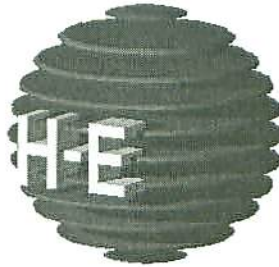




**Barons Gas Station Remediation Project
Barons, AB**

2008 Groundwater Monitoring Report



PREPARED FOR:
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PREPARED BY:
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Consulting Professional Engineers



Environmental
Structural
Civil
Industrial
Municipal

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April 25, 2008

Job #: 07-186

Marie Elizabeth Read
P.O. Box 267
Irma, AB T0B 2H0

Dear Marie:

**Re: Groundwater Monitoring at former Barons Gas Station
Barons, AB**

As per your request, Hasegawa Engineering has collected ground water samples from the groundwater monitoring wells located at and around the gas station property. Refer to Figure 1 for well locations. Samples were submitted to Bodycote Labs for analysis and contamination testing. The test results are enclosed in the following report.

We trust that the enclosed information meets your requirements. Please feel free to contact me at 403-328-2686 if you have any questions or comments regarding these results.

Sincerely,

Mark Hasegawa P. Eng.
Hasegawa Engineering
Consulting Professional Engineers
MAH/cms

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1.0 INTRODUCTION

1.1 *Project Background*

Hasegawa Engineering was retained by Marie Read, to conduct the 2008 groundwater monitoring of groundwater wells located at and around the former gas station in Barons, AB. This property shall herein after be referred to as the "Subject Property".

1.2 *Scope of Work*

The specific activities included in this groundwater assessment included:

- Locating and exposing existing wells
- Gauging of all site wells to establish water table elevations, purging of each well to allow recharging of fresh groundwater, sampling of groundwater from each well
- Submission of groundwater samples for analysis for BTEX, F1, F2, F3, and F4.
- Complete summary report, which includes results, maps, conclusions and recommendations for future work

1.3 *Study Objectives*

The primary objective of this project was to provide the owner or owners, with evaluation of groundwater impact at the site due previous petroleum storage and service operations.

These activities were undertaken in order to evaluate site compliance with present environmental guidelines/legislation as established by Alberta Environment.

The results obtained in the most recent analysis are also compared with historical results.

2.0 METHODOLOGY

2.1 *Groundwater Sampling and Gauging*

Prior to the soil remediation event in 2003 there was a total of 12 groundwater monitoring wells located on and around the former gas station site. MW-2 (Monitoring Well – 2) and MW-7 were destroyed during the soil remediation event in 2003, therefore groundwater samples are no longer available at those locations. Samples were obtained from Monitoring wells MW-1, 3–5, 9, and 10. Samples were not obtained from MW-6 and MW-12 because the wells could not be located. It is assumed that these wells have been destroyed and will require replacement. MW-11 was covered with ice and snow and could not be sampled.

Prior to sampling, all wells were gauged to determine the depth to water. Each well was developed and then purged of at least two well bore volumes or until the well went dry. Samples were then collected using a hand bailer and stored on ice. The bailer was decontaminated with distilled water before sampling subsequent wells.

All samples were then preserved at 4 degrees C and sent to Bodycote Labs on March 13, 2008 for analysis.

2.2 *Assessment Criteria*

Results obtained from Bodycote Labs for the submitted samples of groundwater were evaluated to ensure validity by:

- Reviewing all data provided by the lab to ensure correct methodologies were utilized and laboratory errors had not occurred;
- Comparing concentrations of each indicator parameter to the corresponding Permissible Exposure Limits; and
- Determining whether any concentration that exceeds the exposure limits was not the result of unrelated events.

3.0 GROUNDWATER RESULTS

3.1 General

All samples taken were tested for BTEX (Benzene, Toluene, Ethylbenzene, Xylenes), F1, F2, F3, and F4 fractions of Total Petroleum Hydrocarbons.

3.2 Groundwater Potentiometric Surface

MW-1, 3-5, 9, and 10, were gauged at the site on March 13, 2008 to determine the potentiometric surface elevation. Groundwater potentiometric surface data is shown in Table 1 below as well as in Figure 1 in Appendix A.

