SUBSURFACE INVESTIGATION REPORT

ARCO SERVICE STATION NO. 4400

RENTON, WASHINGTON

Prepared for
ARCO Petroleum Products Company
March 21, 1990

Prepared by
Sweet-Edwards/EMCON, Inc
18912 North Creek Parkway, Suite 210
Bothell, Washington 98011

Project T33-29.01

CONTENTS

Section 1
INTRODUCTION

1.1 WORK SCOPE

Sweet-Edwards/EMCON, Inc. (SE/E) is pleased to submit this draft subsurface investigation report to ARCO Petroleum Products Company (ARCO) summarizing the findings of the subsurface investigation performed at ARCO Service Station No. 4400, located in Renton, Washington.

SE/E was requested by ARCO to drill and sample four borings adjacent to the existing underground storage tank complex in accordance with ARCO's Underground Storage Tank Replacement Assessment Program. Findings of this investigation will assist in the delineation of soil contamination surrounding the tank complex, if present. The work effort was performed in December 1989 included the following tasks:

- Drill three shallow borings (B-1, B-2, and B-3) adjacent to the underground storage tank complex
- Collect soil samples at 5-foot intervals in each boring. Analyze each sample for benzene, toluene, ethyl benzene, total xylenes (BTEX), and total petroleum hydrocarbons (TPH) by EPA methods 8020 and 8015 (modified), respectively
- Prepare a brief report summarizing the findings of the investigation
- Installation of a vapor extraction well in boring B-3, screened from 35 feet to 15 feet below ground surface (bgs)

1.2 SITE LOCATION

ARCO Service Station No. 4400 is located on the southeast corner at the intersection of Sunset Avenue and 12th Street Northeast in Renton, Washington (Figure 1-1). The

topography surrounding the site is relatively flat in three directions, with a hill rising to the east of the station.

The station consists of an AM/PM Mini-Market located near the center of the site, dispensing islands positioned beneath canopies to the north and the west of the mini-market, and the underground storage tank complex located to the northeast of the mini-market. The underground gasoline storage tank complex includes one 10,000-gallon, two 6,000-gallon, and two 4,000-gallon tanks. A site map showing the above mentioned features and boring locations around the tank complex are as shown on Figure 1-2.

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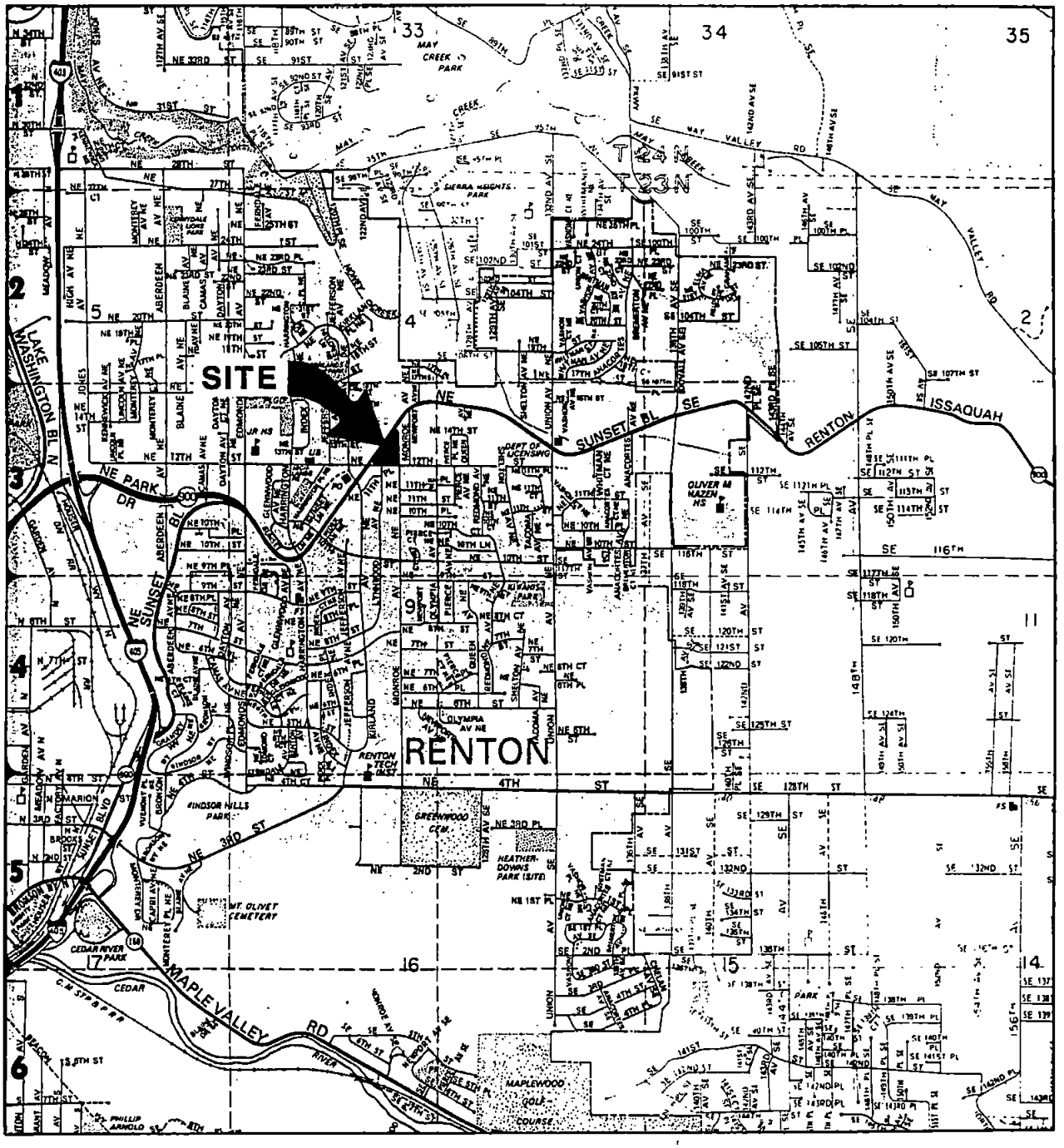

