

Parks Canada Agency

ISSUED FOR USE

CONTAMINATED SITE ASSESSMENT  
INITIAL AND DETAILED TESTING PROGRAMS  
WOOD BUFFALO NATIONAL PARK  
VARIOUS LOCATIONS IN THE COMMUNITY OF GARDEN RIVER, ALBERTA

C22101178

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## EXECUTIVE SUMMARY

### Foreword

Parks Canada Agency (PCA) retained EBA Engineering Consultants Ltd. (EBA) to conduct a Phase II environmental site assessment (ESA) of various locations in the community of Garden River (part of Little Red River Cree Nation) located at the western edge of Wood Buffalo National Park in Alberta.

The objectives of the Phase II ESA were to characterize soil and groundwater quality at the subject site relative to potential sources of environmental impairment identified during a Phase I ESA conducted by EBA (March 2006), and a Phase I ESA conducted by AMEC Earth and Environmental (AMEC) (November 2006) for the subject site. This Phase II ESA was conducted in general accordance with the Canadian Standards Association (CSA) Standard Z769-00 (published in March 2000). The subject site includes the following locations:

1. Garden River Landfill.
2. Garden River Old Dump.
3. Former Septic Tile Field.
4. Garden River Airstrip.
5. Garden River Public Works Yard.
6. Fifth Meridian Market.
7. Northlands School Historic Above-ground Storage Tank (AST).
8. Church.
9. Garden River Trading (Charlie Rose).

The objectives of the Phase II ESA are as follows:

- To determine the hydrological parameters of the site.
- To determine/evaluate the extent and nature of soil and groundwater contamination identified by previous reports at the facilities and fuel storage sites.
- To evaluate the environmental condition of the sites subsurface, using the Federal Contaminated Sites Program.
- To provide information sufficient to develop a remediation action plan where required.

## Findings and Conclusions

### A. Hydrological Parameters

The soil at this site is generally composed of coarse-textured fluvial deposits from the nearby Peace River. The average hydraulic conductivity for groundwater at the site is approximately  $4 \times 10^{-6}$  m/s and the estimated linear flow velocity generally ranged from 0.4 m/year to 4.8 m/year. This site is considered to have a high potential for transport and leaching.

### B. Soil and Groundwater Quality

Soil samples collected from the Former Septic Tile Field, Fifth Meridian Market and Northlands School Historic AST, Church, and Garden River Trading (Charlie Rose) assessment areas met 2007 Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health and/or 2008 Alberta Tier 1 Soil and Groundwater Remediation Guidelines (residential/parkland, coarse-textured surface soils). One soil sample collected at a depth of 7.6 m in the Garden River Old Dump exceeded the applicable guideline for selenium.

One surface soil sample collected from the Garden River Landfill, near scrapped cars on the northern boundary, exceeded the applicable guidelines for petroleum hydrocarbon (PHC) fraction F3 and copper. The detected concentrations were approximately three times greater than the applicable guidelines. Groundwater samples from this assessment area exceeded applicable guidelines for pyrene, benzo(a)anthracene, cadmium, manganese, selenium, and zinc.

One soil sample collected from the Garden River Airstrip, adjacent to fuel drums near the eastern end, exceeded the applicable guidelines for PHC fractions F1 and F2. This sample had a high combustible vapour concentration (CVC) [5% lower explosive limit (LEL), Table 1]. Groundwater samples from this assessment area exceeded applicable guidelines for cadmium, iron, manganese, selenium, and zinc.

Ten soil samples collected from the Garden River Public Works Yard exceeded applicable guidelines for one or more PHC fractions F1, F2, F3, and F4. The samples were collected east and south of the Public Works building adjacent to the waste oil AST and the propane tanks, north of the Public Works trailer near the propane tank and barrel storage areas, and in the equipment parking area. The groundwater sample collected adjacent to the barrel storage area had high concentrations of iron and manganese.

Groundwater samples collected from Garden River Old Dump, Northlands School Historic AST, Former Septic Tile Field, Garden River Trading (Charlie Rose) AST, and Fifth Meridian Market AST exceeded applicable guidelines for one or more of cadmium, iron, manganese, selenium, and zinc. Most exceedances were low except for the Garden River Old Dump, which had high exceedances for cadmium, iron, manganese, selenium, and zinc, and the Northlands School Historic AST area which had a high exceedance for manganese.

### C. National Classification System for Contaminated Sites (NCSCS)

- The Public Works Yard has a total NCSCS score of 75.8 and is ranked as a Class 1 Site, which has a high priority for action.
- The Garden River Airstrip has a total NCSCS score of 75.2 and is ranked as a Class 1 Site, which has a high priority for action.
- The Garden River Landfill has a total NCSCS score of 68.5 and is ranked as a Class 2 Site, which has a medium priority for action.
- The Garden River Old Dump has a total NCSCS score of 63.9 and is ranked as a Class 2 Site, which has a medium priority for action.
- The Northlands School Historic AST has a total NCSCS score of 52.1 is ranked as a Class 2 Site, which has a medium priority for action.
- The Former Septic Field has a total NCSCS score of 50.5 and is ranked as a Class 2 Site, which has a medium priority for action.
- The Garden River Trading (Charlie Rose) AST has a total NCSCS score of 47.2 and is ranked as a Class 3 Site, which has a low priority for action.
- The Fifth Meridian Market AST has a total NCSCS score of 47.2 and is ranked as a Class 3 Site, which has a low priority for action.
- The Church Historic AST was not assessed using NCSCS since there were no detected exceedances.

### Recommendations

Guidance for landfill operations is available from Alberta Environmental (AENV) Protection Code of Practice for Landfills. For this site, EBA recommends that the solid waste material, which is encountered within the upper metre of the area of the current and former landfill locations, should be sealed/capped by means of placing impermeable soil/material on the surface of the same areas. Furthermore, the mentioned solid waste materials should be removed out of proposed building footprints prior to any future development of the landfill locations.

Soil with PHC impacts is found at nine assessment locations in Garden River Public Works Yard. These corresponded to locations with present waste oil AST, propane tanks, and equipment storage and use. EBA's proposed drilling plan was limited by site conditions; therefore, only estimates of the area and volume of impacted soil can be made. The area of soil with PHC impacts was estimated to be 1,800 m<sup>2</sup>. The volume of impacted soil estimated to be approximately 4,000 m<sup>3</sup>. A remediation action plan (RAP), which is included in Appendix D, is proposed for this volume of impacted soil in the Public Works Yard.

Soil with PHC impacts at the Garden River Airstrip is associated with fuel storage at the eastern edge of the airstrip and likely represents small isolated spills related to refuelling. The volume of impacted soil is estimated to be approximately 500 m<sup>3</sup>. A RAP, which is included in Appendix E, is proposed for this volume of impacted soils at the Airstrip.

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## 1.0 INTRODUCTION

### 1.1 GENERAL

Parks Canada Agency (PCA) retained EBA Engineering Consultants Ltd. (EBA) to conduct a contaminated site assessment of the Garden River Indian Reserve (part of Little Red River Cree Nation) located at the western edge of Wood Buffalo National Park in Alberta.

The objectives of the assessment were to characterize soil and groundwater quality at the subject site relative to potential sources of environmental impairment identified during a Phase I environmental site assessment (ESA) conducted by EBA in March 2006, followed by a Phase I ESA conducted by AMEC Earth and Environmental (AMEC) in November 2006 (see Section 2.0). The contaminated site assessment was conducted in general accordance with the Canadian Standards Association (CSA) Standard Z769-00 (published in March 2000).

EBA understands the contaminant assessment being conducted as a part of PCA's due diligence.

### 1.2 AUTHORIZATION

Ms. Naomie Fevry, contracts and material management officer with PCA, provided written authorization to proceed with the present study to Mr. Nayef Mahgoub of EBA on December 14, 2007.

### 1.3 QUALIFICATIONS OF ASSESSORS

Mr. Jack Sambirsky, Dip. CCEP, supervised the drilling and monitoring well installation, and conducted the soil and groundwater monitoring/sampling activities on site. Mr. Sambirsky is an environmental technologist for EBA's Calgary operations and has over 10 years of experience in environmental consulting.

Ms. Cathy Hamlen, Ph.D., A.Ag., interpreted the results and prepared the report. Ms. Hamlen is a soil scientist with a Ph.D. in soil physics from the University of Guelph. Ms. Hamlen has 5 years consulting experience in Alberta.

Mr. Nayef Mahgoub, P.Eng., interpreted the results and reviewed the report. Mr. Mahgoub is a project engineer for EBA's environment practice and has over 12 years of experience in environmental consulting. He is registered as a Professional Engineer in Alberta and Ontario.

Mr. Herb Ziervogel, P.Eng., conducted the final report review. Mr. Ziervogel is a senior environmental engineer with a degree in geological engineering from the University of Manitoba. Mr. Ziervogel has over 19 years of experience in geo-environmental and ESAs. He is registered as a Professional Engineer in Alberta, Northwest Territories, and Nunavut.

## 1.4 BACKGROUND AND SITE DESCRIPTION

The subject site comprised various locations in the community of Garden River, located within the western section of Wood Buffalo National Park, Alberta. The main community is situated in Township 111 and Township 112, Range 24, West of the Fourth Meridian. The area of the site is approximately 36 km<sup>2</sup>.

The subject site is a mixture of residential, commercial, and institutional properties within the Reserve. Figure 1 shows the site location plan and Figure 2 shows the general site plan.

## 1.5 PREVIOUS ASSESSMENTS

EBA completed a Phase I ESA for the subject site in March 2006. AMEC completed a Phase I ESA in November 2006. Based on the results of both Phase I ESA studies, EBA assessed the potential for on-site and off-site impacts. Table A presents the potential on-site environmental concerns identified during the Phase I ESAs conducted for the site.

TABLE A: POTENTIAL ON-SITE SOURCE SUMMARY			
No.	Potential On-site Source	Information Source	EBA Evaluation
1	Garden River Public Works Yard	Observation during site inspection.	Potential to impact soil and groundwater quality at the subject site, due to hydrocarbon product storage, above-ground storage tank (AST) with staining in its vicinity, used batteries, and boneyard.
2	Fifth Meridian AST and former AST	Observation during site inspection.	Potential to impact soil and groundwater quality at the subject site due to former storage tank, as well as present AST containing gasoline.
3	Signs of surficial stains near the Church/Historic AST	Observation during site inspection.	Potential to impact soil and groundwater quality at the subject site due to former fuel storage tank.
4	Garden River Trading (Charlie Rose) AST	Observation during site inspection.	Potential to impact soil and groundwater quality at the subject site due to AST containing gasoline.
5	Historical ASTs at the Old Northland School	Observation during site inspection.	Potential to impact soil and groundwater quality at the subject site due to former storage tank.
6	Garden River Airstrip fuel drum storage	Observation during site inspection.	Potential to impact soil and groundwater quality at the subject site due to jet fuel drum storage.
7	Historic Septic Tile Field east of St. Gloria School	Observation during site inspection.	Potential to impact soil and groundwater quality at the subject site from nutrients, coliforms, total dissolved solids (TDS), and chemical oxygen demand (COD).

**TABLE A: POTENTIAL ON-SITE SOURCE SUMMARY (CONTINUED)**

No.	Potential On-site Source	Information Source	EBA Evaluation
8 and 9	Garden River Landfill and Garden River Old Dump	Observation during site inspection	Potential to impact soil and groundwater quality at the subject site due to landfill leachate.
10	Former ATCO power plant	Observation during site inspection	Large area has been excavated and this is likely due to contamination present at the site.

Table B presents the potential off-site environmental concerns identified during the Phase I ESAs.

**TABLE B: POTENTIAL OFF-SITE SOURCE SUMMARY**

No.	Potential Off-site Source	Information Source	EBA Evaluation
1	New ATCO power plant site	Observations during site inspection.	Potential to impact soil and groundwater quality at the subject site due to hydrocarbon product storage and/or handling; the site is very new and unlikely to be a present concern.

EBA sampled surface soil at 10 locations during the Phase I ESA with locations and UTM coordinates as follows:

Location	UTM Coordinate (12U)	Tests
Diesel Tank Public Works Yard	0333994/6511561	BTEX, F1 to F4
Oil Drums Public Works Yard	0333996/6511583	BTEX, F1 to F4
Boneyard Public Works Yard	0334030/6511554	Metals
Drum Storage Airport	0333816/6511750	BTEX, F1 to F4
Drum Storage Airport	0333918/6511750	BTEX, F1 to F4
Drum Storage Airport	0333973/6511751	BTEX, F1 to F4
Drum Storage Airport	0333973/6511798	BTEX, F1 to F4
Battery Storage Public Works Yard	0334012/6511588	Metals
Fifth Meridian Market AST	0332983/ 6510560	BTEX, F1 to F4
Charlie Rose AST	0333007/ 6510476	BTEX, F1 to F4

Three soil samples exceeded the applicable criteria for hydrocarbons and one soil sample exceeded the CCME residential criteria for nickel (sample 3 with nickel concentration of 180 mg/kg). Hydrocarbon results are presented in Table C as follows:

TABLE C: HYDROCARBON CONCENTRATIONS IN SOIL									
Sample	Location	Benzene (ppm)	Toluene (ppm)	Ethyl-benzene (ppm)	Xylenes (ppm)	F1	F2	F3	F4
1	Diesel Tank PW	<0.05	<b>0.24</b>	<0.1	<b>40</b>	<b>1,500</b>	<b>22,000</b>	<b>15,000</b>	<5
2	Oil Drums PW	<0.005	<0.01	<0.01	<0.01	<5	<b>490</b>	<b>38,000</b>	<b>9,900</b>
4	Drum Storage	<0.005	<0.01	<0.01	<0.01	<5	<5	24	<5
5	Drum Storage	<0.005	<0.01	<0.01	<0.01	<5	<5	5	<5
6	Drum Storage	<0.005	<0.01	<0.01	<0.01	<5	41	7	<5
7	Drum Storage	<b>0.15</b>	<b>20</b>	<b>8.9</b>	<b>420</b>	<b>6,200</b>	<b>6,100</b>	27	18
9	Fifth Meridian AST	0.006	0.05	<0.01	0.16	<5	9	260	55
10	Charlie Rose AST	<0.005	<0.01	<0.01	0.02	<5	9	140	21
Coarse-grained Alberta Tier 1 Natural Area		0.13	0.16	0.36	49	130	230	400	2,800
Coarse-grained Alberta Tier 1 Residential		0.048	0.16	0.36	14	30	150	400	2,800
<b>Bold:</b> Exceeds one or more criteria for coarse-grained surface soil									

EBA also recommended the following for consideration:

- If abandoned water wells are located on the subject site, then they must be decommissioned in accordance with current regulations prior to site development.
- Organic materials have the potential to generate methane gas. Therefore, these materials should be removed (i.e., low lying areas, historical drainage channels) off site.

Based on the concerns identified during the Phase I ESA investigations, EBA and AMEC recommended that further environmental investigation of the potential on-site and off-site sources was warranted. PCA indicated that possible impacts associated with the former/new ATCO power plant sites (No. 10 of Table A and No. 1 of Table B) were remediated and reported on by others; therefore, the ATCO power plants will not be addressed in further environmental investigations. As a result, it was agreed that only nine locations, out of the total of 11 locations listed in Table A and Table B, will be addressed by this investigation.

## 2.0 SCOPE OF WORK AND METHODS

The scope of work was based on proposals submitted to PCA, dated November 2007 and May 2008 (EBA File: PC22101178).

The objectives of the contaminated site assessment are:

- To determine/evaluate the extent and nature of potential soil and groundwater contamination identified by previous reports at the facilities and fuel storage locations;
- To determine the hydrological parameters of the site;
- To evaluate the environmental condition of the subsurface, using the Federal Contaminated Sites Program, including the National Classification System (NCS) [formerly the Federal Contaminated Sites Action Plan (FCSAP)] scores; and
- To provide information sufficient to develop a remediation action plan (RAP) for the site where required.

The objectives were based on the findings of previous Phase I ESAs and discussions with PCA personnel. Investigation of the potential for organic containing materials in low lying areas (i.e., sloughs) was not considered as part of this investigation.

### 2.1 CONTAMINATED SITE ASSESSMENT SCOPE OF WORK

To meet the objectives stated in Section 2.0, the scope of work for the contaminated site assessment included the following tasks:

- Prepared a work plan outlining the required tasks;
- Conducted an on-site tailgate safety meeting and a pre-job hazard assessment (PJHA) prior to any fieldwork;
- Coordinated utility locates (above-ground utilities and underground utilities) using Alberta One-Call, Shaw Cable, and a private utility locator;
- Coordinated borehole drilling (27) and monitoring well installation (23) within a selection of the boreholes;
- Conducted surface soil sampling (34) at various locations;
- Conducted soil field screening and sampling for laboratory analysis;
- Conducted groundwater field screening and sampling;
- Submitted soil samples and groundwater samples to a laboratory for chemical analyses;
- Coordinated the surveying of the groundwater monitoring wells;
- Conducted K tests on three groundwater monitoring wells;
- Conducted a basic site sensitivity analyses to determine the appropriate environmental guidelines that apply to the subject site;

- Interpreted the collected data; and
- Prepared this contaminated site assessment report.

The laboratory analyses were completed by ALS Laboratory Group (ALS) of Calgary, Alberta.

## 2.2 METHODS

Table D summarizes the drilling and soil and groundwater sampling methods, depths, analyses, and sample locations for each of the nine assessment locations of the subject site.

**TABLE D: DRILLING PROGRAM – APPROACH AND ANALYTICAL REQUIREMENTS FOR MARCH AND AUGUST 2008 FIELDWORK**

Project Objective	Approach	Boreholes, Monitoring Wells, Soil Samples			Analytical Requirements		
		Total Number of Boreholes	Number of Boreholes Completed as Wells	Number of Surface Soil Samples	Analyses	Number of Soil Samples	Number of Groundwater Samples
Characterization of soil and groundwater on the subject site due to the use as Garden River Landfill (FCSI No. 00022827).	Drilling boreholes with monitoring well installations, and collecting surface soil samples.	3	3 (08MW01, 08MW02, 08MW03)	5 (08SS24, 08SS25, 08SS26, 08SS27, 08SS28)	Metals	10†	6
					Petroleum hydrocarbons (PHCs) including benzene, toluene, ethylbenzene, and xylenes (BTEX), F1 (C <sub>6</sub> to C <sub>10</sub> ), F2 (C <sub>11</sub> to C <sub>16</sub> ), F3 (C <sub>17</sub> to C <sub>34</sub> ), and F4 (C <sub>35</sub> and greater), VOC, PAH.	11	6
					Detailed salinity/routine water chemistry	6	6
					Particle size	1	N/A
Characterization of soil and groundwater on the subject site due to the use as Garden River Old Dump (FCSI No. 15841002).	Drilling boreholes with monitoring well installations, and collecting surface soil samples.	6	6 (08MW04, 08MW04B, 08MW05A, 08MW05B, 08MW06A, 08MW06B)	5 (08SS45, 08SS46, 08SS47, 08SS48, 08SS49)	Metals	10†	6
					PHCs including BTEX, F1 (C <sub>6</sub> to C <sub>10</sub> ), F2 (C <sub>11</sub> to C <sub>16</sub> ), F3 (C <sub>17</sub> to C <sub>34</sub> ), and F4 (C <sub>35</sub> and greater), VOC, PAH.	11	6
					Detailed salinity/routine water chemistry	7	6
					Particle size	2	N/A

TABLE D: DRILLING PROGRAM – APPROACH AND ANALYTICAL REQUIREMENTS (CONTINUED)

Project Objective	Approach	Boreholes, Monitoring Wells, Soil Samples			Analytical Requirements		
		Total Number of Boreholes	Number of Boreholes Completed as Wells	Number of Surface Soil Samples	Analyses	Number of Soil Samples	Number of Groundwater Samples
Characterization of soil and groundwater on the subject site due to the Former Septic Tile Field (FCSI No. 00022830).	Drilling boreholes with monitoring well installations, and collecting surface soil samples.	4	4 (08MW07A, 08MW07B, 08MW08, 08MW09)	5 (08SS50, 08SS51, 08SS52, 08SS53, 08SS54)	Metals	11†	5
					PHCs including BTEX, F1 (C <sub>6</sub> to C <sub>10</sub> ), F2 (C <sub>11</sub> to C <sub>16</sub> ), F3 (C <sub>17</sub> to C <sub>34</sub> ), and F4 (C <sub>35</sub> and greater)	12	3
					Detailed salinity/routine water chemistry	7	5
					Particle size	1	N/A
Characterization of soil and groundwater due to the use as Garden River Airstrip (FCSI No. 00022199).	Drilling boreholes with monitoring well installations, and collecting surface soil samples.	3	3 (08MW10, 08MW11, 08MW12)	8 (08SS29, 08SS30, 08SS31, 08SS32, 08SS33, 08SS34, 08SS35, 08SS36)	Metals	15†	5
					PHCs including BTEX, F1 (C <sub>6</sub> to C <sub>10</sub> ), F2 (C <sub>11</sub> to C <sub>16</sub> ), F3 (C <sub>17</sub> to C <sub>34</sub> ), and F4 (C <sub>35</sub> and greater)	15	3
					Detailed salinity/routine water chemistry	1	5
					Particle size	3	N/A

TABLE D: DRILLING PROGRAM – APPROACH AND ANALYTICAL REQUIREMENTS (CONTINUED)

Project Objective	Approach	Boreholes, Monitoring Wells, Soil Samples			Analytical Requirements		
		Total Number of Boreholes	Number of Boreholes Completed as Wells	Number of Surface Soil Samples	Analyses	Number of Soil Samples	Number of Groundwater Samples
Characterization of soil and groundwater due to the use as Garden River Public Works Yard (FCSI No. 00022200).	Drilling boreholes with monitoring well installation, and collecting surface soil samples.	4	4 (08MW20, 08MW21, 08MW22, 08MW23)	8 (08SS37, 08SS38, 08SS39, 08SS40, 08SS41, 08SS42, 08SS43, 08SS44)	Metal(s)	11†	4
					PHCs including BTEX, F1 (C <sub>6</sub> to C <sub>10</sub> ), F2 (C <sub>11</sub> to C <sub>16</sub> ), F3 (C <sub>17</sub> to C <sub>34</sub> ), and F4 (C <sub>35</sub> and greater)	17	5
					Detailed salinity/routine water chemistry	4	4
					Particle size	3	N/A
Characterization of soil and groundwater on the subject site due to the Fifth Meridian Market AST (FCSI No. 00022201) and Northlands School Historic AST (FCSI No. 00022828).	Drilling boreholes with monitoring well installations, and collecting surface soil samples.	4	2 (08MW16, 08MW18)	3 (08SS55, 08SS56, 08SS57)	Metals	8†	2
					PHCs including BTEX, F1 (C <sub>6</sub> to C <sub>10</sub> ), F2 (C <sub>11</sub> to C <sub>16</sub> ), F3 (C <sub>17</sub> to C <sub>34</sub> ), and F4 (C <sub>35</sub> and greater)	11	2
					Detailed salinity/routine water chemistry	2	2
					Particle size	1	N/A

TABLE D: DRILLING PROGRAM – APPROACH AND ANALYTICAL REQUIREMENTS (CONTINUED)

Project Objective	Approach	Boreholes, Monitoring Wells, Soil Samples			Analytical Requirements		
		Total Number of Boreholes	Number of Boreholes Completed as Wells	Number of Surface Soil Samples	Analyses	Number of Soil Samples	Number of Groundwater Samples
Characterization of soil due to the Church Historic AST.	Drilling borehole and collecting surface soil samples.	1	None	2 (08SS61, 08SS62)	Metals	3†	None
					PHCs including BTEX, F1 (C <sub>6</sub> to C <sub>10</sub> ), F2 (C <sub>11</sub> to C <sub>16</sub> ), F3 (C <sub>17</sub> to C <sub>34</sub> ), and F4 (C <sub>35</sub> and greater)	4	None
					Detailed salinity/routine water chemistry	2	None
					Particle size	1	N/A
Characterization of soil and groundwater due to the Garden River Trading (Charlie Rose) AST (FCSI No. 00022202).	Drilling boreholes with monitoring well installation, and collecting surface soil samples.	2	1 (08MW14)	2 (08SS59, 08SS60)	Metal(s)	3†	1
					PHCs including BTEX, F1 (C <sub>6</sub> to C <sub>10</sub> ), F2 (C <sub>11</sub> to C <sub>16</sub> ), F3 (C <sub>17</sub> to C <sub>34</sub> ), and F4 (C <sub>35</sub> and greater)	5	1
					Detailed salinity/routine water chemistry	1	1
					Particle size	2	N/A
Notes: † Includes samples for lead analysis only.							

## 2.2.1 Utility Locates

EBA coordinated utility locates for the assessment locations listed in Table D (Drilling Program) of Section 2.2, using private and public utility locators. The client representatives and Public Works personnel identified above-ground and underground facilities including, but not limited to, pipelines, telecommunications lines, power lines, and potential buried objects. Facility locating was completed prior to EBA beginning any ground disturbance activity at the site.

Line locates were completed for the Garden River Landfill, Garden River Old Dump, Former Septic Tile Field, and Garden River Airstrip on March 17, 2008. These locations were assessed during the winter drilling program.

Line locates were completed for the Garden River Public Works Yard, Fifth Meridian Market and Northlands School, the Church, and the Garden River Trading (Charlie Rose) on August 25, 2008. These locations were assessed during the summer drilling program. According to Garden River Public Works personnel, underground water and sewer lines made of polyvinyl chloride (PVC) without attached tracing wires would be found in these assessment locations. Since contact with one of these PVC lines was possible, a stand-by plumber and assistant were present on site with required repair equipment and materials during the summer drilling program.

## 2.2.2 On-site Safety Meeting and Pre-job Hazard Assessment (PJHA)

EBA conducted tailgate safety meetings with all contractors on site, which included a PJHA, prior to initiating work at the subject site.

## 2.2.3 Drilling and Groundwater Monitoring Well Installation Program

Mobile Augers and Research Ltd. (Mobile Augers) of Edmonton, Alberta, drilled 16 boreholes between March 18, 2008 and March 22, 2008 (winter drilling program) and 11 boreholes between August 26, 2008 and August 27, 2008 (summer drilling program). Boreholes were drilled using a 15 cm diameter solid stem augers to a maximum depth of 11.4 m below grade (mbg). EBA logged soils according to the Unified Soil Classification System (USCS), with additional comments on combustible vapour concentrations (CVCs), and unusual stains and/or debris. The on-site personnel did not smell the soil in accordance with EBA's Safe Work Policy. Figure 2 shows a site plan of the community features and assessment areas listed in Table D. Figure 3 through Figure 10 show site plans of each assessment area with the approximate locations of the monitoring wells, boreholes, and surface soil samples. The borehole logs and a key to the USCS are presented in Appendix A.

EBA installed groundwater monitoring wells in 23 of the 27 boreholes. A slotted 51 mm PVC standpipe was inserted from the bottom of the borehole to between approximately 3.1 mbg to 8.2 mbg, and solid PVC pipe was used for the remainder of the well to the surface. Silica sand was placed in the borehole annulus from the base of the borehole to

0.3 m above the slotted interval of the standpipe. To reduce the possibility of inflow of surface water into the standpipe, the annulus of each monitoring well, above the slotted section, was sealed with bentonite chips to grade. Sand was placed above the bentonite to surface and the monitoring wells were secured with a stick up steel casing founded in concrete. The well completion details are summarized in the borehole logs presented in Appendix A.

## 2.2.4 Field Screening

Soil samples were generally collected from the auger at regular intervals (approximately 0.5 m) and/or at changes in soil stratigraphy. Bagged soil samples were screened for CVCs using a GasTech TankTechtor™ (GasTech™) portable gas detector calibrated to hexane and operated in methane elimination mode.

## 2.2.5 Soil Sampling and Analytical Testing

Based on the measured soil CVCs and visual observations made during drilling, soil samples were selected and placed in laboratory supplied 250 mL glass jars with Teflon™-lined lids, kept on ice in coolers, and transported to ALS Laboratories in Edmonton under chain-of-custody (CoC) for laboratory analyses.

The analytical program was developed based on the findings of a Phase I ESA conducted by EBA for the subject site dated March 2006 (EBA File: 5101390), and the findings of a Phase I ESA conducted by AMEC for the subject site dated November 2006. The soil analytical results are summarized in Table 1 and are discussed in Section 3.3.1. The analytical methodologies are referenced with ALS laboratory reports in Appendix B. The reader is directed to these references for further details on specific analytical methods. The soil samples were analyzed for the parameters as indicated in Table D, Section 2.2.

## 2.2.6 Groundwater Monitoring, Sampling, and Analytical Testing

Groundwater monitoring wells were surveyed by Maltais Geomatics. Elevations are geodetic ground and are referred to ASCM 889402, and coordinates are UTM Zone 11 (NAD'83). All monitoring wells were surveyed to determine the relative groundwater elevations and groundwater flow direction.

On March 21, 2008 and August 29, 2008, EBA monitored the groundwater monitoring wells for well headspace CVCs and liquid levels. CVCs were measured using a GasTech™ Model 1238 ME (operated in methane elimination mode calibrated to hexane). Groundwater levels were measured using a Heron interface probe. Monitoring results are presented in Table 2 and discussed in Section 3.2.

Subsequent to monitoring, the groundwater monitoring wells were purged to a minimum of three well volumes, or until dry, and allowed to recover prior to sampling. Groundwater samples were collected on March 24, 2008 and August 29, 2008 using dedicated disposable bailers, stored in laboratory supplied containers, appropriately field

filtered and preserved, and kept cool in a cooler. The samples were transported to ALS under CoC.

EBA developed the analytical testing program based on the recommendations from the 2006 EBA Phase I ESA and 2006 AMEC Phase I ESA. Groundwater analytical results are summarized in Table 3 and discussed in Section 3.3.2. The analytical methodologies are referenced with ALS's laboratory reports in Appendix B.

## 2.2.7 Reference Guidelines

Laboratory results for soils parameters were compared to the Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (CCME, 2007) and to Alberta Environment (AENV) Alberta Tier 1 Soil and Groundwater Remediation Guidelines (AENV, 2008) for residential/parkland land use. Soil samples were submitted for particle size analysis to establish whether the surface soils are fine or coarse textured (Section 3.3.1).

Laboratory results for groundwater parameters were compared to the Health Canada Guidelines for Canadian Drinking Water Quality (CDWQ) – Summary Table (Health Canada, 2008), CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2007), and to AENV Tier 1 Soil and Groundwater Remediation Guidelines (AENV, 2008) for residential/parkland land use.

## 2.2.8 Quality Assurance/Quality Control (QA/QC) Methods

EBA's soil and groundwater quality assurance/quality control (QA/QC) procedures include reviewing the data collected for appropriateness and completeness, following the appropriate field protocol.

The field procedures for QA/QC involved the following:

- Soils:
  - Changing nitrile gloves between sample collections.
  - Using sample containers provided by the laboratory.
  - Filling sample containers for PHC and volatile organic compound (VOC) analysis with minimal headspace (air) when the containers were closed.
  - Documenting field and sampling activities.
- Groundwater:
  - Using a dedicated disposable bailer for each monitoring well to collect groundwater samples.
  - Changing nitrile gloves between wells.
  - Using sample containers provided by the laboratory.

- Filling the sample bottles supplied by ALS directly from the bailer, minimizing air contact. Sample containers for PHCs and VOCs were filled with no headspace (air bubbles) when the containers were closed. The samples were filtered and preserved, if required, according to the laboratory instruction.
- Documenting field and sampling activities.

EBA also verified QA/QC of ALS by submitting duplicate samples for soil analyses and groundwater analyses.

## 3.0 RESULTS

### 3.1 FIELD OBSERVATIONS

This section describes the field observations noted during drilling, soil sampling, site monitoring, and groundwater sampling. Figure 2 shows the Garden River Site Plan and eight assessment areas (one assessment area shows two locations, the Fifth Meridian market and the Northlands School Historic AST). Figure 3 through Figure 10 display each assessment area and show the locations of borehole and/or monitoring well and surface samples.

Soil analytical laboratory data is presented in Table 1, groundwater monitoring data is presented in Table 2, and groundwater analytical laboratory data is presented in Table 3. Borehole logs and well completion details are given in Appendix A. Table A4 at the end of Appendix A summarizes details of the surface soil samples collected on August 26, 2008 and August 27, 2008. Appendix B provides ALS certificates of analysis for soil and groundwater.

#### 3.1.1 Soil Stratigraphy and Observations

The stratigraphy observed at assessment locations north of Garden Creek (at the Garden River Landfill, Old Dump, Public Works Yard, Airstrip, and Former Septic Tile Field) is generally between 1 m and 5 m of sand, overlying a clayey silt layer (approximately 0.25 m thick), overlying sand. Note that the upper 1 m depth of soil at the Garden River Landfill (08MW01 to 08MW03) contained solid waste (e.g., wires, glass, plastic, wood), and lumber was found in the upper 3 m depth of the Garden River Old Dump (08MW04 and 08MW05). No soil staining was encountered within the indicated boreholes, but oil staining was observed in the Garden River Public Works Yard.

The stratigraphy observed at assessment locations south of Garden Creek (at the Fifth Meridian Market and former Northlands School, the Church, and the Garden River Trading – Charlie Rose) was generally clayey silt deposits to approximately 4 m depth, overlying sand deposits. No soil staining was encountered on these areas.

### 3.1.2 Soil Vapour Concentrations

The CVC readings were used to screen for PHCs in soil. The CVCs for each soil sample are noted on the borehole logs and the table summarizing surface soil samples (Table A4 of Appendix A). Most CVCs measured in the field ranged from less than the instrument detection limit to 100 parts per million (ppm). The highest CVC, 5% lower explosive limit (LEL), was measured in a surface soil sample (08SS36) collected from the eastern end of the Garden River Airstrip, where fuel drums were located. EBA personnel could not avoid noticing a diesel smell at this location. A stained surface soil sample (08SS41) collected from the Public Works Yard, north of the waste oil ASTs, had a CVC of 500 ppm. Soil samples from these locations were selected for laboratory analysis.

The CVCs measured below 6 mbg in the Fifth Meridian Market and Historic Northlands School assessment areas were generally 200 ppm to 325 ppm. At the nearby Church assessment area, the maximum CVC was 200 ppm at 4.3 mbg. Soil samples were selected for laboratory analysis.

## 3.2 GROUNDWATER MONITORING

The CVCs measured in the headspace of the monitoring wells were used to screen for VOC in groundwater. The CVC values were generally 50 ppm or less (Table 3). The maximum CVC, 125 ppm (08MW21), and the second highest, 100 ppm (08MW22), were measured in Garden River Public Works Yard. Another CVC of 100 ppm (08MW16) was measured in the Fifth Meridian Market area.

Groundwater levels in 08MW01 through 08MW12 were measured on March 21, 2008 and on August 29, 2008 (Table 2). In 08MW14 through 08MW23, groundwater levels were measured only on August 29, 2008, following installation of these wells during the summer drilling program. The water levels were very similar or identical between the two monitoring events. Groundwater levels ranged from 9.66 mbg (08MW01) to 5.57 mbg (08MW02). Throughout the site, groundwater ranged from a highest elevation of 234.86 m at the Garden River Landfill of (08MW02) to a lowest elevation of 226.55 m near the banks of Peace River (08MW14). Free phase hydrocarbons or sheen was not detected in any monitoring well during monitoring, purging, or sampling activities.

Groundwater contours are displayed on Figure 3 through Figure 6 (the Garden River Landfill, Garden River Old Dump, Former Septic Tile Field, and the Garden River Airstrip locations, respectively). These contour maps were prepared based on the groundwater elevation information obtained on March 21, 2008 (Table 2). At Garden River Landfill, the interpreted direction of groundwater flow is to the northeast. At the Garden River Old Dump, the flow is to the south, towards the Peace River. At the Former Septic Tile Field, it is to the east. At the Garden River Airstrip, it is to the west. Groundwater elevations were measured only few days after monitoring well installation; therefore, it is possible that groundwater levels in the wells has not yet reached equilibrium and that the interpreted groundwater flow direction may not reflect stable conditions. The estimated hydraulic gradients at these sites are presented in Table E.

