
Analyte	MRL			
Benzene	0.05	ND	0.41	ND
Toluene	0.05	0.10	5.11	ND
Ethylbenzene	0.05	0.08	2.01	ND
Total Xylenes	0.05	0.70	11.1	ND
TPH as Gasoline	1	15	155	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 920305

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/28/92
Date Extracted: 03/02/92
Date Analyzed: 03/02/92
Work Order #: B920112

QA/QC Report
Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name	Lab Code	Percent Recovery 4-Bromofluorobenzene
B1-10	B0112-1	91
B2-9	B0112-2	97
Method Blank	B0112-MB	92
	CAS Acceptance Criteria	50-130

TPH Total Petroleum Hydrocarbons

Approved by _____ Date 920305

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Northwest
Project: ARCO 4473 - Everett
Sample Matrix: Soil

Date Received: 02/28/92
Date Extracted: 03/02/92
Date Analyzed: 03/02/92
Work Order #: B920112

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
BTEX
EPA Methods 5030/8020
mg/Kg (ppm)
Dry Weight Basis

Sample Name: Batch QC
Lab Code: B0113-1

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria	Relative Percent Difference
Benzene	0.929	0.895	ND	0.517	0.573	56	64	39-150	13
Toluene	0.929	0.895	ND	0.524	0.572	56	64	46-148	13
Ethylbenzene	0.929	0.895	ND	0.534	0.584	57	65	32-160	13

ND None Detected at or above the method reporting limit

Approved by  Date 920305

Division of AtlanticRichfieldCompany

Task Order No. 4413-7C-1J

ARCO Facility no. 4413	City (Facility) EVERETT, WA	Project manager (Consultant) KIM VIK	Laboratory name CAS
ARCO engineer ROY THUN	Telephone no. (ARCO) (713) 486-1293	Telephone no. (Consultant) (206) 485-5000	Fax no. (Consultant) (206) 486-9766
Consultant name EMCON NORTHWEST, INC.	Address (Consultant) 18912 N. CREEK PKWY, SUITE 210, BOTHELL, WA		Contract number

Method of shipment: HAND DELIVERED

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
31-10		1	X			X		2-28-92	12:41		X											
32-9		1	X			X		2-28-92	14:13		X											

Special detection Limit/reporting: N/A

Special QA/QC: N/A

Remarks: EMCON NW JOB T33-60.03

Lab number: B92-0112

Turnaround time

- Priority Rush 1 Business Day ☒
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

Condition of sample:

Temperature received:

	Date	Time
Relinquished by sampler: Kim S. Vik	2-28-92	16:44
Relinquished by:		
Relinquished by:		

Received by:

Received by:

Received by laboratory — Date: 2-28-92 Time: 16:45

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

PPC-3292 (2-91)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

APPENDIX B

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office, 3190 - 160th Ave S.E. • Bellevue, Washington 98008-5452 • (206) 649-7000

June 9, 1992

Mr. Roy Thun
ARCO Products Company
1055 W. Seventh St.
Los Angeles, CA 90017

Re: ARCO #4473 Final Cleanup Status

Dear Mr. Thun:

The Washington State Department of Ecology (Ecology) has received the report for ARCO #4473, submitted by EMCON NW Inc., dated April 28, 1992.

Based on a review of the report, this site has been given a cleanup status of "no further action" at this time. The report indicates there is approximately 10 cubic yards of gasoline contaminated soil around 155 ppm - 174 ppm TPH, under the footing of the west pump island. The current status of this site is considered a "limited" cleanup, based on the location and quantity of contamination above the Model Toxics Control Act (MTCA) cleanup standard of 100 ppm TPH for gasoline.

The investigation and cleanup at this site is considered an Independent Cleanup Action under the MTCA, and was done at the potentially liable person's own risk. If an investigation is conducted in the future, and new information and analysis demonstrate a potential threat to human health or environment, the cleanup status will become active again.

This letter is not an approval of the investigation and cleanup at the site. Any comments Ecology makes on sites being cleaned up without an order or decree (independent cleanup action) are merely advisory and nonbinding, and it does not constitute an approval of a specific remedial action.

Thank you. If you have any questions, please contact me at (206) 649-7257.

Sincerely,

Annette Petrie
Leaking UST Inspector
Toxic Cleanup Program

AMP:ap

cc (fax): William Tackitt
Kim Vik, EMCON NW, Inc.