Table 1: Groundwater Potentiometric Surface Data

MONITORING WELL	DTW (m)	TD (m)	DTP (m)
MW – 1	3.04	5.4	N/O
MW – 3	4.3	5.3	Sheen
MW – 4	2.15	4.07	N/O
MW – 5	3.45	5.70	N/O
MW – 9	3.25	5.71	N/O
MW – 10	8.9	7.1	N/O

N/O-None Observed

DTW= Depth To Water

NS-Not Sampled

TD= Total Depth

MW-1 was completed on a 45 degree angle therefore the Depth To Water and Total Depth measurements were calculated and are consistent with the other monitoring wells. A sheen of product was observed in MW-3. The groundwater flow direction is towards the west which is fairly consistent with previous results.

3.3 Groundwater Analytical Results

The results of the sample analysis are included in Table 2 below. Monitoring wells MW-1, MW-9, and MW-10 are classified as Residential. Monitoring wells MW3 – 5 are classified as Commercial. This delineation in regulatory levels is due to the proximity of the site to residential lots.

Table 2: Groundwater Quality Data

SAMPLE LOCATION	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)	F1 (Mg/L)	F2 (Mg/L)
Commercial Guidelines	160	228	NG	NG	2	16
MW-3	N/A	N/A	N/A	N/A	N/A	N/A
MW-4	0.04	0.027	0.048	0.258	2.6	32.3
MW-5	1.07	0.015	0.041	0.601	11.6	14.5
Residential Guidelines	160	228	NG	NG	2	16
MW-1	0.399	0.001	0.011	0.004	1	6.6
MW-9	<0.001	<0.001	<0.001	<0.001	<0.2	0.1
MW-10	0.010	0.013	0.004	0.019	<0.2	0.1

 - Exceeds Alberta Environment risk management guidelines for petroleum storage tank sites

NG – No Guideline required for this pathway; limited by solubility

The water quality of all the samples taken is within Alberta Environment Guidelines with the exception of MW-3 and MW-4. Levels for F2, in MW-4, exceed Alberta Environment Guidelines. Petroleum product was visible when groundwater was obtained from Monitoring well MW-3. A strong odor was present as well. Due to high hydrocarbon content in MW-3 the analysis used for water as in the other wells was not applicable. A Hydrocarbon Chromatogram analysis was done on the MW-3 sample and showed hydrocarbons in c8 to c24 range indicating the possible presence of diesel fuel.

The complete groundwater analytical results from Norwest labs are included in Appendix B.

4.0 HISTORICAL COMPARISON

The following information is provided to compare the historical results with current results.

Groundwater

Free product gasoline was detected in MW-2 in the Dec. 2001 groundwater sampling event (refer to Table 3). MW-2 was destroyed during the soil remediation which took place in 2003, therefore no groundwater samples could be obtained in 2007. MW-2 was formerly located just north of the sidewalk approximately 8 meters northeast of MW-3. Free product was present in MW-3 in the 2008 groundwater sampling event. From these findings it appears that the groundwater flow is pushing the remaining product in a south, southwest direction towards the road. However, there was evidence of diesel fuel in

MW-3 in the most recent sampling event. Historically, this site has been impacted with gasoline

Table 3: 2002 Groundwater Analytical Results

Sample Location	Date	Benzene (mg/L)	Toluene (mg/L)	Ethyl-benzene (mg/L)	Xylenes (mg/L)	F1 (mg/L)	F2 (mg/L)
MW-1*	12/19/01		3.26	1.07	11.8		4.4
MW-1*	10/19/03	1.65	.016	0.031	0.605	3.78	
MW-2	12/19/01						
MW-3	12/19/01	2.49	1.4	0.203	2.49	8.6	0.6
MW-4	12/19/01	0.516	0.083	0.001	0.581	1.97	1.2
MW-5	12/19/01	2.17	0.051	0.009	2.81	8.1	
MW-6	14/06/02	1.85	2.19	0.005	3.33	9.85	3.0
MW-7	14/06/02	6.41	9.54	0.239	8.01		3.5
MW-8*	14/06/02	0.001	<0.001	<0.005	0.004	0.05	<0.1
MW-9*	14/06/02	<0.001	<0.001	<0.001	<0.001	<0.01	<0.1
MW-10*	14/06/02	<0.001	<0.001	<0.001	<0.001	<0.01	<0.1

