

**ENVIRONMENTAL SITE ASSESSMENT
FORMER BARONS TURBO BULK STATION
235 MAIN STREET
BARONS, ALBERTA**

SEACOR JOB #H0031-093

Submitted by
SEACOR Environmental Engineering Inc.
Calgary, Alberta

for
Shell Canada Products Limited
c/o Canadian Turbo (1993) Inc.
400, 630 - 4th Avenue SW
Calgary, Alberta T2P 0J9

July 24, 1998

Prepared by:



 Nikole Immel, E.I.T.
Staff Engineer

Reviewed by:



Fred Schuetz, P.Eng.
Manager, Calgary

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EXECUTIVE SUMMARY

SEACOR Environmental Engineering Inc. (SEACOR) of Calgary, Alberta was retained by Canadian Turbo (1993) Inc. (Turbo), a subsidiary of Shell Canada Products Limited (SHELL), to prepare an environmental site assessment (ESA) for the former Barons Turbo Bulk Station located at 235 Main Street in Barons, Alberta. SEACOR's scope of work for the project was to assess the level and extend of hydrocarbon-impacted soils in accordance with Alberta Environmental Protection's (AEP) Risk Management Criteria (RMC) for fine-grained soil (FGS) as outlined in the document *"Remediation Guidelines for Petroleum Storage Tank Sites - July 1994"*.

Eight boreholes were advanced around the perimeter of the concrete berm once used to contain the former above-ground tank farm. Headspace vapour levels and laboratory analysis determined that the total petroleum hydrocarbon (TPH) concentration exceeded the AEP RMC *Level II* criteria for fine-grained soil (FGS) in BH98-4, located east of the concrete berm. Probehole PH98-9, located on the west side of the site exceeded the *Level II* criteria for benzene. The location and nature of the hydrocarbon impacts indicate the possibility of two hydrocarbon sources: diesel fuel at BH98-4 and gasoline at PH98-9.

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1.0 INTRODUCTION

SEACOR Environmental Engineering Inc. (SEACOR) of Calgary, Alberta was retained by Canadian Turbo (1993) Inc. (Turbo), a subsidiary of Shell Canada Products Limited (SHELL), to conduct an intrusive investigation of the former Barons Turbo Bulk Station located at 235 Main Street in Barons, Alberta. The objective of the investigation was to determine the degree and extent of subsurface hydrocarbon impacts outside of the concrete berm which was once used to contain the former tank farm. This report presents the results of the drilling investigation, field observations, and laboratory programs conducted on June 5, 1998. Determination of hydrocarbon impacts were in accordance with the guideline levels specified by Alberta Environmental Protection (AEP) Risk Management Criteria (RMC) as outlined in the document *"Remediation Guidelines for Petroleum Storage Tank Sites - July 1994"*. Authorization to proceed with the project was provided by Mr. Robert Harriott of Turbo.

A plan showing the surrounding land use is shown in Figure 1. A site plan showing borehole locations is provided in Figure 2. Appendix A contains the Borehole Logs, Appendix B contains the Analytical Chemistry Reports, and Appendix C outlines the Relevant Environmental Standards.

2.0 BACKGROUND

The above ground storage tanks were removed and disposed off-site by JBA Project Engineering Ltd. (JBA) of Calgary, Alberta in April 1997. At this time, approximately 280 m³ of soil with headspace vapour levels greater than 700 ppm was excavated and stockpiled on-site. Soil samples were collected from the excavation's base, north, east, and west walls for laboratory analysis. The analytical results determined that the north, east, and west walls, as well as the base of the excavation, were below the AEP RMC *Level II* FGS criteria for all analysed constituents. One soil sample from the south wall of the excavation (along the south property line) exceeded the *Level II* benzene criteria. The stockpiled soil was turned for aeration several times during 1997. Sampling of the stockpile in August 1997 determined that the soil had reached concentrations below AEP RMC *Level I* FGS criteria. The stockpile was then compacted and sloped within the berm to allow proper drainage.

A test pit intrusive investigation was conducted in May 1998. Five test pits were excavated within the bermed area of the former above-ground tank farm. The locations of the test pits are illustrated in Figure 2. Laboratory analysis of soil samples collected from test pits TP3 and TP4 determined that total petroleum hydrocarbon (TPH) concentrations exceeded AEP RMC *Level III* criteria on the east side of the tank farm. Results of the test pit investigation are detailed in a May 27, 1998 letter to Mr. Robert Harriott, P. Geol. of Turbo.

2.1 Site Sensitivity Assessment

A site sensitivity assessment was undertaken in accordance with the procedure outlined in the Alberta Environmental Protection (AEP) document, "*Remediation Guidelines for Petroleum Storage Tank Sites*," draft version dated July 1994. Table 1 outlines the descriptive points required to determine the sensitivity assessment.

TABLE 1: SITE SENSITIVITY FACTORS		
Factor	Site Characteristics	
Site Description	Former bulk retail station including an above-ground tank farm and office building	
Land Use	Commercial	
Surrounding Land Uses	<u>Land Use</u>	<u>Distance (m)</u>
N	Residential	20
E	Residential/Commercial	20
S	Commercial	30
W	Commercial (service station)	adjacent
Groundwater Usages	No known groundwater users	
Surface Waters	None	
Nearby Underground Structures	Buried utilities (natural gas, telephone, power, water and sewer on and adjacent to the site)	
Subsurface Conditions		
Soil Type	Clay backfill in tank farm area, native soils are medium plastic clays overlaying bedrock	
Groundwater	Approximately 2.0 to 3.0 m below grade. Regional gradient is unknown.	

Table 2 summarizes the sensitivity for the ingestion and inhalation of contaminated soil and groundwater.

TABLE 2: SITE SENSITIVITY CLASSIFICATION				
Health Concern	Receptor	Receptor Sensitivity	Likelihood of Impact	Sensitivity Ranking
Ingestion: Groundwater	Groundwater or surface water with no current or potential usage	high	low	no ranking
Inhalation:	On-site commercial buildings	medium	medium	moderate
	Residential building to the north	high	medium	moderate
	Commercial building to the east	medium	medium	moderate
	Commercial building to the south	medium	low	low
	Commercial building to the west	medium	medium	moderate
	Buried utilities (on and adjacent to site)	medium	high	moderate

Based on the fine-grained nature of the native soils and fill at the depths of contamination, and the moderate ranking for the soil and groundwater receptor pathways, the AEP RMC *Level II* criteria for fine-grained soils (FGS) is the recommended criteria for the site.

3.0 INTRUSIVE INVESTIGATION

3.1 Methodology

On June 5, 1998 eight boreholes and three probeholes were advanced at the former Barons Turbo Bulk Station site utilizing a truck-mounted auger rig provided by Double D Drilling (1998) Ltd. of Lethbridge, Alberta. The boreholes were advanced outside the perimeter of the concrete berm to total depths ranging from 4.6 m to 6.1 m below the ground surface (bgs). Soil samples were obtained directly from the solid stem auger flights at approximately 0.75 m intervals. Each sample was classified according to soil type, structure, colour, and moisture, as well as visual and olfactory indications of hydrocarbon contamination. All borehole soil samples were field-screened for the presence of combustible organic vapours using a Trace-Techtor portable hydrocarbon vapour analyzer with methane elimination. Duplicate soil samples were collected from the auger flights for laboratory analysis. Select soil samples were submitted to Enviro-Test Laboratories of Calgary, Alberta for hydrocarbon analysis.

Three probeholes were advanced west of the office building in order to investigate the west side of the site for the presence of hydrocarbon indicators. Evaluation of hydrocarbon impacts within the probeholes was based on the presence of hydrocarbon odour and staining only. Samples were not field-screened at regular intervals for combustible vapour levels, and detailed soil descriptions were not recorded. Soil samples were collected at depths exhibiting either hydrocarbon odour or staining for measurement of combustible vapours and laboratory analysis. The locations of each borehole and probehole are illustrated on Figure 2.

Three fifty-millimeter diameter groundwater monitoring wells were installed in boreholes BH98-1, BH98-4, and BH98-5 for future groundwater monitoring. A basic level survey was conducted to determine the elevation of each monitoring well relative to the top of the fire hydrant on the corner of Main Street and Progress Avenue, which was designated as an arbitrary bench mark. Groundwater had not permeated the monitoring wells at completion of the drilling investigation, therefore groundwater samples could not be collected, nor could groundwater elevations be established.