TABLE E: K TEST RESULTS AND INTERPRETATIONS

Monitoring Well	Hydraulic Gradient (m/m)	Hydraulic Conductivity (m/s)		Estimated Linear Flow Velocity <sup>1</sup> (m/yr)
		Bouwer and Rice	Hvorslev	
08MW01	0.1	$1.12 \times 10^{-6}$	$1.98 \times 10^{-6}$	59.8
08MW06B	0.001	$1.58 \times 10^{-6}$	$2.46 \times 10^{-6}$	0.4
08MW07B	0.003	$2.71 \times 10^{-6}$	$4.84 \times 10^{-6}$	2.3
08MW10	0.007	$5.83 \times 10^{-7}$	$1.37 \times 10^{-6}$	1.5
08MW20	0.008	$7.01 \times 10^{-6}$	$3.82 \times 10^{-6}$	4.8
<b>Notes:</b>				
<sup>1</sup> Estimated using the Hvorslev hydraulic conductivity value.				

K tests were performed on monitoring wells 08MW01, 08MW06B, 08MW07B, and 08MW10 on March 21, 2008, and on monitoring well 08MW20 on August 30, 2008. The results of the K tests are presented in Appendix C and are summarized in Table E. The average hydraulic conductivity (Hvorslev) of the site is  $3.79 \times 10^{-6}$  m/s. Using the more conservative (Hvorslev) hydraulic conductivity and assuming an effective porosity of 20%, calculated linear flow velocities ranged from 59.8 m/year to 0.4 m/year.

### 3.3 ANALYTICAL RESULTS

The analytical results are discussed in the following sections relative to referenced guidelines. The laboratory results and comparative guidelines for soil are summarized in Table 1. The laboratory results and comparative guidelines for groundwater are summarized in Table 3.

Duplicate soil samples were collected from Garden River Airstrip (08SS33), Garden River Public Works yard (08MW22), Fifth Meridian Market and Northlands School Historic AST (08MW16 and 08MW17), Church (08BH19), and Garden River Trading (08SS59). An assessment of the duplicate samples is presented in Appendix D. Most relative percent differences (RPDs) between analytical values are below 75%, and show acceptable QA/QC for field methodology.

Duplicate groundwater samples were collected from Garden River Public Works Yard (08MW21). The analytical results were all below laboratory detection limits, and an assessment of field methodology QA/QC for groundwater is not possible.

#### 3.3.1 Analytical Results – Soils

Approximately half of the analytical results for particle size had greater than 50% sand content and are described as coarse-textured material (Table 1). Thus, the guidelines which apply to this site are for coarse-textured soils.

Measured concentrations of BTEX, chlorinated aliphatics, volatile hydrocarbons, and carcinogenic polyaromatic hydrocarbons (PAHs) were less than applicable guidelines and most were below the laboratory detection limits. One or more of the PHC fractions F1, F2, F3, and F4 were greater than applicable guidelines in ten samples collected from the Garden River Public Works Yard, one sample from Garden River Landfill, and one sample from Garden River Airstrip, as summarized in Table F. The sample from the Garden River Airstrip also had a combustible vapour concentration of 5% LEL.

Generally, the measured concentrations of metals were below applicable guidelines. One sample collected from Garden River Old Dump exceeded the applicable guideline for selenium and one sample collected from Garden River Landfill exceeded the applicable guideline for copper. All electrical conductivity (EC) and sodium adsorption ratios (SARs) were less than the comparative guidelines.

**TABLE F: SUMMARY OF SOIL CONCENTRATIONS GREATER THAN GUIDELINES (mg/kg)**

Parameter	Guidelines	Exceedances		Location
		Sample ID	Concentration (mg/kg)	
F1	24 mg/kg (AENV)	08SS36 08SS41	540 310	Garden River Airstrip; Garden River Public Works yard.
F2	130 mg/kg (AENV)	08SS36 08MW22 (D) <sup>1</sup> 08SS40 08SS41 08SS42 08SS43 08SS44	3,200 540 (450) <sup>1</sup> 820 9,000 150 840 420	Garden River Airstrip; Garden River Public Works yard.
F3	300 mg/kg (AENV)	08SS24 08MW21 08MW22 (D) <sup>1</sup> 08SS37 08SS39 08SS40 08SS41 08SS42 08SS43 08SS44	810 8,000 14,000 (12,000) <sup>1</sup> 2,100 20,000 11,000 24,000 16,000 29,000 11,000	Garden River Landfill; Garden River Public Works yard.
F4	2,800 mg/kg (AENV)	08MW21 08MW22 (D) <sup>1</sup> 08SS39 08SS40	5,200 10,000 (12,000) <sup>1</sup> 23,000 8,900	Garden River Public Works yard.

**TABLE F: SUMMARY OF SOIL CONCENTRATIONS GREATER THAN GUIDELINES (mg/kg)**

Parameter	Guidelines	Exceedances		Location
		Sample ID	Concentration (mg/kg)	
		08SS41	10,000	
		08SS42	16,000	
		08SS43	20,000	
		08SS44	8,800	
Copper	63 mg/kg (CCME, AENV )	08SS24	204	Garden River Landfill.
Selenium	1 mg/kg (CCME, AENV )	08MW04B	1.58	Garden River Old Dump.
<b>Note:</b>				
<sup>1</sup> (D) signifies a duplicate sample, and the duplicated soil analytical result is given in brackets.				

### 3.3.2 Analytical Results – Groundwater

All measured concentrations of monoaromatic hydrocarbons, such as benzene, ethylbenzene, xylenes, PHC fractions F1 and F2, and chlorinated aliphatics were below the applicable guidelines and most were less than laboratory detection limits (Table 3). The concentrations of benzo(a)anthracene and/or pyrene exceeded the applicable guidelines in 08MW01 and 08MW03 (Garden River Landfill).

The concentrations of most dissolved metals met the applicable guidelines. The concentration of iron exceeded the applicable guidelines in one monitoring well from the Garden River Old Dump (08MW05B) and in one monitoring well from the Garden River Public Works Yard (08MW20).

In many of the groundwater samples, the concentrations of selenium exceeded the CCME guideline for the protection of aquatic life. Two groundwater samples from the Garden River Landfill exceeded the CCME criteria for freshwater aquatic life. The method detection limit for cadmium was, however, greater than the criteria itself. The concentrations of manganese also exceeded the CCME guideline in at least one sample from most of the monitoring wells. Generally the manganese exceedances occurred during the March sampling event, but not the August sampling event. Since manganese is a redox sensitive metal and will prevail as dissolved ions when dissolved oxygen is virtually absent, it is assumed that anoxic conditions existed in March. The concentrations of zinc throughout the site also exceeded the CCME guidelines during the March groundwater sampling event.

The groundwater samples which exceeded the applicable guidelines are summarized below in Table G.

**TABLE G: SUMMARY OF GROUNDWATER CONCENTRATIONS GREATER THAN GUIDELINES (MG/L)**

Parameter	Guidelines	Exceedances		Location
		Sample ID	Concentration (mg/L)	
Pyrene	0.000025 mg/L (CCME, AENV)	08MW01 08MW03	0.00003 0.00005	Garden River Landfill
Benzo(a)anthracene	0.000018 mg/L (CCME, AENV)	08MW01	0.00002	Garden River Landfill
Iron	0.3 mg/L (CCME, Health Canada, AENV)	08MW05B 08MW20	2.03, 1.51 2.63	Garden River Old Dump Garden River Public Works.
Cadmium	0.000097 mg/L with hardness of. 350 mg/L (CCME)	08MW01 08MW02	0.0015 0.0009	Garden River Landfill;
Manganese	0.05 mg/L (Health Canada, AENV)	08MW01	0.142	Garden River Landfill;
		08MW02	0.137	
		08MW03	0.145	
		08MW04B	0.259, 0.538	Garden River Old Dump;
		08MW05B	0.294, 0.636	
		08MW06B	0.226	
		08MW07B	0.010	Former Septic Tile Field;
		08MW08	0.170	
		08MW09	0.145	
		08MW10	0.124	Garden River Airstrip;
		08MW12	0.101	
		08MW16	1.58	Northlands School AST;
		08MW20	0.598	Garden River Public Works Yard.
		08MW22	0.157	
		08MW23	0.176	
Zinc	0.03 mg/L (CCME, AENV)	08MW01	0.10	Garden River Landfill;
		08MW02	0.117	
		08MW03	0.103	
		08MW04B	0.0938	Garden River Old Dump;
		08MW05B	0.061	
		08MW06B	0.039, 0.033	
		08MW07B	0.045	Former Septic Tile Field;
		08MW08	0.055	
		08MW09	0.041	
		08MW10	0.066	Garden River Airstrip;
		08MW11	0.096	
		08MW12	0.074	
		08MW14	0.033	Garden River Trading

**TABLE G: SUMMARY OF GROUNDWATER CONCENTRATIONS GREATER THAN GUIDELINES (MG/L)**

Parameter	Guidelines	Exceedances		Location
		Sample ID	Concentration (mg/L)	
Selenium	0.001 mg/L (CCME, AENV)	08MW01	0.0017, 0.0016	Garden River Landfill;
		08MW02	0.0016, 0.0020	
		08MW03	0.0047, 0.0028	
		08MW04B	0.0108, 0.0012	Garden River Old Dump;
		08MW11	0.0061, 0.0214	Garden River Airstrip;
		08MW12	0.0066	
		08MW14	0.0160	Garden River Trading
		08MW16	0.0179	Fifth Meridian Market,
		08MW18	0.0287	
		08MW20	0.0028	Garden River Public Works
		08MW21	0.0031	Yard.
		08MW22	0.0051	
		08MW23	0.0030	

## 4.0 CONCLUSIONS

The subject site includes the following locations:

1. Garden River Landfill.
2. Garden River Old Dump.
3. Former Septic Tile Field.
4. Garden River Airstrip.
5. Garden River Public Works Yard.
6. Fifth Meridian Market.
7. Northlands School Historic AST.
8. Church.
9. Garden River Trading (Charlie Rose).

The objectives of the contaminated site assessment were as follows:

- To determine/evaluate the extent and nature of soil and groundwater potential contamination identified by previous reports at the facilities and fuel storage locations.
- To determine the hydrological parameters of the site.

- To evaluate the environmental condition of the site's subsurface, using the Federal Contaminated Sites Program.
- To provide information sufficient to develop a RAP where required.

For the last five assessment areas, PVC sewer and water pipe lines without tracing wires were reportedly present. Therefore, the public and private utility locators were not able to perform underground utility locates on March 18, 2008 for the winter drilling program. These assessment areas were located in consultation with client representatives and Public Works personnel on August 26, 2008 and were assessed during the summer drilling program, with the fulltime presence of an equipped plumber.

#### 4.1 HYDROLOGICAL PARAMETERS

The soil at this site is generally composed of coarse-textured fluvial deposits from the Peace River. The average hydraulic conductivity in groundwater at the site was approximately  $4 \times 10^{-6}$  m/s. The estimated linear flow velocity ranged from 0.4 m/year to 4.8 m/year, except in Garden River Landfill where high hydraulic gradients led to predictions of approximately 60 m/year.

#### 4.2 GENERAL SOIL AND GROUNDWATER QUALITY

Soil analytical results for BTEX, PHC fractions F1 through F4, EC, SAR, metals, chlorinated aliphatics, volatile hydrocarbons, and carcinogenic PAHs were below the applicable guidelines at the Former Septic Tile Field, Garden River Trading, Fifth Meridian Market and Northlands School Historic AST, and the Church AST. Soil analytical results which exceeded applicable guidelines will be discussed in later sections..

The concentration of dissolved benzo(a)anthracene and/or pyrene exceeded applicable guidelines in two monitoring wells from the Garden River Landfill. The concentration of dissolved iron exceeded the applicable guideline in one well from the Garden River Old Dump and one well from the Garden River Public Works yard.

The groundwater analytical results for cadmium, manganese, selenium, and/or zinc exceeded the applicable guidelines in all monitoring wells. It is suspected that most of these exceedances are naturally occurring, but this cannot be confirmed without comparisons from control areas near the site and longer term assessments of these chemicals in the groundwater. Only monitoring wells with relatively high concentrations of the metals will be discussed in the following sections.

The groundwater analytical results for pyrene, benzo(a)anthracene, and iron which exceeded the applicable guidelines will be discussed in the following sections.

#### 4.3 GARDEN RIVER LANDFILL

One surface soil sample, 08SS24, collected near scrapped cars on the northern boundary of Garden River Landfill exceeded the applicable guidelines for F3 and copper. The detected concentrations were approximately three times greater than the applicable guidelines.

The dissolved concentrations of pyrene and benzo(a)anthracene exceeded applicable guidelines in monitoring well 08MW01, located near the southeast corner of the open excavation at the landfill area. This sample also had a high concentration of cadmium, 15% higher than the applicable guideline. The measured concentration of pyrene also exceeded the applicable guideline in 08MW02, located towards the west side of the assessment area. The interpreted direction of groundwater flow at Garden River Landfill is towards the northeast.

#### 4.4 GARDEN RIVER OLD DUMP

One soil sample collected from the 7.6 m depth of 08MW04B, near the summer trail to the river, exceeded the applicable guideline for selenium. The concentrations of dissolved selenium and manganese in that monitoring well were also high. Further north, in 08MW05B, the concentration of dissolved manganese was 13 times higher than the applicable guideline, and the concentration of dissolved iron exceeded the applicable guideline. The concentration of cadmium in 08MW06B, near the north end of the site, was about 20 times higher than the applicable guideline. Continued monitoring of groundwater in throughout this assessment area would help confirm whether these represent trends in groundwater quality.

#### 4.5 GARDEN RIVER AIRSTRIP

One surface soil sample, 08SS36, collected near the eastern end of Garden River Airstrip adjacent to fuel storage drums, exceeded the applicable guidelines for F1 and F2. This sample had a high CVC (5% LEL, see Table 1). The concentrations of dissolved cadmium, manganese, selenium and zinc in groundwater samples exceeded the applicable guidelines. The interpreted direction of groundwater flow at Garden River Airstrip is from east to west.

Based on field observations, the exceedance at the airstrip likely represents isolated spills caused by fuelling planes at the airstrip. It is estimated that there could be 100 cubic metres of impacted soil at 08SS36. Fuel drums may have been stored at other locations in the past and it may be reasonable to assume that three or four other fuel storage locations also may have minor fuel impacts. For the airstrip, this could represent up to 500 m<sup>3</sup> of impacts as a conservative estimate but specific locations are not known at this time.

#### 4.6 GARDEN RIVER PUBLIC WORKS YARD

Ten soil samples collected from Garden River Public Works Yard exceeded applicable guidelines for one or more PHC fraction F1, F2, F3, and F4. The samples were collected from locations north of the Public Works trailer (08SS37), east and south of the Public Works building (08SS39, 08SS40, 08SS41, 08SS42, and the surface of 08MW21 and 08MW22), and in the equipment parking area (08SS43 and 08SS44). The concentrations of dissolved iron and manganese exceeded the applicable guidelines and were high in 08MW20, north of the Public Works trailer near 08SS37.

EBA's proposed drilling plan was limited by site utilities; therefore, this assessment can only provide an estimate of the area and volume of impacted soil. The area of impacts north of

the Public Works trailer is approximately 140 m<sup>2</sup>. The area of impacts east and south of the Public Works building is approximately 1,300 m<sup>2</sup>. The area of impacts at the equipment parking area is approximately 370 m<sup>2</sup>. The total area of impacted soil in Garden River Public Works Yard is estimated to be 1,800 m<sup>2</sup>. The area of impacts is based on surface soil analytical results and field observations of staining in these areas. The impacts are likely a result of mishandling of fuels, lubricating oils and similar products at this location over a number of years. Four deeper boreholes (installed as monitoring wells) found no evidence of PHC impacts in soil or groundwater at depth. CVC readings throughout the soil profile of these boreholes was generally low. For the majority of stained areas, it is likely that the impacts are surficial only but to be conservative, it should be assumed that at some locations, the impacts are deeper.

Soil samples collected at a depth of 8.5 m in the impacted areas met the applicable guidelines for PHC fractions F1, F2, F3, and F4. Assuming impacts extend to at least 1.5 m across the site, the extent of surficial soil impacts at the site are 2,700 m<sup>3</sup>. We should assume that at some locations, the impacts are at greater depths. Allowing for a 50% contingency, the volume of PHC impacted soil at this location is estimated at 4,000 m<sup>3</sup>.

## 5.0 RECOMMENDATIONS

Each assessment site was assessed using 2008 CCME National Classification System for Contaminated Sites (NCSCS). The following summarizes the NCSCS assessment:

- The Public Works Yard has a total NCSCS score of 75.8 and is ranked as a Class 1 Site, which has a high priority for action.
- The Garden River Airstrip has a total NCSCS score of 75.2 and is ranked as a Class 1 Site, which has a high priority for action.
- The Garden River Landfill has a total NCSCS score of 68.5 and is ranked as a Class 2 Site, which has a medium priority for action.
- The Garden River Old Dump has a total NCSCS score of 63.9 and is ranked as a Class 2 Site, which has a medium priority for action.
- The Northlands School Historic AST has a total NCSCS score of 52.1 and is ranked as a Class 2 Site, which has a medium priority for action.
- The Former Septic Field has a total NCSCS score of 50.5 and is ranked as a Class 2 Site, which has a medium priority for action.
- The Garden River Trading (Charlie Rose) AST has a total NCSCS score of 47.2 and is ranked as a Class 3 Site, which has a low priority for action.
- The Fifth Meridian Market AST has a total NCSCS score of 47.2 and is ranked as a Class 3 Site, which has a low priority for action.
- The Church Historic AST was not assessed using NCSCS since there were no detected exceedances.

Guidance for landfill operations is detailed in AENV's Protection Code of Practice for Landfills<sup>1</sup>. The solid waste materials encountered within the upper metre of the area of the current and former landfill locations should be sealed/capped by means of placing impermeable soil/material on the surface of the same areas. Setbacks according to regulations should be observed for these two landfill sites.

There were hydrocarbon impacts in the soil throughout the Garden River Public Works yard. Impacts were associated with ASTs, and equipment storage, and barrel storage. The estimated volume of hydrocarbon impacted soil is 4,000 m<sup>3</sup>. A RAP for this assessment area is provided in Appendix D.

There were hydrocarbon soil impacts at locations adjacent to the fuel drum storage at the east end of the Garden River Airstrip. The conservative estimate of impacted soil volume is 500 m<sup>3</sup>. A RAP for this assessment area is provided in Appendix E.

## 6.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Parks Canada Agency and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Parks Canada Agency, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement and in the Geo-environment Report - General Conditions provided in Appendix F of this report.

<sup>1</sup> <http://www.qp.gov.ab.ca/documents/codes/LANDFILL.CFM>

## 7.0 CLOSURE

We trust the information herein satisfies your present requirements. Should you have any questions, please contact the undersigned directly.

Respectfully submitted,  
EBA Engineering Consultants Ltd.

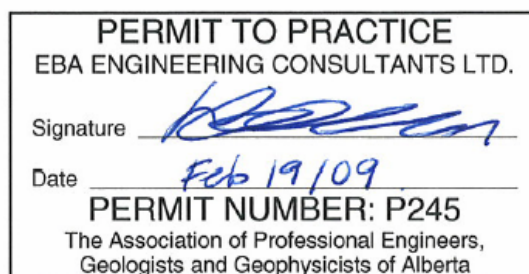


February 17, 2009

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/dlm





# TABLES









**TABLE 2: GROUNDWATER MONITORING RESULTS**

Monitoring Well ID	Borehole Depth (mbg)	Ground Surface Elevation (m)	Top of Casing (TOC) Elevation (m)	Height of Stickup (m)	Slotted Interval (mBG)		Groundwater levels (mBTOC)	Groundwater levels (mbg)	Groundwater levels (mBTOC)	Groundwater levels (mbg)	Slotted Interval Elevation		Groundwater Elevation* (m)	Groundwater Elevation* (m)
					Top (m)	Bottom (m)	21-Mar-08		29-Aug-08		Top (m)	Bottom (m)	21-Mar-08	29-Aug-08
Garden River Landfill														
08MW01	11.3	241.37	242.29	0.92	8.2	11.3	10.06	9.14	10.58	9.66	233.17	230.07	232.23	231.71
08MW02	6.7	240.73	241.87	1.14	3.7	6.7	7.01	5.87	7.01	5.87	237.03	234.03	234.86	234.86
08MW03	11.3	241.38	242.47	1.09		11.3	10.68	9.59	10.66	9.57			231.79	231.81
Garden River Old Dump														
08MW04	6.1	238.84	240.03	1.19	3.1	6.1	dry	dry	dry	dry	235.74	232.74	dry	dry
08MW04B	9.8	238.88	240.16	1.29	6.7	9.8	9.28	8.00	9.31	8.02	232.18	229.08	230.88	230.85
08MW05	6.1	239.09	240.31	1.22	3.1	6.1	dry	dry	dry	dry	235.99	232.99	dry	dry
08MW05B	9.8	239.07	240.27	1.20	6.7	9.8	9.34	8.14	9.35	8.16	232.37	229.27	230.93	230.92
08MW06	8.4	239.06	240.34	1.28	6.4	8.4	dry	dry	9.27	7.99	232.66	230.66	dry	dry
08MW06B	9.8	238.95	240.29	1.34	6.7	9.8	9.32	7.98	9.29	7.95	232.25	229.15	230.97	231.00
Former Septic Tile Field														
08MW07	6.1	239.12	239.00	-0.12	3.1	6.1	dry	dry	5.87	5.99	236.02	233.02	dry	dry
08MW07B	9.2	239.21	239.04	-0.17	6.1	9.2	7.85	8.03	7.85	8.02	233.11	230.01	231.19	231.19
08MW08	9.8	239.33	239.22	-0.11	6.7	9.8	8.10	8.21	8.01	8.13	232.63	229.53	231.12	231.20
08MW09	9.2	239.14	239.03	-0.11	6.1	9.2	7.89	8.00	damaged	damaged	233.04	229.94	231.14	#VALUE!
Garden River Airstrip														
08MW10	9.8	240.87	242.08	1.20	6.7	9.8	10.16	8.96	10.12	8.92	234.17	231.07	231.91	231.95
08MW11	9.8	240.98	242.26	1.27	6.7	9.8	10.35	9.08	10.35	9.08	234.28	231.18	231.91	231.90
08MW12	9.8	241.33	242.57	1.24	6.7	9.8	10.23	8.99	10.00	8.76	234.63	231.53	232.34	232.57
Garden River Trading (Charlie Rose)														
08MW14	10.1	235.73	235.62	-0.11	6.9	9.9			9.07	9.19	228.83	225.83		226.55
Fifth Meridian Market														
08MW16	9.9	236.50	236.39	-0.10	6.9	9.9			9.21	9.31	229.60	226.60		227.18
08MW18	9.9	235.99	235.91	-0.08	6.9	9.9			8.96	9.04	229.09	226.09		226.94
Garden River Public Works														
08MW20	11.4	240.72	240.66	-0.06	8.4	11.4			9.16	9.22	232.32	229.32		231.50
08MW21	9.8	240.19	240.13	-0.06	6.9	9.9			8.60	8.67	233.29	230.29		231.52
08MW22	9.7	240.17	240.06	-0.10	6.9	9.9			8.54	8.64	233.27	230.27		231.52
08MW23	9.9	239.82	239.76	-0.06	6.9	9.9			8.41	8.47	232.92	229.92		231.34
Notes:														
mbg - Metres beneath ground level.														
mBTOC - Metres below top of casing.														
Blank cell - No data.														
Bold - Groundwater elevation is above the screen elevation.														









TABLE 3: GROUNDWATER ANALYTICAL RESULTS							
Parameters	Units	Comparative Guidelines <sup>1</sup>	Comparative Guidelines <sup>2</sup>	Comparative Guidelines <sup>3</sup>	GR Trading	Fifth Meridian Market	
					08MW14	08MW16	08MW18
					31-Aug-08	31-Aug-08	31-Aug-08
<b>Routine Parameters</b>							
Combustible Vapour Concentration (field)	ppm	NG	NG	NG	10	100	25
pH (lab)	pH	6.5 to 8.5	6.5 to 8.5	6.5 to 9.0		7.6	7.6
pH (field)	pH	NG	NG	NG	7.02	6.92	6.76
Electrical Conductivity (EC) (lab)	µS/cm	NG	NG	NG		834	959
Electrical Conductivity (EC) (field)	µS/cm	NG	NG	NG	646	811	918
Temperature (Field)	Degrees C	NG	NG	NG	12.9	13.4	12.8
Alkalinity Total (as CaCO <sub>3</sub> )	mg/L	NG	NG	NG		430	459
Total Dissolved Solids	mg/L	500	500	NG		478	561
Hardness	mg/L	NG	NG	NG		444	531
Calcium (Ca)	mg/L	NG	NG	NG	107	132	157
Magnesium (Mg)	mg/L	NG	NG	NG	22.2	27.9	33.7
Potassium (K)	mg/L	NG	NG	NG	3.6	2.2	1.9
Sodium (Na)	mg/L	200	200	NG	10.4	4	7
Chloride (Cl)	mg/L	230	250	NG		2	3
Sulphate (SO <sub>4</sub> )	mg/L	500	500	NG		52.3	80.0
Bicarbonate (HCO <sub>3</sub> )	mg/L	NG	NG	NG		525	560
Carbonate (CO <sub>3</sub> )	mg/L	NG	NG	NG		<5	<5
Hydroxide	mg/L	NG	NG	NG		<5	<5
Nitrite + Nitrate - N	mg/L	NG	NG	NG		<0.1	0.6
Nitrate - N <sup>3</sup>	mg/L	3	10	3		<0.1	0.6
Nitrite - N	mg/L	NG	1	0.018		<0.05	<0.05
Ionic Balance	%	NG	NG	NG		93.5	99.9
<b>Volatile Hydrocarbons</b>							
Benzene	mg/L	0.005	0.005	0.37	<0.00050		<0.00050
Thiophene	mg/L	NG	NG	NG			
Toluene	mg/L	0.024	0.024	0.002	<0.00050	<0.00050	<0.00050
Chlorobenzene	mg/L	0.0013	NG	0.0013			
Ethylbenzene	mg/L	0.0024	0.0024	0.09	<0.00050	<0.00050	<0.00050
Xylenes	mg/L	0.3	0.3	0.18	<0.00050	<0.00050	<0.00050
Styrene	mg/L	0.072	NG	0.072			
F1 (C <sub>6</sub> to C <sub>10</sub> )	mg/L	0.81	NG	NG	<0.1	<0.1	<0.1
F2 (C <sub>10</sub> to C <sub>16</sub> )	mg/L	1.1	NG	NG	<0.2	<0.2	<0.2
1,3-Dichlorobenzene	mg/L	NG	NG	0.15			
1,4-Dichlorobenzene	mg/L	0.001	0.005	0.026			
1,2-Dichlorobenzene	mg/L	0.0007	0.2	0.0007			
Naphthalene	mg/L	0.0011	NG	0.0011			
Quinoline	mg/L	NG	NG	NG			
Acenaphthene	mg/L	0.0058	NG	0.0058			
Fluorene	mg/L	0.003	NG	0.003			
Phenanthrene	mg/L	0.0004	NG	0.0004			
Anthracene	mg/L	0.000012	NG	0.000012			
Acridine	mg/L	NG	NG	NG			
Fluoranthene	mg/L	0.003	NG	0.00004			
Pyrene	mg/L	0.000025	NG	0.000025			
Benzo(a)anthracene	mg/L	0.000018	NG	0.000018			
Chrysene	mg/L	0.0014	NG	0.0014			
Benzo(b&j)fluoranthene	mg/L	0.00048	NG	0.00048			
Benzo(k)fluoranthene	mg/L	0.00048	NG	0.00048			
Benzo(a)pyrene	mg/L	0.000015	0.00001	0.000015			
Indeno(1,2,3-cd)pyrene	mg/L	0.00021	NG	0.00021			
Dibenzo(a,h)anthracene	mg/L	0.00026	NG	0.00026			
<b>Chlorinated Aliphatics</b>							
1,1-Dichloroethene	mg/L	0.014	NG	NG			
Methylene Chloride	mg/L	0.05	NG	0.0981			
trans-1,2-Dichloroethene	mg/L	NG	NG	NG			
1,1-Dichloroethane	mg/L	NG	NG	NG			
Chloroform	mg/L	0.0018	NG	0.0018			
1,2-Dichloroethane	mg/L	0.005	0.005	0.1			
1,1,1-Trichloroethane	mg/L	NG	NG	NG			
Carbon Tetrachloride	mg/L	0.00056	0.005	0.0133			
Trichloroethene	mg/L	0.005	0.005	0.021			
1,2-Dichloropropane	mg/L	NG	NG	NG			
cis-1,3-Dichloropropene	mg/L	NG	NG	NG			
trans-1,3-Dichloropropene	mg/L	NG	NG	NG			
1,1,2-Trichloroethane	mg/L	NG	NG	NG			
Tetrachloroethylene	mg/L	0.03	0.03	0.111			
1,1,2,2-Tetrachloroethane	mg/L	NG	NG	NG			
<b>Dissolved Metals</b>							
Aluminum (Al)	mg/L	NG	0.1	0.1	<0.01	<0.01	<0.01
Antimony (Sb)	mg/L	0.006	0.006	NG	<0.0004	<0.0004	<0.0004
Arsenic (As)	mg/L	0.005	0.010	0.005	<0.0004	<0.0004	<0.0004
Barium (Ba)	mg/L	1	1	NG	0.130	0.064	0.060
Beryllium (Be)	mg/L	NG	NG	NG	<0.001	<0.001	<0.001
Bismuth (Bi)	mg/L	NG	NG	NG			
Boron (B)	mg/L	5	5	NG	<0.05	0.07	0.09
Cadmium (Cd)	mg/L	0.005	0.005	0.000097	<b>&lt;0.0001</b>	<b>0.0001</b>	<b>0.0001</b>
Chromium (Cr),	mg/L	0.05	0.05	0.21	<0.005	<0.005	<0.005
Cobalt (Co)	mg/L	NG	NG	NG	<0.002	0.003	<0.002
Copper (Cu)	mg/L	1	1	0.026	0.007	0.003	0.004
Iron (Fe)	mg/L	0.3	0.3	0.3	0.005	<0.005	<0.005
Lead (Pb)	mg/L	0.01	0.01	0.0095	0.0001	<0.0001	<0.0001
Lithium (Li)	mg/L	NG	NG	NG	0.842	0.446	0.432
Manganese(Mn)	mg/L	0.05	0.05	NG	<0.001	<b>1.58</b>	0.045
Mercury (Hg)-Dissolved	mg/L	0.001	0.001	NG	<0.00010	<0.00010	<0.00010
Molybdenum (Mo)	mg/L	NG	NG	0.073	<0.005	<0.005	<0.005
Nickel (Ni)	mg/L	NG	NG	0.15	0.002	0.013	0.002
Selenium (Se)	mg/L	0.001	0.01	0.001	<b>0.0160</b>	<b>0.0179</b>	<b>0.0287</b>
Silver (Ag)	mg/L	NG	NG	NG	<0.0001	<0.0001	<0.0001
Strontium (Sr)	mg/L	NG	NG	NG			
Thallium (Tl)	mg/L	NG	NG	NG	<0.0001	0.0001	<0.0001
Tin (Sn)	mg/L	NG	NG	NG	<0.05	<0.05	<0.05
Titanium (Ti)	mg/L	NG	NG	NG	<0.001	<0.001	<0.001
Uranium (U)	mg/L	0.02	0.02	NG	0.0031	0.0092	0.0071
Vanadium (V)	mg/L	NG	NG	NG	<0.001	<0.001	<0.001
Zinc (Zn)	mg/L	0.03	5.0	0.03	<b>0.033</b>	0.015	0.015
<b>Laboratory Identification No.</b>					L676397-12	L676397-13	L676397-14
<b>Notes:</b>							
<sup>1</sup> Alberta Environment (AENV), August 2008. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Referenced Guidelines apply to coarse texture of soils under residential/parkland land use.							
<sup>2</sup> Health Canada, May 2008. Guidelines for Canadian Drinking Water Quality - Summary Table.							
<sup>3</sup> Canadian Council of Ministers of the Environment. 2007. Canadian water quality guidelines for the protection of aquatic life - Summary Table. In Canadian Environmental Quality Guidelines 1999.							
NG - No guideline established.							
ND - Not detected.							
Blank - Not analyzed.							
<b>Bold</b> - Greater than highest referenced guideline.							