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EMCON

DATE 1-90
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REVIS.
PROJECT NO. T3329.01

Figure 1-1
ARCO STATION #4400
RENTON, WASHINGTON
SITE VICINITY MAP

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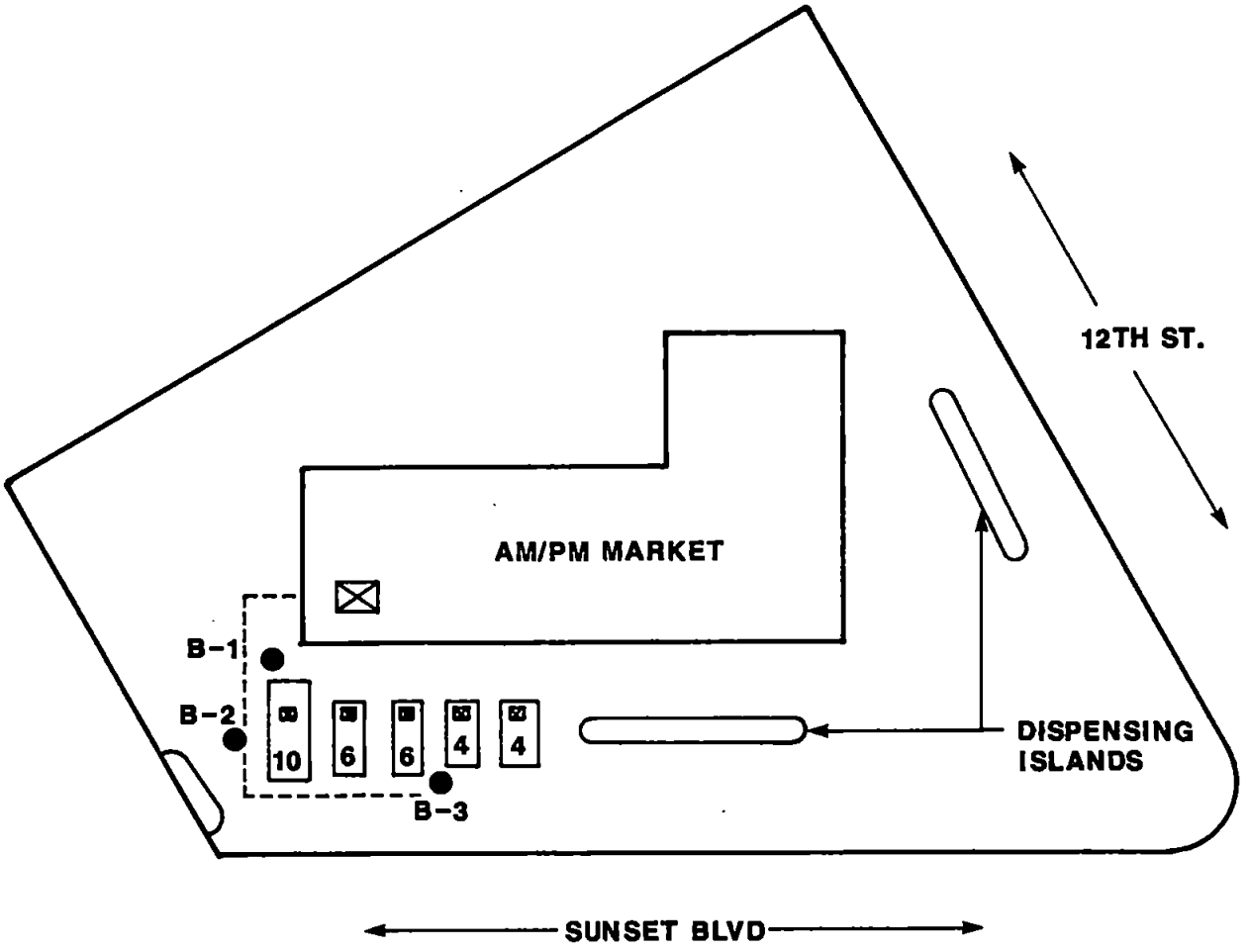