3.2 Soil Profile

The soil profile generally comprised a thin layer of topsoil or gravel fill followed by a native silty clay extending to a depth of 2.6 m bgs to 4.0 m bgs, which in turn was underlain by a sandy clay unit. Six of the boreholes were terminated in sandy bedrock underlaying the sandy clay unit. Soil characteristics and depths varied in each borehole as illustrated on the borehole logs in Appendix B.

3.3 Field Observations

A total of fifty-four (54) soil samples were field screened for combustible vapour levels and for hydrocarbon staining and odour. A summary of the field results is presented in Table 3.

TABLE 3: FIELD OBSERVATIONS					
Borehole	Completion Depth (m bgs)	Hydrocarbon Odour Interval (m)	Hydrocarbon Staining Interval (m)	Combustible Vapour Range (ppmv)	Maximum Combustible Vapour Depth (m bgs)
BH98-1	6.1	none	none	26 - 70	0.8
BH98-2	4.6	1.8 - 3.0	1.8 - 3.0	32 - 110	2.3
BH98-3	4.6	none	none	22 - 66	0.3
BH98-4	6.1	1.7 - 2.1	1.7 - 2.1	46 - 460	1.8
BH98-5	4.6	none	none	23 - 62	1.5
BH98-6	4.6	2.1 - 2.4	2.1 - 2.4	24 - 81	2.3
BH98-7	4.6	none	none	24 - 100	3.8
BH98-8	4.6	none	none	18 - 100	3.8

Hydrocarbon odour and staining were detected in BH98-2, BH98-4, and BH98-6 located east of the bermed area. Elevated combustible vapour levels (>500 ppmv) were not measured in any of the soil samples. The maximum vapour level was measured in BH98-4 at depth of 1.8 m, coinciding with the area of most severe hydrocarbon staining and odour.

Hydrocarbon staining and odours were not noted in probeholes PH98-10 and PH98-11; however major hydrocarbon staining and strong hydrocarbon odour were detected in PH98-9 from 2.3 m to 2.6 m bgs. Light hydrocarbon odour continued in PH98-9 to 3.5 m without any observed hydrocarbon staining. Laboratory samples were collected from PH98-9 at depths of 2.3 m and 3.4 m bgs. With headspace vapour levels of 1600 ppmv and 3800 ppmv, respectively.

3.4 Soil Chemistry Results

Six (6) soil samples were submitted to Enviro-Test Laboratories of Calgary, Alberta for analysis of hydrocarbon constituents. The samples were selected based on organic vapour levels and hydrocarbon staining and odour. The results of the laboratory analysis are summarized in Table 4, with the detailed analytical reports included in Appendix C.

TABLE 4: SOIL ANALYTICAL RESULTS								
Borehole	Depth (m)	Vapour Level (ppmv)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)	TEH (ppm)	TPH (ppm)
BH98-2	2.3	110	<0.01	<0.01	0.25	1.1	1200	1224
BH98-4	1.8	460	<0.01	0.1	1.2	3.3	4100	4200
BH98-4	2.3	320	0.09	0.13	1.3	2.5	2000	2049
BH98-6	2.3	81	<0.01	0.03	0.17	0.29	1900	1924
PH98-9	2.3	1600	0.74	<0.01	5.0	9.3	360	1050
PH98-9	3.4	3800	29	67	21	110	180	3580
AEP RMC Level II FGS			1.5	340	400	130	n.s.	4000
AEP RMC Level III FGS			55	340	400	130	n.s.	5000

- Notes :
- all BTEX concentrations expressed as micrograms per gram (ppm - parts per million)
 - < - less than the analytical detection limit indicated
 - TEH - Total Extractable Hydrocarbons, TPH - Total Petroleum Hydrocarbons, n.s. - no standards
 - **bold** -exceeds AEP RMC Level II criteria FGS
 - AEP RMC - Alberta Environmental Protection Risk Management Criteria for vapour inhalation pathways as outlined in the AEP document, "Remediation Guidelines for Petroleum Storage Tank Sites - July 1994"

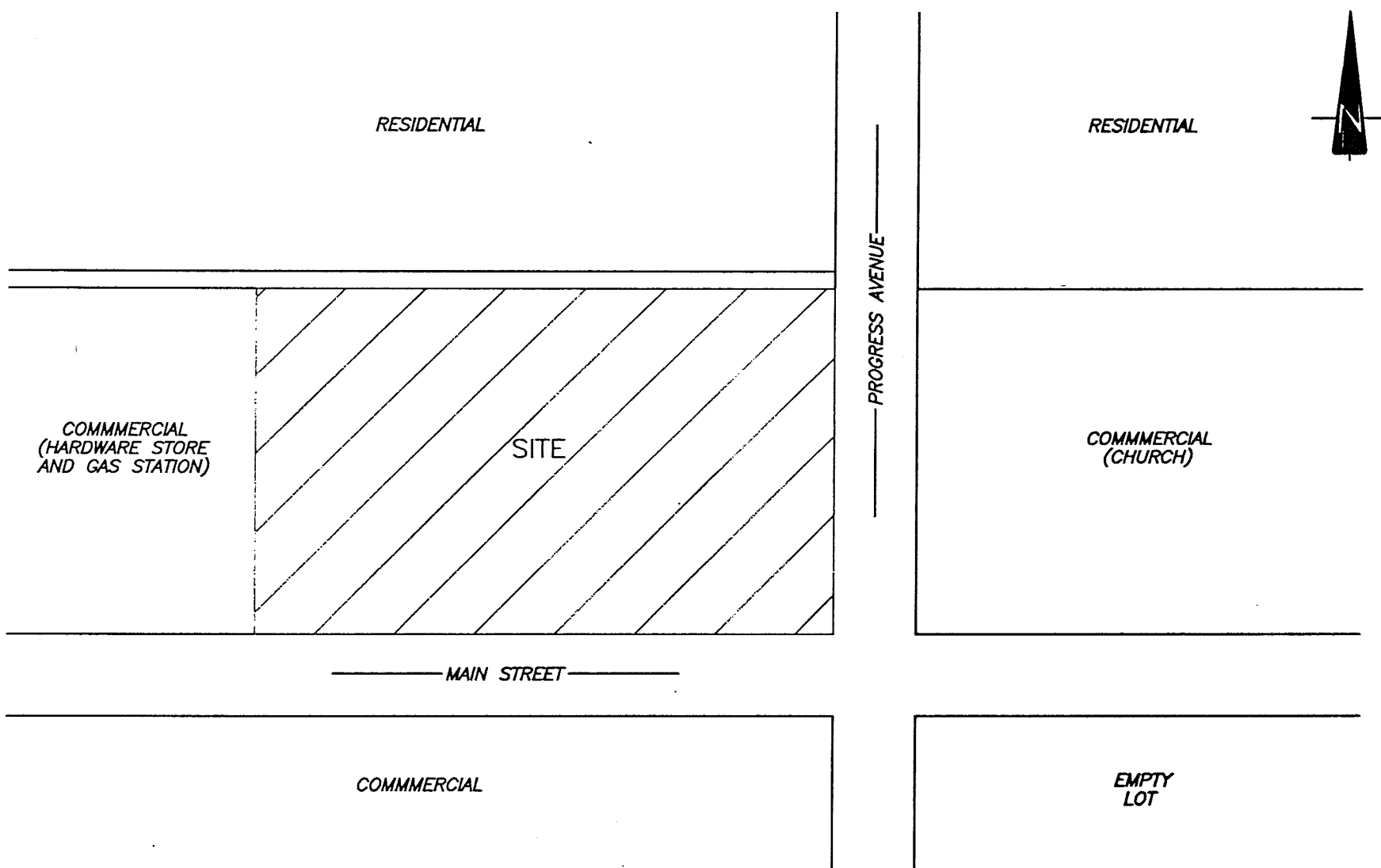
The laboratory results indicate that the TPH concentration in BH98-4 exceeded the AEP RMC *Level II* FGS criteria. The benzene concentration in probehole PH98-9 also exceeded AEP RMC *Level II* FGS criteria. The locations of the boreholes and the nature of the contaminants indicate that the hydrocarbon impacts in BH98-4 and PH98-9 originated from different sources. The soil samples collected from BH98-4 contain high concentrations of extractable hydrocarbons, similar to the soil samples collected from the test pits within the concrete berm adjacent to BH98-4. The soil samples collected from PH98-9 are not in close proximity to the concrete berm and are comprised of relatively high concentrations of volatile organic hydrocarbons (BTEX constituents) and low concentrations of extractable hydrocarbons. The chromatographs of the two samples attached indicate that the hydrocarbon impacts of the BH98-4 sample are associated with diesel fuel and that of the PH98-9 sample are of a gasoline source.