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# FIGURES



**Note:** Background imagery courtesy of Google Earth and is shown for visual presentation purposes only.

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#### PHASE II ENVIRONMENTAL SITE ASSESSMENT GARDEN RIVER INDIAN RESERVATION, AB

#### SITE LOCATION PLAN

**EBA Engineering  
Consultants Ltd.**



PROJECT NO.  
C22101178

DWN  
MM

CKD  
JC

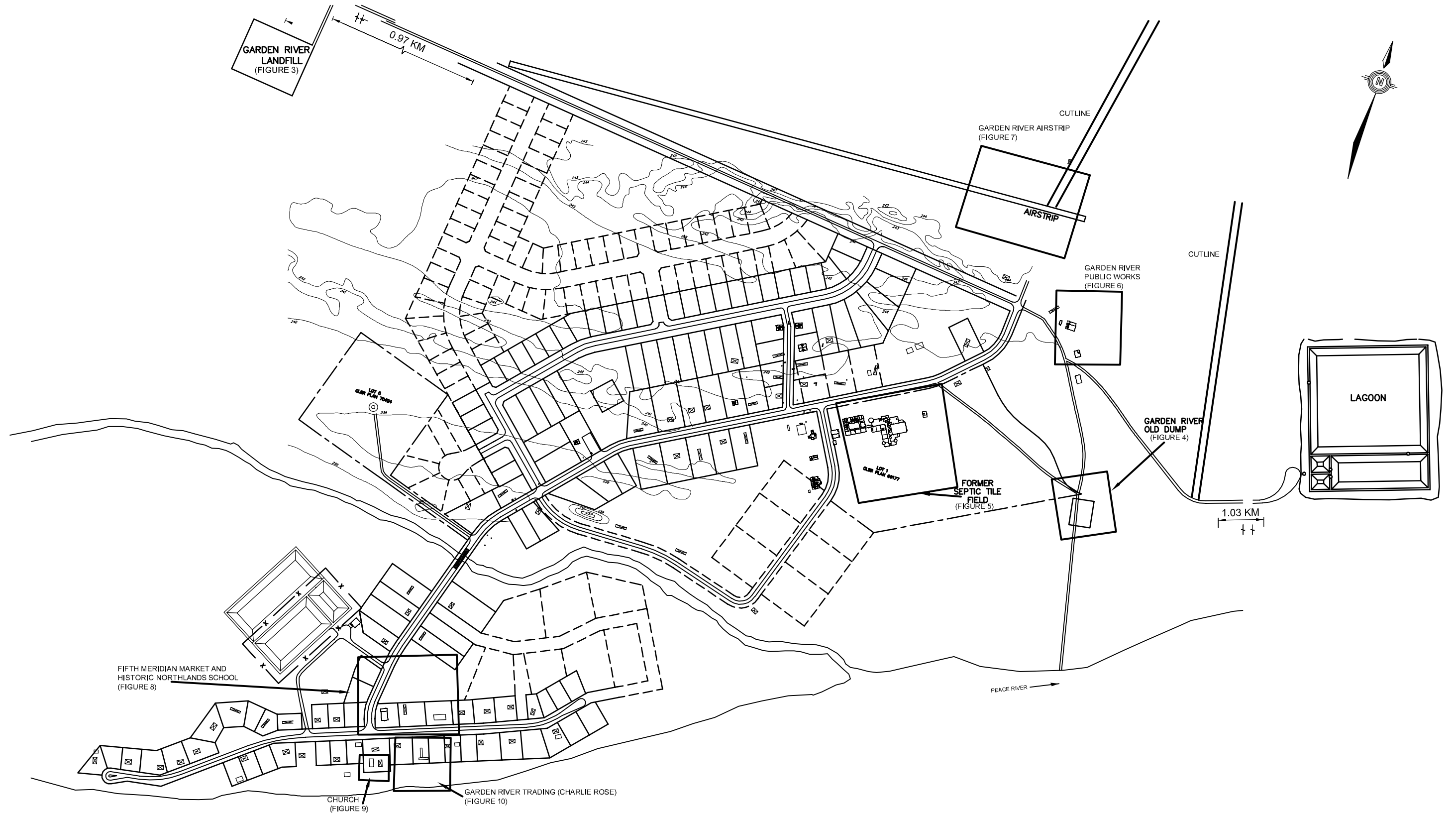
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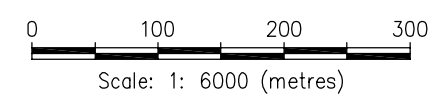
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**Figure 1**

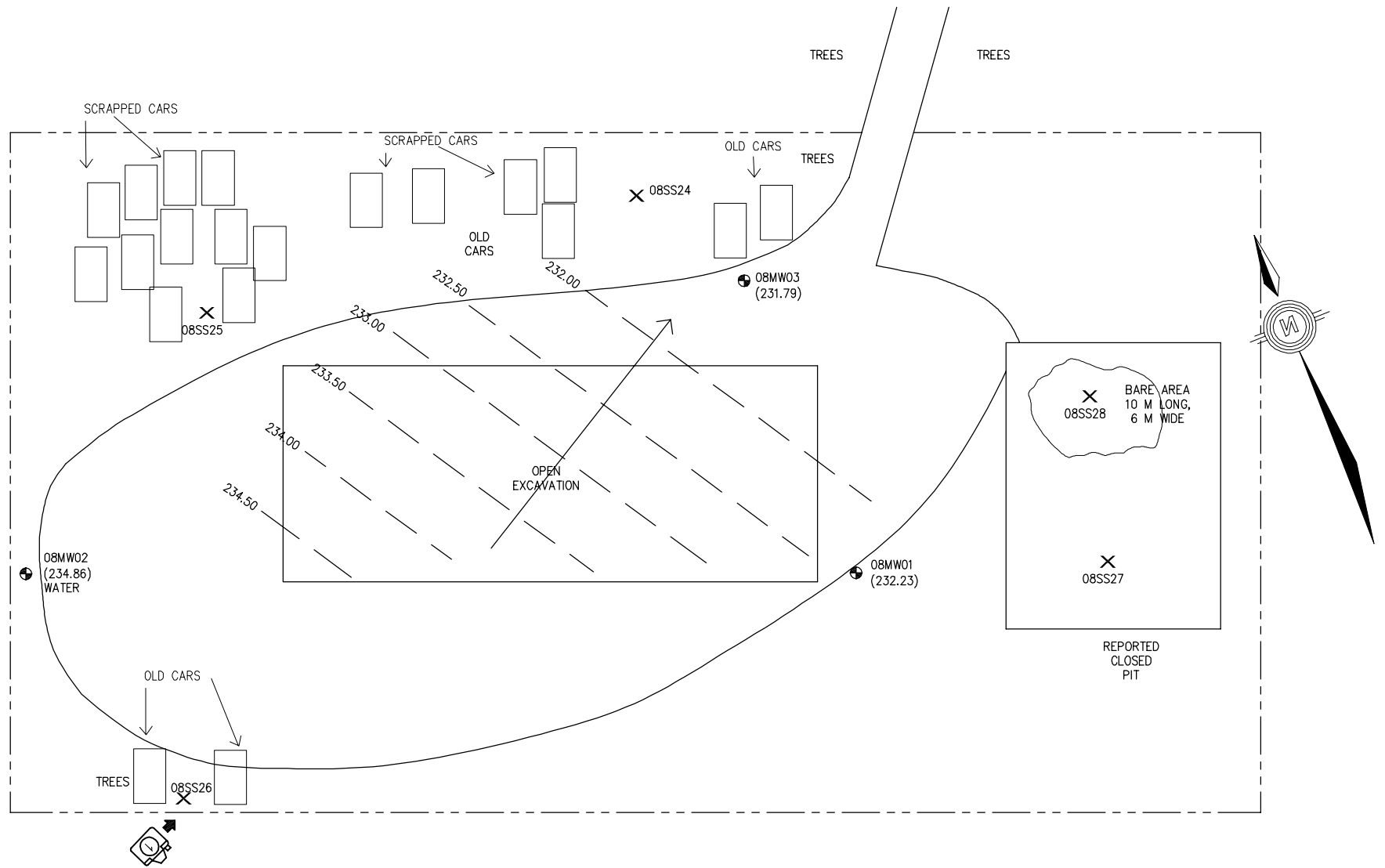
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LEGEND:  
- - - FENCE  
= = = ROAD



CLIENT		CONTAMINATED SITE ASSESSMENT GARDEN RIVER INDIAN RESERVATION, AB				
 Public Works and Government Services Canada		Travaux publics et Services gouvernementaux Canada				
		SITE PLAN SHOWING ASSESSMENT AREAS				
		PROJECT NO. C22101178	DWN RH/HK	CKD JC/CH	REV 0	Figure 2
		OFFICE RIV	DATE February 2009			

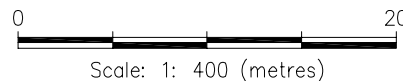


#### LEGEND

- ⊕ (08BH##) MONITORING WELL LOCATION
- × (08SS.##) SHALLOW SOIL SAMPLE LOCATION
- (###.##) GROUNDWATER ELEVATION
- ###.## GROUNDWATER ELEVATION CONTOUR
- INTERPRETED GROUNDWATER FLOW DIRECTION
- 📷 PHOTO DIRECTION AND NUMBER

#### NOTE

MONITORING WELL LOCATIONS ARE ON SCALE AND OTHER FEATURES ON THE DRAWING ARE NOT TO SCALE



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#### CONTAMINATED SITE ASSESSMENT GARDEN RIVER INDIAN RESERVATION, AB

#### GARDEN RIVER LANDFILL SITE PLAN

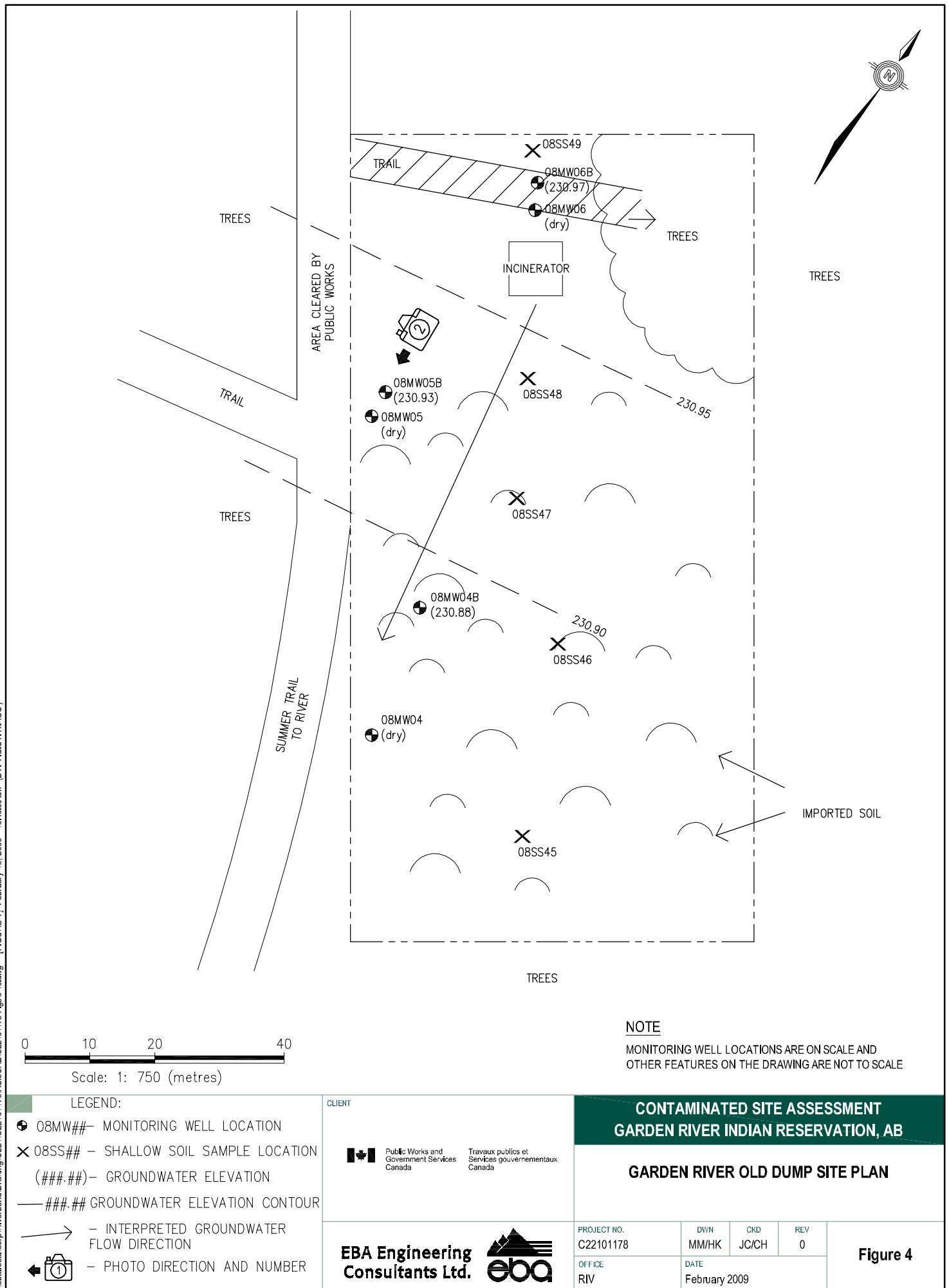
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EBA-RIV

DWN  
MM/HK  
DATE  
February 2009

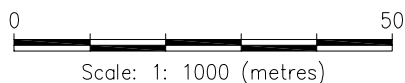
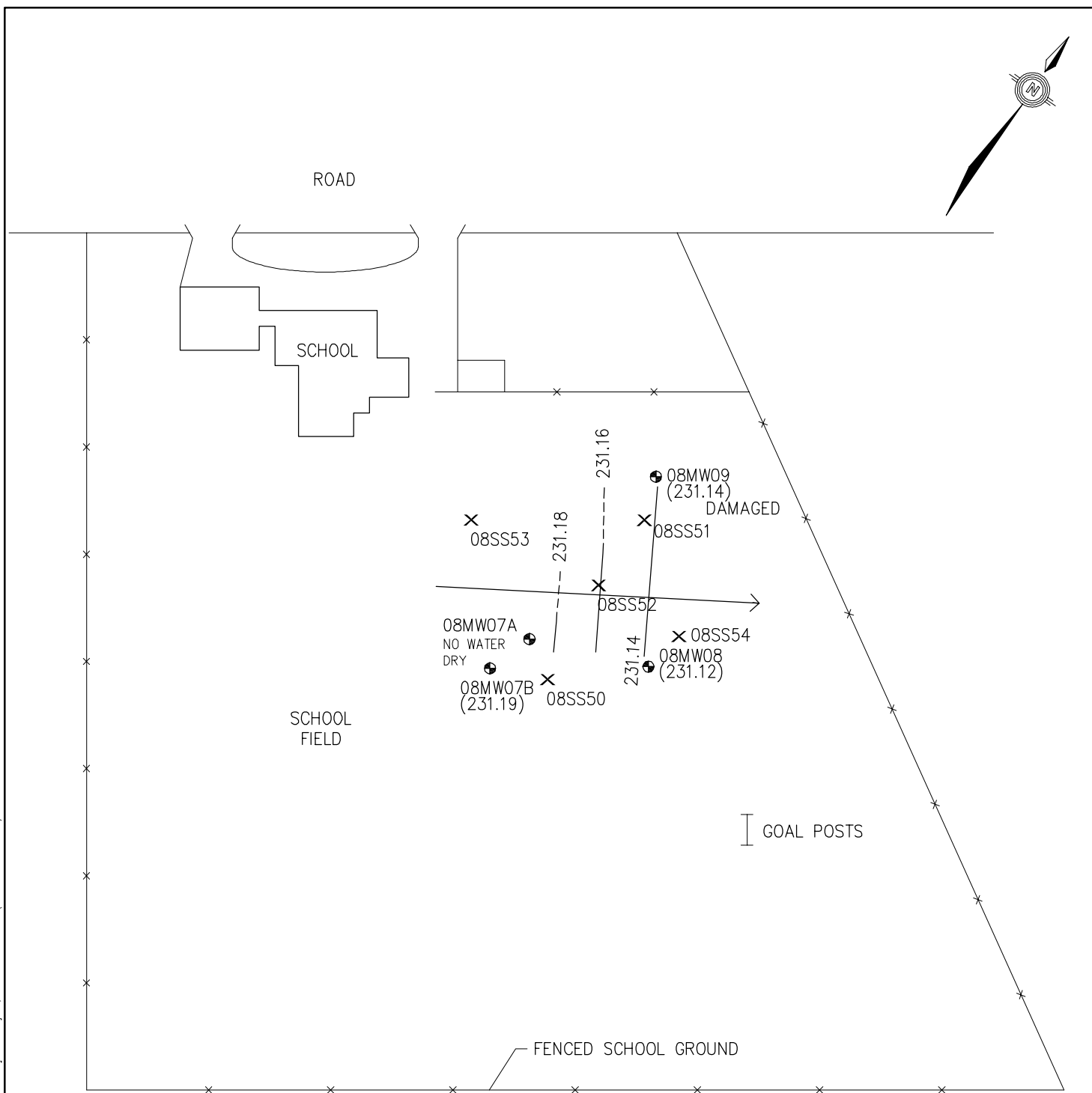
CKD  
JC/KC  
REV  
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**Figure 3**

\\eba.local.corp\Riv\erend\Drafting\C22101178\AutoCAD\C22101178-Figs 3-10.dwg [FIGURE 4] February '13, 2009 - 10:46:00 am (BY: TIGISTIKPOS)



\\eba.local\corp\R\Verbind\Drafting\C221\C22101178\AutoCAD\C22101178-Figs 3-10.dwg [FIGURE 5] February 13, 2009 - 10:57:20 am (BY: TIGISTIKFROS)



#### NOTE

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#### LEGEND:

- 08MW##- MONITORING WELL LOCATION
- × 08SS## - SHALLOW SOIL SAMPLE LOCATION
- (###.##)- GROUNDWATER ELEVATION
- ###.## GROUNDWATER ELEVATION CONTOUR
- - INTERPRETED GROUNDWATER FLOW DIRECTION

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#### CONTAMINATED SITE ASSESSMENT GARDEN RIVER INDIAN RESERVATION, AB

#### FORMER SEPTIC TILE FIELD SITE PLAN

PROJECT NO.  
C22101178

OFFICE  
RIV

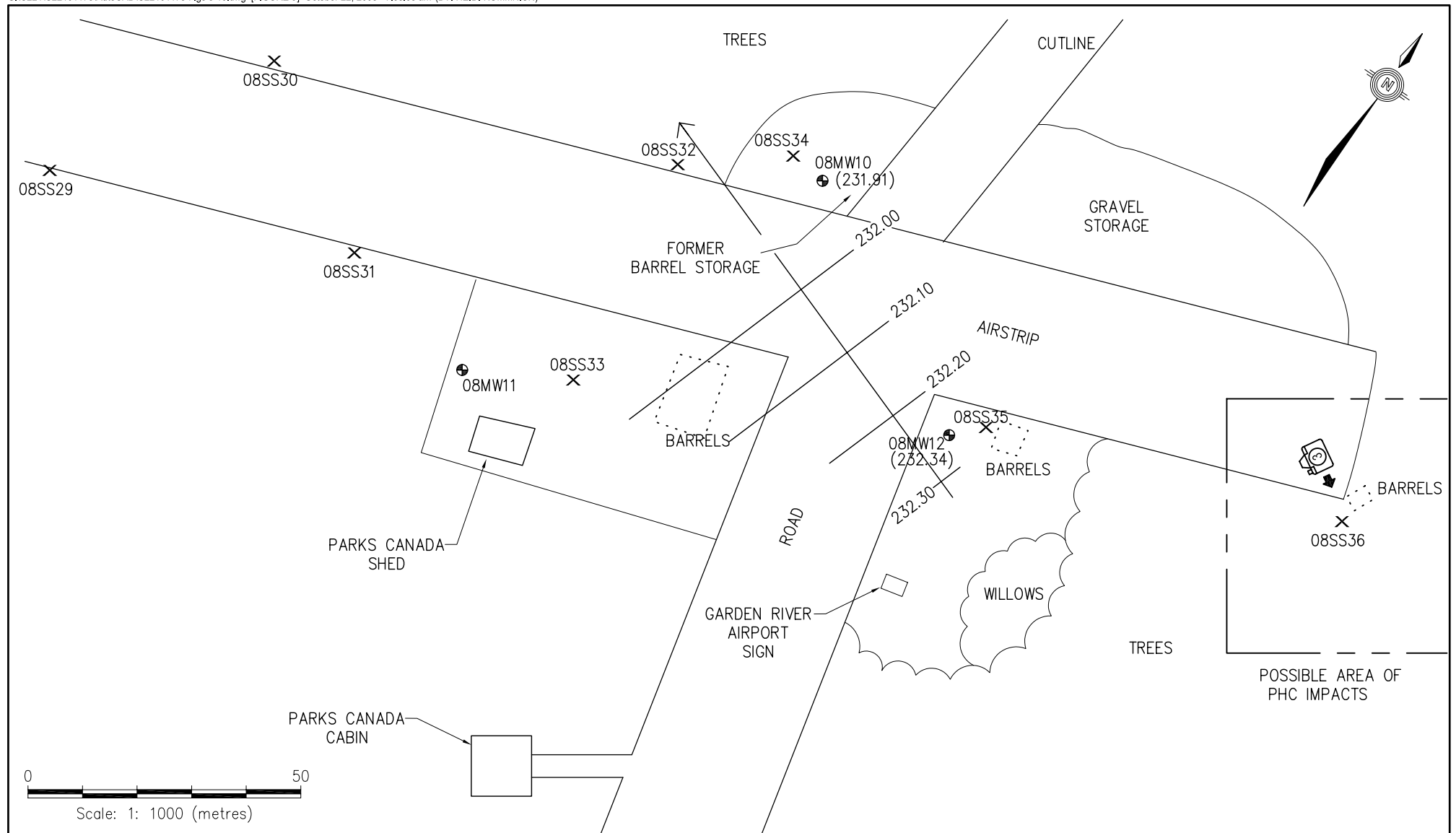
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MM/HK

CKD  
JC/CH

REV  
0

DATE  
February 2009

**Figure 5**



LEGEND:

- ⊕ 08MW## - MONITORING WELL LOCATION
- × 08SS## - SHALLOW SOIL SAMPLE LOCATION
- (###.##) - GROUNDWATER ELEVATION
- ###.## GROUNDWATER ELEVATION CONTOUR
- - INTERPRETED GROUNDWATER FLOW DIRECTION
- 📷 1 - PHOTO DIRECTION AND NUMBER

NOTE

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CONTAMINATED SITE ASSESSMENT  
GARDEN RIVER INDIAN RESERVATION, AB

GARDEN RIVER AIRSTRIP SITE PLAN SHOWING  
GROUNDWATER ELEVATIONS

PROJECT NO.  
C22101178  
OFFICE  
RIV

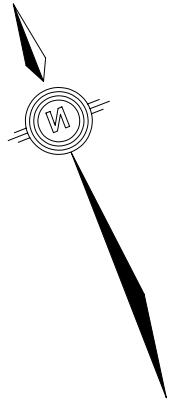
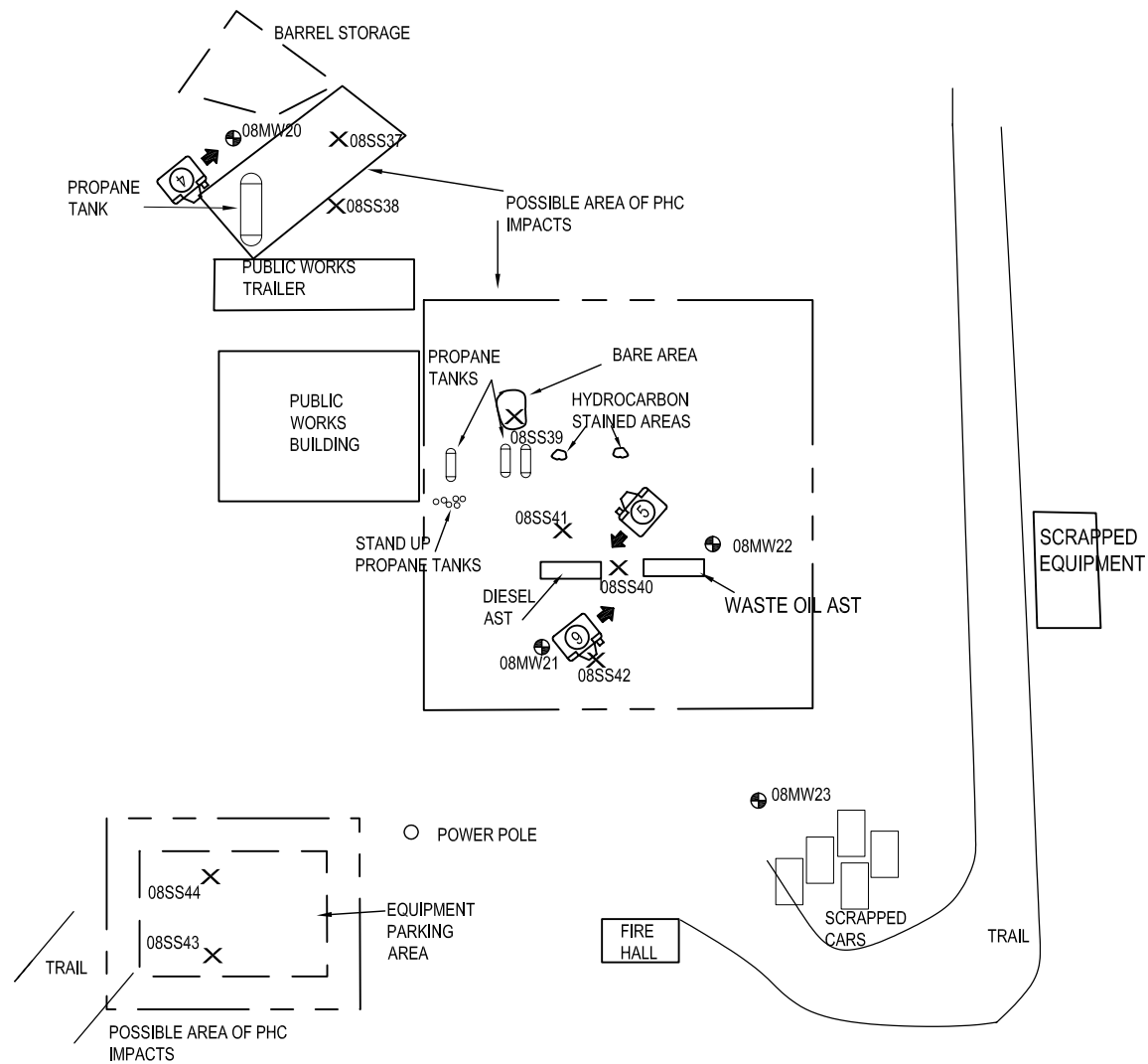
DWN  
MM/HK  
DATE  
October 2008

CKD  
JC/CH  
REV  
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Figure 6

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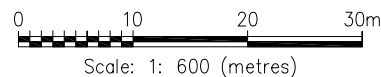


# LEGEND

- ⊕ (08BH##) MONITORING WELL LOCATION
- × (08SS.##) SHALLOW SOIL SAMPLE LOCATION
- 📷 PHOTO DIRECTION AND NUMBER

# NOTE

MONITORING WELL LOCATIONS ARE ON SCALE AND OTHER FEATURES ON THE DRAWING ARE NOT TO SCALE



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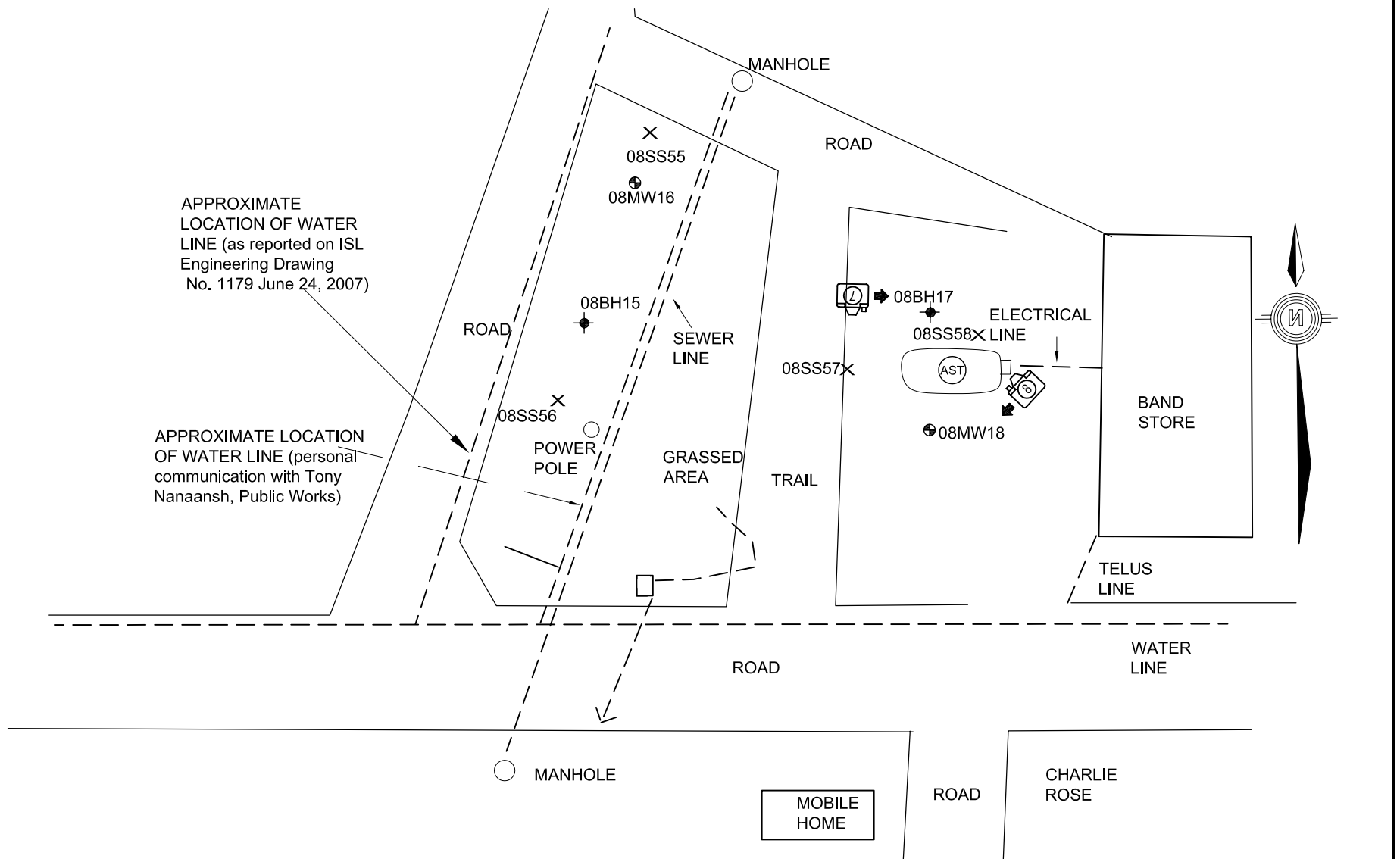
## CONTAMINATED SITE ASSESSMENT GARDEN RIVER INDIAN RESERVATION, AB

### GARDEN RIVER PUBLIC WORKS YARD SITE PLAN

PROJECT NO. C22101178	DWN MM/HK	CKD JC/KC	REV 0	Figure 7
OFFICE EBA-RIV	DATE October 2008			

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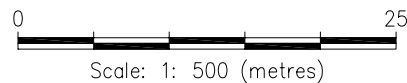


#### LEGEND

- ⊕ (08BH##) MONITORING WELL LOCATION
- ⊙ (08BH##) BOREHOLE LOCATION
- × (08SS.##) SHALLOW SOIL SAMPLE LOCATION
- (###.##) GROUNDWATER ELEVATION
- ###.## GROUNDWATER ELEVATION CONTOUR
- INTERPRETED GROUNDWATER FLOW DIRECTION
- ⊕ PHOTOGRAPH DIRECTION AND NUMBER

#### NOTE

MONITORING WELL LOCATIONS ARE ON SCALE AND OTHER FEATURES ON THE DRAWING ARE NOT TO SCALE



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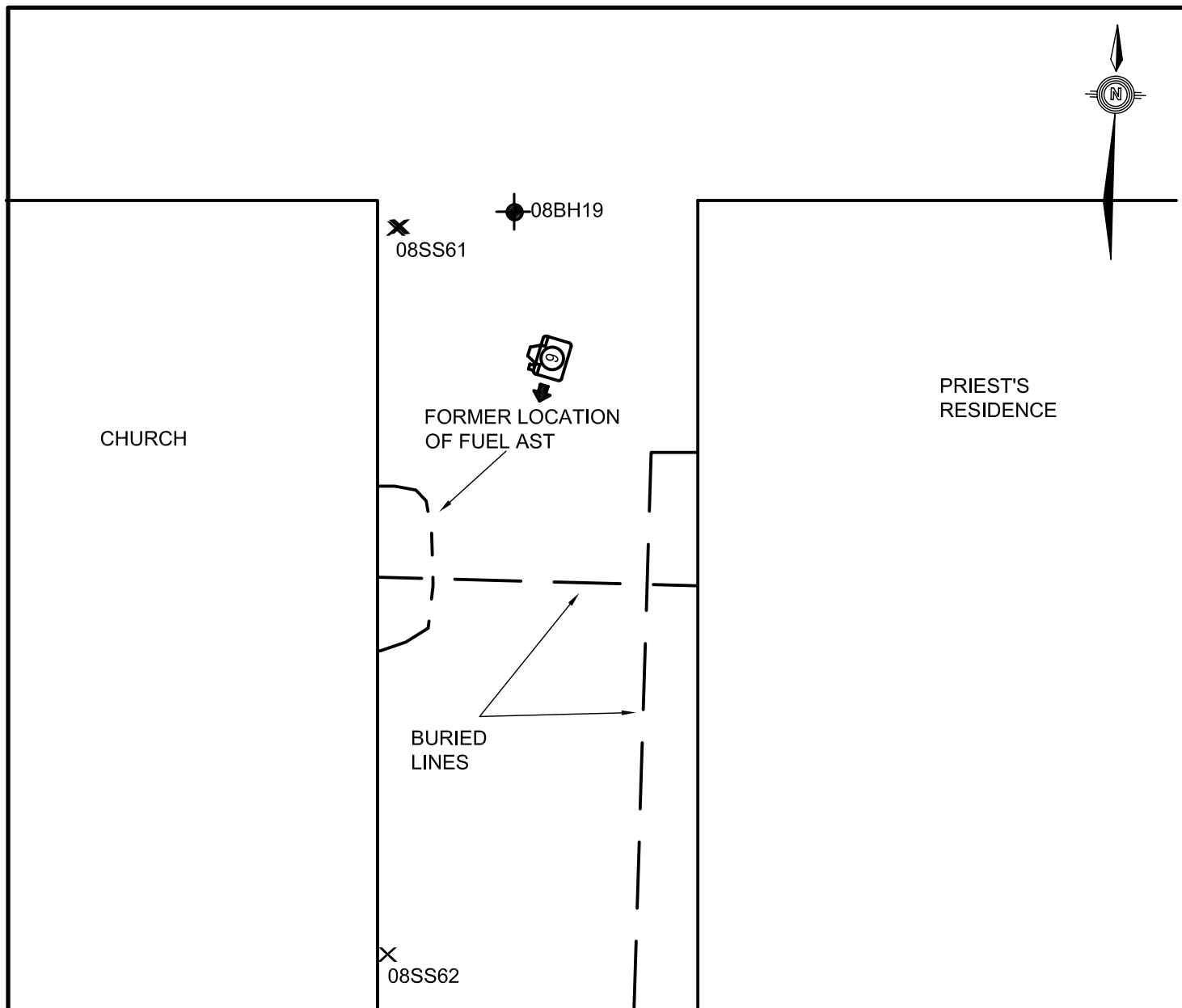
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

#### CONTAMINATED SITE ASSESSMENT GARDEN RIVER INDIAN RESERVATION, AB

#### FIFTH MERIDIAN MARKET AST AND NORTHLANDS SCHOOL HISTORIC AST SITE PLAN

PROJECT NO. C22101178	DWN MM/HK	CKD JC/KC	REV 0	Figure 8
OFFICE EBA-RIV	DATE October 2008			



#### LEGEND

-  (08BH##) BOREHOLE LOCATION
-  (08SS.##) SHALLOW SOIL SAMPLE LOCATION
-  PHOTOGRAPH DIRECTION AND NUMBER

#### NOTE

MONITORING WELL LOCATIONS ARE ON SCALE AND  
OTHER FEATURES ON THE DRAWING ARE NOT TO SCALE

G:\C221\C22101178\AutoCAD\C22101178-Figs 3-10.dwg [FIGURE 9] October 22, 2008 - 7:09:51 am (BY: HEIDI KOMMICK)

0 5  
Scale: 1: 125 (metres)

#### CLIENT



Public Works and  
Government Services  
Canada

Travaux publics et  
Services gouvernementaux  
Canada

#### CONTAMINATED SITE ASSESSMENT GARDEN RIVER INDIAN RESERVATION, AB

#### CHURCH SITE PLAN

**EBA Engineering  
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PROJECT NO.  
C22101178

OFFICE  
RIV

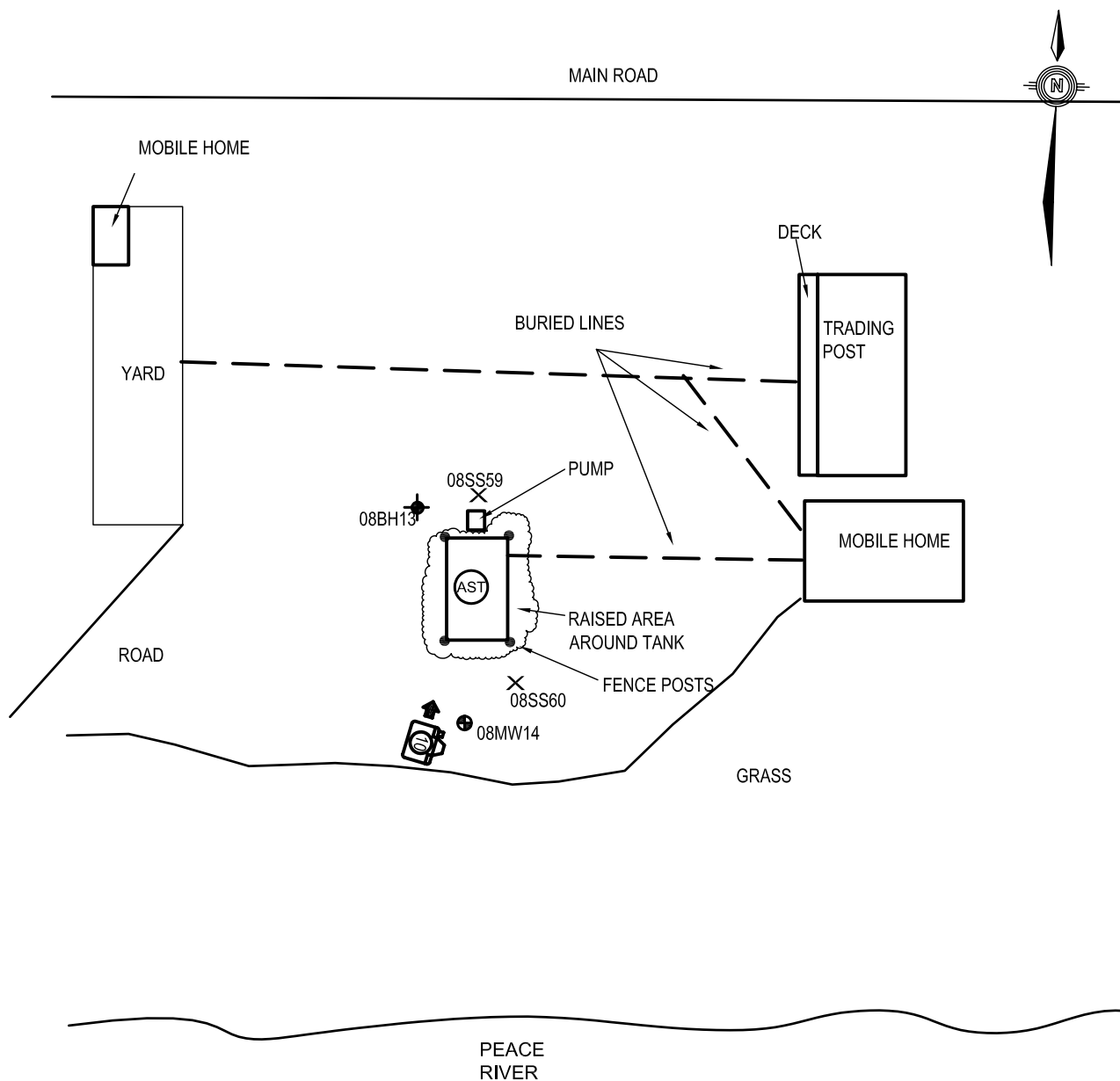
DWN  
MM/HK

CKD  
JC/CH

REV  
0

DATE  
September 2008

**Figure 9**

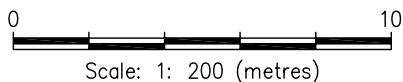


#### LEGEND

- (08BH##) BOREHOLE LOCATION
- MW## MONITORING WELL LOCATION
- (08SS.##) SHALLOW SOIL SAMPLE LOCATION
- PHOTOGRAPH DIRECTION AND NUMBER

#### NOTE

MONITORING WELL LOCATIONS ARE ON SCALE AND OTHER FEATURES ON THE DRAWING ARE NOT TO SCALE



#### CLIENT



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#### CONTAMINATED SITE ASSESSMENT GARDEN RIVER INDIAN RESERVATION, AB

#### GARDEN RIVER TRADING (CHARLIE ROSE) SITE PLAN

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MM/HK

CKD  
JC/CH

REV  
0

DATE  
October 2008

**Figure 10**



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# PHOTOGRAPHS





**Photo 1**

Garden River Landfill looking northeast from 08SS26 (August 26, 2008).