indicates concentration exceeds applicable remedial criteria

*Offsite criteria applies

FP = Free Product

5.0 CONCLUSION

Groundwater sampling occurred at the Subject Property on March 13, 2008. Monitoring wells MW-1, 3-5, 9, and 10, were gauged to determine potentiometric elevations. Groundwater samples were taken from each well and submitted for analysis. The water quality of all the samples taken meets minimum standards as set forth by Alberta Environment Guidelines with the exception of F2 in MW-4. Hydrocarbon Chromatogram results for MW-3 indicate the possible presence of diesel.

It is recommended that 3 additional groundwater monitoring wells be installed to further determine environmental impact onsite as well as offsite. One well to be located directly north of MW-3 approximately where the dispensers were located and two offsite along the road to the south. See Figure 2 for proposed new well locations.

Appendix A

Maps & Figures



Notes:

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Consent to plan and verify all work shown on this drawing is given by the client and shall be held by the Engineer.

Consent to plan and verify all work shown on this drawing is given by the client and shall be held by the Engineer.

Do not make drawings.

All construction shall be in accordance with the latest editions of the applicable codes, standards, and specifications.

Scale: 1:1



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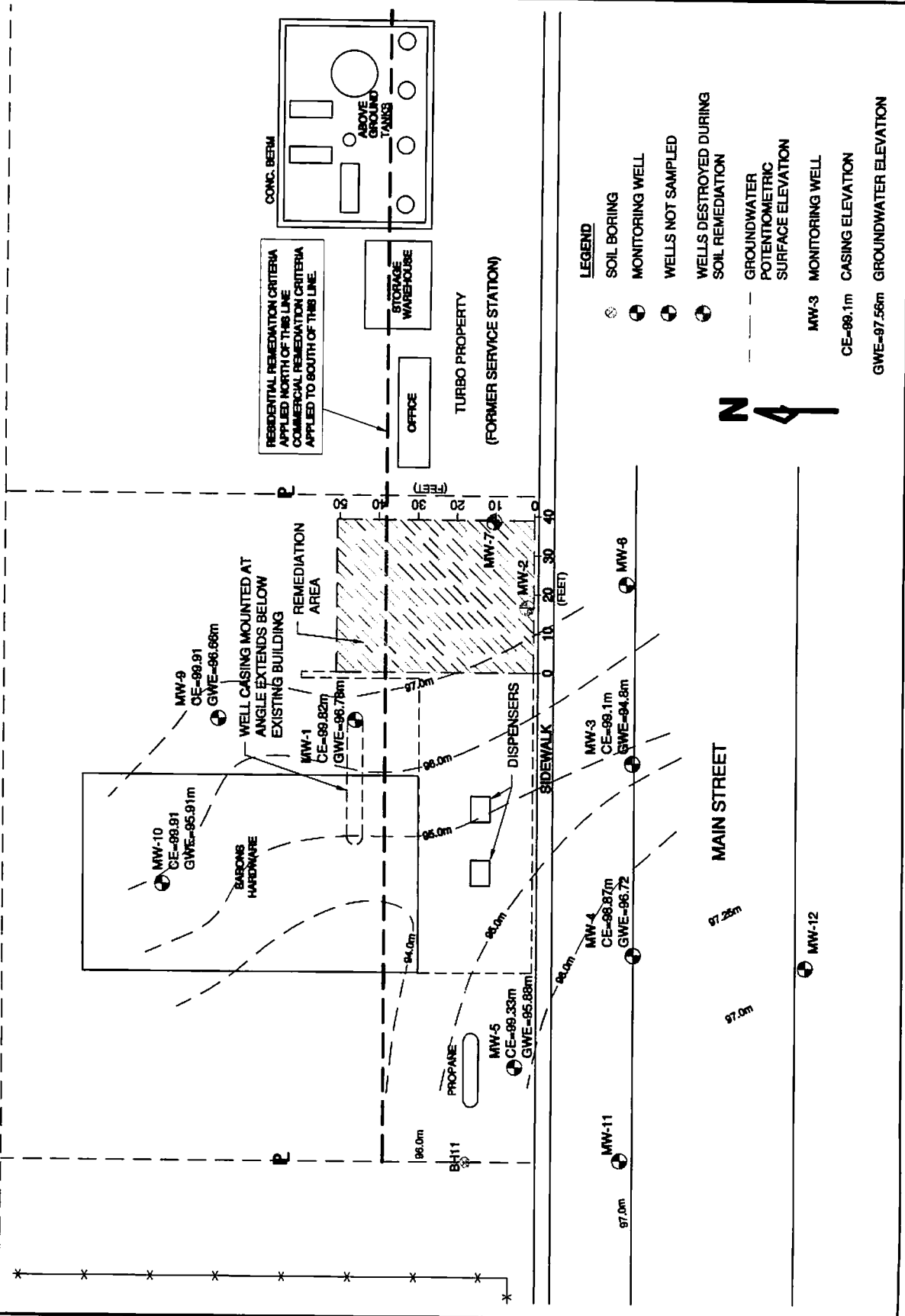
CALGARY OFFICE
201-2816-21 Street NE
Calgary Alberta T2E 6Z2
Ph: 250-5261