Sweet-Edwards EMCON

DATE 12-89
DWN. TB
APPR.
REVIS.
PROJECT NO. T3329.01

Figure 1-2
ARCO STATION #4400, RENTON, WA
SOIL BORING LOCATIONS

Section 2
SUBSURFACE INVESTIGATION

2.1 SOIL BORINGS

On December 13, 1989, three borings (B-1, B-2, and B-3) were drilled around the tank complex to determine the vertical extent of soil contamination, if present. The first boring (B-1) was located near the fill end of the 10,000-gallon tank and was advanced to a depth of 29 feet bgs. Boring B-2 was located on the north side of the tank complex, adjacent to the 10,000-gallon tank, and also was advanced to 29 feet bgs. Boring B-3 was located opposite the fill ends between the 4,000- and 6,000-gallon tanks. Drilling of Boring B-3 was terminated at 42.5 feet bgs for safety concerns when visible vapors were observed rising from within the hollow stem auger. A 4-inch-diameter vapor extraction well was installed in Boring B-3, with the slotted segment of the well placed between 35 and 15 feet bgs. Complete well construction details are shown on Boring Log B-3 in Appendix A. Borings B-1 and B-2 were abandoned with bentonite chips (hydrated) from the total depth to 6-inches bgs and sealed at the surface with a concrete patch.

2.1.1 Drilling Methods

Drilling was performed with a Mobile B-61 drill rig and 4.25-inch I.D. hollow stem auger owned and operated by Geoboring and Development, Inc., of Puyallup, Washington. A geologist from SE/E was present during all drilling activities performed on site.

Drill cuttings were contained and covered on plastic sheeting at a common stock pile along the east edge of the property pending soil quality results. On ARCO's behalf, SE/E will make arrangements to dispose of the soil cuttings based on soil quality data.

2.2 SOIL SAMPLING

Soil samples were collected at 5-foot intervals in each boring beginning 2.5 feet bgs. The samples were collected using 1-3/8-inch I.D. x 18-inch split spoon samplers and stainless steel spoons. Samples were then placed in sterile glass containers. Soil sample containers and Chain-of-Custody Records were placed in a hard cooler and sent by express courier to Columbia Analytical Services (CAS) where they were analyzed for BTEX and TPH by EPA Methods 8020 and 8015 (modified), respectively. Samples were selected for analysis based on the approved work plan and cost estimate sent to Kyle Christie, of ARCO, on August 29, 1989.

The split-spoon samplers and stainless steel spoons were decontaminated between each boring to minimize the possibility of cross contamination. The decontamination process included a non-phosphatic detergent wash, deionized water rinse, methanol solution rinse, and a final deionized water rinse.

Section 3
SUBSURFACE CONDITION

3.1 GEOLOGY

All three borings penetrated approximately four inches of surficial asphalt pavment. Lithology in each boring consisted of gravelly sand with variable percentages of silt from immediately below the asphalt pavement to a depth of 2.5 to 4 feet bgs, then becoming clean, well-graded fine to coarse sand with variable percentages of fine gravel to at least 44 feet bgs.

A product odor was detected in all soil samples collected from 17.5 feet bgs to the bottom of each boring.

3.2 GROUND WATER

Ground water was not encountered in any boring on December 13, 1989.

3.3 SOIL QUALITY RESULTS

Soil quality data indicate that the Washington State Department of Ecology (WDOE) recommended guideline clean-up criteria for BTEX and TPH compounds were exceeded in the following soil samples: TPH levels above 200 ppm were detected in samples collected at 17.5 and 27.5 feet bgs in Boring B-2 and in samples collected at 17.5, 27.5, 32.5 and 37.5 feet bgs in Boring B-3; ethyl benzene levels were detected above 14,000 ppb in samples collected at 27.5 and 32.5 feet bgs in Boring B-3. Benzene and toluene were not detected above recommended clean up levels in any sample from any boring. Currently, no recommended guideline clean-up criteria for xylenes have been established. A summary of the soil quality data is shown in Table 3-1. A complete analytical report is presented in Appendix B.

Table 3-1

SUMMARY OF SOIL QUALITY DATA
ARCO STATION NO. 4400

Boring Number	Sample Number	Depth Collected (feet bgs)	Benzene (ppb)	Touluene (ppb)	Ethyl Benzene (ppb)	Xylenes (ppb)	TPH (ppm)
B-1	B17.5-1289	7.5	50L	50L	50L	50L	1L
	B117.5-1289	17.5	50L	50L	50L	100	1.8
	B122.5-1289	22.5	50	50L	50L	110	1L
	B127.5-1289	27.5	50	50L	50L	90	1L
B-2	B27.5-1289	7.5	50L	50L	50L	50L	1L
	B217.5-1289	17.5	50L	50L	50L	760	241
	B222.5-1289	22.5	50L	50L	50L	80	2
	B227.5-1289	27.5	50L	410	1,470	102,000	2,210
B-3	B37.5-1289	7.5	50L	50L	50L	200	7.4
	B317.5-1289	17.5	50L	3,050	11,000	78,100	1,490
	B327.5-1289	27.5	50L	35,200	52,600	332,000	3,050
	B332.5-1289	32.5	50L	55,600	48,500	276,000	2,330
	B337.5-1289	37.5	50L	170	1,970	20,200	579
	B342.5-1289	42.5	50L	140	90	300	4
	COMP-1289	(composite)	50L	330	1,210	10,200	259

L = Less Than Detection Limit
1 ug/Kg = 1 ppb
1 mg/Kg = 1 ppm

Washington State Department of Ecology recommended clean-up criteria for soil:

Benzene . . . . . 660 ppb
Toluene . . . . . 143 ppm (143,000 ppb)
Ethyl Benzene . . . . 14 ppm (14,000 ppb)
Xylene . . . . . No Recommended Standard
TPH . . . . . 200 ppm

Organic vapor levels measured inside the vapor extraction well (B-3) on December 13, 1989, were approximately 2,700 ppm using a Photovac Tip (TIP). Information obtained using the TIP is useful for determining the relative presence of volatile organic compounds, but cannot be used to evaluate organic levels with the confidence of laboratory analysis.