**Photo 2**

Garden River Old Dump looking south towards 08MW05 area (August 26, 2008)



**Photo 3**  
Garden River Airstrip looking east-southeast at 08SS36 (August 26, 2008).



**Photo 4**  
Garden River Public Works yard looking northeast from 08MW20 (August 26, 2008)



**Photo 5**  
Garden River Public Works yard looking southwest from 08SS40 (August 26, 2008).



**Photo 6**  
Garden River Public Works yard looking northeast from 08MW21 (August 26, 2008).



**Photo 7**  
Fifth Meridian Market looking east at AST (August 26, 2008).



**Photo 8**  
Fifth Meridian Market looking southeast at AST (August 26, 2008).



**Photo 9**

Church assessment area showing former AST area (August 26, 2008).



**Photo 10**

Garden River Trading (Charlie Rose) looking north at the AST (August 26, 2008).

# APPENDIX A

APPENDIX A BOREHOLE LOGS

# UNIFIED SOIL CLASSIFICATION†

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA			
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	$C_u = D_{60}/D_{10}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3  Not meeting both criteria for GW  Atterberg limits plot below 'A' line or plasticity index less than 4  Atterberg limits plot above 'A' line and plasticity index greater than 7  $C_u = D_{60}/D_{10}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3  Not meeting both criteria for SW  Atterberg limits plot below 'A' line or plasticity index less than 4  Atterberg limits plot above 'A' line and plasticity index greater than 7		
		GRAVELS WITH FINES	GP	Poorly-graded gravels and gravel-sand mixtures, little or no fines			
			GM	Silty gravels, gravel-sand-silt mixtures			
			GC	Clayey gravels, gravel-sand clay mixtures			
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines	<div>Classification on basis of percentage of fines GW, GP, SW, SP GM, GC, SM, SC Borderline classification requiring use of dual symbols</div> $C_u = D_{60}/D_{10}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3  Not meeting both criteria for GW  Atterberg limits plot below 'A' line or plasticity index less than 4  Atterberg limits plot above 'A' line and plasticity index greater than 7		
			SP	Poorly-graded sands and gravelly sands, little or no fines			
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures			
			SC	Clayey sands, sand-clay mixtures			
		FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less	ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	<div>PLASTICITY CHART For classification of fine-grained soils and fine fraction of coarse-grained soils Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols Equation of 'A' line: <math>PI = 0.73(LL - 20)</math></div>
				CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
OL	Organic silts and organic silty clays of low plasticity						
SILTS AND CLAYS Liquid limit greater than 50%	MH		Inorganic silts, micaceous or distomaceous fine sands or silts, elastic silts				
	CH		Inorganic silts of high plasticity, fat clays				
	OH		Organic clays of medium to high plasticity				
HIGHLY ORGANIC SOILS	PT	Peat, muck and other highly organic soils	*Based on the material passing the 3 in. (75 mm) sieve †ASTM Designation D 2487, for identification procedure see D 2488				

## GROUND ICE DESCRIPTION

### ICE NOT VISIBLE

GROUP SYMBOLS	SYMBOLS	SUBGROUP DESCRIPTION	
N	Nf	Poorly-bonded or friable	
	Nbn	No excess ice, well-bonded	
	Nbe	Excess ice, well-bonded	

#### NOTE:

- Dual symbols are used to indicate borderline or mixed ice classifications
- Visual estimates of ice contents indicated on borehole logs  $\pm 5\%$
- This system of ground ice description has been modified from NRC Technical Memo 79, Guide to the Field Description of Permafrost for Engineering Purposes

#### LEGEND

Soil Ice

### VISIBLE ICE LESS THAN 50% BY VOLUME

GROUP SYMBOLS	SYMBOLS	SUBGROUP DESCRIPTION	
V	Vx	Individual ice crystals or inclusions	
	Vc	Ice coatings on particles	
	Vr	Random or irregularly oriented ice formations	
	Vs	Stratified or distinctly oriented ice formations	

### VISIBLE ICE GREATER THAN 50% BY VOLUME

ICE	ICE + Soil Type	Ice with soil inclusions	
	ICE	Ice without soil inclusions (greater than 25 mm (1 in.) thick)	

## TERMS USED ON BOREHOLE LOGS

### TERMS DESCRIBING CONSISTENCY OR CONDITION

**COARSE GRAINED SOILS** (major portion retained on 0.075mm sieve): Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in situ tests.

DESCRIPTIVE TERM	RELATIVE DENSITY	N (blows per 0.3m)
Very Loose	0 to 20%	0 to 4
Loose	20 to 40%	4 to 10
Compact	40 to 75%	10 to 30
Dense	75 to 90%	30 to 50
Very Dense	90 to 100%	greater than 50

The number of blows, N, on a 51mm O.D. split spoon sampler of a 63.5kg weight falling 0.76m, required to drive the sampler a distance of 0.3m from 0.15m to 0.45m.

**FINE GRAINED SOILS** (major portion passing 0.075mm sieve): Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in situ tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (kPa)
Very Soft	Less Than 25
Soft	25 to 50
Firm	50 to 100
Stiff	100 to 200
Very Stiff	200 to 400
Hard	Greater Than 400

**NOTE:** Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil.

### GENERAL DESCRIPTIVE TERMS

Slickensided	- having inclined planes of weakness that are slick and glossy in appearance.
Fissured	- containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
Laminated	- composed of thin layers of varying colour and texture.
Interbedded	- composed of alternate layers of different soil types.
Calcareous	- containing appreciable quantities of calcium carbonate.
Well Graded	- having wide range in grain sizes and substantial amounts of intermediate particle sizes.
Poorly graded	- predominantly of one grain size, or having a range of sizes with some intermediate size missing.

CONTAMINATED SITE ASSESSMENT & PHASE 2		PARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08BH13	
COMMUNITY OF GARDEN RIVER, AB					
SAMPLE TYPE <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> SPT <input type="checkbox"/> A-CASING <input type="checkbox"/> SHELBY TUBE <input type="checkbox"/> CORE					
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND					

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm)	Depth (ft)
				● 200 400 600 800 ●	
0	CLAYEY SILT - trace sand, firm, low plastic, massive, poorly graded, moist, grey brown.		BAG, 2 JARS	●	0
1	- laminated layers of grey and brown at 1.0 m.		BAG	●	3
2			BAG	●	6
3	- coal seams, iron staining at 3.0 m.		BAG	●	10
4	SILTY SAND - trace clay, uniform, loose, well graded, light greyish brown.		BAG, 2 JARS	●	15
5	SAND - trace silt, trace clay, uniform, loose, poorly graded, reddish brown.		BAG	●	16
6			BAG, 2 JARS	●	20
7			BAG	●	23
8			BAG	●	26
9	- some gravel, free water at 8.5 m.		BAG, 2 JARS	●	29
10	END OF HOLE AT 9.9 m. NOTES: - backfilled with cuttings and bentonite.		BAG	●	33
11					36
12					39
13					42
14					46

<b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 9.9m
	REVIEWED BY:	COMPLETE: 8/27/2008
	DRAWING NO: 08BH13	Page 1 of 1

CONTAMINATED SITE ASSESSMENT & PHASE 2 E		SPARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08BH15	
COMMUNITY OF GARDEN RIVER, AB					
SAMPLE TYPE <input checked="" type="checkbox"/> DISTURBED <input type="checkbox"/> NO RECOVERY <input checked="" type="checkbox"/> SPT <input type="checkbox"/> A-CASING <input type="checkbox"/> SHELBY TUBE <input type="checkbox"/> CORE					
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND					

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm)	Depth (ft)
				● 200 400 600 800 ●	
0	CLAYEY SILT - some sand, firm, low plastic, massive, well graded, dry, brown.				0
	- light reddish brown from 0.4 m to 0.6 m.		BAG, 2 JARS	●	
1	- moist, grey brown at 0.6 m.		BAG	●	5
	- laminated layers of grey and brown at 1.0 m.		BAG	●	
2			BAG	●	
3			BAG	●	10
4			BAG, 2 JARS	●	
	SAND - trace silt, trace clay, uniform, loose, moist, yellowish brown.		BAG	●	15
5			BAG	●	
			BAG, 2 JARS	●	
6			BAG	●	20
7			BAG	●	
8			BAG	●	25
			BAG, 2 JARS	●	
9	- saturated at 8.5 m.		BAG	●	30
10	END OF HOLE AT 9.9 m.		BAG	●	35
	NOTES: - backfilled with cuttings and bentonite.				
11					
12					40
13					
14					45
					46

<b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 9.9m
	REVIEWED BY:	COMPLETE: 8/27/2008
	DRAWING NO: 08BH15	Page 1 of 1

CONTAMINATED SITE ASSESSMENT & PHASE 2 E		PARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08BH17	
COMMUNITY OF GARDEN RIVER, AB					
SAMPLE TYPE  DISTURBED  NO RECOVERY  SPT  A-CASING  SHELBY TUBE  CORE					
BACKFILL TYPE  BENTONITE  PEA GRAVEL  SLOUGH  GROUT  DRILL CUTTINGS  SAND					

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm)	Depth (ft)
				200  400  600  800	
0	CLAYEY SILT - trace sand, stiff, low plastic, massive, poorly graded, moist, dark brown.		BAG, 2 JARS		0
1	- laminated layers of grey and brown from 1.0 m to 2.5 m.		BAG		5
2			BAG		
3	- light olive brown, coal seams, iron mottles, iron staining at 2.5 m.		BAG		10
4			BAG		
5	SAND - trace silt, trace clay, uniform, loose, moist, light yellowish brown.		BAG, 2 JARS		15
6			BAG		
7			BAG, 2 JARS		20
8			BAG		25
9	- free water at 8.5 m.		BAG		30
10	END OF HOLE AT 9.9 m. NOTES: - backfilled with cuttings and bentonite.		BAG		35
11					40
12					45
13					46

<b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 9.9m
	REVIEWED BY:	COMPLETE: 8/27/2008
	DRAWING NO: 08BH17	Page 1 of 1

CONTAMINATED SITE ASSESSMENT & PHASE 2		SPARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08BH19	
COMMUNITY OF GARDEN RIVER, AB					
SAMPLE TYPE <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY <input checked="" type="checkbox"/> SPT <input type="checkbox"/> A-CASING <input type="checkbox"/> SHELBY TUBE <input type="checkbox"/> CORE					
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE <input checked="" type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> DRILL CUTTINGS <input checked="" type="checkbox"/> SAND					

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm)	Depth (ft)
				● 200 400 600 800 ●	
0	CLAYEY SILT - some sand, firm, low plastic, massive, poorly graded, moist, grey brown.		BAG, 2 JARS	●	0
1	- laminated layers of grey and brown at 1.0 m.		BAG	●	3
2			BAG	●	6
3	- iron staining at 2.4 m.		BAG	●	9
4	- grey at 3.5 m.		BAG	●	12
5	SANDY SILT - trace clay, soft, low plastic, massive, well graded, grey. - saturated at 4.3 m.		BAG, 2 JARS	●	15
6	SILTY SAND - trace clay, uniform, loose, well graded, very wet.		BAG	●	18
7	SAND - trace silt, trace clay, uniform, loose, poorly graded, yellowish brown.		BAG	●	21
8			BAG	●	24
9	SILT - some sand, trace clay, very soft, massive, poorly graded, saturated, grey.		BAG, 2 JARS	●	27
10			BAG	●	30
11	END OF HOLE AT 9.9 m. NOTES: - backfilled with cuttings and bentonite.				33
12					36
13					39
14					42


<b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 9.9m
	REVIEWED BY:	COMPLETE: 8/27/2008
	DRAWING NO: 08BH19	Page 1 of 1


PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW01	
GARDEN RIVER, AB		6512137.677N; 679381.5566E; Zone 11		ELEVATION: 241.3734m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
<input checked="" type="checkbox"/> CORE <input type="checkbox"/> SAND					

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS	SOIL VAPOURS (ppm)	Elevation (m)
0	SAND - some silt, trace clay, loose (frozen to 2.0 m), uniform, well graded, moist, reddish brown, plastic and wire in upper 1.0 m.			BAG, 2 JARS		241.0
1			*	BAG, 2 JARS		240.0
2	- clay silt, very stiff (frozen), low plastic, massive, poorly graded, moist, light grey from 1.5 m to 1.7 m. - trace silt, moist, brown at 1.7 m.			BAG, 2 JARS		239.0
3				BAG, 2 JARS		238.0
4	- coarse grained sand at 3.0 m.			BAG, 2 JARS		237.0
5				BAG, 2 JARS		236.0
6	- very moist to wet, greyish brown at 4.7 m.			BAG, 2 JARS		235.0
7				BAG, 2 JARS		234.0
8	- 1 cm by 1 cm clayey silt lens, very moist, iron mottles at 6.1 m.			BAG, 2 JARS		233.0
9			*	BAG, 2 JARS		232.0
10	CLAYEY SILT - some sand, soft, low plastic, massive, well graded, free water (saturated), grey.			BAG, 2 JARS		231.0
11	SAND - some silt, trace clay, loose, uniform.					230.0
12	END OF HOLE AT 11.3 m. NOTES: - sand point at bottom, clean out/threaded cap. - aboveground casing. - solid pipe from stickup to 8.2 m. - slotted pipe from 8.2 m to 11.3 m. - bentonite from 0.0 m to 7.9 m. - sand from 7.9 m to 11.3 m. - located at current landfill. * sample submitted for laboratory analysis.					229.0
13						228.0
14						

 <b>EBA Engineering Consultants Ltd.</b>		LOGGED BY: JS REVIEWED BY: DRAWING NO: 08MW01	COMPLETION DEPTH: 11.3m COMPLETE: 3/19/2008 Page 1 of 1
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PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW02	
GARDEN RIVER, AB		6512137.755N; 679325.4967E; Zone 11		ELEVATION: 240.7326m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
<div style="display: flex; justify-content: space-between;"> <div> <p>Depth (m)</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> </div> <div> <p>SOIL DESCRIPTION</p> <p>SAND - some silt, trace clay, loose (frozen to 2.0 m), uniform, well graded, moist, reddish brown, glass, plastic and wrappers in upper 1.0 m.</p> <p>- trace silt, greyish brown at 1.3 m.</p> <p>CLAYEY SILT - some sand, soft, low plastic, massive, well graded, saturated, grey.</p> <p>SAND - trace silt, trace clay, loose, uniform, moist to wet, grey.</p> <p>END OF HOLE AT 6.7 m.</p> <p>NOTES:</p> <ul style="list-style-type: none"> <li>- aboveground casing.</li> <li>- solid pipe from stickup to 3.7 m.</li> <li>- slotted pipe from 3.7 m to 6.7 m.</li> <li>- bentonite from 0.0 m to 3.4 m.</li> <li>- sand from 3.4 m to 6.7 m.</li> <li>- located at current landfill.</li> <li>* sample submitted for laboratory analysis.</li> </ul> </div> <div> <p>SAMPLE TYPE</p> <p>SAMPLE NUMBER</p> </div> <div> <p>COMMENTS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> </div> <div> <p>SOIL VAPOURS (ppm)</p> <p>200 400 600 800</p> </div> <div> <p>Elevation (m)</p> <p>240.0</p> <p>239.0</p> <p>238.0</p> <p>237.0</p> <p>236.0</p> <p>235.0</p> <p>234.0</p> <p>233.0</p> <p>232.0</p> <p>231.0</p> <p>230.0</p> <p>229.0</p> <p>228.0</p> <p>227.0</p> </div> </div>					
 <b>EBA Engineering Consultants Ltd.</b>			LOGGED BY: JS REVIEWED BY: DRAWING NO: 08MW02		COMPLETION DEPTH: 6.7m COMPLETE: 3/18/2008 Page 1 of 1

PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW03	
GARDEN RIVER, AB		6512157.932N; 679374.2361E; Zone 11		ELEVATION: 241.3799m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>Depth (m)</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> </div> <div style="width: 40%;"> <p style="text-align: center;">SOIL DESCRIPTION</p> <p>SAND - some silt, trace clay, loose (frozen to 2.0 m), uniform, brown, plastic, metal and glass.</p> <p>CLAYEY SILT - some sand, stiff (frozen), low plastic, massive, well graded, moist, dark brown.</p> <p>SAND - trace silt, trace clay, loose, uniform, moist, greyish brown to brown.</p> <p>- very moist at 5.0 m.</p> <p>- coarse grained, very moist to wet from 8.6 m to 11.3 m.</p> <p>END OF HOLE AT 11.3 m.</p> <p>NOTES:</p> <ul style="list-style-type: none"> <li>- aboveground casing.</li> <li>- solid pipe from stickup to 8.2 m.</li> <li>- slotted pipe from 8.2 m to 11.3 m.</li> <li>- bentonite from 0.0 m to 7.9 m.</li> <li>- sand from 7.9 m to 11.3 m.</li> <li>- located at current landfill.</li> <li>* sample submitted for laboratory analysis.</li> </ul> </div> <div style="width: 10%; text-align: center;"> <p>SAMPLE TYPE</p> <p>SAMPLE NUMBER</p> </div> <div style="width: 20%;"> <p>COMMENTS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> </div> <div style="width: 15%;"> <p>SOIL VAPOURS (ppm)</p> <p>200 400 600 800</p> </div> <div style="width: 15%;"> <p>Elevation (m)</p> <p>241.0</p> <p>240.0</p> <p>239.0</p> <p>238.0</p> <p>237.0</p> <p>236.0</p> <p>235.0</p> <p>234.0</p> <p>233.0</p> <p>232.0</p> <p>231.0</p> <p>230.0</p> <p>229.0</p> <p>228.0</p> </div> </div>					

**EBA Engineering Consultants Ltd.**

LOGGED BY: JS

REVIEWED BY:

DRAWING NO: 08MW03

COMPLETION DEPTH: 11.3m

COMPLETE: 3/19/2008


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PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.		
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW04		
GARDEN RIVER, AB		6511925.497N; 681596.2257E; Zone 11		ELEVATION: 238.8412m		
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> CORE
BACKFILL TYPE	<input type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS	SOIL VAPOURS (ppm)	Elevation (m)
0	SILTY SAND - trace clay, some ash (20%), stiff (frozen), well graded, dry, grey brown.			BAG, 2 JARS	•	238.8
1	SANDY SILT - some clay, soft, well graded, moist to very moist, olive brown.		*	BAG, 2 JARS	•	238.0
			BAG, 2 JARS	•	237.0	
			BAG, 2 JARS	•	236.0	
			BAG, 2 JARS	•	235.0	
2				BAG, 2 JARS	•	234.0
3				BAG, 2 JARS	•	233.0
4				BAG, 2 JARS	•	232.0
5	- clayey silt, some sand, well graded, saturated from 4.6 m to 4.8 m.			BAG, 2 JARS	•	231.0
6				BAG, 2 JARS	•	230.0
7	END OF HOLE AT 6.1 m.					229.0
8	NOTES: - end cap/threaded cap/clean out. - aboveground casing. - solid pipe from stickup to 3.1 m. - slotted pipe from 3.1 m to 6.1 m. - bentonite from 0.0 m to 2.7 m. - sand from 2.7 m to 6.1 m. - located at former landfill site. - snow cleared for access. * sample submitted for laboratory analysis.					228.0
9						227.0
10						226.0
11						225.0
12						
13						
14						

 <b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 6.1m
	REVIEWED BY:	COMPLETE: 3/19/2008
	DRAWING NO: 08MW04	Page 1 of 1

PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW04B	
GARDEN RIVER, AB		6511924.557N; 681597.5407E; Zone 11		ELEVATION: 238.877m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>Depth (m)</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> </div> <div style="width: 35%; text-align: center;"> <p>SOIL DESCRIPTION</p> </div> <div style="width: 10%; text-align: center;"> <p>SAMPLE TYPE</p> <p>SAMPLE NUMBER</p> </div> <div style="width: 20%; text-align: center;"> <p>COMMENTS</p> </div> <div style="width: 15%;"> <p>SOIL VAPOURS (ppm)</p> <p>200 400 600 800</p> </div> <div style="width: 10%;"> <p>Elevation (m)</p> <p>238.0</p> <p>237.0</p> <p>236.0</p> <p>235.0</p> <p>234.0</p> <p>233.0</p> <p>232.0</p> <p>231.0</p> <p>230.0</p> <p>229.0</p> <p>228.0</p> <p>227.0</p> <p>226.0</p> <p>225.0</p> </div> </div>					
<p>0 SILTY SAND - trace clay, some ash (20%), stiff (frozen), well graded, dry, grey brown.</p>					
<p>1 SANDY SILT - some clay, soft, well graded, moist to very moist, olive brown.</p>					
<p>2</p>					
<p>3</p>					
<p>4</p>					
<p>5 - soft, low plastic, massive, saturated, grey from 4.6 m to 4.8 m.</p>					
<p>6</p>					
<p>7 CLAYEY SILT - some sand, low plastic, massive, poorly graded, wet, grey.</p>					
<p>8 SAND/GRAVEL - trace silt, trace clay, loose, uniform, saturated.</p>		*	BAG, 2 JARS	●	
<p>9</p>			BAG, 2 JARS	●	
<p>10 END OF HOLE AT 9.8 m.</p> <p>NOTES:</p> <ul style="list-style-type: none"> <li>- sand point at bottom, threaded cap/clean out.</li> <li>- aboveground casing.</li> <li>- solid pipe from stickup to 6.7 m.</li> <li>- slotted pipe from 6.7 m to 9.8 m.</li> <li>- bentonite from 0.0 m to 6.4 m.</li> <li>- sand from 6.4 m to 9.8 m.</li> <li>- located at former landfill site.</li> <li>- snow cleared for access.</li> <li>* sample submitted for laboratory analysis.</li> </ul>					
<p>11</p>					
<p>12</p>					
<p>13</p>					
<p>14</p>					




PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW05	
GARDEN RIVER, AB		6511959.332N; 681591.0148E; Zone 11		ELEVATION: 239.0892m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
				<input type="checkbox"/> CORE	<input type="checkbox"/> SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS	SOIL VAPOURS (ppm)	Elevation (m)
0	SANDY SILT - some clay, firm (frozen to 1.0 m), low plastic, well graded, light olive brown, wood (lumber).			BAG, 2 JARS		239.0
1			*	BAG, 2 JARS		238.0
2				BAG, 2 JARS		237.0
3	- 3 cm by 3 cm thick clayey silt lenses intermixed with sand at 3.1 m.			BAG, 2 JARS		236.0
4	SILTY SAND - trace clay, loose, uniform, moist.					235.0
5	CLAYEY SILT - some sand, soft, low plastic, well graded, saturated, grey.			BAG, 2 JARS		234.0
6	SAND - trace silt, trace clay, loose, uniform, light greyish brown. - 10 cm thick clayey silt layer from 5.5 m to 5.6 m.			BAG, 2 JARS		233.0
7	END OF HOLE AT 6.1 m. NOTES: - end cap/threaded cap/clean out. - aboveground casing. - solid pipe from stickup to 3.1 m. - slotted pipe from 3.1 m to 6.1 m. - bentonite from 0.0 m to 2.7 m. - sand from 2.7 m to 6.1 m. - located at former landfill site. - 1 m from snow covered mound. - snow cleared for access. * sample submitted for laboratory analysis.					232.0
8						231.0
9						230.0
10						229.0
11						228.0
12						227.0
13						226.0
14						


 <b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 6.1m
	REVIEWED BY:	COMPLETE: 3/19/2008
	DRAWING NO: 08MW05	Page 1 of 1

PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW05B	
GARDEN RIVER, AB		6511956.6N; 681591.9637E; Zone 11		ELEVATION: 239.0744m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
				<input type="checkbox"/> CORE	<input type="checkbox"/> SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS	SOIL VAPOURS (ppm)	Elevation (m)
0	SANDY SILT - some clay, firm (frozen to 1.0 m), low plastic, well graded, light olive brown, wood (lumber).				● 200 400 600 800 ●	239.0
1						238.0
2						237.0
3	- 3 cm by 3 cm thick clayey silt lenses intermixed with sand at 3.1 m.					236.0
4	SILTY SAND - trace clay, loose, uniform, moist.					235.0
5	CLAYEY SILT - some sand, soft, low plastic, well graded, saturated, grey.					234.0
6	SAND - trace silt, trace clay, loose, uniform, light greyish brown. - 10 cm thick clayey silt layer from 5.5 m to 5.6 m.					233.0
7	- some gravel from 7.0 m to 9.0 m.					232.0
8			*	BAG, 2 JARS	●	231.0
9				BAG, 2 JARS	●	230.0
10	END OF HOLE AT 9.8 m. NOTES: - sand point at bottom, slip cap. - aboveground casing. - solid pipe from stickup to 6.7 m. - slotted pipe from 6.7 m to 9.8 m. - bentonite from 0.0 m to 6.4 m. - sand from 6.4 m to 9.8 m. - located at former landfill site. - 1 m from snow covered mound. - snow cleared for access. * sample submitted for laboratory analysis.					229.0
11						228.0
12						227.0
13						226.0
14						

 <b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 9.8m
	REVIEWED BY:	COMPLETE: 3/20/2008
	DRAWING NO: 08MW05B	Page 1 of 1

PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW06	
GARDEN RIVER, AB		6511987.141N; 681614.8296E; Zone 11		ELEVATION: 239.0565m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>Depth (m)</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> </div> <div style="width: 35%;"> <p>SOIL DESCRIPTION</p> <p>CLAYEY SILT - some ash, trace sand, very stiff (frozen to 1.0 m), low plastic, massive, well graded, dry, light grey.</p> <p>SANDY SILT - trace clay, soft, low plastic, massive, well graded, moist, olive brown.</p> <p>- increased silt, with sand content, coal stringers, brown from 3.1 m to 3.7 m.</p> <p>CLAYEY SILT - some sand, soft, low plastic, massive, well graded, very moist.</p> <p>SAND - trace silt, trace clay, loose, uniform, well graded, moist, brown. - 5 cm thick silt layers, saturated, grey from 4.3 m to 6.4 m.</p> <p>- coarse grained sand, very moist from 6.4 m to 8.4 m.</p> <p>END OF HOLE AT 8.4 m.</p> <p>NOTES:</p> <ul style="list-style-type: none"> <li>- end cap/threaded cap/clean out.</li> <li>- aboveground casing.</li> <li>- solid pipe from stickup to 3.8 m.</li> <li>- slotted pipe from 3.8 m to 8.4 m.</li> <li>- bentonite from 0.0 m to 3.5 m.</li> <li>- sand from 3.5 m to 8.4 m.</li> <li>- 5 m east of old incinerator.</li> <li>- located at former landfill site.</li> <li>- snow cleared for access.</li> <li>- near cutline.</li> <li>* sample submitted for laboratory analysis.</li> </ul> </div> <div style="width: 10%;"> <p>SAMPLE TYPE</p> <p>SAMPLE NUMBER</p> </div> <div style="width: 20%;"> <p>COMMENTS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> </div> <div style="width: 20%;"> <p>SOIL VAPOURS (ppm)</p> <p>200 400 600 800</p> </div> <div style="width: 10%;"> <p>Elevation (m)</p> <p>239.0</p> <p>238.0</p> <p>237.0</p> <p>236.0</p> <p>235.0</p> <p>234.0</p> <p>233.0</p> <p>232.0</p> <p>231.0</p> <p>230.0</p> <p>229.0</p> <p>228.0</p> <p>227.0</p> <p>226.0</p> </div> </div>					


<b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 8.4m
	REVIEWED BY:	COMPLETE: 3/19/2008
	DRAWING NO: 08MW06	Page 1 of 1

PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW06B	
GARDEN RIVER, AB		6511989.071N; 681615.3663E; Zone 11		ELEVATION: 238.9504m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE
					<input checked="" type="checkbox"/> SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm)	Elevation (m)
				200 400 600 800	
0	CLAYEY SILT - some ash, trace sand, very stiff (frozen to 1.0 m), low plastic, massive, well graded, dry, light grey.				238.0
1	SANDY SILT - trace clay, soft, low plastic, massive, well graded, moist, olive brown.				237.0
2					236.0
3	- increased silt with sand content, coal stringers, brown from 3.1 m to 3.7 m.				235.0
4	CLAYEY SILT - some sand, soft, low plastic, massive, well graded, very moist.				234.0
5	SAND - trace silt, trace clay, loose, uniform, well graded, moist, brown. - 5 cm thick silt layers, saturated, grey from 4.3 m to 6.4 m.				233.0
6					232.0
7	- coarse grained sand, some gravel, very moist from 6.4 m to 9.8 m.				231.0
8					230.0
9	- free water in hole at 9.2 m.		BAG, 2 JARS		229.0
10	END OF HOLE AT 9.8 m.				228.0
11	NOTES: - sand point at bottom, threaded cap/clean out. - aboveground casing. - solid pipe from stickup to 6.7 m. - slotted pipe from 6.7 m to 9.8 m. - bentonite from 0.0 m to 6.1 m. - sand from 6.1 m to 9.8 m. - 4 m east of old incinerator.				227.0
12	- located at former landfill site. - snow cleared for access. - near outline.				226.0
13					225.0
14					


 <b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 9.8m
	REVIEWED BY:	COMPLETE: 3/20/2008
	DRAWING NO: 08MW06B	Page 1 of 1


PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW07	
GARDEN RIVER, AB		6511934.964N; 681358.7766E; Zone 11		ELEVATION: 239.0031m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE
					<input checked="" type="checkbox"/> SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS	SOIL VAPOURS (ppm)	Monitoring well	Elevation (m)
0	SANDY SILT - trace clay, soft (frozen to 0.6 m), low plastic, massive, well graded, light olive brown.			BAG, 2 JARS	200 400 600 800		239.0
1				BAG, 2 JARS			238.0
2				BAG, 2 JARS			237.0
3	SAND - some silt, trace clay, loose, uniform, well graded, brown.			BAG, 2 JARS			236.0
4				BAG, 2 JARS			235.0
5	CLAYEY SILT - some sand, soft, low plastic, massive, well graded, saturated, grey.			BAG, 2 JARS			234.0
6	SAND - trace silt, trace clay, loose, uniform, moist, greyish brown.			BAG, 2 JARS			233.0
7	END OF HOLE AT 6.1 m. NOTES: - end cap/threaded cap/clean out. - flushmount casing cemented in place. - solid pipe from 0.2 m to 3.1 m. - slotted pipe from 3.1 m to 6.1 m. - bentonite from 0.2 m to 2.7 m. - sand from 2.7 m to 6.1 m. - located at former septic field site. - located identified by Public Works personnel. - snow cleared for access. * sample submitted for laboratory analysis.						232.0
8							231.0
9							230.0
10							229.0
11							228.0
12							227.0
13							226.0
14							

 <b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 6.1m
	REVIEWED BY:	COMPLETE: 3/19/2008
	DRAWING NO: 08MW07	Page 1 of 1

PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW07B	
GARDEN RIVER, AB		6511934.816N; 681360.6319E; Zone 11		ELEVATION: 239.0409m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>Depth (m)</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> </div> <div style="width: 40%;"> <p>SOIL DESCRIPTION</p> <p>SANDY SILT - trace clay, soft (frozen to 0.6 m), low plastic, massive, well graded, light olive brown.</p> <p>SAND - some silt, trace clay, loose, uniform, well graded, brown.</p> <p>CLAYEY SILT - some sand, soft, low plastic, massive, well graded, saturated, grey.</p> <p>SAND - trace silt, trace clay, loose, uniform, moist, greyish brown.</p> <p>- coarse grained, saturated from 8.3 m to 9.2 m.</p> <p>END OF HOLE AT 9.2 m.</p> <p>NOTES:</p> <ul style="list-style-type: none"> <li>- sand point at bottom, threaded cap/clean out.</li> <li>- flushmount casing cemented in place.</li> <li>- solid pipe from 0.3 m to 6.1 m.</li> <li>- slotted pipe from 6.1 m to 9.2 m.</li> <li>- bentonite from 0.3 m to 5.8 m.</li> <li>- sand from 5.8 m to 9.2 m.</li> <li>- located at former septic field site.</li> <li>- location identified by Public Works personnel.</li> <li>- snow cleared for access.</li> <li>* sample submitted for laboratory analysis.</li> </ul> </div> <div style="width: 10%;"> <p>SAMPLE TYPE</p> <p>SAMPLE NUMBER</p> </div> <div style="width: 25%;"> <p>COMMENTS</p> <p>BAG, 2 JARS</p> <p>BAG, 2 JARS</p> </div> <div style="width: 10%;"> <p>SOIL VAPOURS (ppm)</p> <p>200 400 600 800</p> </div> <div style="width: 15%;"> <p>Monitoring well</p> <p>Elevation (m)</p> <p>239.0</p> <p>238.0</p> <p>237.0</p> <p>236.0</p> <p>235.0</p> <p>234.0</p> <p>233.0</p> <p>232.0</p> <p>231.0</p> <p>230.0</p> <p>229.0</p> <p>228.0</p> <p>227.0</p> <p>226.0</p> </div> </div>					
 <b>EBA Engineering Consultants Ltd.</b>				LOGGED BY: JS REVIEWED BY: DRAWING NO: 08MW07B	
				COMPLETION DEPTH: 9.2m COMPLETE: 3/20/2008 Page 1 of 1	

PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.		
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW08		
GARDEN RIVER, AB		6511935.374N; 681387.1719E; Zone 11		ELEVATION: 239.2167m		
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> CORE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND
Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS	SOIL VAPOURS (ppm)	Elevation (m)
0	SANDY SILT - some clay, firm (frozen to 1.0 m), massive, well graded, moist, light olive brown.			BAG, 2 JARS	●	239.0
1				BAG, 2 JARS	●	238.0
2	- some gravel, trace clay at 1.5 m.			BAG, 2 JARS	●	237.0
3	SILTY SAND - trace clay, loose, uniform, well graded, moist, brown.			BAG, 2 JARS	●	236.0
4				BAG, 2 JARS	●	235.0
5	CLAYEY SILT - some sand, soft, low plastic, massive, well graded, saturated, grey.			BAG, 2 JARS	●	234.0
6	SAND - trace silt, trace clay, loose, uniform, moist, grey brown.			BAG, 2 JARS	●	233.0
7	- 2 cm thick silty clay lenses, wet from 5.8 m to 9.8 m.			BAG, 2 JARS	●	232.0
8	- coarse grained sand, saturated (free water) from 7.9 m to 9.8 m.			BAG, 2 JARS	●	231.0
9				BAG, 2 JARS	●	230.0
10	END OF HOLE AT 9.8 m.					229.0
11	NOTES: - sand point at bottom, threaded cap/clean out. - flushmount casing cemented in place. - solid pipe from 0.2 m to 6.7 m. - slotted pipe from 6.7 m to 9.8 m. - bentonite from 0.2 m to 6.1 m. - sand from 6.1 m to 9.8 m. - located at former septic field site.					228.0
12	- location identified by Public Works personnel. - snow cleared for access. * sample submitted for laboratory analysis.					227.0
13						226.0
14						



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LOGGED BY: JS

REVIEWED BY:

DRAWING NO: 08MW08

COMPLETION DEPTH: 9.8m

COMPLETE: 3/20/2008

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PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW09	
GARDEN RIVER, AB		6511968.45N; 681389.7407E; Zone 11		ELEVATION: 239.0257m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>Depth (m)</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> </div> <div style="width: 35%; text-align: center;"> <p>SOIL DESCRIPTION</p> </div> <div style="width: 5%; text-align: center;"> <p>SAMPLE TYPE</p> </div> <div style="width: 5%; text-align: center;"> <p>SAMPLE NUMBER</p> </div> <div style="width: 20%; text-align: center;"> <p>COMMENTS</p> </div> <div style="width: 20%;"> <p>SOIL VAPOURS (ppm)</p> <p>200 400 600 800</p> </div> <div style="width: 10%; text-align: center;"> <p>Monitoring well</p> </div> <div style="width: 10%;"> <p>Elevation (m)</p> <p>239.0</p> <p>238.0</p> <p>237.0</p> <p>236.0</p> <p>235.0</p> <p>234.0</p> <p>233.0</p> <p>232.0</p> <p>231.0</p> <p>230.0</p> <p>229.0</p> <p>228.0</p> <p>227.0</p> <p>226.0</p> </div> </div>					
SANDY SILT - some clay, firm (frozen to 1.0 m), massive, well graded, moist, light brown.				BAG, 2 JARS	
				BAG, 2 JARS	
				BAG, 2 JARS	
SILTY SAND - trace clay, loose, uniform, well graded, moist, brown.				BAG, 2 JARS	
				BAG, 2 JARS	
CLAYEY SILT - some sand, soft, low plastic, massive, well graded, saturated, grey.					
SAND - trace silt, trace clay, loose, uniform, moist, grey brown.				BAG, 2 JARS	
- 2 to 3 cm thick clayey silt layers from 4.8 m to 6.1 m.					
				BAG, 2 JARS	
- coarse grained from 6.1 m to 9.2 m.					
				BAG, 2 JARS	
				BAG, 2 JARS	
END OF HOLE AT 9.2 m.				BAG, 2 JARS	
NOTES:					
- sand point at bottom, threaded cap/clean out.					
- flushmount casing cemented in place.					
- solid pipe from 0.2 m to 6.1 m.					
- slotted pipe from 6.1 m to 9.2 m.					
- bentonite from 0.2 m to 5.8 m.					
- sand from 5.8 m to 9.2 m.					
- located at former septic field site.					
- location identified by Public Works personnel.					
- snow cleared for access.					
* sample submitted for laboratory analysis.					