MARIE READ

BARONS
HARDWARE

2008 GROUNDWATER SAMPLING
SITE MAP

07186
NTS
FIG.1
APR. 25, 09





NOTES:

1. This drawing is to be used for information only and is not to be used for construction or for any other purpose without the written permission of the Engineer.

2. The Engineer is not responsible for the accuracy of the information provided by the client or for the results of any tests or analyses performed by the client or any other party.

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5. The Engineer is not responsible for the accuracy of the information provided by the client or for the results of any tests or analyses performed by the client or any other party.

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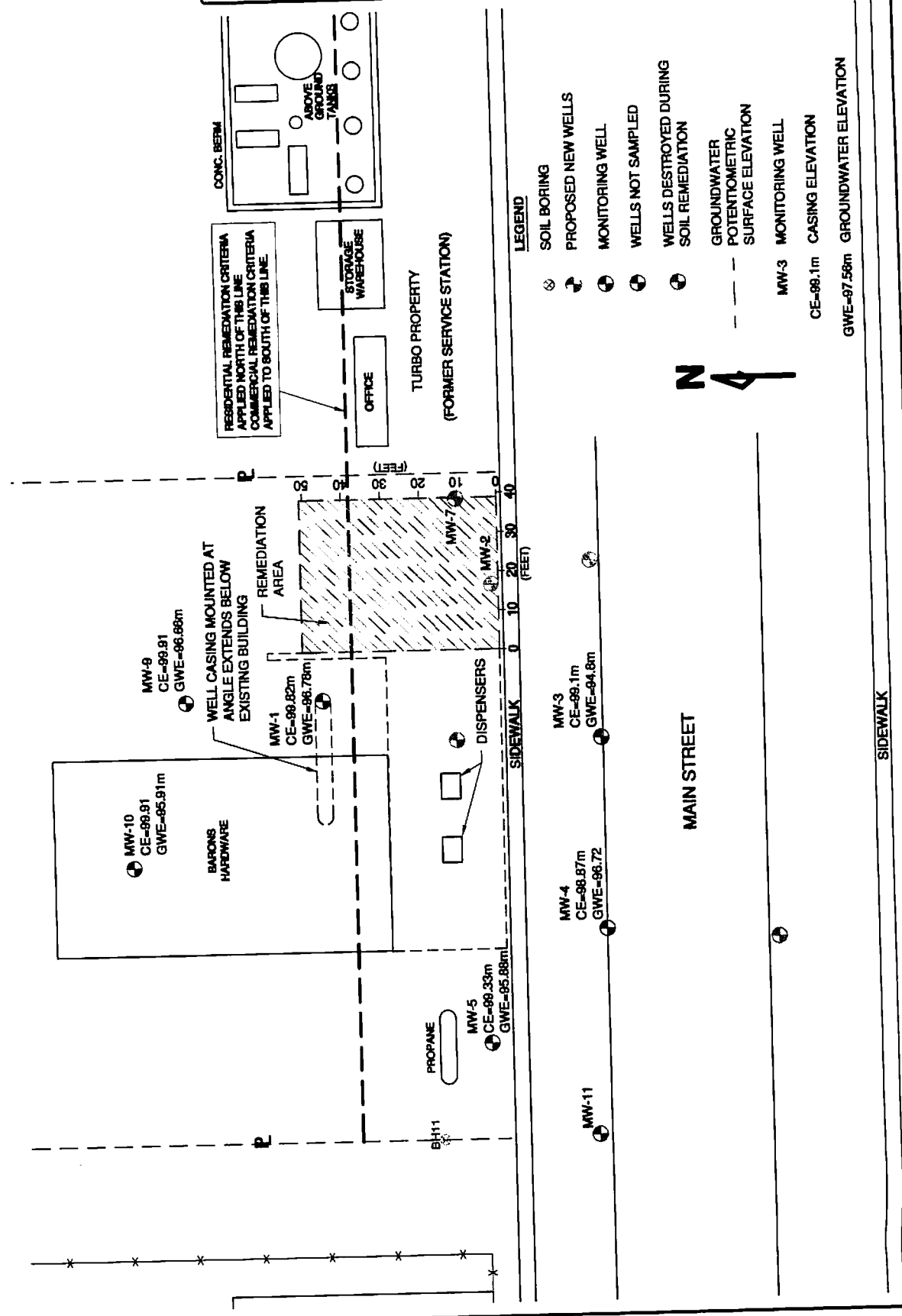
MARIE READ