Section 4
CONCLUSIONS

The following conclusions are made based on the findings of our investigation performed during December 1989:

- The site is covered by asphalt pavement and underlain by 2.5 to 4 feet of gravelly sand with variable silt, underlain by a clean, fine to coarse sand with variable fine gravel to at least 44 feet bgs.

- Ground water was not encountered within 44 feet bgs, the maximum depth explored, on December 13, 1989.

- Soil quality data results indicate that Washington State Department of Ecology (WDOE) recommended guideline clean-up criteria for TPH compounds were exceeded in samples taken at 17.5 and 27.5 feet bgs in Boring B-2 and in all samples from 17.5 to 37.5 feet bgs in Boring B-3. Levels of ethyl benzene exceeded WDOE criteria in samples taken at 27.5 and 32.5 feet bgs in Boring B-3. TPH and BTEX levels in all other soil samples were below WDOE recommended guideline clean-up criteria at the time of the investigation.

- SE/E installed a 4-inch-diameter vapor extraction well within B-3 to facilitate an active blower system which will be designed and operated in the next few weeks to reduce the levels of organic vapors in soils beneath the site.

Appendix A
BORING LOGS

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4400	BORING NO.	B-1
LOCATION	12th & Sunset, Renton, Washington	PAGE	1 OF 2
DRILLED BY	Geoboring, Inc.	REFERENCE ELEV.	
DRILL METHOD	4.25" HSA	TOTAL DEPTH	29.00'
LOGGED BY	Rob Lindsay	DATE COMPLETED	12/13/89

SAMPLE NUMBER	SAMPLE METHOD	BLOWS/6" 140 LBS/ 30"	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								0 - 4 inches: ASPHALT.
1	SS	4 4 6		5				4 inches - 2.5 feet: GRAVELLY SAND; rusty brown, 60 to 70 percent fine to coarse sand, 20 to 30 percent fine to medium subround gravel, 10 percent silt, damp. (FILL) 2.5 - 7.5 feet: SAND; rusty brown, 80 to 90 percent fine sand, 10 to 20 percent silt, loose, dry to damp. (SP)
2	SS	9 17 18		10				7.5 - 12.5 feet: SAND; grey, 80 to 90 percent fine to medium sand, 10 to 20 percent silt, medium dense, dry to damp. (SP)
3	SS	19 36 50/4"		15				12.5 - 17.5 feet: SAND; grey, 90 percent well-graded fine to coarse sand, 10 percent fine subrounded gravel (to 1/2 inch), very dense, dry to damp. (SW)
4	SS	50		20				SAND; as above, moist, slight odor.

REMARKS

Boring was backfilled with Environplug bentonite chips (medium) from total depth to 10 inches bgs. Concrete patch was placed from 10 inches bgs to surface.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4400	BORING NO.	B-1
LOCATION	12th & Sunset, Renton, Washington	PAGE	2 OF 2
DRILLED BY	Geoboring, Inc.	REFERENCE ELEV.	
DRILL METHOD	4.25" HSA	TOTAL DEPTH	29.00'
LOGGED BY	Rob Lindsay	DATE COMPLETED	12/13/89

SAMPLE NUMBER	SAMPLE METHOD	BLOWS/6" 140 LBS/ 30"	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
5	SS	29 50		25				20 - 27.5 feet: SAND; grey, well-graded fine to coarse sand, clean, moist, very dense, slight odor.
6	SS	16 26 26						27.5 - 29 feet: SAND; as above.
				30				Bottom of boring at 29 feet.
				35				
				40				

REMARKS

Boring was backfilled with Environplug bentonite chips (medium) from total depth to 10 inches bgs. Concrete patch was placed from 10 inches bgs to surface.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4400	BORING NO.	B-2
LOCATION	12th & Sunset, Renton, Washington	PAGE	1 OF 2
DRILLED BY	Geoboring, Inc.	REFERENCE ELEV.	
DRILL METHOD	4.25" HSA	TOTAL DEPTH	29.00'
LOGGED BY	Rob Lindsay	DATE COMPLETED	12/13/89

SAMPLE NUMBER	SAMPLE METHOD	BLOWS/6" 140 LBS/ 30"	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								0 - 4 inches: ASPHALT.
1	SS	4 4 6		5				4 inches - 2.5 feet: GRAVELLY SAND; rusty brown, 60 to 70 percent fine to coarse sand, 20 to 30 percent fine to medium subrounded gravel, 10 percent fines, damp. (FILL) 2.5 - 7.5 feet: SAND; rusty brown, 80 to 90 percent fine sand, 10 to 20 percent fines, loose, dry to damp. (SP)
2	SS	7 11 15		10				7.5 - 12.5 feet: SAND; grey, fine to medium sand, clean, 5 to 10 percent fine gravel, medium dense, dry to damp. (SW)
3	SS	17 23 40		15				12.5 - 22.5 feet: SAND; grey, slightly mottled, 85 to 90 percent fine to medium sand, clean, 10 to 15 percent fine gravel, dense, dry to damp. (SW)
4	SS	30 50		20				SAND; as above, slight odor.