4.0 CLOSURE

The assessment and conclusions in this report are based on the interpretation of data collected from field investigations and results of the laboratory analyses, which were limited to the quantification of common hydrocarbon indicators in select samples. SEACOR expresses no warranty with respect to the accuracy of the laboratory analyses, methodologies used or presentation of the analytical results by the laboratory. Actual hydrocarbon concentrations in the samples submitted may vary according to the extraction and testing procedures used. The evaluation and conclusions reported herein do not preclude the existence of other chemical compounds and/or that variations of conditions within the site may be possible. Hence, this report should be used for informational purposes only and should not be construed as a comprehensive hydrogeological or chemical characterization of the site.

This report is for the exclusive use of Canadian Turbo (1993) Inc., a subsidiary of Shell Canada Products Ltd. and its authorized agents. Third party use of this ESA, or any reliance of, or decisions made on the information herein, is at the sole risk of the third party. SEACOR has no obligation, contractual or otherwise, to any third persons using or relying upon this report for any reason and therefore accepts no responsibility for damage suffered by any third party as a result of the actions taken or decisions made on the basis of the information or conclusions of this report.

FIGURES



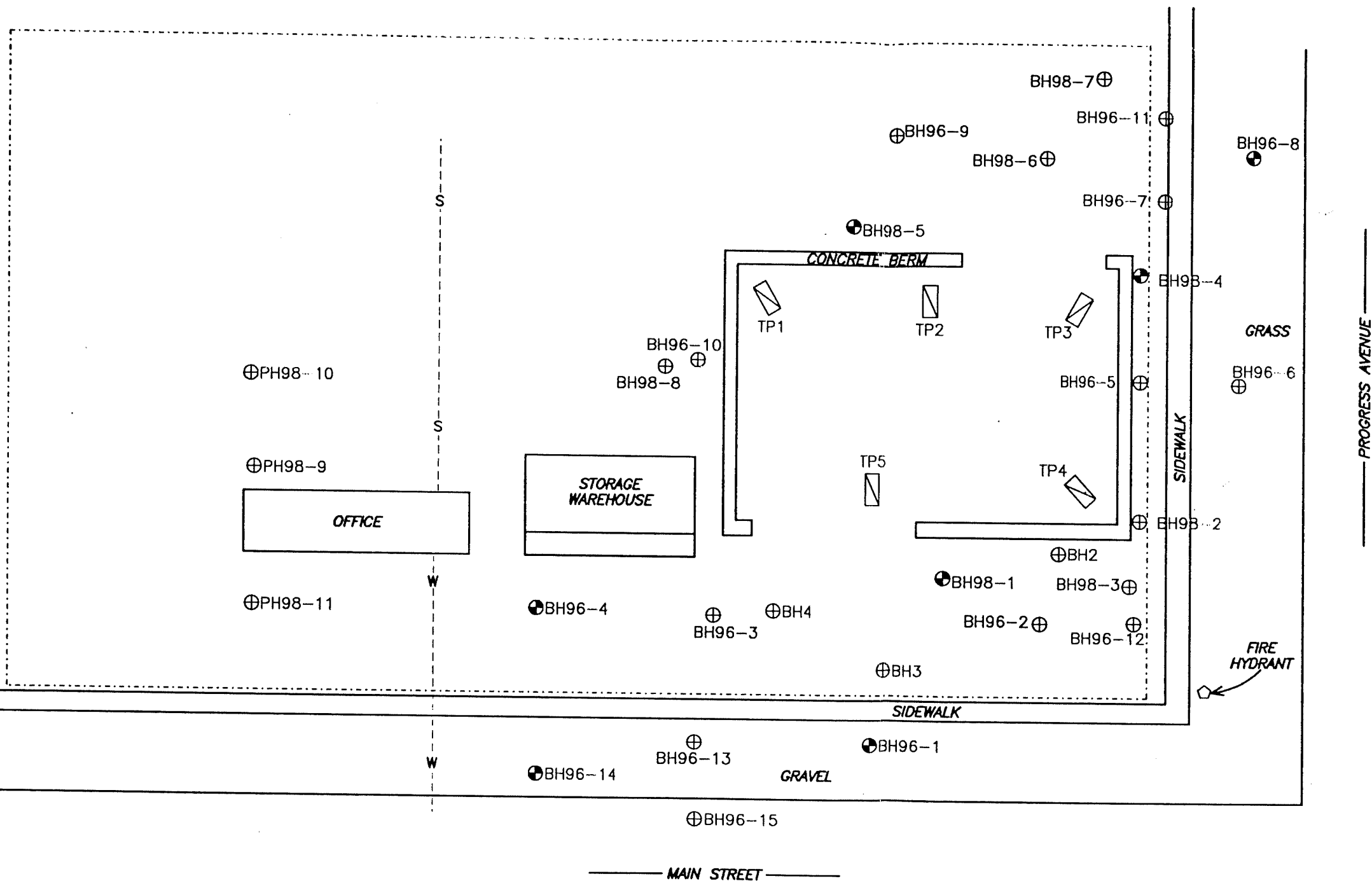
THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.

SEACOR
ENVIRONMENTAL
ENGINEERING INC.

CANADIAN TURBO (1993) INC.
BARONS TURBO BULK STATION #2520
235 MAIN STREET
BARONS, ALBERTA

SURROUNDING LAND USE PLAN

SCALE NTS	DATE 07/05/98	FILE NAME 31-93A3.DWG	MADE PRT/DAA	CHKD NDI	JOB NO. H0031-093	FIG 1
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LEGEND

- PROPERTY LINE
- W- WATER LINE (UNDERGROUND)
- S- SEWER LINE (UNDERGROUND)
- ⊕ BOREHOLE LOCATION
- ⊕ BOREHOLE COMPLETED AS A MONITORING WELL
- ▭ TEST PIT LOCATION

SCALE 1:250 (APPROX.)



5				
4				
3				
2				
1				
REV.	DESCRIPTION	DATE	MADE	CHKD

SEACOR
ENVIRONMENTAL ENGINEERING INC.

CANADIAN TURBO (1993) INC.
BARONS TURBO BULK STATION #2520
235 MAIN STREET
BARONS, ALBERTA

**SITE PLAN
BOREHOLE LOCATIONS**

THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY.
ACTUAL LOCATIONS MAY VARY AND NOT ALL
STRUCTURES ARE SHOWN.

SCALE 1:250	DATE 07/06/98	FILE NAME 31-93A2.DWG
MADE PRT/DAA	CHKD EAP	JOB NO. H0031-093
		FIG 2

SEACOR ENVIRONMENTAL ENGINEERING INC.

CLIENT: Canadian Turbo (1993) Inc.
PROJECT: Barons Turbo Bulk Station
235 Main Street
Barons, Alberta

BOREHOLE LOG

BOREHOLE NO: BH98-1
ELEVATION: 99.34

SEACOR JOB NO: H0031-093

DEPTH (m)	SAMPLE TYPE	SOIL TYPE	SOIL DESCRIPTION	TEST DATA				WELL COMPLETION	WATER LEVEL	FIELD NOTES	DEPTH (m)
				HYDROCARBON VAPOUR LEVEL (ppmv)							
				10	100	1000	10000				
			GRAVEL FILL (GW)								
			NATIVE CLAY (CL-ML)								
			Silty, trace sand, medium to low plastic, brown, soft, and moist.								
			Firm at 1.5 m.								
			No hydrocarbon odour or staining.								
1.0										flush roadbox, concrete seal	
										bentonite seal	1.0
2.0											
3.0											
			NATIVE CLAY (CL)								
			Sandy, some silt, trace pebbles, low plastic, firm, brown, and moist.								
			No hydrocarbon odour or staining.							silica sand	3.0
4.0											
			NATIVE CLAY (CL)								
			Silty, some sand, some pebbles, low plastic, stiff, grey, and dry.								4.0
			No hydrocarbon odour or staining.								
5.0											
			NATIVE BEDROCK								
			Very hard, dry, and grey.								5.0
			No hydrocarbon odour or staining.								
6.0											
			End of Borehole at 6.1 m.								6.0

DRILLING METHOD: Rotary Auger Drill

DATE DRILLED: 6/5/98

Notes:

☐ NO RECOVERY
☒ AUGER SAMPLE
☒ SPLIT SPOON SAMPLE
☒ CONTINUOUS SAMPLE

Sheet 1 of 1

SEACOR

ENVIRONMENTAL ENGINEERING INC.