BARONS HARDWARE

PROPOSED NEW WELLS LOCATIONS

H.E.	07186
M.D.	
H.E.	
H.E.	
H.E.	
APR. 25, 08	

FIG. 2



Appendix B

Analytical Reports

607183

Control Number **A034507**

Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Bodycote location and proper sampling protocol

Billing Address:		Copy of Report To:		Copy of Invoice: ☐	
Company: <i>Hasegawa Engineering</i>		Company:		Mail invoice to this address for approval ☐	
Address: <i>1220 31 St. N.</i>		Address:			
<i>Lethbridge</i>					
Attention: <i>Ryan</i>		Attention:		Report Results:	
Phone: <i>328-2686</i>		Phone:		Fax ☐	
Fax: <i>328-2728</i>		Fax:		Mail ☐	
Cell: <i>795-7506</i>		Cell:		Courier ☐	
e-mail:		e-mail:		e-mail ☐	
				e-Service ☐	
Report Results:					
Fax ☒					
Mail ☒					
Courier ☐					
e-mail ☐					
e-Service ☐					

Information to be Included on Report and Invoice Project ID: <i>Baron 5</i> Project Name: Project Location: Legal Location: PO#: Proj. Acct. Code: Agreement ID:	Rush Please contact the laboratory to confirm rush dates and times before submitting samples.	Sample Custody (Please Print) Sampled by: _____ Company <i>Hasegawa</i> Signature <i>[Signature]</i>
	Upon filling out this section, client accepts that surcharges will be attached to this analysis RUSH All analysis As indicated required on: ☐ or ☐ Date Required: _____ Signature: _____ Bodycote Authorization: _____	I authorize Bodycote to proceed with the work indicated on this form: Date: <i>12/3/08</i> Initial: <i>RS</i>
		Received by: <i>[Signature]</i> Sample Temp. _____ °C
		Waybill # _____ Date <i>Mar 13/08</i>
		Company _____ Time <i>3:24 pm</i>

Special Instructions / Comments							FOR LAB USE ONLY Condition of containers / coolers upon arrival at lab		☐ Check here if Bodycote is required to report results directly to a regulatory body (Please include contact information) ☐ Check here if you're testing POTABLE WATER for HUMAN CONSUMPTION.									
Please indicate which regulations you are required to meet: _____									Enter tests above (✓ relevant samples below)									
Sample Identification	Location	Depth IN CM M	Date/Time Sampled	Matrix	Sampling Method	Number of Containers												
1 <i>MW 1</i>						4												
2 <i>MW 3</i>						4												
3 <i>MW 4</i>						4												
4 <i>MW 5</i>						4												
5 <i>MW 9</i>						4												
6 <i>MW 10</i>						4												
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		