REMARKS

Boring was backfilled with Enviroplug bentonite chips (medium) from total depth to 10 inches bgs. Concrete patch was placed from 10 inches bgs to surface.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4400	BORING NO.	B-2
LOCATION	12th & Sunset, Renton, Washington	PAGE	2 OF 2
DRILLED BY	Geoboring, Inc.	REFERENCE ELEV.	
DRILL METHOD	4.25" HSA	TOTAL DEPTH	29.00'
LOGGED BY	Rob Lindsay	DATE COMPLETED	12/13/89

SAMPLE NUMBER	SAMPLE METHOD	BLOWS/6" 140 LBS/ 30"	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
5	SS	25 33 42		25				22.5 - 29 feet: SAND; grey, fine to coarse sand, clean, dense, damp. (SW)
6	SS	19 29 30		30				Bottom of boring at 29 feet.
				35				
				40				

REMARKS

Boring was backfilled with Enviroplug bentonite chips (medium) from total depth to 10 inches bgs. Concrete patch was placed from 10 inches bgs to surface.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4400	BORING NO.	B-3
LOCATION	12th & Sunset, Renton, Washington	PAGE	1 OF 3
DRILLED BY	Geoboring, Inc.	REFERENCE ELEV.	
DRILL METHOD	4.25" HSA	TOTAL DEPTH	43.50'
LOGGED BY	Rob Lindsay	DATE COMPLETED	12/13/89

SAMPLE NUMBER	SAMPLE METHOD	BLOWS/6" 140 LBS/ 30"	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								0 - 4 inches: ASPHALT.
1	SS	4 4 3		5				4 inches - 4 feet: GRAVELLY SAND; rusty brown 60 to 70 percent fine to coarse sand, 20 to 30 percent fine to medium subrounded gravel, 10 to 20 percent silt, loose, moist. (FILL)
2	SS	1 - -		10				7.5 - 12.5 feet: SAND; grey, well-graded fine to coarse sand, 5 to 10 percent silt, loose, damp. (SW)
3	SS	50		15				12.5 - 17.5 feet: SAND; grey, well-graded fine to coarse sand, 5 to 10 percent fine to medium gravel, damp. (SW)
4	SS	24 38 43		20				17.5 - 22.5 feet: SAND; grey, fine to medium sand, clean, very dense, damp, product odor. (SW)

REMARKS

Vapor extraction well was installed as follows: 0.0010-inch slotted PVC pipe from 35 feet bgs to 15 feet bgs, PVC blank from 15 feet bgs to surface; native sand placed from bottom of boring to 12 feet bgs, hydrated bentonite from 12 feet bgs to 10 inches bgs. The well was capped and a protective monument was concreted in from 10 inches bgs to surface elevation.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4400	BORING NO.	B-3
LOCATION	12th & Sunset, Renton, Washington	PAGE	2 OF 3
DRILLED BY	Geoboring, Inc.	REFERENCE ELEV.	
DRILL METHOD	4.25" HSA	TOTAL DEPTH	43.50'
LOGGED BY	Rob Lindsay	DATE COMPLETED	12/13/89

SAMPLE NUMBER	SAMPLE METHOD	BLOWS/6" 140 LBS/ 30"	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
5	SS	18 50						22.5 - 32.5 feet: SAND; brownish grey, well-graded fine to coarse sand, trace silt, very dense, damp, product odor. (SW)
				25				
6	SS	12 24 32						
				30				
7	SS	13 20 55						32.5 - 37.5 feet: SAND; grey, fine to medium sand, trace silt, very dense damp, product odor. (SW)
				35				
8	SS	29 50						37.5 - 42.5 feet: SAND; grey, well-graded fine to coarse sand, clean, product odor. (SW)
				40				

REMARKS

Vapor extraction well was installed as follows: 0.0010-inch slotted PVC pipe from 35 feet bgs to 15 feet bgs, PVC blank from 15 feet bgs to surface; native sand placed from bottom of boring to 12 feet bgs, hydrated bentonite from 12 feet bgs to 10 inches bgs. The well was capped and a protective monument was concreted in from 10 inches bgs to surface elevation.

LOG OF EXPLORATORY BORING

PROJECT NAME	ARCO 4400	BORING NO.	B-3
LOCATION	12th & Sunset, Renton, Washington	PAGE	3 OF 3
DRILLED BY	Geoboring, Inc.	REFERENCE ELEV.	
DRILL METHOD	4.25" HSA	TOTAL DEPTH	43.50'
LOGGED BY	Rob Lindsay	DATE COMPLETED	12/13/89

SAMPLE NUMBER	SAMPLE METHOD	BLOWS/6" 140 LBS/ 30"	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
9	SS	33 50/5"		45 50 55 60				42.5 - 43.5 feet: SAND; brownish grey, fine to medium sand, clean, very dense, damp, slight product odor. (SW) Bottom of boring at 43.5 feet. Boring terminated when visible vapors were rising from within the hollow-stem auger.