SEACOR JOB NO: H0031-093

CLIENT: Canadian Turbo (1993) Inc.
PROJECT: Barons Turbo Bulk Station
235 Main Street
Barons, Alberta

BOREHOLE LOG

BOREHOLE NO: BH98-3
ELEVATION:

DEPTH (m)	SAMPLE TYPE	SOIL TYPE	SOIL DESCRIPTION	TEST DATA				WELL COMPLETION	WATER LEVEL	FIELD NOTES	DEPTH (m)
				HYDROCARBON VAPOUR LEVEL (ppmv)							
				10	100	1000	10000				
			GRAVEL FILL (GW)								
			CLAY FILL (CL)								
			Silty, low plastic, stiff, black, and moist to dry.								
			No hydrocarbon odour or staining.								
			NATIVE CLAY (CL-ML)								
			Silty, trace sand, medium to low plastic, brown, soft, and moist.								
			Firm at 1.5 m.								
			No hydrocarbon odour or staining.								
1.0											1.0
2.0											2.0
3.0			NATIVE CLAY (CL)								3.0
			Sandy, some silt, trace pebbles, low plastic, firm, brown, and moist.								
			Hardness increasing with depth.								
			No hydrocarbon odour or staining.								
4.0											4.0
			End of Borehole at 4.6 m.								

DRILLING METHOD: Rotary Auger Drill

DATE DRILLED: 6/5/98

Notes:



NO RECOVERY
AUGER SAMPLE
SPLIT SPOON SAMPLE
CONTINUOUS SAMPLE

Sheet 1 of 1

SEACOR ENVIRONMENTAL ENGINEERING INC.

SEACOR JOB NO: H0031-093

CLIENT: Canadian Turbo (1993) Inc.
PROJECT: Barons Turbo Bulk Station
235 Main Street
Barons, Alberta

BOREHOLE LOG

BOREHOLE NO: BH98-4
ELEVATION: 99.14

				TEST DATA									
DEPTH (m)	SAMPLE TYPE	SOIL TYPE	SOIL DESCRIPTION	HYDROCARBON VAPOUR LEVEL (ppmv)				WELL COMPLETION	WATER LEVEL	FIELD NOTES	DEPTH (m)		
				10	100	1000	10000						
			TOPSOIL NATIVE CLAY (CL) Some silt, medium to high plastic, brown, soft, and moist. Some sand and firm from 1.7 m to 3.0 m. Dry and low plastic from 3.7 m to 4.0 m. Moderate hydrocarbon odour from 1.7 m to 2.0 m, light hydrocarbon odour from 2.0 m to 2.1 m. Minor hydrocarbon staining from 1.7 m to 2.1 m.							flush roadbox, concrete seal			
1.0										bentonite seal	1.0		
2.0											2.0		
3.0										silica sand	3.0		
4.0			NATIVE CLAY (CL) Sandy, some silt, trace pebbles, low plastic, firm, brown, and dry. No hydrocarbon odour or staining.								4.0		
5.0			NATIVE BEDROCK Sandy, very hard, brown, and dry. No hydrocarbon staining or odour.								5.0		
6.0			End of Borehole at 6.1 m.								6.0		

DRILLING METHOD: Rotary Auger Drill

DATE DRILLED: 6/5/98

Notes:

 NO RECOVERY

 AUGER SAMPLE

 SPLIT SPOON SAMPLE

 CONTINUOUS SAMPLE

Sheet 1 of 1

DRILLING METHOD: Rotary Auger Drill

DATE DRILLED: 6/5/98

Notes:

-  NO RECOVERY
-  AUGER SAMPLE
-  SPLIT SPOON SAMPLE
-  CONTINUOUS SAMPLE

Sheet 1 of 1

SEACOR ENVIRONMENTAL ENGINEERING INC.

SEACOR JOB NO: H0031-093

CLIENT: Canadian Turbo (1993) Inc.
PROJECT: Barons Turbo Bulk Station
235 Main Street
Barons, Alberta

BOREHOLE LOG

BOREHOLE NO: BH98-5
ELEVATION: 99.11

DEPTH (m)	SAMPLE TYPE	SOIL TYPE	SOIL DESCRIPTION	TEST DATA				WELL COMPLETION	WATER LEVEL	FIELD NOTES	DEPTH (m)
				HYDROCARBON VAPOUR LEVEL (ppmv)							
				10	100	1000	10000				
			TOPSOIL								
			NATIVE CLAY (CL)								
			Some silt, medium plastic, brown, soft, and moist.								
			No hydrocarbon odour or staining.								
1.0										flush roadbox, concrete seal	1.0
										bentonite seal	
2.0											2.0
3.0			NATIVE SILT (ML)								3.0
			Sandy, clayey, medium plastic, brown, soft, and wet.								
			Some oxidation.								
			No hydrocarbon odour or staining.								
			NATIVE CLAY (CL)								
			Sandy, some silt, trace pebbles, low plastic, stiff, brown, and dry.								
4.0											4.0
			No hydrocarbon odour or staining.								
			NATIVE BEDROCK								
			Very hard, grey, and dry.								
			No hydrocarbon staining or odour.								
			End of Borehole at 4.6 m.								

DRILLING METHOD: Rotary Auger Drill

DATE DRILLED: 6/5/98

Notes:



NO RECOVERY



AUGER SAMPLE



SPLIT SPOON SAMPLE



CONTINUOUS SAMPLE

Sheet 1 of 1

SEACOR JOB NO: H0031-093

CLIENT: **Canadian Turbo (1993) Inc.**
PROJECT: **Barons Turbo Bulk Station**
235 Main Street
Barons, Alberta

BOREHOLE NO: BH98-6
ELEVATION:

Sheet 1 of 1

SEACOR ENVIRONMENTAL ENGINEERING INC.

CLIENT: Canadian Turbo (1993) Inc.
PROJECT: Barons Turbo Bulk Station
235 Main Street
Barons, Alberta

BOREHOLE LOG

BOREHOLE NO: BH98-7
ELEVATION:

SEACOR JOB NO: H0031-093

DEPTH (m)	SAMPLE TYPE	SOIL TYPE	SOIL DESCRIPTION	TEST DATA				WELL COMPLETION	WATER LEVEL	FIELD NOTES	DEPTH (m)
				HYDROCARBON VAPOUR LEVEL (ppmv)							
				10	100	1000	10000				
			TOPSOIL								
			CLAY FILL (CL) Some silt, some sand, trace pebbles, low plastic, firm, brown, and moist to dry. No hydrocarbon staining or odour.							concrete seal	
1.0			NATIVE CLAY (CL) Some silt, medium plastic, brown, firm, and moist. Silt seams at 1.8 m. No hydrocarbon odour or staining.	38						bentonite seal	1.0
2.0				24							
				38							
				26							2.0
3.0			NATIVE CLAY (CL) Sandy, some silt, trace pebbles, low plastic, stiff, brown, and dry. No hydrocarbon odour or staining.							clean soil cuttings	3.0
4.0			NATIVE BEDROCK Very hard, grey, and dry. No hydrocarbon staining or odour.	100							4.0
			End of Borehole at 4.6 m.	50							

DRILLING METHOD: Rotary Auger Drill

DATE DRILLED: 6/5/98

Notes:



NO RECOVERY
AUGER SAMPLE
SPLIT SPOON SAMPLE
CONTINUOUS SAMPLE

Sheet 1 of 1

SEACOR ENVIRONMENTAL ENGINEERING INC.