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LOGGED BY: JS

REVIEWED BY:

DRAWING NO: 08MW09

COMPLETION DEPTH: 9.2m

COMPLETE: 3/20/2008

Page 1 of 1

PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW10	
GARDEN RIVER, AB		6512475.265N; 681364.3781E; Zone 11		ELEVATION: 240.8725m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>Depth (m)</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> </div> <div style="width: 35%; text-align: center;"> <p>SOIL DESCRIPTION</p> </div> <div style="width: 10%; text-align: center;"> <p>SAMPLE TYPE</p> <p>SAMPLE NUMBER</p> </div> <div style="width: 20%; text-align: center;"> <p>COMMENTS</p> </div> <div style="width: 15%;"> <p>SOIL VAPOURS (ppm)</p> <p>200 400 600 800</p> </div> <div style="width: 10%;"> <p>Elevation (m)</p> <p>240.0</p> <p>239.0</p> <p>238.0</p> <p>237.0</p> <p>236.0</p> <p>235.0</p> <p>234.0</p> <p>233.0</p> <p>232.0</p> <p>231.0</p> <p>230.0</p> <p>229.0</p> <p>228.0</p> <p>227.0</p> </div> </div>					
SANDY SILT - trace clay, firm (frozen to 0.8 m), low plastic, massive, well graded, moist, reddish brown.		BAG, 2 JARS			
SILTY SAND - trace clay, loose, uniform, well graded, moist, brown.		BAG, 2 JARS			
		BAG, 2 JARS			
		BAG, 2 JARS			
- coarse grained sand from 4.0 m to 5.5 m.		BAG, 2 JARS			
- coarser sand, some gravel from 5.5 m to 7.0 m.		BAG, 2 JARS			
- decreased coarseness, no gravel from 7.0 m to 9.8 m.		BAG, 2 JARS			
- saturated at 7.8 m.		BAG, 2 JARS			
END OF HOLE AT 9.8 m.		BAG, 2 JARS			
<p>NOTES:</p> <ul style="list-style-type: none"> <li>- sand point at bottom, push cap.</li> <li>- aboveground casing.</li> <li>- solid pipe from stickup to 6.7 m.</li> <li>- slotted pipe from 6.7 m to 9.8 m.</li> <li>- bentonite from 0.0 m to 6.4 m.</li> <li>- sand from 6.4 m to 9.8 m.</li> <li>- located at landing strip.</li> <li>- snow cleared for access.</li> <li>- * sample submitted for laboratory analysis.</li> </ul>					



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REVIEWED BY:

DRAWING NO: 08MW10

COMPLETION DEPTH: 9.8m

COMPLETE: 3/21/2008

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PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW11	
GARDEN RIVER, AB		6512421.745N; 681309.559E; Zone 11		ELEVATION: 240.9826m	
SAMPLE TYPE  DISTURBED  NO RECOVERY  SPT  A-CASING  SHELBY TUBE  CORE					
BACKFILL TYPE  BENTONITE  PEA GRAVEL  SLOUGH  GROUT  DRILL CUTTINGS  SAND					

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS	SOIL VAPOURS (ppm)	Elevation (m)
0	SANDY SILT - trace clay, firm (frozen to 0.8 m), low plastic, massive, well graded, moist, reddish brown.			BAG, 2 JARS	● 200 400 600 800	
1	SILTY SAND - trace clay, loose, uniform, well graded, moist, brown.			BAG, 2 JARS		240.0
2				BAG, 2 JARS		239.0
3				BAG, 2 JARS		238.0
4				BAG, 2 JARS		237.0
5	CLAYEY SILT - trace sand, soft, low plastic, massive, well graded, wet, grey.			BAG, 2 JARS		236.0
6	SILTY SAND - trace clay, loose, uniform, well graded, moist, brown.			BAG, 2 JARS		235.0
7	- coarse grained sand, some gravel at 6.6 m.			BAG, 2 JARS		234.0
8	- saturated, grey from 8.0 m to 9.8 m.			BAG, 2 JARS		233.0
9				BAG, 2 JARS		232.0
10	END OF HOLE AT 9.8 m.					231.0
11	NOTES: - sand point at bottom, push cap. - aboveground casing. - solid pipe from stickup to 6.7 m. - slotted pipe from 6.7 m to 9.8 m. - bentonite from 0.0 m to 6.4 m. - sand from 6.4 m to 9.8 m. - located at landing strip. - snow cleared for access. * sample submitted for laboratory analysis.					230.0
12						229.0
13						228.0
14						227.0

<b>EBA Engineering Consultants Ltd.</b>		LOGGED BY: JS REVIEWED BY: DRAWING NO: 08MW11	COMPLETION DEPTH: 9.8m COMPLETE: 3/21/2008 Page 1 of 1
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PHASE 2 ENVIRONMENTAL SITE ASSESSMENT		PARKS CANADA		PROJECT NO. - BOREHOLE NO.	
LITTLE RED RIVER CREE NATION		SOLID STEM/HOLLOW STEM AUGER		C22101178-08MW12	
GARDEN RIVER, AB		6512425.94N; 681404.2111E; Zone 11		ELEVATION: 241.3308m	
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> A-CASING	<input checked="" type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS
					<input checked="" type="checkbox"/> CORE
					<input checked="" type="checkbox"/> SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	COMMENTS	SOIL VAPOURS (ppm)	Elevation (m)
0	SANDY SILT - trace clay, firm (frozen to 0.8 m), low plastic, well graded.			BAG, 2 JARS		241.0
1	SILTY SAND - trace clay, loose, uniform, well graded, moist, brown.			BAG, 2 JARS		240.0
2				BAG, 2 JARS		239.0
3				BAG, 2 JARS		238.0
4	- grey brown from 4.0 m to 7.6 m.			BAG, 2 JARS		237.0
5				BAG, 2 JARS		236.0
6				BAG, 2 JARS		235.0
7				BAG, 2 JARS		234.0
8	- wet, grey from 7.6 m to 9.2 m. - saturated at 8.0 m.			BAG, 2 JARS		233.0
9				BAG, 2 JARS		232.0
10	END OF HOLE AT 9.8 m.					231.0
11	NOTES: - sand point at bottom, push cap. - aboveground casing. - solid pipe from stickup to 6.7 m. - slotted pipe from 6.7 m to 9.8 m. - bentonite from 0.0 m to 6.4 m. - sand from 6.4 m to 9.8 m. - located at landing strip. - snow cleared for access. * sample submitted for laboratory analysis.					230.0
12						229.0
13						228.0
14						

EBA Engineering Consultants Ltd.		LOGGED BY: JS	COMPLETION DEPTH: 9.8m
		REVIEWED BY:	COMPLETE: 3/21/2008
		DRAWING NO: 08MW12	Page 1 of 1

CONTAMINATED SITE ASSESSMENT & PHASE 2		SPARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08MW14	
COMMUNITY OF GARDEN RIVER, AB					

SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE	<input type="checkbox"/> CORE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input checked="" type="checkbox"/> SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm)	Monitoring well	Depth (ft)
				200 400 600 800		
0	CLAYEY SILT - some sand, stiff, low plastic, massive, poorly graded, moist, grey brown.	<input checked="" type="checkbox"/>	BAG, 2 JARS	•	Monitoring well	0
1	- laminated layers of grey and brown at 1.2 m.	<input checked="" type="checkbox"/>	BAG	•		5
		<input checked="" type="checkbox"/>	BAG	•		
2		<input checked="" type="checkbox"/>	BAG	•		
3	- organic layer from 3.1 m to 3.2 m.	<input checked="" type="checkbox"/>	BAG	•		10
		<input checked="" type="checkbox"/>	BAG	•		
4		<input checked="" type="checkbox"/>	BAG, 2 JARS	•		15
5	SILTY SAND - trace clay, uniform, loose, poorly graded, moist, reddish brown.	<input checked="" type="checkbox"/>	BAG	•		
	- silt layer from 4.9 m to 5.0 m.	<input checked="" type="checkbox"/>	BAG	•		
	- wet from 5.5 m to 5.7 m.	<input checked="" type="checkbox"/>	BAG	•		20
6		<input checked="" type="checkbox"/>	BAG	•		
	SAND - trace silt, trace clay, uniform, loose, poorly graded, moist, greyish brown.	<input checked="" type="checkbox"/>	BAG, 2 JARS	•		25
7		<input checked="" type="checkbox"/>	BAG	•		
	CLAYEY SILT - trace sand, soft, low plastic, massive, well graded, wet, grey.	<input checked="" type="checkbox"/>	BAG	•		30
8		<input checked="" type="checkbox"/>	BAG	•		
		<input checked="" type="checkbox"/>	BAG, 2 JARS	•	35	
9		<input checked="" type="checkbox"/>	BAG	•		
		<input checked="" type="checkbox"/>	BAG	•	40	
10	END OF HOLE AT 9.9 m.				45	
	NOTES: - flushmounted road box. - drive point/threaded cap/clean out plug. - solid pipe from 0.3 m to 6.9 m. - slotted pipe from 6.9 m to 9.9 m. - bentonite from 0.0 m to 6.1 m. - sand from 6.1 m to 9.9 m.				46	

<b>EBA Engineering Consultants Ltd.</b>		LOGGED BY: JS	COMPLETION DEPTH: 9.9m
		REVIEWED BY:	COMPLETE: 8/27/2008
		DRAWING NO: 08MW14	Page 1 of 1

CONTAMINATED SITE ASSESSMENT & PHASE 2		PARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08MW16	
COMMUNITY OF GARDEN RIVER, AB					
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Depth (m)</p> <p>SOIL DESCRIPTION</p> <p>0 CLAYEY SILT - some sand, stiff, low plastic, poorly graded, grey brown.</p> <p>1 - laminated layers of grey and brown at 1.0 m.</p> <p>2</p> <p>3</p> <p>4 - grey at 3.7 m.</p> <p>5 SAND - trace silt, trace clay, uniform, loose, moist, brown.</p> <p>6</p> <p>7</p> <p>8</p> <p>9 - free water at 8.5 m.</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> </div> <div style="width: 45%;"> <p>SAMPLE TYPE</p> <p>COMMENTS</p> <p>BAG, 2 JARS</p> <p>BAG</p> <p>BAG</p> <p>BAG</p> <p>BAG</p> <p>BAG</p> <p>BAG, 2 JARS</p> <p>BAG</p> <p>BAG</p> <p>BAG, 2 JARS</p> <p>BAG</p> <p>BAG</p> <p>BAG, 2 JARS</p> <p>BAG</p> <p>BAG</p> <p>END OF HOLE AT 9.9 m.</p> <p>NOTES:</p> <ul style="list-style-type: none"> <li>- flushmounted road box.</li> <li>- drive point/threaded cap/clean out plug.</li> <li>- solid pipe from 0.3 m to 6.9 m.</li> <li>- slotted pipe from 6.9 m to 9.9 m.</li> <li>- bentonite from 0.3 m to 6.4 m.</li> <li>- sand from 6.4 m to 9.9 m.</li> </ul> </div> </div>					
				<p>SOIL VAPOURS (ppm)</p> <p>200 400 600 800</p>	
				<p>Monitoring well</p> <p>Depth (ft)</p>	
<p>LOGGED BY: JS</p> <p>REVIEWED BY:</p> <p>DRAWING NO: 08MW16</p>					
<p>COMPLETION DEPTH: 9.9m</p> <p>COMPLETE: 8/27/2008</p> <p>Page 1 of 1</p>					

CONTAMINATED SITE ASSESSMENT & PHASE 2 E		PARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08MW18	
COMMUNITY OF GARDEN RIVER, AB					
<b>SAMPLE TYPE</b> <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> NO RECOVERY <input checked="" type="checkbox"/> SPT <input type="checkbox"/> A-CASING <input type="checkbox"/> SHELBY TUBE <input type="checkbox"/> CORE					
<b>BACKFILL TYPE</b> <input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND					
Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm)	Monitoring well
				200 400 600 800	
0	CLAYEY SILT - trace sand, stiff, low plastic, massive, poorly graded, moist, dark brown.	BAG, 2 JARS			
1	- laminated from 1.0 m to 2.4 m.	BAG			
2		BAG			
3	- olive brown, intermixed sand lenses, coal nuggets, iron mottles at 2.4 m.	BAG			
4		BAG			
5	SAND - trace silt, trace clay, uniform, loose, moist, reddish brown.	BAG, 2 JARS			
6		BAG			
7	- silty clay stringer from 5.5 m to 5.7 m.	BAG			
8	- silty clay stringer from 6.1 m to 6.2 m.	BAG			
9	- silty clay stringer from 6.7 m to 6.8 m.	BAG, 2 JARS			
10	- black streaks in sand at 7.3 m.	BAG			
11		BAG			
12	- free water at 8.5 m.	BAG, 2 JARS			
13		BAG			
14	END OF HOLE AT 9.9 m.	BAG			
NOTES: - flushmounted road box. - drive point/end cap/clean out plug. - solid pipe from 0.3 m to 6.9 m. - slotted pipe from 6.9 m to 9.9 m. - bentonite from 0.3 m to 6.2 m. - sand from 6.2 m to 9.9 m.					
<b>EBA Engineering Consultants Ltd.</b>		LOGGED BY: JS REVIEWED BY: DRAWING NO: 08MW18		COMPLETION DEPTH: 9.9m COMPLETE: 8/27/2008 Page 1 of 1	

CONTAMINATED SITE ASSESSMENT & PHASE 2		SPARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08MW20	
COMMUNITY OF GARDEN RIVER, AB					
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
<div style="display: flex; justify-content: space-between;"> <div style="width: 15%;"> <p>Depth (m)</p> <p>0</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> </div> <div style="width: 35%; text-align: center;"> <p>SOIL DESCRIPTION</p> </div> <div style="width: 10%; text-align: center;"> <p>SAMPLE TYPE</p> </div> <div style="width: 20%; text-align: center;"> <p>COMMENTS</p> </div> <div style="width: 20%;"> <p>● SOIL VAPOURS (ppm)</p> <p>200 400 600 800</p> </div> <div style="width: 10%; text-align: center;"> <p>Monitoring well</p> </div> <div style="width: 15%;"> <p>Depth (ft)</p> <p>0</p> <p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> <p>30</p> <p>35</p> <p>40</p> <p>45</p> <p>46</p> </div> </div>					
<p>SAND - some silt, trace clay, uniform, very loose, well graded, moist, light yellowish brown, iron staining intermixed throughout.</p>		BAG, 2 JARS		●	
		BAG		●	
		BAG		●	
<p>SILTY CLAY - some sand, very soft, low plastic, massive, well graded, wet, very light grey.</p>		BAG		●	
<p>SAND - some silt, trace clay, uniform, very loose, well graded, moist, light yellowish brown, iron staining intermixed throughout.</p>		BAG		●	
		BAG		●	
		BAG, 2 JARS		●	
<p>SAND - trace silt, trace clay, wet to 4.9 m.</p>		BAG		●	
		BAG		●	
<p>- moist, light grey brown from 4.9 m to 9.2 m.</p>		BAG		●	
		BAG, 2 JARS		●	
		BAG		●	
		BAG		●	
<p>- coarser sand at 7.3 m.</p>		BAG		●	
		BAG		●	
		BAG		●	
<p>- free water from 9.2 m to 11.4 m.</p>		BAG, 2 JARS		●	
		BAG		●	
		BAG		●	
		BAG		●	
<p>END OF HOLE AT 11.4 m.</p> <p>NOTES:</p> <ul style="list-style-type: none"> <li>- flushmounted road box.</li> <li>- drive point/threaded cap/clean out plug.</li> <li>- solid pipe from 0.3 m to 8.4 m.</li> <li>- slotted pipe from 8.4 m to 11.4 m.</li> <li>- bentonite from 0.3 m to 1.7 m and from 7.2 m to 8.1 m.</li> <li>- cuttings from 1.7 m to 7.2 m.</li> <li>- sand from 8.1 m to 11.4 m.</li> </ul>					

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DRAWING NO: 08MW20

COMPLETION DEPTH: 11.4m

COMPLETE: 8/26/2008

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CONTAMINATED SITE ASSESSMENT & PHASE 2 E		PARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08MW21	
COMMUNITY OF GARDEN RIVER, AB					
SAMPLE TYPE	DISTURBED	NO RECOVERY	SPT	A-CASING	SHELBY TUBE
BACKFILL TYPE	BENTONITE	PEA GRAVEL	SLOUGH	GROUT	DRILL CUTTINGS
				CORE	SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm)	Monitoring well	Depth (ft)
				200 400 600 800		
0	SILTY SAND - trace clay, uniform, loose, well graded, brown.		BAG, 2 JARS			0
1			BAG			5
2	SAND - trace silt, trace clay, uniform, loose, well graded, brown.		BAG			10
3			BAG			15
4	SANDY SILT - trace clay, soft, low plastic, massive, well graded, moist, greyish brown.		BAG, 2 JARS			20
5	SAND - trace silt, trace clay, uniform, loose, well graded, moist, brown, coal stringers.		BAG			25
6			BAG			30
7			BAG			35
8			BAG			40
9	SAND AND GRAVEL - trace silt, trace clay, uniform, loose, very moist.		BAG, 2 JARS			45
10			BAG			46
11	END OF HOLE AT 9.9 m.					
12	NOTES: - flushmounted road box. - drive point/threaded cap/clean out plug. - solid pipe from 0.3 m to 6.9 m. - slotted pipe from 6.9 m to 9.9 m. - bentonite from 0.3 m to 6.6 m. - sand from 6.6 m to 9.9 m.					
13						
14						


	LOGGED BY: JS	COMPLETION DEPTH: 9.9m
	REVIEWED BY:	COMPLETE: 8/26/2008
	DRAWING NO: 08MW21	Page 1 of 1

CONTAMINATED SITE ASSESSMENT & PHASE 2		PARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.	
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08MW22	
COMMUNITY OF GARDEN RIVER, AB					
SAMPLE TYPE	<input checked="" type="checkbox"/> DISTURBED	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> A-CASING	<input type="checkbox"/> SHELBY TUBE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS
	<input type="checkbox"/> SAND				


  

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm)	Monitoring well	Depth (ft)
0	SILTY SAND - trace clay, uniform, loose, well graded, brown.					0
1	- light brown at 0.8 m.	BAG, 2 JARS				5
2		BAG				10
3		BAG				15
4	SANDY SILT - trace clay, soft, low plastic, massive, well graded, wet, greyish brown, coal stringers.	BAG, 2 JARS				20
5	SAND - trace silt, trace clay, uniform, loose, moist, brown.	BAG				25
6		BAG				30
7	- with gravel at 6.1 m.	BAG, 2 JARS				35
8		BAG				40
9	- free water at 8.5 m.	BAG, 2 JARS				45
10	END OF HOLE AT 9.9 m.	BAG				46
11	NOTES: - flushmounted road box. - drive point/threaded cap/clean out plug. - solid pipe from 0.3 m to 6.9 m. - slotted pipe from 6.9 m to 9.9 m. - bentonite from 0.3 m to 6.6 m. - sand from 6.6 m to 9.9 m.					
12						
13						
14						

 <b>EBA Engineering Consultants Ltd.</b>	LOGGED BY: JS	COMPLETION DEPTH: 9.9m
	REVIEWED BY:	COMPLETE: 8/26/2008
	DRAWING NO: 08MW22	Page 1 of 1

CONTAMINATED SITE ASSESSMENT & PHASE 2		SPARKS CANADA AGENCY		PROJECT NO. - BOREHOLE NO.		
WOOD BUFFALO NATIONAL PARK		6" SOLID STEM AUGER		C22101178-08MW23		
COMMUNITY OF GARDEN RIVER, AB						
SAMPLE TYPE	DISTURBED	NO RECOVERY	SPT	A-CASING	SHELBY TUBE	CORE
BACKFILL TYPE	BENTONITE	PEA GRAVEL	SLOUGH	GROUT	DRILL CUTTINGS	SAND
Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	COMMENTS	SOIL VAPOURS (ppm) 200 400 600 800		Monitoring well
0	SILTY SAND - trace clay, uniform, loose, well graded, dry, grey brown.		BAG, 2 JARS			
1			BAG			
2	SAND - trace silt, trace clay, uniform, loose, well graded, moist, brown, coal stringers.		BAG			
3			BAG			
4			BAG, 2 JARS			
5			BAG			
6			BAG			
7			BAG, 2 JARS			
8	SAND AND GRAVEL - trace silt, trace clay, uniform, loose, poorly graded, free water, brown.		BAG			
9			BAG			
10	END OF HOLE AT 9.9 m. NOTES: - flushmounted road box. - drive point/threaded cap/clean out plug. - solid pipe from 0.3 m to 6.9 m. - slotted pipe from 6.9 m to 9.9 m. - bentonite from 0.3 m to 6.6 m. - sand from 6.6 m to 9.9 m.		BAG, 2 JARS			
11			BAG			
12			BAG			
13			BAG			
14			BAG			


**EBA Engineering Consultants Ltd.**

LOGGED BY: JS  
 REVIEWED BY:  
 DRAWING NO: 08MW23

COMPLETION DEPTH: 9.9m  
 COMPLETE: 8/26/2008  
 Page 1 of 1

TABLE A4: SUMMARY OF SURFACE SOIL SAMPLES			
Assessment Area	Surface Sample Number	Soil Characteristics	Combustible Vapour Concentration
Garden River Landfill	08SS24	Sand, trace silt, trace clay; 10% garbage	50 ppm
	08SS25	Silty sand, trace clay;	50 ppm
	08SS26	Silty sand, trace clay;	50 ppm
	08SS27	Silty sand, trace clay;	50 ppm
	08SS28	Silty sand, trace clay;	50 ppm
Garden River Airstrip	08SS29	Silty sand, trace clay;	ND
	08SS30	Silty sand, trace clay;	ND
	08SS31	Silty sand, trace clay;	25 ppm
	08SS32	Silty sand, trace clay;	25 ppm
	08SS33	Silty sand, trace clay;	ND
	08SS34	Silty sand, trace clay;	ND
	08SS35	Silty sand, trace clay;	10 ppm
	08SS36	Silty sand, trace clay; diesel fuel odour.	5% LEL
Garden River Public Works Yard	08SS37	Silty sand, trace clay; oil stain.	25 ppm
	08SS38	Silty sand, trace clay.	5 ppm
	08SS39	Silty sand, trace clay; oil stain.	50 ppm
	08SS40	Silty sand, trace clay; oil stain.	150 ppm
	08SS41	Silty sand, trace clay; stained area.	500 ppm
	08SS42	Silty sand, trace clay; stained area.	25 ppm
	08SS43	Silty sand, trace clay; oil stain	50 ppm
	08SS44	Silty sand, trace clay; oil stain.	50 ppm
Garden River Old Dump	08SS45	Silty sand, some clay.	20 ppm
	08SS46	Silty sand, some clay.	30 ppm
	08SS47	Silty sand, some clay.	25 ppm
	08SS48	Silty sand, some clay.	25 ppm
	08SS49	Silty sand, some clay.	25 ppm
Former Septic Tile Field	08SS50	Silty sand, trace silt;	ND
	08SS51	Silty sand, trace silt;	15 ppm
	08SS52	Silty sand, trace silt;	30 ppm
	08SS53	Silty sand, trace silt;	ND
	08SS54	Silty sand, trace silt;	ND

TABLE 4: SUMMARY OF SURFACE SOIL SAMPLES (CONTINUED)			
Assessment Area	Surface Sample Number	Soil Characteristics	Combustible Vapour Concentration
Northlands School	08SS55	Clayey silt, some sand.	50 ppm
	08SS56	Clayey silt, some sand.	10 ppm
5 <sup>th</sup> Meridian Market	08SS57	Clayey silt, some sand.	50 ppm
	08SS58	Clayey silt, some sand.	75 ppm
Garden River Trading	08SS59	Clayey silt, some sand.	75 ppm
	08SS60	Clayey silt, some sand.	ND
Church	08SS61	Clayey silt, some sand.	10 ppm
	08SS62	Clayey silt, some sand.	5 ppm



# APPENDIX B

APPENDIX B ANALYTICAL DATA





**Environmental Division**

**Certificate of Analysis**

EBA ENG CONSULTANTS LTD  
ATTN: KRISTEN OSTERMANN  
115, 200 RIVERCREST DR SE  
CALGARY AB T2C 2X5

**Reported On:** 21-OCT-08 03:48 PM  
**Revision:** 2

**Lab Work Order #:** L676396

**Date Received:** 31-AUG-08

**Project P.O. #:**  
**Job Reference:** C22101178  
**Legal Site Desc:**  
**CofC Numbers:** 08-041277, 08-041278, 08-041279, 08-041280, 08-041281, 08-041282, 08-041283, 08-041284, 08-041285, 08-041286, 08-041287, 08-041288, 08-041289, 08-041290, 08-042138, 08-042139, 08-042140, 08-042141, 08-042142  
**Other Information:**

**Comments:** 21-OCT-08 Updated sample id on -68, 123, 127 and 130  
21-OCT-08 Recheck completed on -123 for F2-F4, results confirmed.

CATHERINE EVARISTO-CORDERO  
Senior Account 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.

**ALS Canada Ltd. (formerly ETL Chemspec Analytical Ltd.)**  
Part of the **ALS Laboratory Group**

9936-67 Avenue, Edmonton, AB T6E 0P5  
**Phone:** +1 780 413 5227 **Fax:** +1 780 437 2311 [www.alsglobal.com](http://www.alsglobal.com)  
A Campbell Brothers Limited Company

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-1 08MW20 @ 0.6								
Sampled By: JACK on 26-AUG-08 @ 13:15								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	108		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	95		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	7.1		0.1	%		02-SEP-08	SHL	R717303
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	7.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	196		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	7		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	14.9		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	14		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	19		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	7		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	30		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	60		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-15 08MW20 @ 9.2								
Sampled By: JACK on 26-AUG-08 @ 14:42								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	106		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	95		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	16		0.1	%		02-SEP-08	SHL	R717303

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-19 08MW21 @ 0.6								
Sampled By: JACK on 26-AUG-08 @ 13:15								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		09-SEP-08		
F1-BTEX	<5		5	mg/kg		09-SEP-08		
F2 (C10-C16)	110		20	mg/kg		09-SEP-08		
F3 (C16-C34)	8000		20	mg/kg		09-SEP-08		
F4 (C34-C50)	1200		20	mg/kg		09-SEP-08		
F4G-SG (GHH-Silica)	5200		500	mg/kg		09-SEP-08		
Total Hydrocarbons (C6-C50)	9300		20	mg/kg		09-SEP-08		
Chromatogram to baseline at nC50	NO					09-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	78		25-175	%	05-SEP-08	07-SEP-08	YZH	R720022
Surr: Hexatriacontane	187	SOL:MI	25-175	%	05-SEP-08	07-SEP-08	YZH	R720022
Prep/Analysis Dates					05-SEP-08	07-SEP-08	YZH	R720022
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	7.9		0.1	%		02-SEP-08	SHL	R717303
F4G Prep/Analysis Dates					09-SEP-08	09-SEP-08	VN	R720646
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	8.6		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	160		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	7		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	17.8		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	16		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	21		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	8		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.7		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	33		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	60		10	mg/kg		06-SEP-08	QLI	R718976
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	11		7	mg/kg		05-SEP-08		
Calcium (Ca)	23		2	mg/kg		05-SEP-08		
Magnesium (Mg)	5		1	mg/kg		05-SEP-08		
Potassium (K)	1.3		0.7	mg/kg		05-SEP-08		
Sodium (Na)	4.4		0.7	mg/kg		05-SEP-08		
Sulfate (SO4)	23		2	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	66		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								

# ALS LABORATORY GROUP ANALYTICAL REPORT

[illegible]

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-32 08MW21 @ 8.5								
Sampled By: JACK on 26-AUG-08 @ 15:00								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	102		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	93		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	17		0.1	%		02-SEP-08	SHL	R717303
MUST PSA % > 75um	90		1	%		08-SEP-08	SRJ	R719890

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-35 08MW22 @ 0.6								
Sampled By: JACK on 26-AUG-08 @ 15:20								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		09-SEP-08		
F1-BTEX	<5		5	mg/kg		09-SEP-08		
F2 (C10-C16)	540		20	mg/kg		09-SEP-08		
F3 (C16-C34)	14000		20	mg/kg		09-SEP-08		
F4 (C34-C50)	2600		20	mg/kg		09-SEP-08		
F4G-SG (GHH-Silica)	10000		500	mg/kg		09-SEP-08		
Total Hydrocarbons (C6-C50)	17000		20	mg/kg		09-SEP-08		
Chromatogram to baseline at nC50	NO					09-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	73		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	168		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	11		0.1	%		02-SEP-08	SHL	R717303
F4G Prep/Analysis Dates					09-SEP-08	09-SEP-08	VN	R720646
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	6.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	132		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	5		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	9.7		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	13		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	15		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	6		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	22		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	80		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-48 08MW22 @ 8.5								
Sampled By: JACK on 26-AUG-08 @ 16:40								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	107		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	101		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	19		0.1	%		02-SEP-08	SHL	R717303
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	<6		6	mg/kg		05-SEP-08		
Calcium (Ca)	10		2	mg/kg		05-SEP-08		
Magnesium (Mg)	2		1	mg/kg		05-SEP-08		
Potassium (K)	1.0		0.6	mg/kg		05-SEP-08		
Sodium (Na)	2.6		0.6	mg/kg		05-SEP-08		
Sulfate (SO4)	9		2	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	26		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	32.5		0.1	%		05-SEP-08	SRJ	R718749
pH in Saturated Paste	8.2		0.1	pH		05-SEP-08	SRJ	R718749
Conductivity Sat. Paste	0.20		0.01	dS m-1		05-SEP-08	SRJ	R718749
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	31		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	3		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	7		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	8		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.3		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	<20		20	mg/L		05-SEP-08	KFA	R718996

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-51 08MW23 @ 0.6								
Sampled By: JACK on 26-AUG-08 @ 16:00								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	60		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	80		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	97		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	103		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	2.9		0.1	%		02-SEP-08	SHL	R717303
MUST PSA % > 75um	75		1	%		08-SEP-08	SRJ	R719890
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	5.9		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	142		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	5		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	10.0		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	11		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	16		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	5		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	23		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	50		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-60 08MW23 @ 6.1								
Sampled By: JACK on 26-AUG-08 @ 17:10								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	113		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	105		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	3.7		0.1	%		02-SEP-08	SHL	R717303