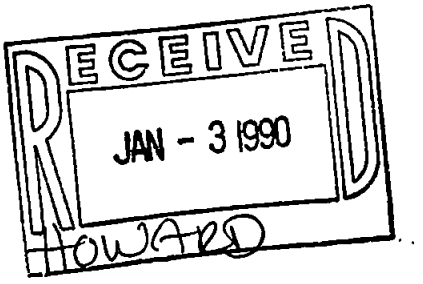
REMARKS

Vapor extraction well was installed as follows: 0.0010-inch slotted PVC pipe from 35 feet bgs to 15 feet bgs, PVC blank from 15 feet bgs to surface; native sand placed from bottom of boring to 12 feet bgs, hydrated bentonite from 12 feet bgs to 10 inches bgs. The well was capped and a protective monument was concreted in from 10 inches bgs to surface elevation.

Appendix B
SOIL ANALYTICAL RESULTS

Columbia Analytical Services, Inc.
1317 South 13th Street • P.O. Box 479 • Kelso, WA 98626 • (206) 577-7222 • Fax (206) 636-1068

CAS



December 27, 1989

Kevin Rattue
Sweet - Edwards/EMCON
18912 N. Creek Pkwy
Suite 210
Bothell, WA 98011

RE: Arco #4400

Dear Kevin:

Enclosed are the results of the soil samples submitted to our lab on December 15, 1989. For your reference, our service request number for this work is 893166.

Please call if you have any questions.

Respectfully submitted:

Dave Edelman

Dave Edelman
COLUMBIA ANALYTICAL SERVICES, INC.

mbm/DLE

cc: Rob Lindsay - SE/Bothell

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco #4400
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/18/89
DATE ANALYZED: 12/18/89
WORK ORDER #: 893166

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			Method Blank
Lab Code:			3166-MB
	Units	MRL	
Benzene	µg/Kg	50	ND
Toluene	µg/Kg	50	ND
Ethyl Benzene	µg/Kg	50	ND
Total Xylenes	µg/Kg	50	ND
Gasoline	mg/Kg	1	ND

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Edelman Date 12/27/89

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco #4400
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/18/89
DATE ANALYZED: 12/18/89
WORK ORDER #: 893166

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			B17.5-1289	B117.5-1289
Lab Code:			3166-1	3166-2
	Units	MRL		
Benzene	µg/Kg	50	ND	ND
Toluene	µg/Kg	50	ND	ND
Ethyl Benzene	µg/Kg	50	ND	ND
Total Xylenes	µg/Kg	50	ND	100
Gasoline	mg/Kg	1	ND	1.8

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Shulman./ Date 12/27/89

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco #4400
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/18/89
DATE ANALYZED: 12/18/89
WORK ORDER #: 893166

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			B122.5-1289	B127.5-1289
Lab Code:			3166-3	3166-4
	Units	MRL		
Benzene	µg/Kg	50	ND	ND
Toluene	µg/Kg	50	50	50
Ethyl Benzene	µg/Kg	50	ND	ND
Total Xylenes	µg/Kg	50	110	90
Gasoline	mg/Kg	1	ND	ND

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Stelman Date 12/27/89

CAS

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco #4400
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/18/89
DATE ANALYZED: 12/18/89
WORK ORDER #: 893166

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			B27.5-1289	B217.5-1289
Lab Code:			3166-5	3166-6
	Units	MRL		
Benzene	µg/Kg	50	ND	ND
Toluene	µg/Kg	50	ND	ND
Ethyl Benzene	µg/Kg	50	ND	ND
Total Xylenes	µg/Kg	50	ND	760
Gasoline	mg/Kg	1	ND	241

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Shuman Date 12/27/89

1317 South 13th Street • P.O. Box 479 • Kelso, WA 98626 • (206) 577-7222 • Fax (206) 636-1068

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco #4400
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/18/89
DATE ANALYZED: 12/18/89
WORK ORDER #: 893166

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			B222.5-1289	B227.5-1289
Lab Code:			3166-7	3166-8
	Units	MRL		
Benzene	µg/Kg	50	ND	ND
Toluene	µg/Kg	50	ND	410
Ethyl Benzene	µg/Kg	50	ND	1470
Total Xylenes	µg/Kg	50	80	102,000
Gasoline	mg/Kg	1	2	2,210

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Johnson Date 12/27/89

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco #4400
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/18/89
DATE ANALYZED: 12/18/89
WORK ORDER #: 893166

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			B37.5-1289	B317.5-1289
Lab Code:			3166-9	3166-10
	Units	MRL		
Benzene	µg/Kg	50	ND	ND
Toluene	µg/Kg	50	ND	3,050
Ethyl Benzene	µg/Kg	50	ND	11,000
Total Xylenes	µg/Kg	50	200	78,100
Gasoline	mg/Kg	1	7.4	1,490