CLIENT: Canadian Turbo (1993) Inc.
PROJECT: Barons Turbo Bulk Station
235 Main Street
Barons, Alberta

BOREHOLE LOG

BOREHOLE NO: BH98-8
ELEVATION:

SEACOR JOB NO: H0031-093

DEPTH (m)	SAMPLE TYPE	SOIL TYPE	SOIL DESCRIPTION	TEST DATA				WELL COMPLETION	WATER LEVEL	FIELD NOTES	DEPTH (m)
				HYDROCARBON VAPOUR LEVEL (ppmv)							
				10	100	1000	10000				
			TOPSOIL								
			NATIVE SILT (ML) Clayey, medium plastic, soft, brown, and moist. Sandy at 1.2 m. No hydrocarbon odour or staining.							concrete seal	
1.0										bentonite seal	1.0
			NATIVE CLAY (CL) Some silt, medium plastic, brown, firm, and moist. Silt seams at 1.8 m. No hydrocarbon odour or staining.								
2.0											
			NATIVE CLAY (CL) Sandy, some silt, trace pebbles, low plastic, stiff, brown, and dry. No hydrocarbon odour or staining.							clean soil cuttings	
3.0											3.0
			NATIVE BEDROCK Very hard, grey, and dry. No hydrocarbon staining or odour.								
4.0											4.0
			End of Borehole at 4.6 m.								

DRILLING METHOD: Rotary Auger Drill

DATE DRILLED: 6/5/98

Notes:

- NO RECOVERY
- AUGER SAMPLE
- SPLIT SPOON SAMPLE
- CONTINUOUS SAMPLE

Sheet 1 of 1

ETL EnviroTest

LABORATORIES

A DIVISION OF ETL CHEMSPEC ANALYTICAL LIMITED

Edmonton (Main)
9936 - 67 Avenue
Edmonton, AB
T6E 0P5
Phone: (403) 413-5227
Fax: (403) 437-2311

Edmonton (Downtown)
2nd Flr., 10158 - 103 Street
Edmonton, AB
T5J 0X6
Phone: (403) 413-5265
Fax: (403) 424-4602

Calgary
Bay 2, 1313-44th Ave. N.E.
Calgary, AB
T2E 6L5
Phone: (403) 291-9897
Fax: (403) 291-0298

Saskatoon
124 Veterinary Road
Saskatoon, SK
S7N 5E3
Phone: (306) 668-8370
Fax: (306) 668-8383
1-800-667-7645

Winnipeg
745 Logan Avenue
Winnipeg, MB
R3E 3L5
Phone: (204) 945-3705
Fax: (204) 945-0763

Thunder Bay Analytical
1081 Barton Street
Thunder Bay, ON
P7B 5N3
Phone: (807) 623-6463
Fax: (807) 623-7598

Canada Wide Phone:
1-800-668-9878

Western Canada Fax:
1-800-286-7319

CHEMICAL ANALYSIS REPORT

SEACOR ENVIRONMENTAL ENG
405 525 11 AVE SW
CALGARY AB T2R 0C9

DATE: June 20, 1998

ATTN: NIKOLE IMMEL

Lab Work Order #: E806334

Sampled By: NIKOLE IMMEL

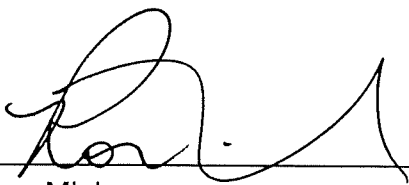
Project Reference: H0031-093

Date Received: 06/08/98

Project P.O.#: BARONS TURBO

Comments:

APPROVED BY:


Ron Minks
Project Manager

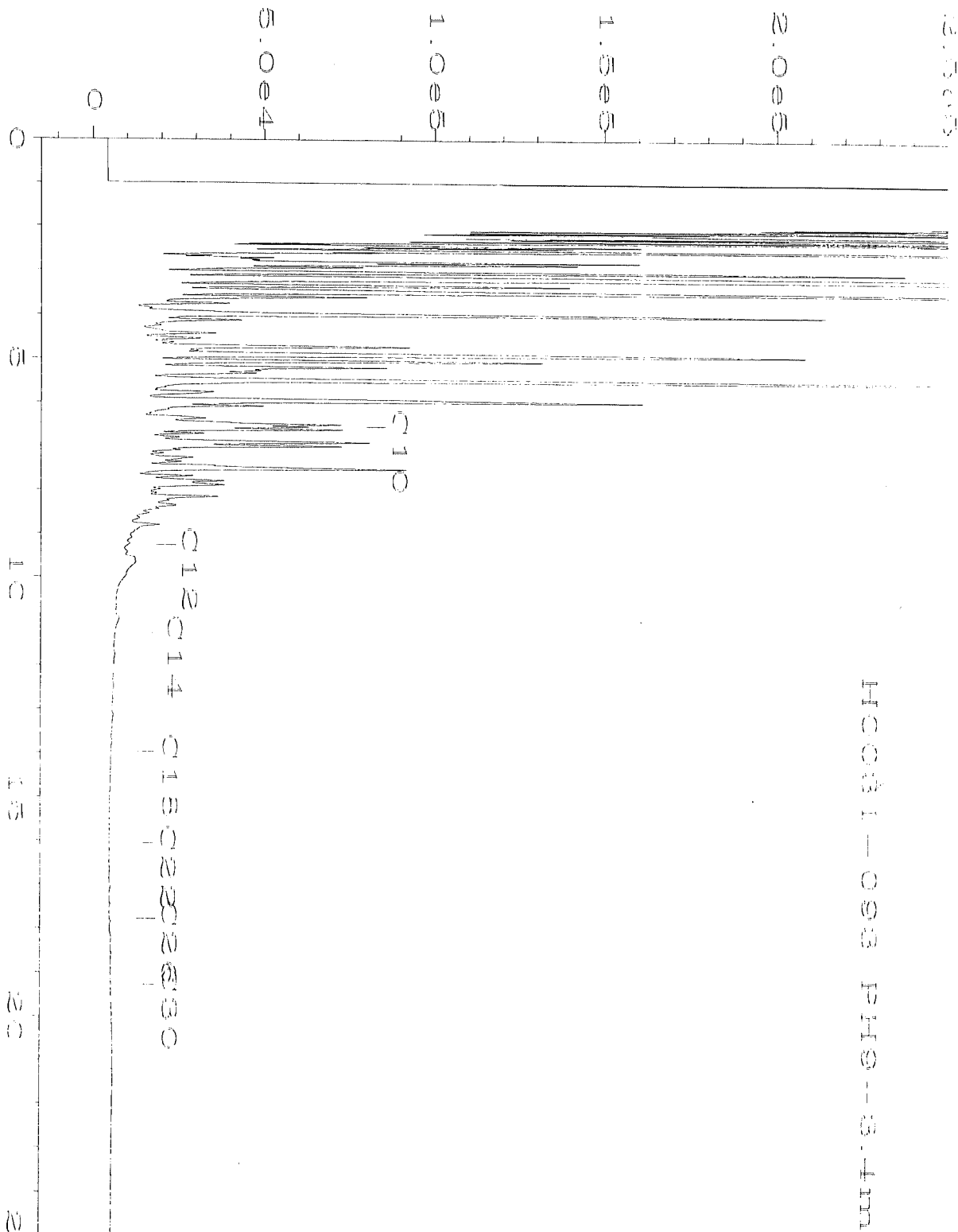
THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE
ADDITIONAL SAMPLE STORAGE TIME.