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-67 08MW22D @ 0.6								
Sampled By: JACK on 26-AUG-08 @ 15:20								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		09-SEP-08		
F1-BTEX	<5		5	mg/kg		09-SEP-08		
F2 (C10-C16)	450		20	mg/kg		09-SEP-08		
F3 (C16-C34)	12000		20	mg/kg		09-SEP-08		
F4 (C34-C50)	2300		20	mg/kg		09-SEP-08		
F4G-SG (GHH-Silica)	12000		500	mg/kg		09-SEP-08		
Total Hydrocarbons (C6-C50)	15000		20	mg/kg		09-SEP-08		
Chromatogram to baseline at nC50	NO					09-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	64		25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Surr: Hexatriacontane	371	SOL:MI	25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Prep/Analysis Dates					04-SEP-08	04-SEP-08	CVC	R719181
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	03-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	03-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	03-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	03-SEP-08	03-SEP-08	SPA	R718455
% Moisture	10		0.1	%		02-SEP-08	SHL	R717303
F4G Prep/Analysis Dates					09-SEP-08	09-SEP-08	VN	R720646
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	6.6		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	152		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	5		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	11.4		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	14		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	16		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	7		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	24		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	90		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-68 08BH13 @ 0.6								
Sampled By: JACK on 27-AUG-08 @ 15:20								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	70	RAMB	20	mg/kg		05-SEP-08		
F4 (C34-C50)	40	RAMB	20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	110		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	130		25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Surr: Hexatriacontane	145		25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Prep/Analysis Dates					04-SEP-08	04-SEP-08	CVC	R719181
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	03-SEP-08	03-SEP-08	SPA	R717641
Toluene	0.03		0.01	mg/kg	03-SEP-08	03-SEP-08	SPA	R717641
Ethylbenzene	<0.01		0.01	mg/kg	03-SEP-08	03-SEP-08	SPA	R717641
Xylenes	0.04		0.02	mg/kg	03-SEP-08	03-SEP-08	SPA	R717641
% Moisture	17		0.1	%		02-SEP-08	SHL	R717303
Lead (Pb)	16		5	mg/kg		06-SEP-08	QLI	R718976
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	<10		10	mg/kg		05-SEP-08		
Calcium (Ca)	43		3	mg/kg		05-SEP-08		
Magnesium (Mg)	11		2	mg/kg		05-SEP-08		
Potassium (K)	12		1	mg/kg		05-SEP-08		
Sodium (Na)	12		1	mg/kg		05-SEP-08		
Sulfate (SO4)	23		4	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	34		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	68.3		0.1	%		04-SEP-08	SRJ	R717998
pH in Saturated Paste	6.7		0.1	pH		04-SEP-08	SRJ	R717998
Conductivity Sat. Paste	0.32		0.01	dS m-1		04-SEP-08	SRJ	R717998
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	63		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	18		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	16		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	18		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.5		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	<20		20	mg/L		04-SEP-08	KFA	R718391

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-96 08MW14 @ 8.5								
Sampled By: JACK on 27-AUG-08 @ 10:38								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20	RAMB	20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20	RAMB	20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	121		25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Surr: Hexatriacontane	117		25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Prep/Analysis Dates					04-SEP-08	04-SEP-08	CVC	R719181
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	11		0.1	%		02-SEP-08	ADE	R717289
MUST PSA % > 75um	96		1	%		08-SEP-08	SRJ	R719890

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-123 08MW16 @ 6.1								
Sampled By: JACK on 27-AUG-08 @ 11:40								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	30		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	30		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	108		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	103		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	0.04		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	3.3		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	5.0		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	79		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	4		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	16.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	7		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	3		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	13		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	15		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	30		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-127 08MW16 @ 8.5								
Sampled By: JACK on 27-AUG-08 @ 11:50								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	96		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	96		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	0.04		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	15		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	2.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	55		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	3		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	3.8		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	4		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	6		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.5		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	8		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	20		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-130 08MW16D @ 6.1								
Sampled By: JACK on 27-AUG-08 @ 11:40								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	40		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	40		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	103		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	95		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	0.04		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	3.4		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	4.7		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	115		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	4		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	5.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	6		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	10		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	15		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	30		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-137 08BH17 @ 4.3								
Sampled By: JACK on 27-AUG-08 @ 14:25								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	109		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	98		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
% Moisture	3.9		0.1	%		02-SEP-08	ADE	R717289
MUST PSA % > 75um	89		1	%		08-SEP-08	SRJ	R719890
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	5.9		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	109		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	4		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	6.9		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	8		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	11		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	17		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	40		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-145 08BH17 @ 9.2								
Sampled By: JACK on 27-AUG-08 @ 15:15								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	110		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	99		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	18		0.1	%		02-SEP-08	ADE	R717289

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-147 08BH17D @ 4.3								
Sampled By: JACK on 27-AUG-08 @ 14:25								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	95		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	94		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	7.6		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	5.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	88		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	4		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	7.1		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	8		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	10		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	17		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	40		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-148 08MW18 @ 0.6								
Sampled By: JACK on 27-AUG-08 @ 20:15								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	40		20	mg/kg		08-SEP-08		
F4 (C34-C50)	20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	60		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	103		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	97		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	21		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	11.9		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	428		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	0.6		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	15		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	38.8		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	33		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	42		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	20		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	1.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	68		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	170		10	mg/kg		06-SEP-08	QLI	R718976

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-169 08BH19 @ 4.3								
Sampled By: JACK on 27-AUG-08 @ 16:30								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	107		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	98		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	20		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	8.7		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	227		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	6		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	14.4		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	16		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	19		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	8		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	30		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	80		10	mg/kg		06-SEP-08	QLI	R718976
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	<7		7	mg/kg		05-SEP-08		
Calcium (Ca)	21		2	mg/kg		05-SEP-08		
Magnesium (Mg)	4		1	mg/kg		05-SEP-08		
Potassium (K)	<0.7		0.7	mg/kg		05-SEP-08		
Sodium (Na)	3.3		0.7	mg/kg		05-SEP-08		
Sulfate (SO4)	16		2	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	44		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	36.2		0.1	%		04-SEP-08	SRJ	R717998
pH in Saturated Paste	7.3		0.1	pH		04-SEP-08	SRJ	R717998

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-169 08BH19 @ 4.3								
Sampled By: JACK on 27-AUG-08 @ 16:30								
Matrix: SOIL								
<b>Detailed Salinity</b>								
<b>pH and EC (Saturated Paste)</b>								
Conductivity Sat. Paste	0.29		0.01	dS m-1		04-SEP-08	SRJ	R717998
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	57		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	<2		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	11		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	9		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.3		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	<20		20	mg/L		04-SEP-08	KFA	R718391

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-179 08BH19D @ 4.3								
Sampled By: JACK on 27-AUG-08 @ 16:30								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	115		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	111		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	20		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	14.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	285		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	0.6		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	7		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	20.3		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	25		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	2		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	25		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	11		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.6		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	38		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	110		10	mg/kg		06-SEP-08	QLI	R718976
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	18		9	mg/kg		05-SEP-08		
Calcium (Ca)	26		2	mg/kg		05-SEP-08		
Magnesium (Mg)	6		1	mg/kg		05-SEP-08		
Potassium (K)	1.7		0.9	mg/kg		05-SEP-08		
Sodium (Na)	5.4		0.9	mg/kg		05-SEP-08		
Sulfate (SO4)	32		3	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	73		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	43.7		0.1	%		04-SEP-08	SRJ	R717998
pH in Saturated Paste	7.6		0.1	pH		04-SEP-08	SRJ	R717998

# ALS LABORATORY GROUP ANALYTICAL REPORT

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## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-180 08SS24								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F2-Naphth	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	810		20	mg/kg		08-SEP-08		
F3-PAH	810		20	mg/kg		08-SEP-08		
F4 (C34-C50)	50		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	860		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	109		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	111		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	0.039		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	0.03		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	18		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	5.7		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	442		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	7		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	15.7		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	204		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	15		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	9		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	30		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	140		10	mg/kg		06-SEP-08	QLI	R718976
<b>CCME PAHs</b>								
Naphthalene	0.02		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Quinoline	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Phenanthrene	0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Pyrene	0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(a)anthracene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(b&j)fluoranthene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(k)fluoranthene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(a)pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Indeno(1,2,3-cd)pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L	Units	Extracted	Analyzed	By	Batch
676396-180 08SS24									
Sampled By: JACK on 28-AUG-08									
Matrix: SOIL									
<b>CCME PAHs</b>									
	Dibenzo(a,h)anthracene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Surr:	Nitrobenzene d5	46		20-140	%	05-SEP-08	07-SEP-08	PCL	R719239
Surr:	2-Fluorobiphenyl	62		34-136	%	05-SEP-08	07-SEP-08	PCL	R719239
Surr:	p-Terphenyl d14	65		41-150	%	05-SEP-08	07-SEP-08	PCL	R719239
<b>CCME Volatile HydroCarbon</b>									
<b>EPA 5030/8015&amp;8260-P&amp;T GC-MS</b>									
	Thiophene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	Chlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	Styrene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	1,3-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	1,4-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	1,2-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Surr:	1,2-Dichloroethane d4	108		77-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr:	Toluene d8	102		71-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr:	4-Bromofluorobenzene	85		62-130	%	03-SEP-08	04-SEP-08	DDU	R718196
<b>CCME Chlorinated Aliphatics</b>									
	1,1-Dichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	Methylene Chloride	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	trans-1,2-Dichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	1,1-Dichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	Chloroform	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	1,1,1-Trichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	Carbon Tetrachloride	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	Trichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	1,2-Dichloropropane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	cis-1,3-Dichloropropene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	trans-1,3-Dichloropropene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	1,1,2-Trichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	1,2-Dichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	Tetrachloroethylene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
	1,1,2,2-Tetrachloroethane	<0.02		0.02	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Surr:	1,2-Dichloroethane d4	108		77-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr:	Toluene d8	102		71-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr:	4-Bromofluorobenzene	85		62-130	%	03-SEP-08	04-SEP-08	DDU	R718196

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-181 08SS25								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	113		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	110		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	9.0		0.1	%		02-SEP-08	ADE	R717289
Lead (Pb)	7		5	mg/kg		06-SEP-08	QLI	R718976

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# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-183 08SS27								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F2-Naphth	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F3-PAH	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	99		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	102		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	6.5		0.1	%		02-SEP-08	ADE	R717289
<b>CCME PAHs</b>								
Naphthalene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Quinoline	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Phenanthrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(a)anthracene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(b&j)fluoranthene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(k)fluoranthene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(a)pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Indeno(1,2,3-cd)pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Dibenzo(a,h)anthracene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Surr: Nitrobenzene d5	64		20-140	%	05-SEP-08	07-SEP-08	PCL	R719239
Surr: 2-Fluorobiphenyl	70		34-136	%	05-SEP-08	07-SEP-08	PCL	R719239
Surr: p-Terphenyl d14	78		41-150	%	05-SEP-08	07-SEP-08	PCL	R719239
<b>CCME Volatile HydroCarbon</b>								
<b>EPA 5030/8015&amp;8260-P&amp;T GC-MS</b>								
Thiophene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Chlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Styrene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,3-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,4-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,2-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 1,2-Dichloroethane d4	106		77-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: Toluene d8	101		71-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 4-Bromofluorobenzene	87		62-130	%	03-SEP-08	04-SEP-08	DDU	R718196
<b>CCME Chlorinated Aliphatics</b>								
1,1-Dichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Methylene Chloride	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
trans-1,2-Dichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,1-Dichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-183 08SS27								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
CCME Volatile HydroCarbon								
CCME Chlorinated Aliphatics								
Chloroform	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,1,1-Trichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Carbon Tetrachloride	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Trichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,2-Dichloropropane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
cis-1,3-Dichloropropene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
trans-1,3-Dichloropropene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,1,2-Trichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,2-Dichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Tetrachloroethylene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,1,2,2-Tetrachloroethane	<0.02		0.02	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 1,2-Dichloroethane d4	106		77-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: Toluene d8	101		71-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 4-Bromofluorobenzene	87		62-130	%	03-SEP-08	04-SEP-08	DDU	R718196

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-184 08SS28								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	91		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	96		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	7.1		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	6.5		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	152		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	5		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	10.1		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	10		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	14		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	23		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	50		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-185	08SS29								
Sampled By: JACK on 28-AUG-08									
Matrix: SOIL									
<b>CCME BTEX, TVHs and TEHs</b>									
<b>CCME Total Hydrocarbons</b>									
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08			
F1-BTEX	<5		5	mg/kg		05-SEP-08			
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08			
F3 (C16-C34)	20		20	mg/kg		05-SEP-08			
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08			
Total Hydrocarbons (C6-C50)	20		20	mg/kg		05-SEP-08			
Chromatogram to baseline at nC50	YES					05-SEP-08			
<b>CCME Total Extractable Hydrocarbons</b>									
Surr:	2-Bromobenzotrifluoride	103		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr:	Hexatriacontane	105		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
	Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>									
Benzene	<0.005		0.005	mg/kg		02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg		02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg		02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg		02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	7.2		0.1	%			02-SEP-08	ADE	R717289
Lead (Pb)	7		5	mg/kg			06-SEP-08	QLI	R718976

# ALS LABORATORY GROUP ANALYTICAL REPORT

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## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-187 08SS31								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	96		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	101		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	6.3		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	8.8		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	167		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	8		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	20.1		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	14		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	20		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	9		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.5		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	37		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	70		10	mg/kg		06-SEP-08	QLI	R718976

# ALS LABORATORY GROUP ANALYTICAL REPORT

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## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-189 08SS33								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	91		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	94		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	9.3		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	8.7		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	194		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	9		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	23.9		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	14		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	20		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	9		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	42		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	70		10	mg/kg		06-SEP-08	QLI	R718976

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# ALS LABORATORY GROUP ANALYTICAL REPORT

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## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-192 08SS36								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	540		5	mg/kg		08-SEP-08		
F1-BTEX	540		5	mg/kg		08-SEP-08		
F2 (C10-C16)	3200		20	mg/kg		08-SEP-08		
F3 (C16-C34)	40		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	3800		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	52		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	90		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	2.7		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	22		0.1	%		02-SEP-08	ADE	R717289
MUST PSA % > 75um	9		1	%		08-SEP-08	SRJ	R719890
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	4.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	309		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	7		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	18.6		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	9		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	14		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	7		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	32		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	80		10	mg/kg		06-SEP-08	QLI	R718976
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	<10		10	mg/kg		05-SEP-08		
Calcium (Ca)	32		3	mg/kg		05-SEP-08		
Magnesium (Mg)	5		2	mg/kg		05-SEP-08		
Potassium (K)	7		1	mg/kg		05-SEP-08		
Sodium (Na)	2		1	mg/kg		05-SEP-08		
Sulfate (SO4)	7		3	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	14		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	52.6		0.1	%		04-SEP-08	SRJ	R717998

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-192 08SS36								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>Detailed Salinity</b>								
<b>pH and EC (Saturated Paste)</b>								
pH in Saturated Paste	7.0		0.1	pH		04-SEP-08	SRJ	R717998
Conductivity Sat. Paste	0.28		0.01	dS m-1		04-SEP-08	SRJ	R717998
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	60		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	14		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	9		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	3		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.1		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	<20		20	mg/L		04-SEP-08	KFA	R718391

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-193 08SS33D								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	100		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	104		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	11		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	6.6		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	173		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	9		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	22.0		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	9		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	17		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	8		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	38		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	60		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-194 08SS37								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	2100		20	mg/kg		05-SEP-08		
F4 (C34-C50)	100		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	2200		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	103		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	96		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Toluene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	04-SEP-08	SDL	R718740
% Moisture	7.4		0.1	%		02-SEP-08	ADE	R717289
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	6.9		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	188		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	6		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	14.9		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	13		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	18		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	8		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	31		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	60		10	mg/kg		06-SEP-08	QLI	R718976

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-195	08SS38								
Sampled By:	JACK on 28-AUG-08								
Matrix:	SOIL								
<b>CCME BTEX, TVHs and TEHs</b>									
<b>CCME Total Hydrocarbons</b>									
F1 (C6-C10)		<5		5	mg/kg		05-SEP-08		
F1-BTEX		<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)		<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)		<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)		<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)		<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50		YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>									
Surr:	2-Bromobenzotrifluoride	97		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr:	Hexatriacontane	106		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates						04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>									
Benzene		<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene		<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene		<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes		<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture		2.8		0.1	%		02-SEP-08	ADE	R717440
MUST PSA % > 75um		76		1	%		08-SEP-08	SRJ	R719890

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-196 08SS39								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		09-SEP-08		
F1-BTEX	<5		5	mg/kg		09-SEP-08		
F2 (C10-C16)	90		20	mg/kg		09-SEP-08		
F3 (C16-C34)	20000		20	mg/kg		09-SEP-08		
F4 (C34-C50)	6200		20	mg/kg		09-SEP-08		
F4G-SG (GHH-Silica)	23000		500	mg/kg		09-SEP-08		
Total Hydrocarbons (C6-C50)	26000		20	mg/kg		09-SEP-08		
Chromatogram to baseline at nC50	NO					09-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	71	SDO:RNA	25-175	%	05-SEP-08	07-SEP-08	YZH	R720022
Surr: Hexatriacontane	0		25-175	%	05-SEP-08	07-SEP-08	YZH	R720022
Prep/Analysis Dates					05-SEP-08	07-SEP-08	YZH	R720022
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	5.0		0.1	%		02-SEP-08	ADE	R717440
F4G Prep/Analysis Dates					09-SEP-08	09-SEP-08	VN	R720646
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	8.0		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	199		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	7		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	16.1		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	16		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	20		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	8		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	33		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	90		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-197 08SS40								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	6		5	mg/kg		09-SEP-08		
F1-BTEX	6		5	mg/kg		09-SEP-08		
F2 (C10-C16)	820		20	mg/kg		09-SEP-08		
F3 (C16-C34)	11000		20	mg/kg		09-SEP-08		
F4 (C34-C50)	1300		20	mg/kg		09-SEP-08		
F4G-SG (GHH-Silica)	8900		500	mg/kg		09-SEP-08		
Total Hydrocarbons (C6-C50)	13000		20	mg/kg		09-SEP-08		
Chromatogram to baseline at nC50	NO					09-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	70		25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Surr: Hexatriacontane	287	SOL:MI	25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Prep/Analysis Dates					04-SEP-08	04-SEP-08	CVC	R719181
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	10		0.1	%		02-SEP-08	ADE	R717440
F4G Prep/Analysis Dates					09-SEP-08	09-SEP-08	VN	R720646
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	7.7		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	182		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	7		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	22.2		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	11		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	18		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	9		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	42		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	70		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L	Units	Extracted	Analyzed	By	Batch
676396-198 08SS41								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	310		5	mg/kg		09-SEP-08		
F1-BTEX	310		5	mg/kg		09-SEP-08		
F2 (C10-C16)	9000		20	mg/kg		09-SEP-08		
F3 (C16-C34)	24000		20	mg/kg		09-SEP-08		
F4 (C34-C50)	810		20	mg/kg		09-SEP-08		
F4G-SG (GHH-Silica)	10000		500	mg/kg		09-SEP-08		
Total Hydrocarbons (C6-C50)	34000		20	mg/kg		09-SEP-08		
Chromatogram to baseline at nC50	NO					09-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Sum: 2-Bromobenzotrifluoride	241	SOL:MI	25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Sum: Hexatriacontane	405	SOL:MI	25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Prep/Analysis Dates					04-SEP-08	04-SEP-08	CVC	R719181
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	7.3		0.1	%		02-SEP-08	ADE	R717440
F4G Prep/Analysis Dates					09-SEP-08	09-SEP-08	VN	R720646
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	<8		8	mg/kg		05-SEP-08		
Calcium (Ca)	33		2	mg/kg		05-SEP-08		
Magnesium (Mg)	4		1	mg/kg		05-SEP-08		
Potassium (K)	1.0		0.8	mg/kg		05-SEP-08		
Sodium (Na)	3.8		0.8	mg/kg		05-SEP-08		
Sulfate (SO4)	13		2	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	35		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	37.9		0.1	%		04-SEP-08	SRJ	R717998
pH in Saturated Paste	7.1		0.1	pH		04-SEP-08	SRJ	R717998
Conductivity Sat. Paste	0.42		0.01	dS m-1		04-SEP-08	SRJ	R717998
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	88		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	3		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	11		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	10		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.3		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	<20		20	mg/L		04-SEP-08	KFA	R718391

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-199 08SS42								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		09-SEP-08		
F1-BTEX	<5		5	mg/kg		09-SEP-08		
F2 (C10-C16)	150		20	mg/kg		09-SEP-08		
F3 (C16-C34)	16000		20	mg/kg		09-SEP-08		
F4 (C34-C50)	2200		20	mg/kg		09-SEP-08		
F4G-SG (GHH-Silica)	16000		500	mg/kg		09-SEP-08		
Total Hydrocarbons (C6-C50)	18000		20	mg/kg		09-SEP-08		
Chromatogram to baseline at nC50	NO					09-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	66		25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Surr: Hexatriacontane	384	SOL:MI	25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Prep/Analysis Dates					04-SEP-08	04-SEP-08	CVC	R719181
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	4.0		0.1	%		02-SEP-08	ADE	R717440
F4G Prep/Analysis Dates					09-SEP-08	09-SEP-08	VN	R720646
Lead (Pb)	7		5	mg/kg		06-SEP-08	QLI	R718976
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	8		8	mg/kg		05-SEP-08		
Calcium (Ca)	31		2	mg/kg		05-SEP-08		
Magnesium (Mg)	5		1	mg/kg		05-SEP-08		
Potassium (K)	1.1		0.8	mg/kg		05-SEP-08		
Sodium (Na)	4.0		0.8	mg/kg		05-SEP-08		
Sulfate (SO4)	55		2	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	144		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	38.5		0.1	%		04-SEP-08	SRJ	R717998
pH in Saturated Paste	7.2		0.1	pH		04-SEP-08	SRJ	R717998
Conductivity Sat. Paste	0.41		0.01	dS m-1		04-SEP-08	SRJ	R717998
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	81		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	3		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	14		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	11		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.3		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	20		20	mg/L		04-SEP-08	KFA	R718391

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# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-201 08SS44								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	10		5	mg/kg		09-SEP-08		
F1-BTEX	10		5	mg/kg		09-SEP-08		
F2 (C10-C16)	420		20	mg/kg		09-SEP-08		
F3 (C16-C34)	11000		20	mg/kg		09-SEP-08		
F4 (C34-C50)	1200		20	mg/kg		09-SEP-08		
F4G-SG (GHH-Silica)	8800		500	mg/kg		09-SEP-08		
Total Hydrocarbons (C6-C50)	13000		20	mg/kg		09-SEP-08		
Chromatogram to baseline at nC50	NO					09-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	78		25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Surr: Hexatriacontane	243	SOL:MI	25-175	%	04-SEP-08	04-SEP-08	CVC	R719181
Prep/Analysis Dates					04-SEP-08	04-SEP-08	CVC	R719181
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	03-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	03-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	03-SEP-08	03-SEP-08	SPA	R718455
Xylenes	0.03		0.02	mg/kg	03-SEP-08	03-SEP-08	SPA	R718455
% Moisture	7.4		0.1	%		02-SEP-08	ADE	R717440
F4G Prep/Analysis Dates					09-SEP-08	09-SEP-08	VN	R720646
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	7.0		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	201		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	7		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	16.3		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	18		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	2		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	18		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	10		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	31		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	90		10	mg/kg		06-SEP-08	QLI	R718976

# ALS LABORATORY GROUP ANALYTICAL REPORT

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-203 08SS46								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F2-Naphth	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F3-PAH	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	99		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	85		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	7.8		0.1	%		02-SEP-08	ADE	R717440
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	5.8		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	270		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	8		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	19.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	12		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	16		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	10		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	36		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	90		10	mg/kg		06-SEP-08	QLI	R718976
<b>CCME PAHs</b>								
Naphthalene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Quinoline	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Phenanthrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(a)anthracene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(b&j)fluoranthene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(k)fluoranthene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(a)pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Indeno(1,2,3-cd)pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-204 08SS47								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	98		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	101		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	7.8		0.1	%		02-SEP-08	ADE	R717440
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	10.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	255		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	8		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	20.9		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	22		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	24		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	11		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.6		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	40		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	90		10	mg/kg		06-SEP-08	QLI	R718976
<b>CCME Volatile HydroCarbon</b>								
<b>EPA 5030/8015&amp;8260-P&amp;T GC-MS</b>								
Thiophene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Chlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Styrene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,3-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,4-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,2-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 1,2-Dichloroethane d4	107		77-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: Toluene d8	102		71-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 4-Bromofluorobenzene	86		62-130	%	03-SEP-08	04-SEP-08	DDU	R718196
<b>CCME Chlorinated Aliphatics</b>								
1,1-Dichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196

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Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-204 08SS47								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME Volatile HydroCarbon</b>								
<b>CCME Chlorinated Aliphatics</b>								
Methylene Chloride	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
trans-1,2-Dichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,1-Dichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Chloroform	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,1,1-Trichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Carbon Tetrachloride	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Trichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,2-Dichloropropane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
cis-1,3-Dichloropropene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
trans-1,3-Dichloropropene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,1,2-Trichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,2-Dichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Tetrachloroethylene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,1,2,2-Tetrachloroethane	<0.02		0.02	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 1,2-Dichloroethane d4	107		77-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: Toluene d8	102		71-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 4-Bromofluorobenzene	86		62-130	%	03-SEP-08	04-SEP-08	DDU	R718196

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-205 08SS48								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	91		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	85		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	10		0.1	%		02-SEP-08	ADE	R717440
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	<9		9	mg/kg		05-SEP-08		
Calcium (Ca)	29		2	mg/kg		05-SEP-08		
Magnesium (Mg)	7		1	mg/kg		05-SEP-08		
Potassium (K)	<0.9		0.9	mg/kg		05-SEP-08		
Sodium (Na)	4.5		0.9	mg/kg		05-SEP-08		
Sulfate (SO4)	7		3	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	15		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	44.3		0.1	%		04-SEP-08	SRJ	R717998
pH in Saturated Paste	7.3		0.1	pH		04-SEP-08	SRJ	R717998
Conductivity Sat. Paste	0.33		0.01	dS m-1		04-SEP-08	SRJ	R717998
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	66		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	<2		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	16		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	10		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.3		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	<20		20	mg/L		04-SEP-08	KFA	R718391

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-206 08SS49								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F2-Naphth	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F3-PAH	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	97		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	105		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	11		0.1	%		02-SEP-08	ADE	R717440
Lead (Pb)	10		5	mg/kg		06-SEP-08	QLI	R718976
<b>CCME PAHs</b>								
Naphthalene	<0.01	RAMB	0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Quinoline	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Phenanthrene	0.02		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(a)anthracene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(b&j)fluoranthene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(k)fluoranthene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Benzo(a)pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Indeno(1,2,3-cd)pyrene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Dibenzo(a,h)anthracene	<0.01		0.01	mg/kg	05-SEP-08	07-SEP-08	PCL	R719239
Surr: Nitrobenzene d5	63		20-140	%	05-SEP-08	07-SEP-08	PCL	R719239
Surr: 2-Fluorobiphenyl	76		34-136	%	05-SEP-08	07-SEP-08	PCL	R719239
Surr: p-Terphenyl d14	81		41-150	%	05-SEP-08	07-SEP-08	PCL	R719239
<b>CCME Volatile HydroCarbon</b>								
<b>EPA 5030/8015&amp;8260-P&amp;T GC-MS</b>								
Thiophene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Chlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Styrene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,3-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,4-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,2-Dichlorobenzene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 1,2-Dichloroethane d4	104		77-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: Toluene d8	101		71-120	%	03-SEP-08	04-SEP-08	DDU	R718196
Surr: 4-Bromofluorobenzene	86		62-130	%	03-SEP-08	04-SEP-08	DDU	R718196
<b>CCME Chlorinated Aliphatics</b>								
1,1-Dichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
Methylene Chloride	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
trans-1,2-Dichloroethene	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196
1,1-Dichloroethane	<0.01		0.01	mg/kg	03-SEP-08	04-SEP-08	DDU	R718196

# ALS LABORATORY GROUP ANALYTICAL REPORT

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## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-207 08SS50								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	89		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	99		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	6.7		0.1	%		02-SEP-08	ADE	R717440
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	8.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	236		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	8		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	21.1		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	14		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	20		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	10		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.6		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	40		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	70		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-208	08SS51								
Sampled By: JACK on 28-AUG-08									
Matrix: SOIL									
<b>CCME BTEX, TVHs and TEHs</b>									
<b>CCME Total Hydrocarbons</b>									
F1 (C6-C10)		<5		5	mg/kg		05-SEP-08		
F1-BTEX		<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)		<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)		<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)		<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)		<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50		YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>									
Surr:	2-Bromobenzotrifluoride	100		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr:	Hexatriacontane	109		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates						04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>									
Benzene		<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene		<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene		<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes		<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture		7.3		0.1	%		02-SEP-08	ADE	R717440
Lead (Pb)		9		5	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-209 08SS52								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	87		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	95		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	7.5		0.1	%		02-SEP-08	ADE	R717440
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	6.7		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	272		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	9		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	20.4		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	12		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	16		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	11		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	40		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	70		10	mg/kg		06-SEP-08	QLI	R718976

# ALS LABORATORY GROUP ANALYTICAL REPORT

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## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-211 08SS54								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	93		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	102		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	6.5		0.1	%		02-SEP-08	ADE	R717440
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	<8		8	mg/kg		05-SEP-08		
Calcium (Ca)	23		2	mg/kg		05-SEP-08		
Magnesium (Mg)	3		1	mg/kg		05-SEP-08		
Potassium (K)	1.1		0.8	mg/kg		05-SEP-08		
Sodium (Na)	1.6		0.8	mg/kg		05-SEP-08		
Sulfate (SO4)	4		2	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	11		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	39.1		0.1	%		04-SEP-08	SRJ	R717998
pH in Saturated Paste	7.6		0.1	pH		04-SEP-08	SRJ	R717998
Conductivity Sat. Paste	0.26		0.01	dS m-1		04-SEP-08	SRJ	R717998
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	59		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	3		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	9		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	4		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.1		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	<20		20	mg/L		04-SEP-08	KFA	R718391

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-212 08SS52D								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	30		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	30		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	91		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Surr: Hexatriacontane	91		25-175	%	04-SEP-08	04-SEP-08	YZH	R718768
Prep/Analysis Dates					04-SEP-08	04-SEP-08	YZH	R718768
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	7.6		0.1	%		02-SEP-08	ADE	R717440
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	6.3		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	219		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	7		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	19.8		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	11		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	16		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	9		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.4		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	37		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	70		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L	Units	Extracted	Analyzed	By	Batch
676396-213 08SS56								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		05-SEP-08		
F1-BTEX	<5		5	mg/kg		05-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		05-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		05-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		05-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		05-SEP-08		
Chromatogram to baseline at nC50	YES					05-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	92		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Surr: Hexatriacontane	105		25-175	%	02-SEP-08	03-SEP-08	VN	R718666
Prep/Analysis Dates					02-SEP-08	03-SEP-08	VN	R718666
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	20		0.1	%		02-SEP-08	ADE	R717440
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	<10		10	mg/kg		05-SEP-08		
Calcium (Ca)	50		4	mg/kg		05-SEP-08		
Magnesium (Mg)	11		2	mg/kg		05-SEP-08		
Potassium (K)	6		1	mg/kg		05-SEP-08		
Sodium (Na)	6		1	mg/kg		05-SEP-08		
Sulfate (SO4)	19		4	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	26		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	73.5		0.1	%		04-SEP-08	SRJ	R717998
pH in Saturated Paste	7.2		0.1	pH		04-SEP-08	SRJ	R717998
Conductivity Sat. Paste	0.33		0.01	dS m-1		04-SEP-08	SRJ	R717998
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	68		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	8		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	15		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	8		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.2		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	<20		20	mg/L		04-SEP-08	KFA	R718391

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-214 08SS57								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	102		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	95		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	22		0.1	%		02-SEP-08	ADE	R717440
<b>Detail Salinity in mg/kg</b>								
Chloride (Cl)	10		10	mg/kg		05-SEP-08		
Calcium (Ca)	23		3	mg/kg		05-SEP-08		
Magnesium (Mg)	5		2	mg/kg		05-SEP-08		
Potassium (K)	2		1	mg/kg		05-SEP-08		
Sodium (Na)	8		1	mg/kg		05-SEP-08		
Sulfate (SO4)	11		4	mg/kg		05-SEP-08		
<b>Detailed Salinity</b>								
Sulphate (SO4)	18		6	mg/L		05-SEP-08	EOC	R718988
<b>pH and EC (Saturated Paste)</b>								
% Saturation	62.1		0.1	%		04-SEP-08	SRJ	R717998
pH in Saturated Paste	7.1		0.1	pH		04-SEP-08	SRJ	R717998
Conductivity Sat. Paste	0.21		0.01	dS m-1		04-SEP-08	SRJ	R717998
<b>Salinity calculation check</b>								
<b>SAR</b>								
Calcium (Ca)	37		5	mg/L		05-SEP-08	EOC	R718988
Potassium (K)	3		2	mg/L		05-SEP-08	EOC	R718988
Magnesium (Mg)	9		3	mg/L		05-SEP-08	EOC	R718988
Sodium (Na)	12		2	mg/L		05-SEP-08	EOC	R718988
SAR	0.5		0.1	SAR		05-SEP-08	EOC	R718988
<b>Chloride (Cl) (Saturated Paste)</b>								
Chloride (Cl)	20		20	mg/L		04-SEP-08	KFA	R718391

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676396-215 08SS58								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	90		20	mg/kg		08-SEP-08		
F4 (C34-C50)	30		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	120		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	104		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	102		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	0.008		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	0.08		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	0.17		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	20		0.1	%		02-SEP-08	ADE	R717440
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	10.5		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	388		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	<0.5		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	12		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	31.7		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	31		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	36		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	16		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	1.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	56		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	130		10	mg/kg		06-SEP-08	QLI	R718976

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-216 08SS55								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	70		20	mg/kg		08-SEP-08		
F4 (C34-C50)	40		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	110		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	100		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	105		25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates					04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	15		0.1	%		02-SEP-08	ADE	R717440
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	10.6		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	397		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	0.7		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	13		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	31.4		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	30		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	38		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	17		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	1.1		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	54		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	160		10	mg/kg		06-SEP-08	QLI	R718976

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# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-218	08SS59D								
Sampled By:	JACK on 28-AUG-08								
Matrix:	SOIL								
<b>CCME BTEX, TVHs and TEHs</b>									
<b>CCME Total Hydrocarbons</b>									
F1 (C6-C10)	<5			5	mg/kg		08-SEP-08		
F1-BTEX	<5			5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20			20	mg/kg		08-SEP-08		
F3 (C16-C34)	300			20	mg/kg		08-SEP-08		
F4 (C34-C50)	110			20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	410			20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES						08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>									
Surr: 2-Bromobenzotrifluoride	89			25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Surr: Hexatriacontane	97			25-175	%	04-SEP-08	05-SEP-08	YZH	R720042
Prep/Analysis Dates						04-SEP-08	05-SEP-08	YZH	R720042
<b>CCME BTEX</b>									
Benzene	<0.005			0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	0.04			0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01			0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	0.05			0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	20			0.1	%		02-SEP-08	ADE	R717440
Lead (Pb)	23			5	mg/kg		06-SEP-08	QLI	R718976

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# ALS LABORATORY GROUP ANALYTICAL REPORT

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## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676396-221 08SS62								
Sampled By: JACK on 28-AUG-08								
Matrix: SOIL								
<b>CCME BTEX, TVHs and TEHs</b>								
<b>CCME Total Hydrocarbons</b>								
F1 (C6-C10)	<5		5	mg/kg		08-SEP-08		
F1-BTEX	<5		5	mg/kg		08-SEP-08		
F2 (C10-C16)	<20		20	mg/kg		08-SEP-08		
F3 (C16-C34)	<20		20	mg/kg		08-SEP-08		
F4 (C34-C50)	<20		20	mg/kg		08-SEP-08		
Total Hydrocarbons (C6-C50)	<20		20	mg/kg		08-SEP-08		
Chromatogram to baseline at nC50	YES					08-SEP-08		
<b>CCME Total Extractable Hydrocarbons</b>								
Surr: 2-Bromobenzotrifluoride	111		25-175	%	05-SEP-08	05-SEP-08	0	R720057
Surr: Hexatriacontane	106		25-175	%	05-SEP-08	05-SEP-08	0	R720057
Prep/Analysis Dates					05-SEP-08	05-SEP-08	0	R720057
<b>CCME BTEX</b>								
Benzene	<0.005		0.005	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Toluene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Ethylbenzene	<0.01		0.01	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
Xylenes	<0.02		0.02	mg/kg	02-SEP-08	03-SEP-08	SPA	R718455
% Moisture	31		0.1	%		02-SEP-08	ADE	R717440
<b>Metals in Soil - CCME List</b>								
Silver (Ag)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Arsenic (As)	7.0		0.2	mg/kg		06-SEP-08	QLI	R718976
Barium (Ba)	341		5	mg/kg		06-SEP-08	QLI	R718976
Beryllium (Be)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Cadmium (Cd)	1.4		0.5	mg/kg		06-SEP-08	QLI	R718976
Cobalt (Co)	8		1	mg/kg		06-SEP-08	QLI	R718976
Chromium (Cr)	19.0		0.5	mg/kg		06-SEP-08	QLI	R718976
Copper (Cu)	20		2	mg/kg		06-SEP-08	QLI	R718976
Mercury (Hg)	<0.05		0.05	mg/kg		06-SEP-08	QLI	R718976
Molybdenum (Mo)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Nickel (Ni)	25		2	mg/kg		06-SEP-08	QLI	R718976
Lead (Pb)	14		5	mg/kg		06-SEP-08	QLI	R718976
Antimony (Sb)	<0.2		0.2	mg/kg		06-SEP-08	QLI	R718976
Selenium (Se)	0.9		0.2	mg/kg		06-SEP-08	QLI	R718976
Tin (Sn)	<5		5	mg/kg		06-SEP-08	QLI	R718976
Thallium (Tl)	<1		1	mg/kg		06-SEP-08	QLI	R718976
Uranium (U)	<2		2	mg/kg		06-SEP-08	QLI	R718976
Vanadium (V)	31		1	mg/kg		06-SEP-08	QLI	R718976
Zinc (Zn)	170		10	mg/kg		06-SEP-08	QLI	R718976
* Refer to Referenced Information for Qualifiers (if any) and Methodology.								