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Shelmon / Date 12/27/89

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco #4400
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/18/89
DATE ANALYZED: 12/18/89
WORK ORDER #: 893166

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			B327.5-1289	B332.5-1289
Lab Code:			3166-11	3166-12
	Units	MRL		
Benzene	µg/Kg	50	ND	ND
Toluene	µg/Kg	50	35,200	55,600
Ethyl Benzene	µg/Kg	50	52,600	48,500
Total Xylenes	µg/Kg	50	332,000	276,000
Gasoline	mg/Kg	1	3,050	2,330

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Ellsworth Date 12/27/89

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco #4400
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/18/89
DATE ANALYZED: 12/18/89
WORK ORDER #: 893166

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			B337.5-1289	B342.5-1289
Lab Code:			3166-13	3166-14
	Units	MRL		
Benzene	µg/Kg	50	ND	ND
Toluene	µg/Kg	50	170	140
Ethyl Benzene	µg/Kg	50	1,970	90
Total Xylenes	µg/Kg	50	20,200	300
Gasoline	mg/Kg	1	579	4

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Shuman Date 12/27/89

CAS

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco #4400
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/18/89
DATE ANALYZED: 12/18/89
WORK ORDER #: 893166

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			4400C-1289
Lab Code:			3166-15
	Units	MRL	
Benzene	µg/Kg	50	ND
Toluene	µg/Kg	50	330
Ethyl Benzene	µg/Kg	50	1,210
Total Xylenes	µg/Kg	50	10,200
Gasoline	mg/Kg	1	259

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Shelton Date 12/27/89

1317 South 13th Street • P.O. Box 479 • Kelso, WA 98626 • (206) 577-7222 • Fax (206) 636-1068

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Sweet - Edwards/EMCON
SUBMITTED BY: Rob Lindsay
PROJECT: Arco / 5207
SAMPLE DESCRIPTION: Soil

DATE RECEIVED: 12/15/89
DATE EXTRACTED: 12/19/89
DATE ANALYZED: 12/20/89
WORK ORDER #: 893164

Hydrocarbon Scan/BTEX Analyses
EPA Methods 5030/8020/8015
Dry Weight Basis

Sample Name:			B412.5-1289
Lab Code:			3164-10
	Units	MRL *	
Benzene	µg/Kg	500	ND
Toluene	µg/Kg	500	ND
Ethyl Benzene	µg/Kg	500	760
Total Xylenes	µg/Kg	1000	1,340
Gasoline	mg/Kg	10	311

* Elevated MRL due to sample matrix

MRL means Method Reporting Limit
ND means None Detected at or above the MRL

Approved by Dave Hedman / Date 1/5/90

Sweet-Edwards / EMCON, Inc.
Kelso, WA (206) 423-3580
Bothell, WA (206) 485-5000

Chain of Custody / Laboratory Analysis Request

DATE 12/14/89 PAGE 1 OF 2

PROJECT ARCO 4400 # T33290 1
CLIENT INFO. CONTACT KEVIN RATTIE | KYLE CHRISTIE
ADDRESS SE|E BOTHELL
TELEPHONE# 485-5000
SAMPLERS NAME ROB LINDSAY PHONE# 4855000
SAMPLERS SIGNATURE Robert Lindsay

SAMPLE I.D.	DATE	TIME	LAB I.D.	TYPE	BASE/NEU/ACID ORGAN. GC/MS/625/8270	VOLATILE ORGANICS GC/MS/624/8240	HALOGENATED VOLATILE ORGANICS 601/8010	PHENOLICS 604/8040	POLYNUCLEAR AROMATIC 610/8310	TOTAL ORGANIC CARBON (TOC) 415/9060	TOTAL ORGANIC HALIDE (TOX) 9020	EP TOX/TCLP METALS (Circle One)	METALS (TOTAL) (See Special Inst.)	TCLP ORGANICS	pH, COND ALK	NO_3/NO_2, Cl SO_4	Ca, Mg, Na, K	BTEX	TPH					NUMBER OF CONTAINERS
1. B17.5-1289	12/13/89	845		SOIL														1	1					1
2. B117.5-1289		910																1	1					1
3. B122.5-1289		920																1	1					1
4. B127.5-1289		930																1	1					1
5. B27.5-1289		1055																1	1					1
6. B217.5-1289		1110																1	1					1
7. B222.5-1289		1120																1	1					1
8. B227.5-1289		1130																1	1					1

ANALYSIS REQUESTED — GENERAL CHEMISTRY (Specify) — OTHER (Specify)

Relinquished By Sweet Edwards & Assoc.	Relinquished By	Relinquished By
Signature: Rob Lindsay	Signature:	Signature:
Printed Name: ROB LINDSAY	Printed Name:	Printed Name:
Firm: SE|E BOTHELL	Firm:	Firm:
Date/Time: 12-14-89 / 1430	Date/Time:	Date/Time:
Received By: GREYHOUND	**Received By:** Ruth Allison	**Received By:**
Signature:	Signature: Ruth Allison	Signature:
Printed Name:	Printed Name: CAS	Printed Name:
Firm: 12-14-89 / 1430	Firm: 12/15/89 1200	Firm:
Date/Time:	Date/Time:	Date/Time:

PROJECT INFORMATION
Shipping I.D. No.:
VIA:
Project:

SAMPLE RECEIPT
Total No. of Containers:
Chain of Custody Seals:
Received in good condition:
LAB NO.:

SPECIAL INSTRUCTIONS/COMMENTS
ARCHIVE B12.5-1289
B112.5-1289
B22.5-1289
B212.5-1289
~~TMPSP~~ SAMPLES ARE FROM ARCO ~~#207~~ FCA
SEND RESULTS; ATTN: ROB LINDSAY

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - ed by originator.