ACCREDITATIONS: STANDARDS COUNCIL OF CANADA (SCC), IN COOPERATION WITH THE CANADIAN ASSOCIATION FOR
ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL): FOR SPECIFIC TESTS AS REGISTERED BY THE
COUNCIL (EDMONTON, CALGARY)
AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA): FOR INDUSTRIAL HYGIENE ANALYSIS (EDMONTON)
AGRICULTURE CANADA: UNDER THE CANADIAN FERTILIZER QUALITY ASSURANCE PROGRAM (SASKATOON)

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

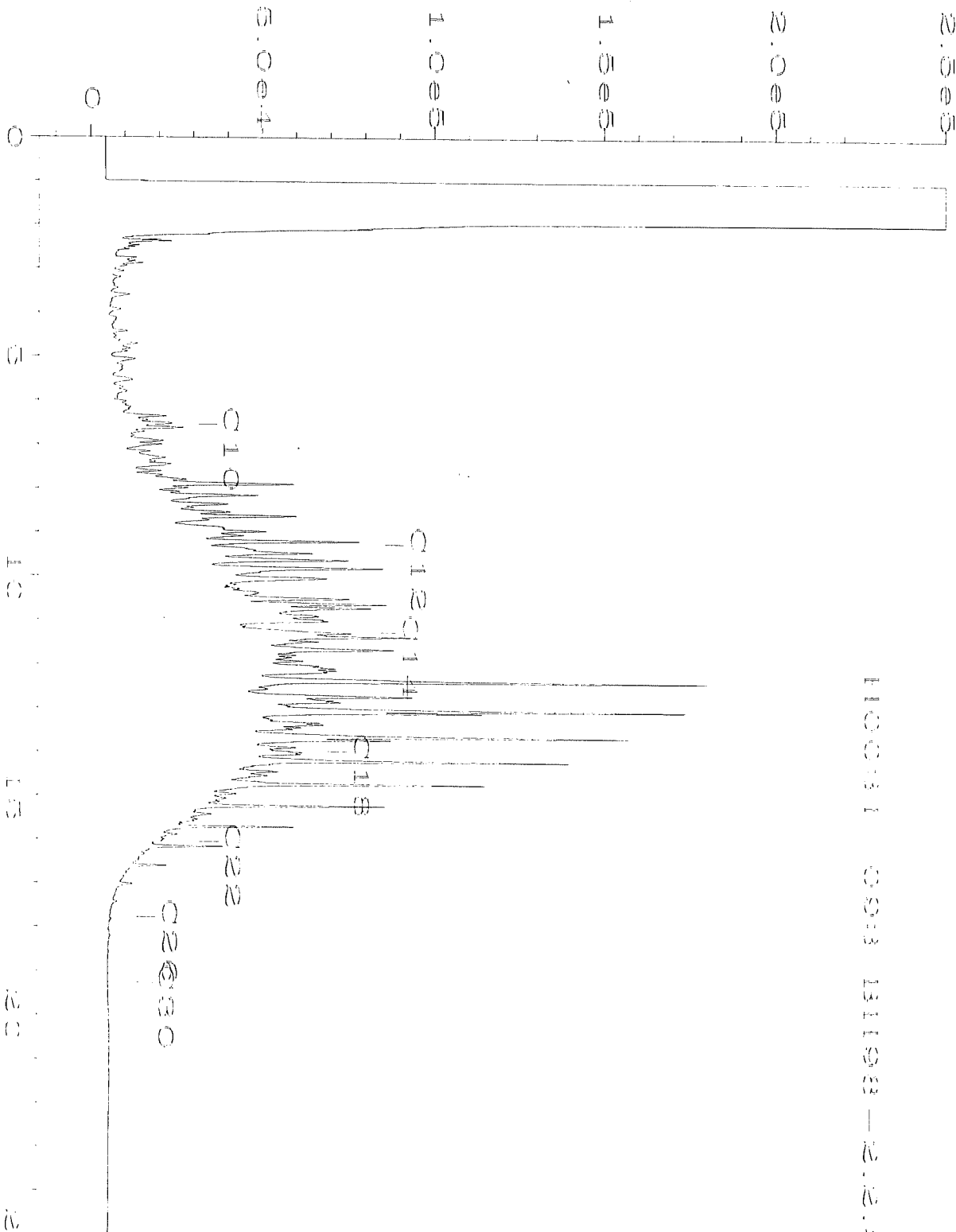
LAB ID	SAMPLE ID	TEST DESCRIPTION	RESULT	D.L.	UNITS	EXTRACTED	ANALYZED	BY
E806334-01	PH 9 2.3m Sample Type:SOIL Collected:06/05/98	BTEX, TVH and TEH in Soil						
		BTEX and TVH in Soil						
		Benzene	0.74	0.01	ug/L (ppm)	06/11/98	06/12/98	JWM
		Toluene	< 0.01	0.01	ug/L (ppm)	06/11/98	06/12/98	JWM
		Ethylbenzene	5.0	0.01	ug/L (ppm)	06/11/98	06/12/98	JWM
		Xylenes	9.3	0.01	ug/L (ppm)	06/11/98	06/12/98	JWM
		Total Volatiles	690	0.5	ug/L (ppm)	06/11/98	06/12/98	JWM
		% Moisture	24.5	0.1	%	06/11/98	06/12/98	EIS
		Total Extractables (Soil)	360	5	ug/g (ppm)	06/11/98	06/11/98	JWM
E806334-02	PH 9 3.4m Sample Type:SOIL Collected:06/05/98	BTEX, TVH and TEH in Soil						
		BTEX and TVH in Soil						
		Benzene	29	0.01	ug/g (ppm)	06/11/98	06/18/98	JWM
		Toluene	67	0.01	ug/g (ppm)	06/11/98	06/18/98	JWM
		Ethylbenzene	21	0.01	ug/g (ppm)	06/11/98	06/18/98	JWM
		Xylenes	110	0.01	ug/g (ppm)	06/11/98	06/18/98	JWM
		Total Volatiles	3400	0.5	ug/g (ppm)	06/11/98	06/18/98	JWM
		% Moisture	17.7	0.1	%	06/11/98	06/12/98	EIS
		Total Extractables (Soil)	180	5	ug/g (ppm)	06/11/98	06/11/98	JWM
E806334-03	BH98-2,2.3m Sample Type:SOIL Collected:06/05/98	BTEX, TVH and TEH in Soil						
		BTEX and TVH in Soil						
		Benzene	< 0.01	0.01	ug/g (ppm)	06/11/98	06/16/98	JWM
		Toluene	< 0.01	0.01	ug/g (ppm)	06/11/98	06/16/98	JWM
		Ethylbenzene	0.25	0.01	ug/g (ppm)	06/11/98	06/16/98	JWM
		Xylenes	1.1	0.01	ug/g (ppm)	06/11/98	06/16/98	JWM
		Total Volatiles	24	0.5	ug/g (ppm)	06/11/98	06/16/98	JWM
		% Moisture	25.0	0.1	%	06/11/98	06/12/98	EIS
		Total Extractables (Soil)	1200	5	ug/g (ppm)	06/11/98	06/11/98	JWM
E806334-04	BH98-4,1.8m Sample Type:SOIL Collected:06/05/98	BTEX, TVH and TEH in Soil						
		BTEX and TVH in Soil						
		Benzene	< 0.01	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Toluene	0.1	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Ethylbenzene	1.2	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Xylenes	3.3	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Total Volatiles	100	0.5	ug/g (ppm)	06/11/98	06/12/98	JWM
		% Moisture	26.7	0.1	%	06/11/98	06/12/98	EIS
		Total Extractables (Soil)	4100	5	ug/g (ppm)	06/11/98	06/11/98	JWM
E806334-05	BH98-4,2.3m Sample Type:SOIL Collected:06/05/98	BTEX, TVH and TEH in Soil						
		BTEX and TVH in Soil						
		Benzene	0.09	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Toluene	0.13	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Ethylbenzene	1.3	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Xylenes	2.5	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Total Volatiles	49	0.5	ug/g (ppm)	06/11/98	06/12/98	JWM
		% Moisture	26.2	0.1	%	06/11/98	06/12/98	EIS
		Total Extractables (Soil)	2000	5	ug/g (ppm)	06/11/98	06/11/98	JWM
E806334-06	BH98-6,2.3m Sample Type:SOIL Collected:06/05/98	BTEX, TVH and TEH in Soil						
		BTEX and TVH in Soil						
		Benzene	< 0.01	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Toluene	0.03	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM

LAB ID	SAMPLE ID	TEST DESCRIPTION	RESULT	D.L.	UNITS	EXTRACTED	ANALYZED	BY
E806334-06	BH98-6,2.3m							
Sample Type:SOIL								
Collected:06/05/98								
		BTEX, TVH and TEH in Soil						
		Ethylbenzene	0.17	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Xylenes	0.29	0.01	ug/g (ppm)	06/11/98	06/12/98	JWM
		Total Volatiles	24	0.5	ug/g (ppm)	06/11/98	06/12/98	JWM
		% Moisture	25.2	0.1	%	06/11/98	06/12/98	EIS
		Total Extractables (Soil)	1900	5	ug/g (ppm)	06/11/98	06/11/98	JWM
N.D. - NOT DETECTED, LESS THAN THE DETECTION LIMIT								
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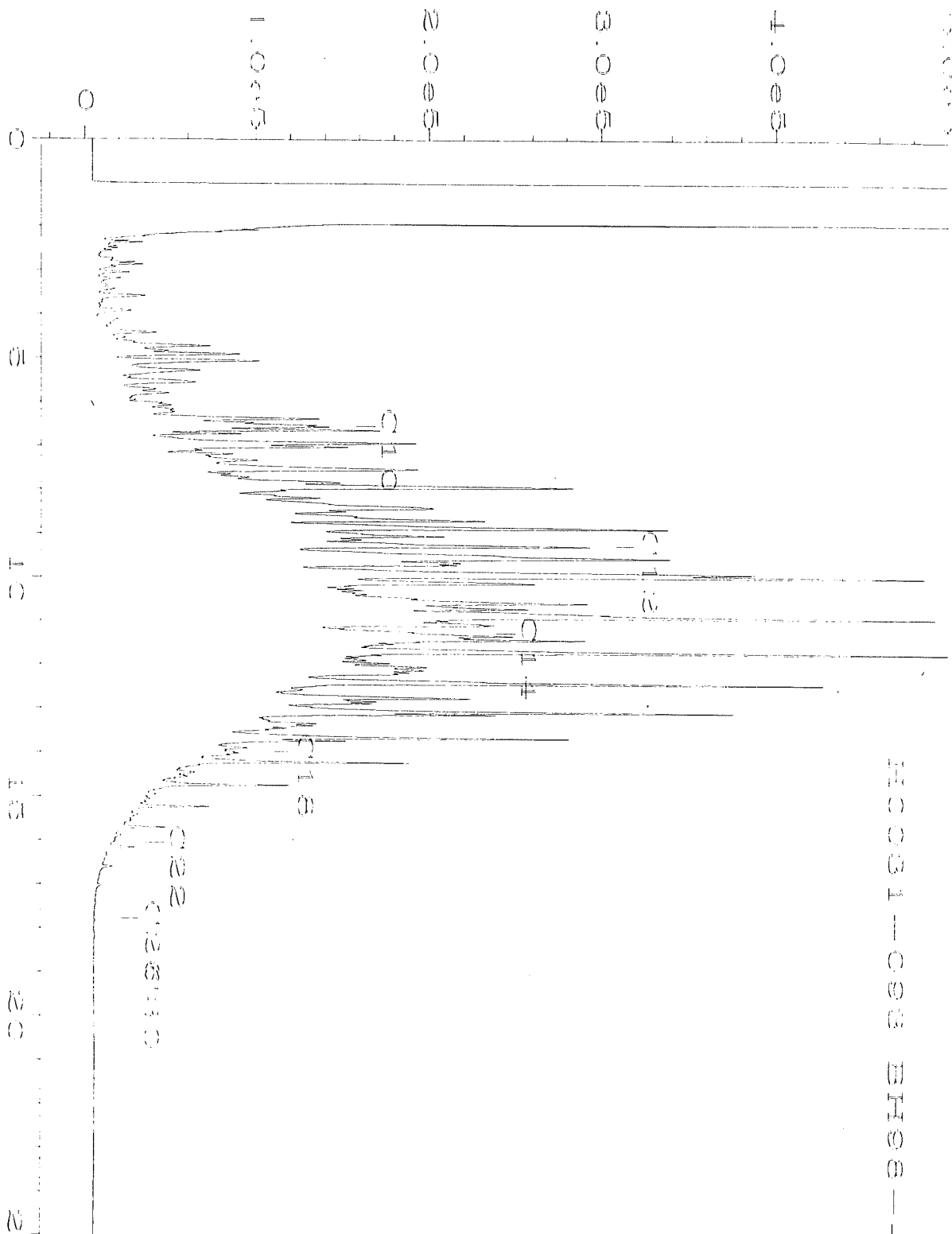
00061-000 PHO-3.4m

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Operator	: Joanna Wasik	Vial Number	: 7
Instrument	: HP-1	Injection Number	: 1
Sample Name	: E8-06-334-02	Sequence Line	: 1
Run Time Bar Code:		Instrument Method:	TEH.MTH
Acquired on	: 11 Jun 98 08:35 PM	Analysis Method	: LABEL.MTH
Report Created on:	03 Jul 98 01:17 PM		



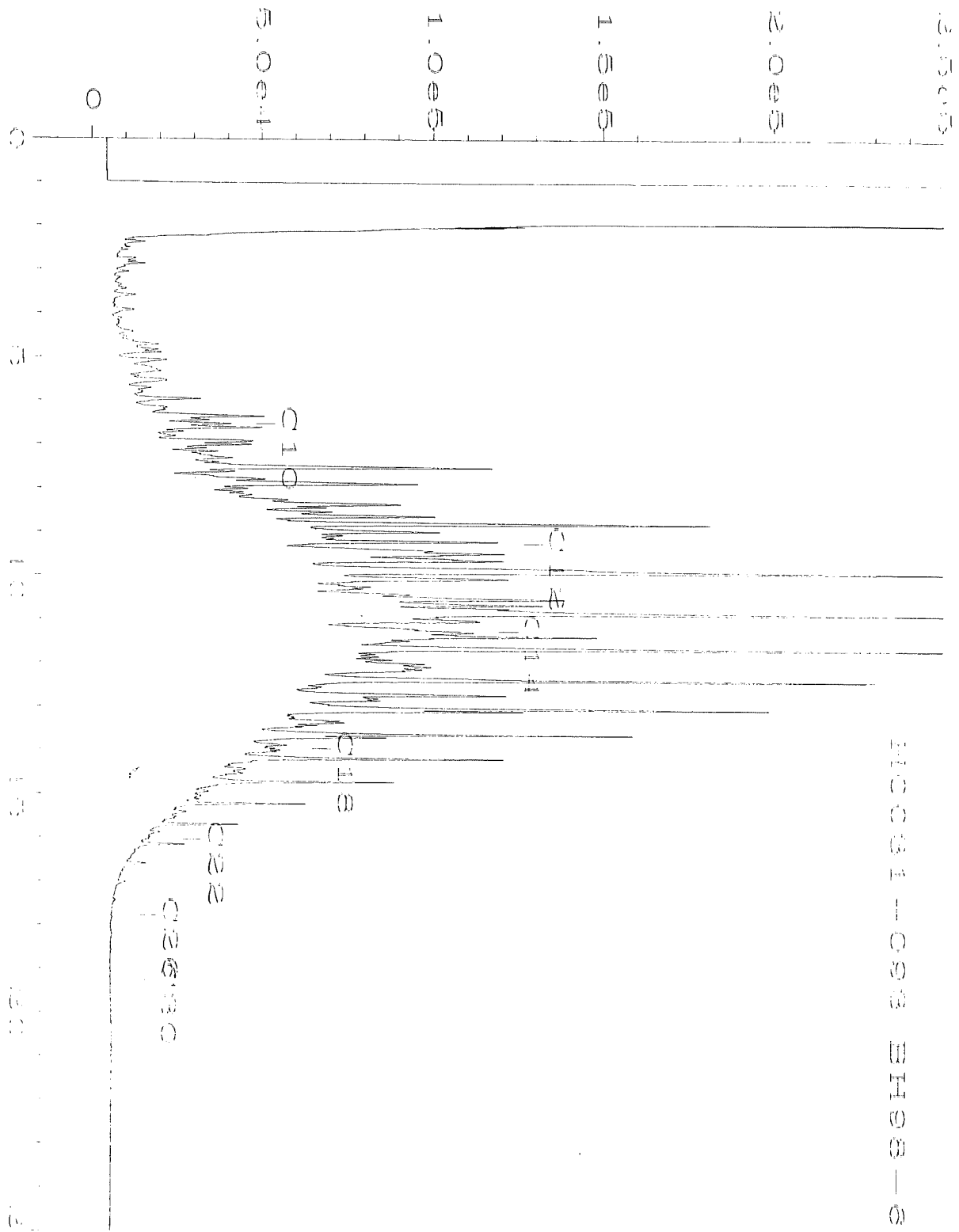
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Instrument	: HP-1	Injection Number	: 1
Sample Name	: E8-06-334-03	Sequence Line	: 1
Run Time Bar Code:		Instrument Method	: TEH.MTH
Acquired on	: 11 Jun 98 09:09 PM	Analysis Method	: LABEL.MTH
Report Created on:	03 Jul 98 01:19 PM		