## Reference Information

## Sample Parameter Qualifier key listed:

Qualifier	Description
RAMB	Result Adjusted For Method Blank
SDO:RNA	Surrogate diluted out:% recovery not available
SOL:MI	Surrogate recovery outside acceptable limits due to matrix interference

## Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Preparation Method Reference(Based On)	Analytical Method Reference(Based On)
CL-SAR-ED	Soil	Chloride (Cl) (Saturated Paste)		APHA 4500 Cl E-Colorimetry
ETL-BTX,TVH-CCME-ED	Soil	CCME BTEX	EPA 5030	CCME CWS-PHC Dec-2000 - Pub# 1310
ETL-TVH,TEH-CCME-ED	Soil	CCME Total Hydrocarbons		CCME CWS-PHC Dec-2000 - Pub# 1310

Analytical methods used for analysis of CCME Petroleum Hydrocarbons have been validated and comply with the Reference Method for the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

In cases where results for both F4 and F4G are reported, the greater of the two results must be used in any application of the CWS PHC guidelines and the gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.

In samples where BTEX and F1 were analyzed, F1-BTEX represents a value where the sum of Benzene, Toluene, Ethylbenzene and total Xylenes has been subtracted from F1.

In samples where PAHs, F2 and F3 were analyzed, F2-Naphth represents the result where Naphthalene has been subtracted from F2. F3-PAH represents a result where the sum of Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-cd)pyrene, Phenanthrene, and Pyrene has been subtracted from F3.

Unless otherwise qualified, the following quality control criteria have been met for the F1 hydrocarbon range:

1. All extraction and analysis holding times were met.
2. Instrument performance showing response factors for C6 and C10 within 30% of the response factor for toluene.
3. Linearity of gasoline response within 15% throughout the calibration range.

Unless otherwise qualified, the following quality control criteria have been met for the F2-F4 hydrocarbon ranges:

1. All extraction and analysis holding times were met.
2. Instrument performance showing C10, C16 and C34 response factors within 10% of their average.
3. Instrument performance showing the C50 response factor within 30% of the average of the C10, C16 and C34 response factors.
4. Linearity of diesel or motor oil response within 15% throughout the calibration range.

F2-4-TMB-ED	Soil	CCME Total Extractable Hydrocarbons		CCME CWS-PHC Dec-2000 - Pub# 1310
F4G-TMB-ED	Soil	CCME Gravimetric Heavy Hydrocarbons (SG)		CCME CWS-PHC Dec-2000 - Pub# 1310
METAL-CCME-ED	Soil	Metals in Soil - CCME List	EPA 3050	EPA 6020
PAH-CCME-ED	Soil	CCME PAHs	EPA 3540C	EPA 3540/8270-GC/MS
PB-ED	Soil	Lead (Pb)	EPA 3050	EPA 6020
PREP-MOISTURE-ED	Soil	% Moisture		Oven dry 105C-Gravimetric
PSA-MUST-ED	Soil	MUST PSA D50 > 75um		ASTM D422-63-HYDROMETER/SIEVE
SAL-MG/KG-CALC-ED	Soil	Detail Salinity in mg/kg		Manual Calculation
SALINITY-INTCHECK-ED	Soil	Salinity calculation check		CSSS 18.4-Calculation
SAR-CALC-ED	Soil	SAR		CSSS 18.4-Calculation
SAT/PH/EC-ED	Soil	pH and EC (Saturated Paste)		CSSS 18.2, 16.2, 18.3
SO4-SAR-ED	Soil	Sulfate (SO4) in saturated paste		APHA 3120 B-ICP-OES
VOC-CLALI-CCME-ED	Soil	CCME Chlorinated Aliphatics	EPA 5030	SW 846 8260-GC-MS
VOC-MAH-CCME-ED	Soil	EPA 5030/8015&8260-P&T GC-MS	EPA 5030	SW 846 8260-GC-MS

\*\* Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.

## Reference Information

## Chain of Custody numbers:

08-041277	08-041278	08-041279	08-041280	08-041281
08-041282	08-041283	08-041284	08-041285	08-041286
08-041287	08-041288	08-041289	08-041290	08-042138
08-042139	08-042140	08-042141	08-042142	

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA		

## GLOSSARY OF REPORT TERMS

*Surr* - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in environmental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds. The reported surrogate recovery value provides a measure of method efficiency. The Laboratory control limits are determined under column heading D.L.

mg/kg (units) - unit of concentration based on mass, parts per million

mg/L (units) - unit of concentration based on volume, parts per million

< - Less than

D.L. - Detection Limit

N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

UNLESS OTHERWISE STATED, SAMPLES ARE NOT CORRECTED FOR CLIENT FIELD BLANKS.

Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

## ALS Routine Water Chemistry Report

**L676396**

[illegible]

## ALS LABORATORY GROUP SOIL SALINITY CONVERSION

L676396

Lab ID	Sample ID				Lab ID	Sample ID			
876396-19	08MW21 @ 0.6				L676396-48	08MW22 @ 8.5			
Sample Date: 26-AUG-08					Sample Date: 26-AUG-08				
Matrix: SOIL					Matrix: SOIL				
	Result mg/L	% Sat	Meq/L	Dry Soil mg/kg		Result mg/L	% Sat	Meq/L	Dry Soil mg/kg
Chloride (Cl)	30	34.3	0.86	11	Chloride (Cl)	<20	32.5	<0.56	<6
Sulphate (SO4)	66	34.3	1.37	23	Sulphate (SO4)	26	32.5	0.55	9
Calcium (Ca)	68	34.3	3.38	23	Calcium (Ca)	31	32.5	1.57	10
Potassium (K)	4	34.3	0.10	1.3	Potassium (K)	3	32.5	0.08	1.0
Magnesium (Mg)	14	34.3	1.19	5	Magnesium (Mg)	7	32.5	0.56	2
Sodium (Na)	13	34.3	0.55	4.4	Sodium (Na)	8	32.5	0.35	2.6
876396-68	08BH13 @ 0.6				L676396-169	08BH19 @ 4.3			
Sample Date: 27-AUG-08					Sample Date: 27-AUG-08				
Matrix: SOIL					Matrix: SOIL				
	Result mg/L	% Sat	Meq/L	Dry Soil mg/kg		Result mg/L	% Sat	Meq/L	Dry Soil mg/kg
Chloride (Cl)	<20	68.3	<0.56	<10	Chloride (Cl)	<20	36.2	<0.56	<7
Sulphate (SO4)	34	68.3	0.71	23	Sulphate (SO4)	44	36.2	0.91	16
Calcium (Ca)	63	68.3	3.16	43	Calcium (Ca)	57	36.2	2.84	21
Potassium (K)	18	68.3	0.45	12	Potassium (K)	<2	36.2	<0.05	<0.7
Magnesium (Mg)	16	68.3	1.34	11	Magnesium (Mg)	11	36.2	0.87	4
Sodium (Na)	18	68.3	0.78	12	Sodium (Na)	9	36.2	0.40	3.3
876396-179	08BH19D @ 4.3				L676396-192	08SS36			
Sample Date: 27-AUG-08					Sample Date: 28-AUG-08				
Matrix: SOIL					Matrix: SOIL				
	Result mg/L	% Sat	Meq/L	Dry Soil mg/kg		Result mg/L	% Sat	Meq/L	Dry Soil mg/kg
Chloride (Cl)	40	43.7	1.18	18	Chloride (Cl)	<20	52.6	<0.56	<10
Sulphate (SO4)	73	43.7	1.53	32	Sulphate (SO4)	14	52.6	0.28	7
Calcium (Ca)	59	43.7	2.92	26	Calcium (Ca)	60	52.6	3.00	32
Potassium (K)	4	43.7	0.10	1.7	Potassium (K)	14	52.6	0.36	7
Magnesium (Mg)	14	43.7	1.19	6	Magnesium (Mg)	9	52.6	0.78	5
Sodium (Na)	12	43.7	0.54	5.4	Sodium (Na)	3	52.6	0.14	2
"Calculations are as per: Methods of Analysis for Soils, Plants and Waters Homer D. Chapman and Parker F. Pratt University of California, Riverside, CA. August, 1961."									

## ALS LABORATORY GROUP SOIL SALINITY CONVERSION

L676396

Lab ID	Sample ID				Lab ID	Sample ID			
676396-198	08SS41				L676396-199	08SS42			
Sample Date: 28-AUG-08					Sample Date: 28-AUG-08				
Matrix: SOIL					Matrix: SOIL				
	Result mg/L	% Sat	Meq/L	Dry Soil mg/kg		Result mg/L	% Sat	Meq/L	Dry Soil mg/kg
Chloride (Cl)	<20	37.9	<0.56	<8	Chloride (Cl)	20	38.5	0.62	8
Sulphate (SO4)	35	37.9	0.72	13	Sulphate (SO4)	144	38.5	3.00	55
Calcium (Ca)	88	37.9	4.40	33	Calcium (Ca)	81	38.5	4.06	31
Potassium (K)	3	37.9	0.07	1.0	Potassium (K)	3	38.5	0.07	1.1
Magnesium (Mg)	11	37.9	0.92	4	Magnesium (Mg)	14	38.5	1.17	5
Sodium (Na)	10	37.9	0.43	3.8	Sodium (Na)	11	38.5	0.46	4.0
676396-205	08SS48				L676396-211	08SS54			
Sample Date: 28-AUG-08					Sample Date: 28-AUG-08				
Matrix: SOIL					Matrix: SOIL				
	Result mg/L	% Sat	Meq/L	Dry Soil mg/kg		Result mg/L	% Sat	Meq/L	Dry Soil mg/kg
Chloride (Cl)	<20	44.3	<0.56	<9	Chloride (Cl)	<20	39.1	<0.56	<8
Sulphate (SO4)	15	44.3	0.32	7	Sulphate (SO4)	11	39.1	0.22	4
Calcium (Ca)	66	44.3	3.31	29	Calcium (Ca)	59	39.1	2.96	23
Potassium (K)	<2	44.3	<0.05	<0.9	Potassium (K)	3	39.1	0.07	1.1
Magnesium (Mg)	16	44.3	1.32	7	Magnesium (Mg)	9	39.1	0.73	3
Sodium (Na)	10	44.3	0.45	4.5	Sodium (Na)	4	39.1	0.18	1.6
676396-213	08SS56				L676396-214	08SS57			
Sample Date: 28-AUG-08					Sample Date: 28-AUG-08				
Matrix: SOIL					Matrix: SOIL				
	Result mg/L	% Sat	Meq/L	Dry Soil mg/kg		Result mg/L	% Sat	Meq/L	Dry Soil mg/kg
Chloride (Cl)	<20	73.5	<0.56	<10	Chloride (Cl)	20	62.1	0.65	10
Sulphate (SO4)	26	73.5	0.53	19	Sulphate (SO4)	18	62.1	0.36	11
Calcium (Ca)	68	73.5	3.38	50	Calcium (Ca)	37	62.1	1.86	23
Potassium (K)	8	73.5	0.20	6	Potassium (K)	3	62.1	0.09	2
Magnesium (Mg)	15	73.5	1.22	11	Magnesium (Mg)	9	62.1	0.70	5
Sodium (Na)	8	73.5	0.34	6	Sodium (Na)	12	62.1	0.53	8
"Calculations are as per: Methods of Analysis for Soils, Plants and Waters Homer D. Chapman and Parker F. Pratt University of California, Riverside, Cl. August, 1961."									



**Environmental Division**

# **ALS Laboratory Group Quality Control Report**

Workorder: L676396

Report Date: 21-OCT-08

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Client: EBA ENG CONSULTANTS LTD  
115, 200 RIVERCREST DR SE  
CALGARY AB T2C 2X5  
Contact: KRISTEN OSTERMANN

Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>-SAR-ED Soil</b>							
<b>Batch R718391</b>							
<b>WG829083-2</b> DUP	<b>L676396-198</b>						
Chloride (Cl)	<20	<20	RPD-NA	mg/L	N/A	15	04-SEP-08
<b>WG829083-5</b> DUP	<b>L676999-1</b>						
Chloride (Cl)	<20	<20	RPD-NA	mg/L	N/A	15	04-SEP-08
<b>WG829083-1</b> IRM	<b>SALINITY_SOIL3</b>						
Chloride (Cl)		104		%		70-130	04-SEP-08
<b>WG829083-4</b> IRM	<b>SALINITY_SOIL3</b>						
Chloride (Cl)		106		%		70-130	04-SEP-08
<b>WG829083-3</b> MS	<b>L676396-199</b>						
Chloride (Cl)		109		%		84-131	04-SEP-08
<b>WG829083-6</b> MS	<b>L676999-17</b>						
Chloride (Cl)		95		%		84-131	04-SEP-08
<b>Batch R718996</b>							
<b>WG830061-2</b> DUP	<b>L676396-48</b>						
Chloride (Cl)	<20	<20	RPD-NA	mg/L	N/A	15	05-SEP-08
<b>WG830061-1</b> IRM	<b>SALINITY_SOIL3</b>						
Chloride (Cl)		95		%		70-130	05-SEP-08
<b>WG830061-3</b> MS	<b>L639194-69</b>						
Chloride (Cl)		108		%		84-131	05-SEP-08
<b>L-BTX,TVH-CCME-ED Soil</b>							
<b>Batch R717641</b>							
<b>WG827757-1</b> DUP	<b>L676396-68</b>						
Benzene	<0.005	<0.005	RPD-NA	mg/kg	N/A	40	03-SEP-08
Ethylbenzene	<0.01	<0.01	RPD-NA	mg/kg	N/A	49	03-SEP-08
Toluene	0.03	0.02	J	mg/kg	0.01	0.04	03-SEP-08
TVH: (C6-C10 / No BTEX Correction)	<5	<5	RPD-NA	mg/kg	N/A	64	03-SEP-08
Xylenes	0.04	0.04	J	mg/kg	0.00	0.08	03-SEP-08
<b>WG828671-2</b> LCS							
Benzene		107		%		55-145	02-SEP-08
Ethylbenzene		83		%		52-125	02-SEP-08
Toluene		98		%		31-105	02-SEP-08
TVH: (C6-C10 / No BTEX Correction)		88		%		70-130	02-SEP-08
Xylenes		73		%		28-106	02-SEP-08
<b>WG828671-1</b> MB							
Benzene		<0.005		mg/kg		0.005	02-SEP-08
Ethylbenzene		<0.01		mg/kg		0.01	02-SEP-08

# ALS Laboratory Group Quality Control Report

Workorder: L676396

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
L-BTX,TVH-CCME-ED Soil								
Batch R717641								
WG828671-1 MB								
	Toluene		<0.01		mg/kg		0.01	02-SEP-08
	TVH: (C6-C10 / No BTEX Correction)		<5		mg/kg		5	02-SEP-08
	Xylenes		<0.02		mg/kg		0.02	02-SEP-08
Batch R718455								
WG827978-1 DUP L676353-16								
	Benzene	<0.005	<0.005	RPD-NA	mg/kg	N/A	40	03-SEP-08
	Ethylbenzene	0.02	<0.01	DUP-H	mg/kg	N/A	49	03-SEP-08
	Toluene	0.07	<0.01	DUP-H	mg/kg	N/A	53	03-SEP-08
	TVH: (C6-C10 / No BTEX Correction)	<5	<5	RPD-NA	mg/kg	N/A	64	03-SEP-08
	Xylenes	0.18	<0.02	DUP-H	mg/kg	N/A	54	03-SEP-08
WG827978-2 DUP L676396-195								
	Benzene	<0.005	<0.005	RPD-NA	mg/kg	N/A	40	03-SEP-08
	Ethylbenzene	<0.01	<0.01	RPD-NA	mg/kg	N/A	49	03-SEP-08
	Toluene	<0.01	<0.01	RPD-NA	mg/kg	N/A	53	03-SEP-08
	TVH: (C6-C10 / No BTEX Correction)	<5	<5	RPD-NA	mg/kg	N/A	64	03-SEP-08
	Xylenes	<0.02	<0.02	RPD-NA	mg/kg	N/A	54	03-SEP-08
WG827978-3 DUP L676396-221								
	Benzene	<0.005	<0.005	RPD-NA	mg/kg	N/A	40	03-SEP-08
	Ethylbenzene	<0.01	<0.01	RPD-NA	mg/kg	N/A	49	03-SEP-08
	Toluene	<0.01	<0.01	RPD-NA	mg/kg	N/A	53	03-SEP-08
	TVH: (C6-C10 / No BTEX Correction)	<5	<5	RPD-NA	mg/kg	N/A	64	03-SEP-08
	Xylenes	<0.02	<0.02	RPD-NA	mg/kg	N/A	54	03-SEP-08
WG829615-2 LCS								
	Benzene		107		%		55-145	03-SEP-08
	Ethylbenzene		84		%		52-125	03-SEP-08
	Toluene		98		%		31-105	03-SEP-08
	TVH: (C6-C10 / No BTEX Correction)		92		%		70-130	03-SEP-08
	Xylenes		73		%		28-106	03-SEP-08
WG827757-2 MB								
	Benzene		<0.005		mg/kg		0.005	03-SEP-08
	Ethylbenzene		<0.01		mg/kg		0.01	03-SEP-08
	Toluene		<0.01		mg/kg		0.01	03-SEP-08
	TVH: (C6-C10 / No BTEX Correction)		<5		mg/kg		5	03-SEP-08
	Xylenes		<0.02		mg/kg		0.02	03-SEP-08

# ALS Laboratory Group Quality Control Report

Workorder: L676396

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
L-BTX,TVH-CCME-ED	Soil							
Batch	R718455							
WG829615-1	MB							
Benzene			<0.005		mg/kg		0.005	03-SEP-08
Ethylbenzene			<0.01		mg/kg		0.01	03-SEP-08
Toluene			<0.01		mg/kg		0.01	03-SEP-08
TVH: (C6-C10 / No BTEX Correction)			<5		mg/kg		5	03-SEP-08
Xylenes			<0.02		mg/kg		0.02	03-SEP-08
Batch	R718740							
WG827796-1	DUP	L676396-96						
Benzene		<0.005	<0.005	RPD-NA	mg/kg	N/A	40	04-SEP-08
Ethylbenzene		<0.01	<0.01	RPD-NA	mg/kg	N/A	49	04-SEP-08
Toluene		<0.01	<0.01	RPD-NA	mg/kg	N/A	53	04-SEP-08
TVH: (C6-C10 / No BTEX Correction)		<5	<5	RPD-NA	mg/kg	N/A	64	04-SEP-08
Xylenes		<0.02	<0.02	RPD-NA	mg/kg	N/A	54	04-SEP-08
WG827796-3	DUP	L676396-179						
Benzene		<0.005	<0.005	RPD-NA	mg/kg	N/A	40	04-SEP-08
Ethylbenzene		<0.01	<0.01	RPD-NA	mg/kg	N/A	49	04-SEP-08
Toluene		<0.01	<0.01	RPD-NA	mg/kg	N/A	53	04-SEP-08
TVH: (C6-C10 / No BTEX Correction)		<5	<5	RPD-NA	mg/kg	N/A	64	04-SEP-08
Xylenes		<0.02	<0.02	RPD-NA	mg/kg	N/A	54	04-SEP-08
WG829925-2	LCS							
Benzene			88		%		55-145	04-SEP-08
Ethylbenzene			79		%		52-125	04-SEP-08
Toluene			87		%		31-105	04-SEP-08
TVH: (C6-C10 / No BTEX Correction)			101		%		70-130	04-SEP-08
Xylenes			74		%		28-106	04-SEP-08
WG827796-2	MB							
Benzene			<0.005		mg/kg		0.005	04-SEP-08
Ethylbenzene			<0.01		mg/kg		0.01	04-SEP-08
Toluene			<0.01		mg/kg		0.01	04-SEP-08
TVH: (C6-C10 / No BTEX Correction)			<5		mg/kg		5	04-SEP-08
Xylenes			<0.02		mg/kg		0.02	04-SEP-08
WG829925-1	MB							
Benzene			<0.005		mg/kg		0.005	04-SEP-08
Ethylbenzene			<0.01		mg/kg		0.01	04-SEP-08
Toluene			<0.01		mg/kg		0.01	04-SEP-08

# ALS Laboratory Group Quality Control Report

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
L-BTX,TVH-CCME-ED	Soil							
Batch	R718740							
WG829925-1	MB							
TVH: (C6-C10 / No BTEX Correction)			<5		mg/kg		5	04-SEP-08
Xylenes			<0.02		mg/kg		0.02	04-SEP-08
4-TMB-ED	Soil							
Batch	R718666							
WG829619-2	LCS							
TEH: (C10-C16)			69		%		55-145	03-SEP-08
TEH: (C16-C34)			69		%		55-145	03-SEP-08
TEH: (C34-C50)			69		%		55-145	03-SEP-08
WG829619-1	MB							
TEH: (C10-C16)			<20		mg/kg		20	03-SEP-08
TEH: (C16-C34)			<20		mg/kg		20	03-SEP-08
TEH: (C34-C50)			<20		mg/kg		20	03-SEP-08
Batch	R718768							
WG829653-3	DUP	L676396-208						
TEH: (C10-C16)		<20	<20	RPD-NA	mg/kg	N/A	39	04-SEP-08
TEH: (C16-C34)		<20	<20	RPD-NA	mg/kg	N/A	39	04-SEP-08
TEH: (C34-C50)		<20	<20	RPD-NA	mg/kg	N/A	39	04-SEP-08
WG829653-2	LCS							
TEH: (C10-C16)			86		%		55-145	04-SEP-08
TEH: (C16-C34)			86		%		55-145	04-SEP-08
TEH: (C34-C50)			86		%		55-145	04-SEP-08
WG829653-1	MB							
TEH: (C10-C16)			<20		mg/kg		20	04-SEP-08
TEH: (C16-C34)			<20		mg/kg		20	04-SEP-08
TEH: (C34-C50)			<20		mg/kg		20	04-SEP-08
Batch	R719181							
WG830303-3	DUP	L676396-68						
TEH: (C10-C16)		<20	<20	RPD-NA	mg/kg	N/A	39	04-SEP-08
TEH: (C16-C34)		70	80	J	mg/kg	0	80	04-SEP-08
TEH: (C34-C50)		40	60	J	mg/kg	20	80	04-SEP-08
WG830303-2	LCS							
TEH: (C10-C16)			93		%		55-145	04-SEP-08
TEH: (C16-C34)			93		%		55-145	04-SEP-08
TEH: (C34-C50)			93		%		55-145	04-SEP-08

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
4-TMB-ED	Soil							
Batch	R719181							
WG830303-1	MB							
TEH: (C10-C16)			<20		mg/kg		20	04-SEP-08
TEH: (C16-C34)			40	A	mg/kg		20	04-SEP-08
TEH: (C34-C50)			30	A	mg/kg		20	04-SEP-08
COMMENTS: Interpret positive sample results of less than 5x the DL with caution.								
Batch	R720022							
WG831089-3	DUP	L677119-8						
TEH: (C10-C16)		<20	<20	RPD-NA	mg/kg	N/A	39	07-SEP-08
TEH: (C16-C34)		30	30	J	mg/kg	0	80	07-SEP-08
TEH: (C34-C50)		30	40	J	mg/kg	0	80	07-SEP-08
WG831089-2	LCS							
TEH: (C10-C16)			106		%		55-145	07-SEP-08
TEH: (C16-C34)			106		%		55-145	07-SEP-08
TEH: (C34-C50)			106		%		55-145	07-SEP-08
WG831089-1	MB							
TEH: (C10-C16)			<20		mg/kg		20	07-SEP-08
TEH: (C16-C34)			<20		mg/kg		20	07-SEP-08
TEH: (C34-C50)			<20		mg/kg		20	07-SEP-08
Batch	R720042							
WG831024-3	DUP	L676396-180						
TEH: (C10-C16)		<20	<20	RPD-NA	mg/kg	N/A	39	05-SEP-08
TEH: (C16-C34)		810	700		mg/kg	15	39	05-SEP-08
TEH: (C34-C50)		50	40	J	mg/kg	10	80	05-SEP-08
WG831024-2	LCS							
TEH: (C10-C16)			80		%		55-145	05-SEP-08
TEH: (C16-C34)			80		%		55-145	05-SEP-08
TEH: (C34-C50)			80		%		55-145	05-SEP-08
WG831024-1	MB							
TEH: (C10-C16)			<20		mg/kg		20	05-SEP-08
TEH: (C16-C34)			<20		mg/kg		20	05-SEP-08
TEH: (C34-C50)			<20		mg/kg		20	05-SEP-08
Batch	R720057							
WG831243-3	DUP	L677114-1						
TEH: (C10-C16)		<20	<20	RPD-NA	mg/kg	N/A	39	05-SEP-08
TEH: (C16-C34)		<20	<20	RPD-NA	mg/kg	N/A	39	05-SEP-08
TEH: (C34-C50)		<20	<20	RPD-NA	mg/kg	N/A	39	05-SEP-08

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
4-TMB-ED	Soil							
atch	R720057							
WG831243-2	LCS							
TEH: (C10-C16)			91		%		55-145	05-SEP-08
TEH: (C16-C34)			91		%		55-145	05-SEP-08
TEH: (C34-C50)			91		%		55-145	05-SEP-08
WG831243-1	MB							
TEH: (C10-C16)			<20		mg/kg		20	05-SEP-08
TEH: (C16-C34)			<20		mg/kg		20	05-SEP-08
TEH: (C34-C50)			<20		mg/kg		20	05-SEP-08
TAL-CCME-ED	Soil							
atch	R718976							
WG828702-2	CRM	2702_SOIL						
Arsenic (As)			102		%		92-111	06-SEP-08
Barium (Ba)			111		%		90-123	06-SEP-08
Beryllium (Be)			94		%		80-126	06-SEP-08
Chromium (Cr)			102		%		86-119	06-SEP-08
Cobalt (Co)			105		%		90-120	06-SEP-08
Copper (Cu)			105		%		91-118	06-SEP-08
Lead (Pb)			102		%		90-126	06-SEP-08
Mercury (Hg)			89		%		37-185	06-SEP-08
Molybdenum (Mo)			106		%		87-124	06-SEP-08
Nickel (Ni)			101		%		89-121	06-SEP-08
Selenium (Se)			109		%		78-123	06-SEP-08
Silver (Ag)			85		%		47-158	06-SEP-08
Tin (Sn)			109		%		73-139	06-SEP-08
Uranium (U)			96		%		89-128	06-SEP-08
Vanadium (V)			99		%		86-116	06-SEP-08
Zinc (Zn)			104		%		81-112	06-SEP-08
Cadmium (Cd)			103		%		87-117	09-SEP-08
WG828702-3	DUP	L676396-1						
Antimony (Sb)		<0.2	<0.2	RPD-NA	mg/kg	N/A	41	06-SEP-08
Arsenic (As)		7.3	7.4		mg/kg	1.3	15	06-SEP-08
Barium (Ba)		196	182		mg/kg	7.7	22	06-SEP-08
Beryllium (Be)		<1	<1	RPD-NA	mg/kg	N/A	26	06-SEP-08
Cadmium (Cd)		<0.5	<0.5	RPD-NA	mg/kg	N/A	23	06-SEP-08

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TAL-CCME-ED	Soil							
atch	R718976							
WG828702-3	DUP	L676396-1						
Chromium (Cr)		14.9	14.7		mg/kg	1.2	19	06-SEP-08
Cobalt (Co)		7	6	J	mg/kg	0	4	06-SEP-08
Copper (Cu)		14	14	J	mg/kg	0	8	06-SEP-08
Lead (Pb)		7	7	J	mg/kg	0	20	06-SEP-08
Mercury (Hg)		<0.05	<0.05	RPD-NA	mg/kg	N/A	25	06-SEP-08
Molybdenum (Mo)		1	1	J	mg/kg	0	4	06-SEP-08
Nickel (Ni)		19	18	J	mg/kg	0	8	06-SEP-08
Selenium (Se)		0.4	0.3	J	mg/kg	0.0	0.8	06-SEP-08
Silver (Ag)		<1	<1	RPD-NA	mg/kg	N/A	33	06-SEP-08
Thallium (Tl)		<1	<1	RPD-NA	mg/kg	N/A	27	06-SEP-08
Tin (Sn)		<5	<5	RPD-NA	mg/kg	N/A	31	06-SEP-08
Uranium (U)		<2	<2	RPD-NA	mg/kg	N/A	16	06-SEP-08
Vanadium (V)		30	29		mg/kg	2.0	23	06-SEP-08
Zinc (Zn)		60	60	J	mg/kg	0	40	06-SEP-08
WG828702-5	DUP	L676396-193						
Antimony (Sb)		<0.2	<0.2	RPD-NA	mg/kg	N/A	41	06-SEP-08
Arsenic (As)		6.6	5.8		mg/kg	13	15	06-SEP-08
Barium (Ba)		173	155		mg/kg	11	22	06-SEP-08
Beryllium (Be)		<1	<1	RPD-NA	mg/kg	N/A	26	06-SEP-08
Cadmium (Cd)		<0.5	<0.5	RPD-NA	mg/kg	N/A	23	06-SEP-08
Chromium (Cr)		22.0	19.5		mg/kg	12	19	06-SEP-08
Cobalt (Co)		9	8	J	mg/kg	1	4	06-SEP-08
Copper (Cu)		9	8	J	mg/kg	1	8	06-SEP-08
Lead (Pb)		8	7	J	mg/kg	1	20	06-SEP-08
Mercury (Hg)		<0.05	<0.05	RPD-NA	mg/kg	N/A	25	06-SEP-08
Molybdenum (Mo)		<1	<1	RPD-NA	mg/kg	N/A	25	06-SEP-08
Nickel (Ni)		17	15	J	mg/kg	2	8	06-SEP-08
Selenium (Se)		0.3	0.3	J	mg/kg	0.1	0.8	06-SEP-08
Silver (Ag)		<1	<1	RPD-NA	mg/kg	N/A	33	06-SEP-08
Thallium (Tl)		<1	<1	RPD-NA	mg/kg	N/A	27	06-SEP-08
Tin (Sn)		<5	<5	RPD-NA	mg/kg	N/A	31	06-SEP-08
Uranium (U)		<2	<2	RPD-NA	mg/kg	N/A	16	06-SEP-08
Vanadium (V)		38	33		mg/kg	15	23	06-SEP-08

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TAL-CCME-ED	Soil							
Batch	R718976							
WG828702-5	DUP	L676396-193						
Zinc (Zn)		60	50	J	mg/kg	10	40	06-SEP-08
WG828702-1	MB							
Antimony (Sb)			<0.2		mg/kg		1	06-SEP-08
Arsenic (As)			<0.2		mg/kg		1	06-SEP-08
Barium (Ba)			<5		mg/kg		25	06-SEP-08
Beryllium (Be)			<1		mg/kg		1	06-SEP-08
Cadmium (Cd)			<0.5		mg/kg		2.5	06-SEP-08
Chromium (Cr)			<0.5		mg/kg		2.5	06-SEP-08
Cobalt (Co)			<1		mg/kg		5	06-SEP-08
Copper (Cu)			<2		mg/kg		10	06-SEP-08
Lead (Pb)			<5		mg/kg		25	06-SEP-08
Mercury (Hg)			<0.05		mg/kg		0.25	06-SEP-08
Molybdenum (Mo)			<1		mg/kg		5	06-SEP-08
Nickel (Ni)			<2		mg/kg		10	06-SEP-08
Selenium (Se)			<0.2		mg/kg		1	06-SEP-08
Silver (Ag)			<1		mg/kg		5	06-SEP-08
Thallium (Tl)			<1		mg/kg		5	06-SEP-08
Tin (Sn)			<5		mg/kg		25	06-SEP-08
Uranium (U)			<2		mg/kg		2	06-SEP-08
Vanadium (V)			<1		mg/kg		5	06-SEP-08
Zinc (Zn)			<10		mg/kg		50	06-SEP-08
WG828702-4	MS	L676396-1						
Antimony (Sb)			105		%		90-118	06-SEP-08
Arsenic (As)			99		%		91-114	06-SEP-08
Barium (Ba)			99		%		56-151	06-SEP-08
Beryllium (Be)			99		%		82-121	06-SEP-08
Cadmium (Cd)			102		%		92-117	06-SEP-08
Chromium (Cr)			98		%		85-117	06-SEP-08
Cobalt (Co)			94		%		87-112	06-SEP-08
Copper (Cu)			93		%		80-116	06-SEP-08
Lead (Pb)			96		%		83-119	06-SEP-08
Molybdenum (Mo)			101		%		91-122	06-SEP-08
Nickel (Ni)			89		%		83-112	06-SEP-08