S-E/E 400-05

Chain of Custody / Laboratory Analysis Request

Sweet-Edwards / EMCON, Inc.
Kelso, WA (206) 423-3580
Bothell, WA (206) 485-5000

DATE 12-14-89 PAGE 2 OF 2

PROJECT ARCO 4400 # T332901
CLIENT INFO. CONTACT KEVIN RATTIVE / KYLE CHRISTIE
ADDRESS SE/E BOTHELL
TELEPHONE# 485-5000
SAMPLERS NAME ROB LINDSAY PHONE# 485-5800
SAMPLERS SIGNATURE Robert Lindsay

SAMPLE I.D.	DATE	TIME	LAB I.D.	TYPE	BASE/NEU/ACID ORGAN. GC/MS/625/8270	VOLATILE ORGANICS GC/MS/624/8240	HALOGENATED VOLATILE ORGANICS 601/8010	PHENOLICS 604/8040	POLYNUCLEAR AROMATIC 610/8310	TOTAL ORGANIC CARBON (TOC) 415/9060	TOTAL ORGANIC HALIDE (TOX) 9020	EP TOX/TCLP METALS (Circle One)	METALS (TOTAL) (See Special Inst.)	TCLP ORGANICS	pH. COND ALK	NO_3/NO_2. Cl SO_4	Ca. Mg. Na. K	BTEX	TPH					NUMBER OF CONTAINERS
1. B37.5 - 1289	12/13/89	1210		SOIL													X	1	1					1
2. B317.5 - 1289		1225															X	1	1					1
3. B327.5 - 1289		1235															X	1	1					1
4. B332.5 - 1289		1250															X	1	1					1
5. B337.5 - 1289		1300															X	1	1					1
6. B342.5 - 1289		1325															X	1	1					1
7. 4400 C - 1289		1445															X	1	1					1
8.																								

ANALYSIS REQUESTED — GENERAL CHEMISTRY (Specify) — OTHER (Specify)

Relinquished By Sweet/Edwards & Assoc.	Relinquished By	Relinquished By	PROJECT INFORMATION	SAMPLE RECEIPT
Signature: Robert Lindsay	Signature:	Signature:		
Printed Name: ROB LINDSAY	Printed Name:	Printed Name:	Shipping I.D. No.	Total No. of Containers
Firm: SE/E BOTHELL	Firm:	Firm:	VIA	Chain of Custody Seals
Date/Time: 12-14-89 / 1430	Date/Time:	Date/Time:	Project	Received in good condition
				LAB NO.
Received By: GREYHOUND	Received By: Ruth Allison	Received By:	SPECIAL INSTRUCTIONS/COMMENTS	
Signature:	Signature: Ruth Allison	Signature:	ARCHIVE B32.5 - 1289	
Printed Name:	Printed Name: CAS	Printed Name:	B312.5 - 1289	
Firm: 12-14-89 / 1430	Firm: 12/15/89 1200	Firm:	B322.5 - 1289	
Date/Time:	Date/Time:	Date/Time:	SEND RESULTS ATTN: ROB LINDSAY	

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator.

S-E/E 400-05

Sweet-Edwards/EMCON, Inc.
Ground Water, Engineering, Waste Management, & Drilling Services

18912 N. Creek Parkway, Suite 210 • Bothell, WA 98011
Office (206) 485-5000 • FAX (206) 486-9766

March 22, 1990

Mr. Joe Hickey
Washington Department of Ecology
4350 - 150 Avenue NE
Redmond, Washington 98052-5301

RE: Subsurface Investigation
ARCO Service Station Number 4400, Renton, Washington

Dear Mr. Hickey:

Enclosed please find the subsurface investigation report for ARCO Service Station Number 4400 located in Renton, Washington.

Soil quality data indicated that Washington State Department of Ecology (WDOE) recommended guideline clean-up criteria for gasoline compounds in soil were exceeded in soil samples collected from 17.5 and 32.5 feet below ground surface (bgs) in Boring B-2 and in all samples collected between 17.5 and 37.5 bgs in Boring B-3. WDOE criteria for ethylbenzene were exceeded in samples collected from 27.5 and 32.5 feet bgs in Boring B-3. A 4-inch diameter vapor extraction well was installed in Boring B-3 to a depth of 35 feet bgs.

If you have any questions or concerns, please do not hesitate to contact us.

Sincerely,

Sweet-Edwards/EMCON, Inc.

Kevin G. Rattue
Project Manager

Don Cordell
Branch Manager

Enclosure

cc: Kyle Christie
John Guenther

475/4400-R.214/cjf:7(wp)
T33-29.01