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Instrument	: HP-1	Injection Number	: 1
Sample Name	: E8-06-334-04A	Sequence Line	: 1
Run Time Bar Code:		Instrument Method:	TEH.MTH
Acquired on	: 11 Jun 98 09:43 PM	Analysis Method	: LABEL.MTH
Report Created on:	03 Jul 98 01:21 PM		

TEH0611-009F0101.D 4.1.0m



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Instrument	: HP-1	Injection Number	: 1
Sample Name	: E8-06-334-06	Sequence Line	: 1
Run Time Bar Code:		Instrument Method:	TEH.MTH
Acquired on	: 11 Jun 98 11:57 PM	Analysis Method	: LABEL.MTH
Report Created on:	03 Jul 98 01:27 PM		

Appendix A Test Methodologies

BTEX and TVH in Soil

PREPARATION METHOD: Methanol extraction with headspace analysis.

INSTRUMENTAL METHOD: GC/PID for BTEX.

GC/FID for TVH - summation of hydrocarbons from C5 to C10 carbon range and is calculated against a BTEX standard.

NOTE: Results based upon dry weight.

METHOD REFERENCE: Modified SW-846 USEPA Method 5021 and 8015/8020.

BTEX QC SUMMARY:	Accuracy	Precision
	93%	+/- 23%

NOTE: Accuracy is expressed as the average % recovery and Precision as the relative standard deviation (RSD) of fortifications made using certified standards (BTEX).

TVH QC SUMMARY:	Accuracy	Precision
	96%	+/- 24%

NOTE: Accuracy is expressed as the average % recovery and Precision as the relative standard deviation (RSD) of fortifications made using certified standards (BTEX).

% Moisture

PREPARATION METHOD: Sample is oven-dried at 105 C

INSTRUMENTAL METHOD: Gravimetric analysis

Total Extractables (Soil)

PREPARATION METHOD: Shake and sonication extraction with organic solvent

INSTRUMENTAL METHOD: GC/FID - summation of hydrocarbons from C11 to C30 carbon range (excluding benzene, toluene, ethylbenzene, and xylenes) and calculated against diesel standard.

NOTE: Results based upon dry weight.

METHOD REFERENCE: Modified SW-846 USEPA Method 3550/3580 and 8000

QC SUMMARY:	Accuracy	Precision
	111%	+/- 24%

NOTE: Accuracy is expressed as the average % recovery and Precision as the relative standard deviation (RSD) of fortifications made using in-house standards (TEH).

THIS IS THE LAST PAGE OF THE METHODOLOGY APPENDIX.

CHAIN-OF-CUSTODY

SEACOR Environmental Engineering Inc.

Client: <u>TURBO-BAXX Bulk Station</u>		SEACOR Project #: <u>H0031-093</u>	
Station #: <u>Proposa # C047C8.TCX</u>		Mail Final Report to: <u>Nikole Immel</u>	
Address:		Fax Interim Results to: <u>Nikole Immel</u>	
Sampled By: <u>Nikole Immel</u>		Laboratory: <u>ETL</u>	
Laboratory Use:		Turnaround: ☐ 24 hr ☐ 3 days	
		☒ Regular ☐ 5-Day	
Page <u>1</u> of <u>1</u>			

Sample ID	Depth	Date	Matrix	Headspace	Vapour Levels	Comments
7H9-2.3m		June 5/98	Soil			
PH9-3.4m		June 5/98	Soil			
8H98-2.2.3.3m		5/16/98	Soil	40		
8H98-4.1.8m		5/16/98	Soil	460		
8H98-4.2.3.3m		5/16/98	Soil	320		
8H98-6.2.3.3m		5/16/98	Soil	81		
8H98-2.3.0m		5/16/98	Soil	34		
8H98-3.2.3m		5/16/98	Soil	54		
8H98-5.2.3m		5/16/98	Soil	52		
8H98-5.3.4m		5/16/98	Soil	23.		
8H98-7.2.3m		5/16/98	Soil	26		
8H98-6.3.0m		5/16/98	Soil	36		

Relinquished by: <u>Nikole Immel</u>		Date: <u>June 8/98</u>		Time:	
Received by: <u>[Signature]</u>		Date: <u>June 8/98</u>		Time:	
Remarks:					

White: File Copy Pink/Yellow: Laboratory

RELEVANT ENVIRONMENTAL STANDARDS

PROVINCIAL CRITERIA

The document entitled "Subsurface Remediation Guidelines for Underground Storage Tanks", - Draft, February, 1991, produced by the Alberta Departments of Environment & Labour, Management of Underground Storage Tanks (MUST) Project, has been standard by which the Department of Environment and industry in Alberta has evaluated contaminated sites since its inception in 1991.

Since July 1994, a new guideline has been proposed: "Remediation Guidelines for Petroleum Storage Tanks Sites", Draft July 1994. Produced by Alberta Environmental Protection, it provides a risk management process specific to impacted soil and groundwater originating from existing or former petroleum storage facilities. The document is in draft form only, pending completion of a public review and consultation period. Alberta Environmental Protection has agreed to allow the use of these guidelines provided that should the guidelines change as a result of public review or consultation, the party responsible must upgrade the remediation to meet the criteria contained in the final guideline.

There are three levels of contamination *I*, *II* and *III* for which allowable concentrations are given in each guideline. The *Levels (I, II, III)* apply to high, moderate and low site sensitivities in relation to potential health risks and environmental effects. The new 1994 RMC guidelines also differentiate between coarse and fine grained soils and for the groundwater found in either of the soils. The new guidelines have allowable concentrations for soils and groundwater at each level and grain size type.

REMEDIATION CRITERIA

Typically, *Level III* threshold criteria applies to facilities with ongoing petroleum storage and handling operations and for those sites located in industrial districts. Commercial and/or light industrial districts are normally assessed against *Level II* threshold criteria, and *Level I* threshold criteria applies to sites in residential districts or other environmentally sensitive areas. Remediation of decommissioned properties depends on final land use, whether commercial/industrial or residential.

It should be noted that LH and TEH analyses are not included in the Alberta MUST evaluation criteria; they are presented herein (Appendix D) for the sole purpose of assessing the relative proportions of gasoline to diesel residues in the subsurface soil and groundwater regime.

1994 RMC STANDARDS - INHALATION PATHWAYS

SOIL						
HYDROCARBON COMPONENT	COARSE GRAINED			FINE GRAINED		
	I	II	III	I	II	III
Benzene	0.04	0.3	1.6	0.2	1.5	55
Toluene	10	60	320	40	340	340
Ethylbenzene	70	400	400	300	400	400
Xylene	25	130	130	110	130	130
TPH	1000	2000	5000	2000	4000	5000
Phenol	ns	ns	ns	ns	ns	ns
Lead	50	200	600	50	200	600
WATER						
HYDROCARBON COMPONENT	COARSE GRAINED			FINE GRAINED		
	I	II	III	I	II	III
Benzene	0.3	1.6	7.5	0.4	4.2	75
Toluene	15	90	430	25	240	430
Ethylbenzene	30	30	30	50	50	50
Xylene	50	50	50	80	80	80
TPH	ns	ns	ns	ns	ns	ns
Phenol	ns	ns	ns	ns	ns	ns
Lead	ns	ns	ns	ns	ns	ns

- Notes:
- ns - not specified
 - all concentrations in parts per million

1994 RMC STANDARDS - INGESTION PATHWAYS

HYDROCARBON COMPONENT	SOIL		WATER
	Coarse Grained	Fine Grained	
Benzene	0.02	0.07	0.005
Toluene	0.36	1.22	0.024
Ethylbenzene	0.10	0.41	0.0024
Xylene	3.5	11.9	0.3
TPH	1000*	2000*	ns
Phenol	ns	ns	ns
Lead	50	50	0.01

- Notes:
- ns - not specified
 - * - recommended only
 - all concentrations in parts per million