Hydrocarbon Chromatogram

Bill To: Hasegawa Engineering
Report To: Hasegawa Engineering

1220 - 31 Street North
Lethbridge, AB, Canada
T1H 5J8

Attn: Mike Oler

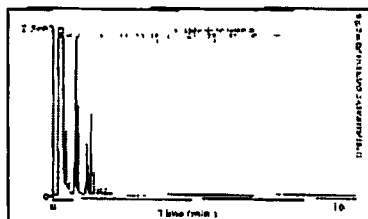
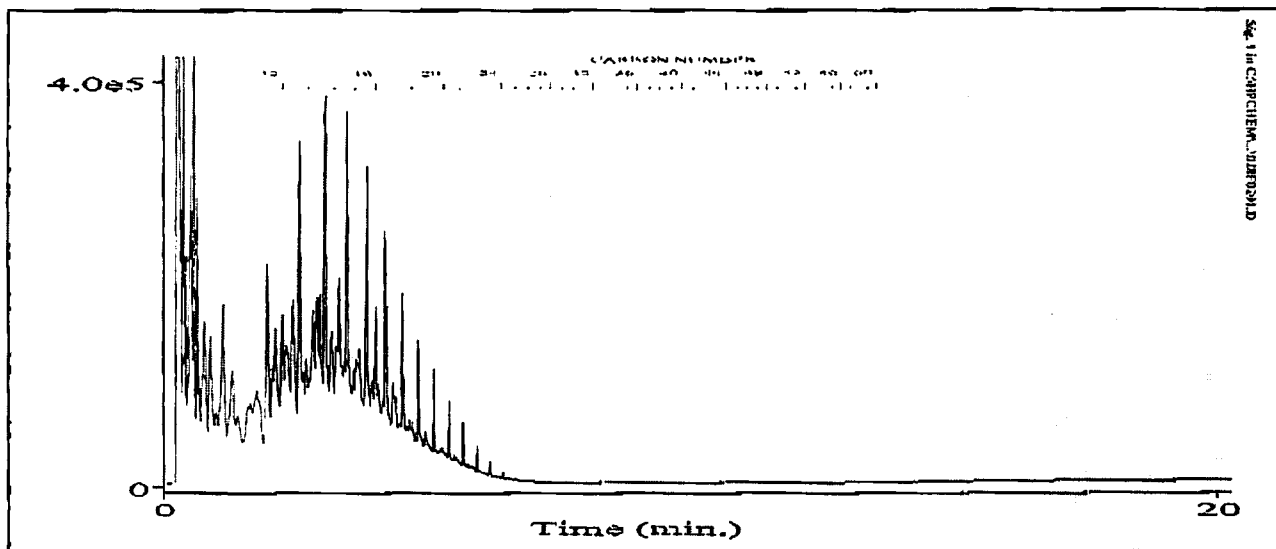
Sampled by:
Company:

Project ID:
Name: Barons
Location:
LSD:
P.O.:

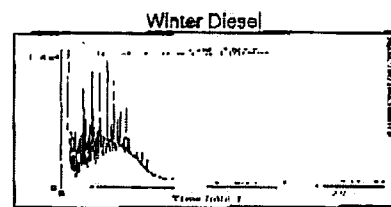
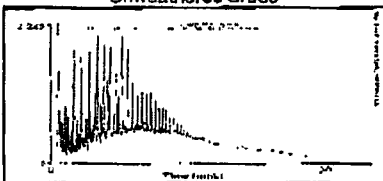
Lot ID: 607183
Control Number: A034507
Date Received: Mar 13, 2008
Date Reported:
Report Number:

NWL Number: 607183-2
Sample Date:

Sample Description: MW3



TYPICAL PRODUCT CHROMATOGRAMS
Unweathered Crude



Product Carbon Number Ranges

Hydrocarbon Assessment

Gasoline C4-C12
Vasol C8-C12

Kerosene C7-C16
Diesel C8-C22

Lubricating Oils C20-C40
Crude Oils C3-C60+

The chromatogram contains hydrocarbons in c8 to c24 range indicating the possible presence of diesel.