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Item	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TAL-CCME-ED	Soil							
Batch	R718976							
WG828702-4	MS	L676396-1						
Selenium (Se)			102		%		90-120	06-SEP-08
Silver (Ag)			20		%		18-114	06-SEP-08
Thallium (Tl)			97		%		83-126	06-SEP-08
Tin (Sn)			103		%		92-118	06-SEP-08
Uranium (U)			97		%		86-117	06-SEP-08
Vanadium (V)			100		%		84-117	06-SEP-08
Zinc (Zn)			98		%		85-118	06-SEP-08
Mercury (Hg)			43		%		48-138	09-SEP-08
WG828702-6	MS	L676396-193						
Antimony (Sb)			105		%		90-118	06-SEP-08
Arsenic (As)			98		%		91-114	06-SEP-08
Barium (Ba)			89		%		56-151	06-SEP-08
Beryllium (Be)			99		%		82-121	06-SEP-08
Cadmium (Cd)			104		%		92-117	06-SEP-08
Chromium (Cr)			101		%		85-117	06-SEP-08
Cobalt (Co)			95		%		87-112	06-SEP-08
Copper (Cu)			97		%		80-116	06-SEP-08
Lead (Pb)			98		%		83-119	06-SEP-08
Molybdenum (Mo)			102		%		91-122	06-SEP-08
Nickel (Ni)			90		%		83-112	06-SEP-08
Selenium (Se)			103		%		90-120	06-SEP-08
Thallium (Tl)			101		%		83-126	06-SEP-08
Tin (Sn)			103		%		92-118	06-SEP-08
Uranium (U)			99		%		86-117	06-SEP-08
Vanadium (V)			100		%		84-117	06-SEP-08
Zinc (Zn)			101		%		85-118	06-SEP-08
Mercury (Hg)			62		%		48-138	09-SEP-08
Silver (Ag)			23		%		18-114	09-SEP-08
H-CCME-ED	Soil							
Batch	R719239							
WG829889-2	DUP	L677421-1						
Benzo(a)anthracene		0.02	0.01	J	mg/kg	0.01	0.04	07-SEP-08
Benzo(a)pyrene		0.02	0.02	J	mg/kg	0.01	0.04	07-SEP-08

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H-CCME-ED Soil								
Batch	R719239							
WG829889-2	DUP	L677421-1						
Benzo(b&j)fluoranthene		0.03	0.03	J	mg/kg	0.01	0.04	07-SEP-08
Benzo(k)fluoranthene		0.01	<0.01	RPD-NA	mg/kg	N/A	26	07-SEP-08
Dibenzo(a,h)anthracene		<0.01	<0.01	RPD-NA	mg/kg	N/A	40	07-SEP-08
Indeno(1,2,3-cd)pyrene		0.01	<0.01	RPD-NA	mg/kg	N/A	35	07-SEP-08
Naphthalene		<0.01	<0.01	RPD-NA	mg/kg	N/A	25	07-SEP-08
Phenanthrene		0.04	0.02	J	mg/kg	0.01	0.04	07-SEP-08
Pyrene		0.04	0.02	J	mg/kg	0.01	0.04	07-SEP-08
Quinoline		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	07-SEP-08
WG829889-1 MB								
Benzo(a)anthracene			<0.01		mg/kg		0.01	06-SEP-08
Benzo(a)pyrene			<0.01		mg/kg		0.01	06-SEP-08
Benzo(b&j)fluoranthene			<0.01		mg/kg		0.01	06-SEP-08
Benzo(k)fluoranthene			<0.01		mg/kg		0.01	06-SEP-08
Dibenzo(a,h)anthracene			<0.01		mg/kg		0.01	06-SEP-08
Indeno(1,2,3-cd)pyrene			<0.01		mg/kg		0.01	06-SEP-08
Naphthalene			<0.01		mg/kg		0.01	06-SEP-08
Phenanthrene			<0.01		mg/kg		0.01	06-SEP-08
Pyrene			<0.01		mg/kg		0.01	06-SEP-08
Quinoline			<0.01		mg/kg		0.01	06-SEP-08
-ED Soil								
Batch	R718976							
WG828702-2	CRM	2702_SOIL						
Lead (Pb)			102		%		90-126	06-SEP-08
WG828702-1 MB								
Lead (Pb)			<5		mg/kg		25	06-SEP-08
EP-MOISTURE-ED Soil								
Batch	R717289							
WG827800-1	DUP	L676396-96						
% Moisture		11	10		%	4.3	20	02-SEP-08
WG827800-2 DUP								
% Moisture		L676396-179 20	21		%	7.3	20	02-SEP-08
WG827800-3 DUP								
% Moisture		L676396-194 7.4	7.9		%	6.8	20	02-SEP-08

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EP-MOISTURE-ED	Soil							
Batch	R717303							
WG827760-1	DUP	L676396-35						
% Moisture		11	10		%	1.0	20	02-SEP-08
Batch	R717440							
WG827983-1	DUP	L676353-16						
% Moisture		5.0	4.6		%	8.4	20	02-SEP-08
WG827983-2	DUP	L676396-195						
% Moisture		2.8	2.6		%	6.1	20	02-SEP-08
WG827983-3	DUP	L676396-221						
% Moisture		31	29		%	5.1	20	02-SEP-08
A-MUST-ED	Soil							
Batch	R719890							
WG830352-1	DUP	L676396-202						
MUST PSA % > 75um		12	12		%	3.5	10	08-SEP-08
R-CALC-ED	Soil							
Batch	R718988							
WG830009-2	DUP	L676396-198						
Calcium (Ca)		88	97		mg/L	9.7	16	05-SEP-08
Magnesium (Mg)		11	12	J	mg/L	1	12	05-SEP-08
Potassium (K)		3	3	J	mg/L	1	8	05-SEP-08
Sodium (Na)		10	11	J	mg/L	1	8	05-SEP-08
WG830009-4	DUP	L676396-48						
Calcium (Ca)		31	32	J	mg/L	0	20	05-SEP-08
Magnesium (Mg)		7	7	J	mg/L	0	12	05-SEP-08
Potassium (K)		3	3	J	mg/L	0	8	05-SEP-08
Sodium (Na)		8	8	J	mg/L	0	8	05-SEP-08
WG830009-1	IRM	SALINITY_SOIL3						
Calcium (Ca)			112		%		70-130	05-SEP-08
Magnesium (Mg)			115		%		70-130	05-SEP-08
Potassium (K)			118		%		72-128	05-SEP-08
Sodium (Na)			107		%		71-129	05-SEP-08
WG830009-6	IRM	SALINITY_SOIL3						
Calcium (Ca)			92		%		70-130	05-SEP-08
Magnesium (Mg)			91		%		70-130	05-SEP-08
Potassium (K)			93		%		72-128	05-SEP-08

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R-CALC-ED Soil								
Batch	R718988							
WG830009-6	IRM	SALINITY_SOIL3						
Sodium (Na)			86		%		71-129	05-SEP-08
WG830009-3	MS	L676396-198						
Calcium (Ca)			99		%		88-115	05-SEP-08
Magnesium (Mg)			109		%		88-116	05-SEP-08
Potassium (K)			96		%		87-113	05-SEP-08
Sodium (Na)			101		%		85-116	05-SEP-08
WG830009-5	MS	L676396-48						
Calcium (Ca)			101		%		88-115	05-SEP-08
Magnesium (Mg)			107		%		88-116	05-SEP-08
Potassium (K)			94		%		87-113	05-SEP-08
Sodium (Na)			96		%		85-116	05-SEP-08
T/PH/EC-ED Soil								
Batch	R717998							
WG828464-2	DUP	L676396-198						
% Saturation		37.9	36.2		%	4.7	9.8	04-SEP-08
Conductivity Sat. Paste		0.42	0.42		dS m-1	1.4	10	04-SEP-08
pH in Saturated Paste		7.1	7.1	J	pH	0.1	0.26	04-SEP-08
WG828464-1	IRM	SALINITY_SOIL3						
% Saturation			110		%		70-130	04-SEP-08
Conductivity Sat. Paste			109		%		73-127	04-SEP-08
pH in Saturated Paste			6.7		pH		5-8.3	04-SEP-08
WG828464-3	LCS							
pH in Saturated Paste			4.0		pH		3.9-4.1	04-SEP-08
WG828464-4	LCS							
pH in Saturated Paste			7.0		pH		6.9-7.1	04-SEP-08
WG828464-5	LCS							
pH in Saturated Paste			9.9		pH		9.9-10.1	04-SEP-08
WG828464-6	LCS							
Conductivity Sat. Paste			108		%		98-112	04-SEP-08
WG828464-7	LCS							
Conductivity Sat. Paste			105		%		96-109	04-SEP-08
WG828464-8	LCS							
Conductivity Sat. Paste			100		%		94-112	04-SEP-08

# ALS Laboratory Group Quality Control Report

Workorder: L676396

Report Date: 21-OCT-08

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
T/PH/EC-ED	Soil							
batch	R718749							
WG829201-2	DUP	L676396-48						
% Saturation		32.5	32.0		%	1.6	9.8	05-SEP-08
Conductivity Sat. Paste		0.20	0.20		dS m-1	0.50	10	05-SEP-08
pH in Saturated Paste		8.2	8.2	J	pH	0.0	0.26	05-SEP-08
WG829201-1	IRM	SALINITY_SOIL3						
% Saturation			105		%		70-130	05-SEP-08
Conductivity Sat. Paste			101		%		73-127	05-SEP-08
pH in Saturated Paste			6.3		pH		5-8.3	05-SEP-08
WG829201-3	LCS							
pH in Saturated Paste			4.0		pH		3.9-4.1	05-SEP-08
WG829201-4	LCS							
pH in Saturated Paste			7.0		pH		6.9-7.1	05-SEP-08
WG829201-5	LCS							
pH in Saturated Paste			9.9		pH		9.9-10.1	05-SEP-08
WG829201-6	LCS							
Conductivity Sat. Paste			105		%		98-112	05-SEP-08
WG829201-7	LCS							
Conductivity Sat. Paste			102		%		96-109	05-SEP-08
WG829201-8	LCS							
Conductivity Sat. Paste			100		%		94-112	05-SEP-08
4-SAR-ED	Soil							
batch	R718988							
WG830009-2	DUP	L676396-198						
Sulphate (SO4)		35	40	J	mg/L	5	24	05-SEP-08
WG830009-4	DUP	L676396-48						
Sulphate (SO4)		26	26	J	mg/L	0	24	05-SEP-08
WG830009-1	IRM	SALINITY_SOIL3						
Sulphate (SO4)			115		%		68-132	05-SEP-08
WG830009-6	IRM	SALINITY_SOIL3						
Sulphate (SO4)			90		%		68-132	05-SEP-08
WG830009-3	MS	L676396-198						
Sulphate (SO4)			94		%		73-130	05-SEP-08
WG830009-5	MS	L676396-48						
Sulphate (SO4)			90		%		73-130	05-SEP-08
C-CLALI-CCME-ED	Soil							

# ALS Laboratory Group Quality Control Report

Workorder: L676396

Report Date: 21-OCT-08

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-CLALI-CCME-ED	Soil							
atch	R718196							
WG828918-1	DUP	L676396-204						
1,1,1-Trichloroethane		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
1,1,2,2-Tetrachloroethane		<0.02	<0.02	RPD-NA	mg/kg	N/A	39	04-SEP-08
1,1,2-Trichloroethane		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
1,1-Dichloroethane		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
1,1-Dichloroethene		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
1,2-Dichloroethane		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
1,2-Dichloropropane		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
Carbon Tetrachloride		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
Chloroform		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
cis-1,3-Dichloropropene		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
Methylene Chloride		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
Tetrachloroethylene		<0.01	<0.01	RPD-NA	mg/kg	N/A	50	04-SEP-08
trans-1,2-Dichloroethene		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
trans-1,3-Dichloropropene		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
Trichloroethene		<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
WG829335-2	LCS							
1,1,1-Trichloroethane			97		%		70-130	03-SEP-08
1,1-Dichloroethene			80		%		70-130	03-SEP-08
1,2-Dichloroethane			123		%		70-130	03-SEP-08
Carbon Tetrachloride			100		%		70-130	03-SEP-08
Chloroform			97		%		70-130	03-SEP-08
Methylene Chloride			89		%		70-130	03-SEP-08
Trichloroethene			106		%		70-130	03-SEP-08
WG829335-1	MB							
1,1,1-Trichloroethane			<0.01		mg/kg		0.01	03-SEP-08
1,1,2,2-Tetrachloroethane			<0.02		mg/kg		0.02	03-SEP-08
1,1,2-Trichloroethane			<0.01		mg/kg		0.01	03-SEP-08
1,1-Dichloroethane			<0.01		mg/kg		0.01	03-SEP-08
1,1-Dichloroethene			<0.01		mg/kg		0.01	03-SEP-08
1,2-Dichloroethane			<0.01		mg/kg		0.01	03-SEP-08
1,2-Dichloropropane			<0.01		mg/kg		0.01	03-SEP-08
Carbon Tetrachloride			<0.01		mg/kg		0.01	03-SEP-08
Chloroform			<0.01		mg/kg		0.01	03-SEP-08

# ALS Laboratory Group Quality Control Report

Workorder: L676396

Report Date: 21-OCT-08

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>C-CLALI-CCME-ED</b> Soil								
Batch R718196								
<b>WG829335-1 MB</b>								
	cis-1,3-Dichloropropene		<0.01		mg/kg		0.01	03-SEP-08
	Methylene Chloride		<0.01		mg/kg		0.01	03-SEP-08
	Tetrachloroethylene		<0.01		mg/kg		0.01	03-SEP-08
	trans-1,2-Dichloroethene		<0.01		mg/kg		0.01	03-SEP-08
	trans-1,3-Dichloropropene		<0.01		mg/kg		0.01	03-SEP-08
	Trichloroethene		<0.01		mg/kg		0.01	03-SEP-08
<b>C-MAH-CCME-ED</b> Soil								
Batch R718196								
<b>WG828918-1 DUP</b> L676396-204								
	1,2-Dichlorobenzene	<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
	1,3-Dichlorobenzene	<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
	1,4-Dichlorobenzene	<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
	Chlorobenzene	<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
	Styrene	<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
	Thiophene	<0.01	<0.01	RPD-NA	mg/kg	N/A	39	04-SEP-08
<b>WG829335-2 LCS</b>								
	1,4-Dichlorobenzene		92		%		70-130	03-SEP-08
	Benzene		96		%		70-130	03-SEP-08
	Ethylbenzene		114		%		70-130	03-SEP-08
	m+p-Xylenes		120		%		70-130	03-SEP-08
	o-Xylene		123		%		70-130	03-SEP-08
	Styrene		105		%		70-130	03-SEP-08
	Toluene		90		%		70-130	03-SEP-08
<b>WG829335-1 MB</b>								
	1,2-Dichlorobenzene		<0.01		mg/kg		0.01	03-SEP-08
	1,3-Dichlorobenzene		<0.01		mg/kg		0.01	03-SEP-08
	1,4-Dichlorobenzene		<0.01		mg/kg		0.01	03-SEP-08
	Benzene		<0.005		mg/kg		0.005	03-SEP-08
	Chlorobenzene		<0.01		mg/kg		0.01	03-SEP-08
	Ethylbenzene		<0.01		mg/kg		0.01	03-SEP-08
	m+p-Xylenes		<0.01		mg/kg		0.01	03-SEP-08
	o-Xylene		<0.01		mg/kg		0.01	03-SEP-08
	Styrene		<0.01		mg/kg		0.01	03-SEP-08

# ALS Laboratory Group Quality Control Report

Workorder: L676396

Report Date: 21-OCT-08

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t	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-MAH-CCME-ED	Soil							
atch	R718196							
WG829335-1	MB							
Thiophene			<0.01		mg/kg		0.01	03-SEP-08
Toluene			<0.01		mg/kg		0.01	03-SEP-08

## ALS Laboratory Group Quality Control Report

Workorder: L676396

Report Date: 21-OCT-08

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### Legend:

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Limit 99% Confidence Interval (Laboratory Control Limits)  
DUP Duplicate  
RPD Relative Percent Difference  
N/A Not Available  
LCS Laboratory Control Sample  
SRM Standard Reference Material  
MS Matrix Spike  
MSD Matrix Spike Duplicate  
ADE Average Desorption Efficiency  
MB Method Blank  
IRM Internal Reference Material  
CRM Certified Reference Material  
CCV Continuing Calibration Verification  
CVS Calibration Verification Standard  
LCSD Laboratory Control Sample Duplicate

### Sample Parameter Qualifier Definitions:

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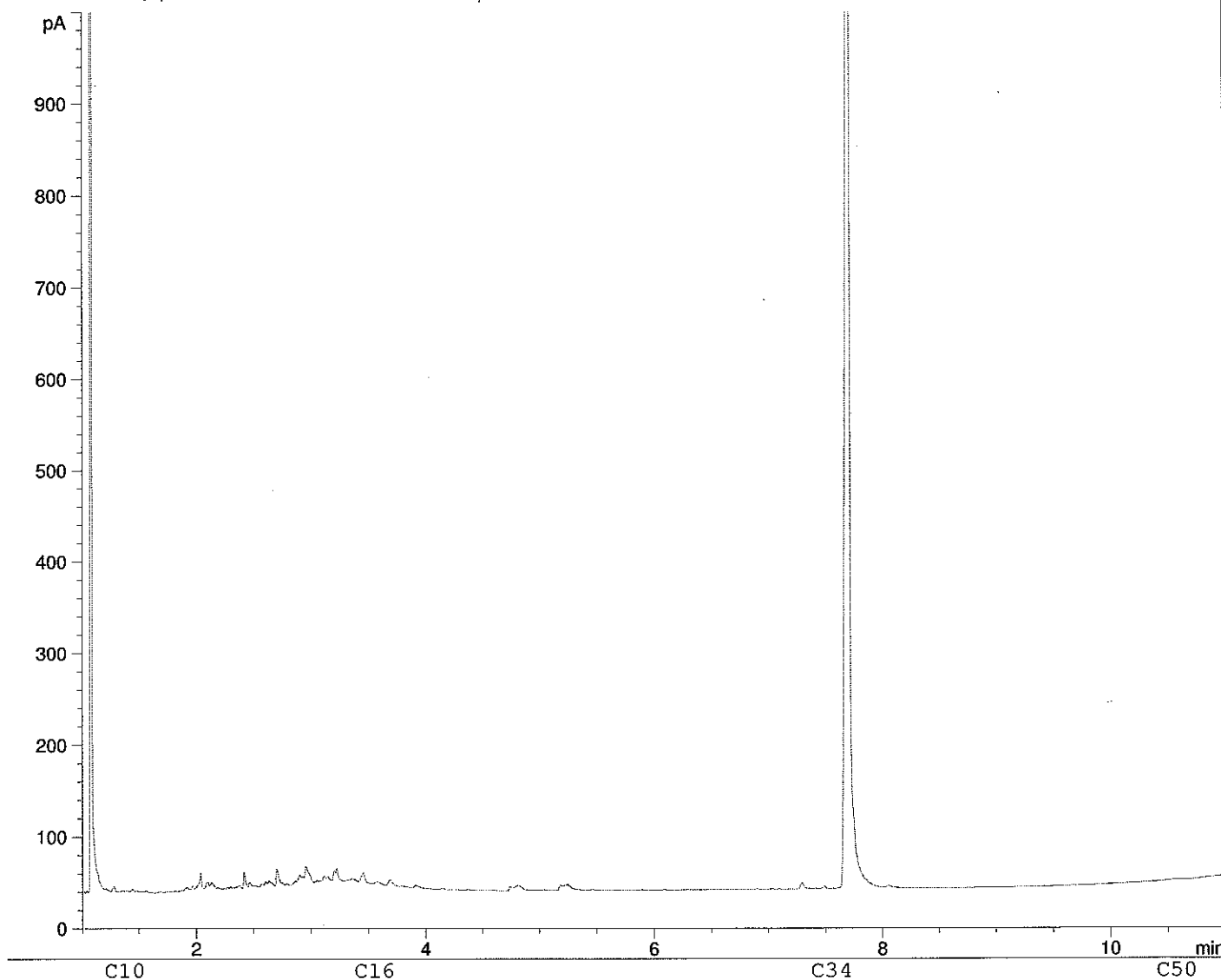
Qualifier	Description
A	Method Blank exceeds ALS DQO. Refer to narrative comments for further information.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Client ID: 08BH16 @ 6.1  
Sample ID: L676396-123 30  
Injection Date: 9/4/2008 1:52:20 AM  
Instrument: 6890



# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0903B\0903BK16.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products

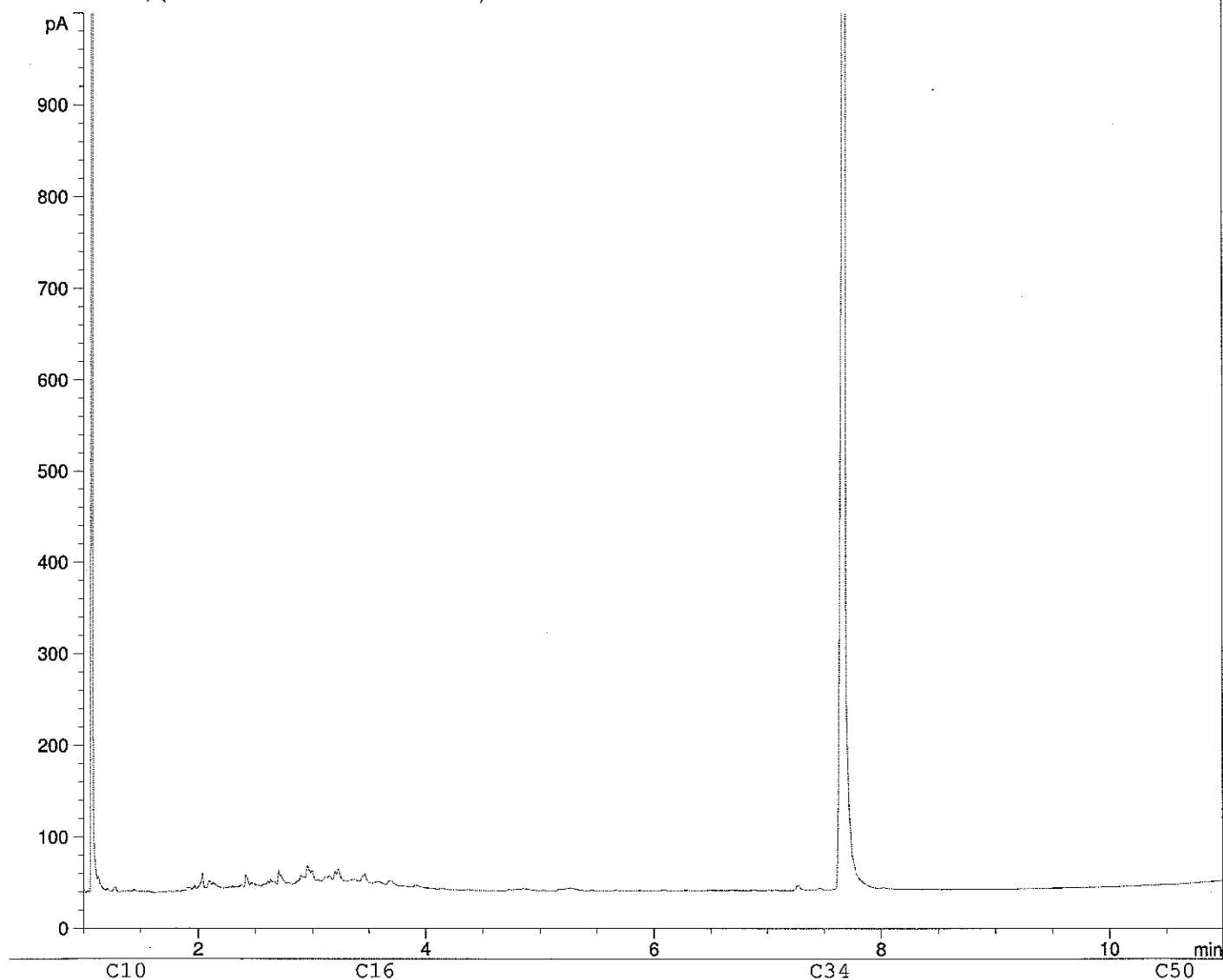
Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→																										
Mineral Spirits																											
#2 Diesel																											
JP5, Jet A																											
Heavy Diesel																											
Gas Oil, Fuel Oil																											
Lubricating Oils																											

Adapted from: Drews, A.W.; ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

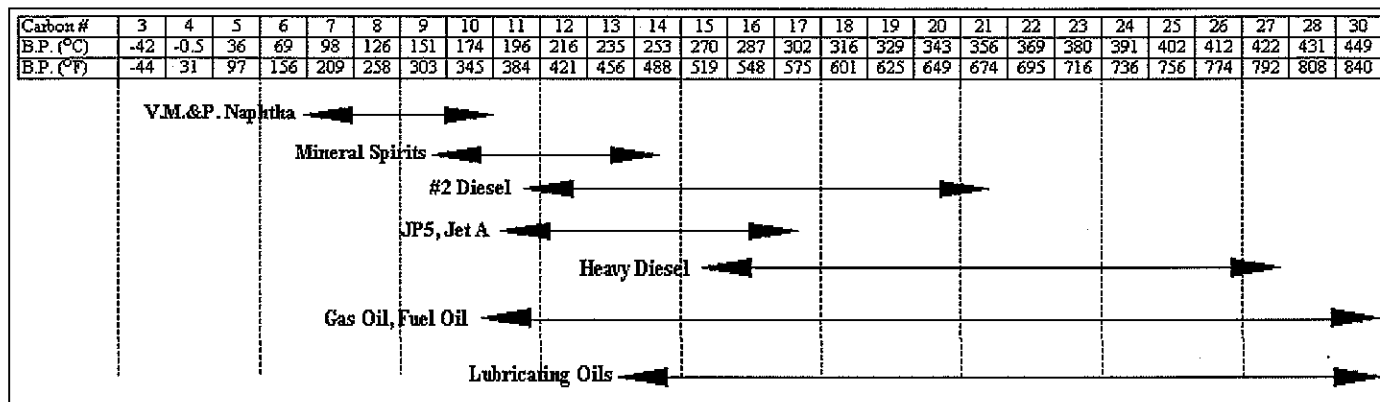
Client ID: 08BH16D @ 6.1  
Sample ID: L676396-130 30  
Injection Date: 9/4/2008 2:36:33 AM  
Instrument: 6890



Total Extractable Hydrocarbons  
FID2 B, (I:\ALSED.GC\FID5\0903B\0903BK18.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products

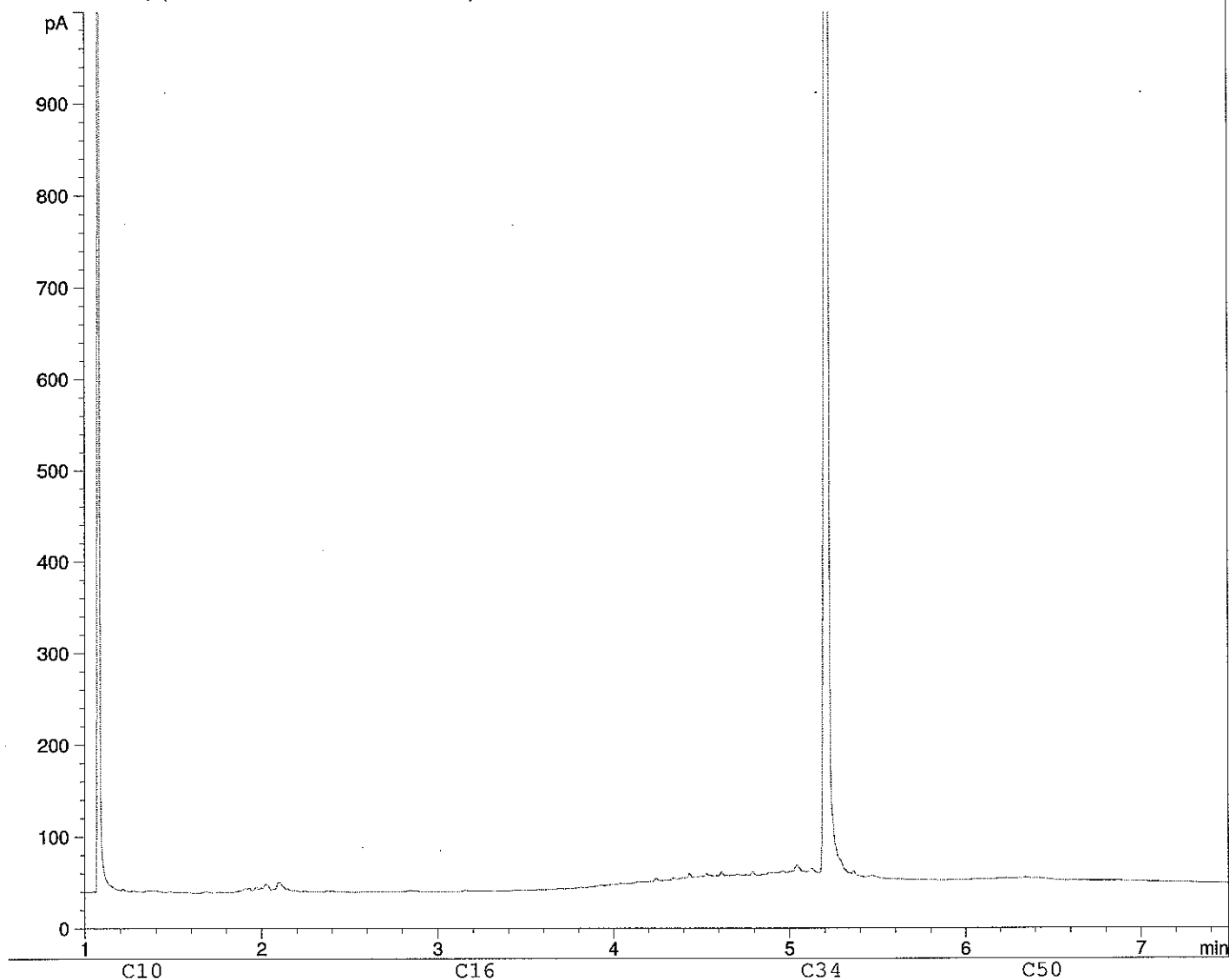


Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

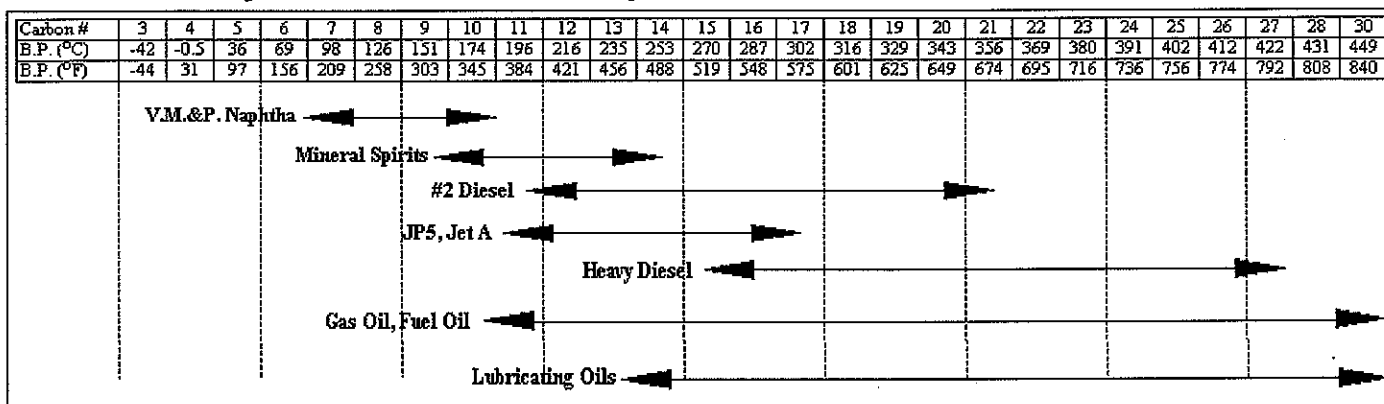
Client ID: 08BH18 @ 0.6  
Sample ID: L676396-148 30  
Injection Date: 9/6/2008 12:30:30 AM  
Instrument: 6890



Total Extractable Hydrocarbons  
FID2 B, (I:\ALSED.GCFID5\0905\0905BK14.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products



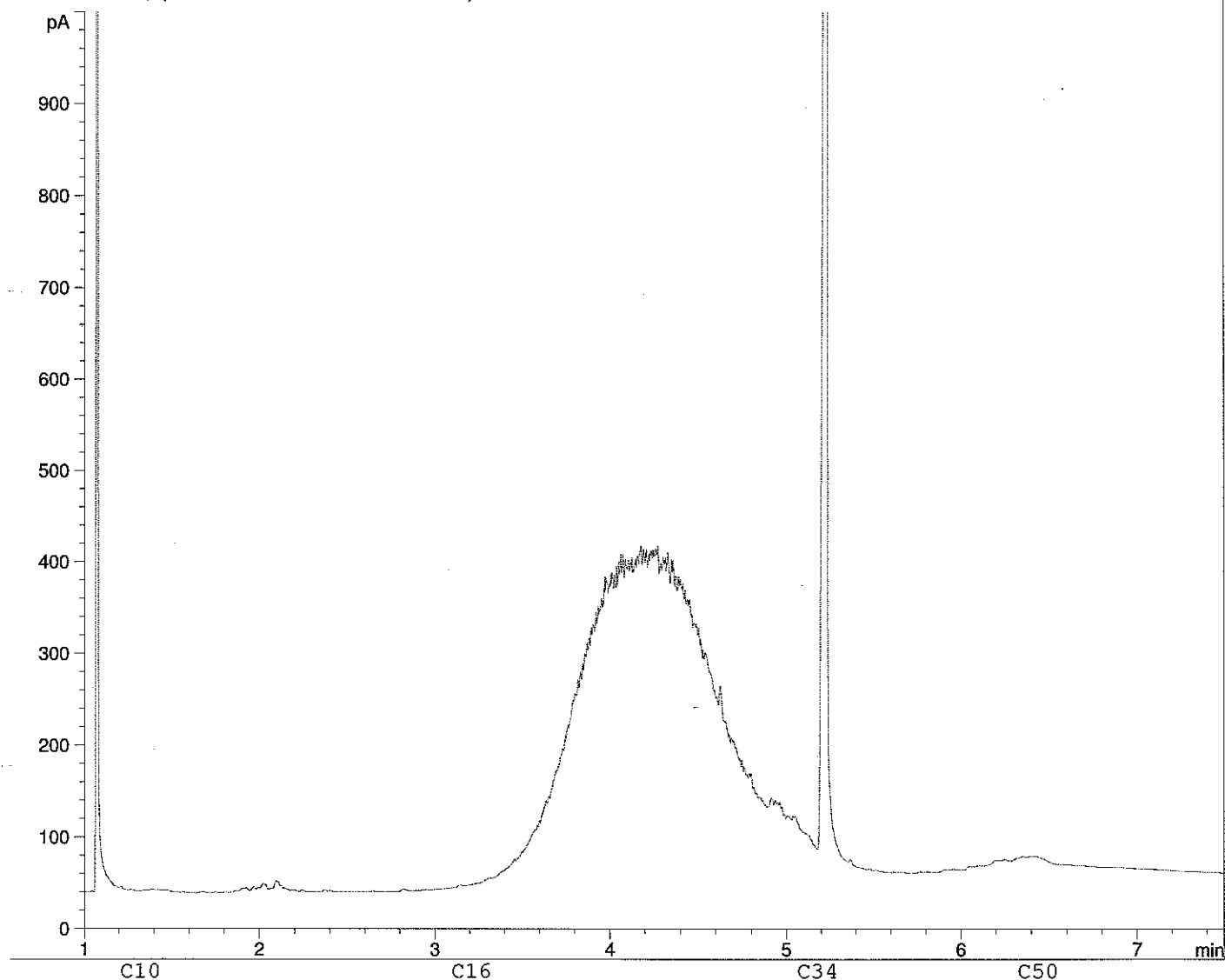
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS24  
Sample ID: L676396-180 30  
Injection Date: 9/6/2008 1:06:32 AM  
Instrument: 6890



# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0905\0905BK16.D)



## Boiling Point Distribution Range of Petroleum Based Fuel Products

Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Mineral Spirits	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
#2 Diesel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
JP5, Jet A	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Heavy Diesel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Gas Oil, Fuel Oil	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Lubricating Oils	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→

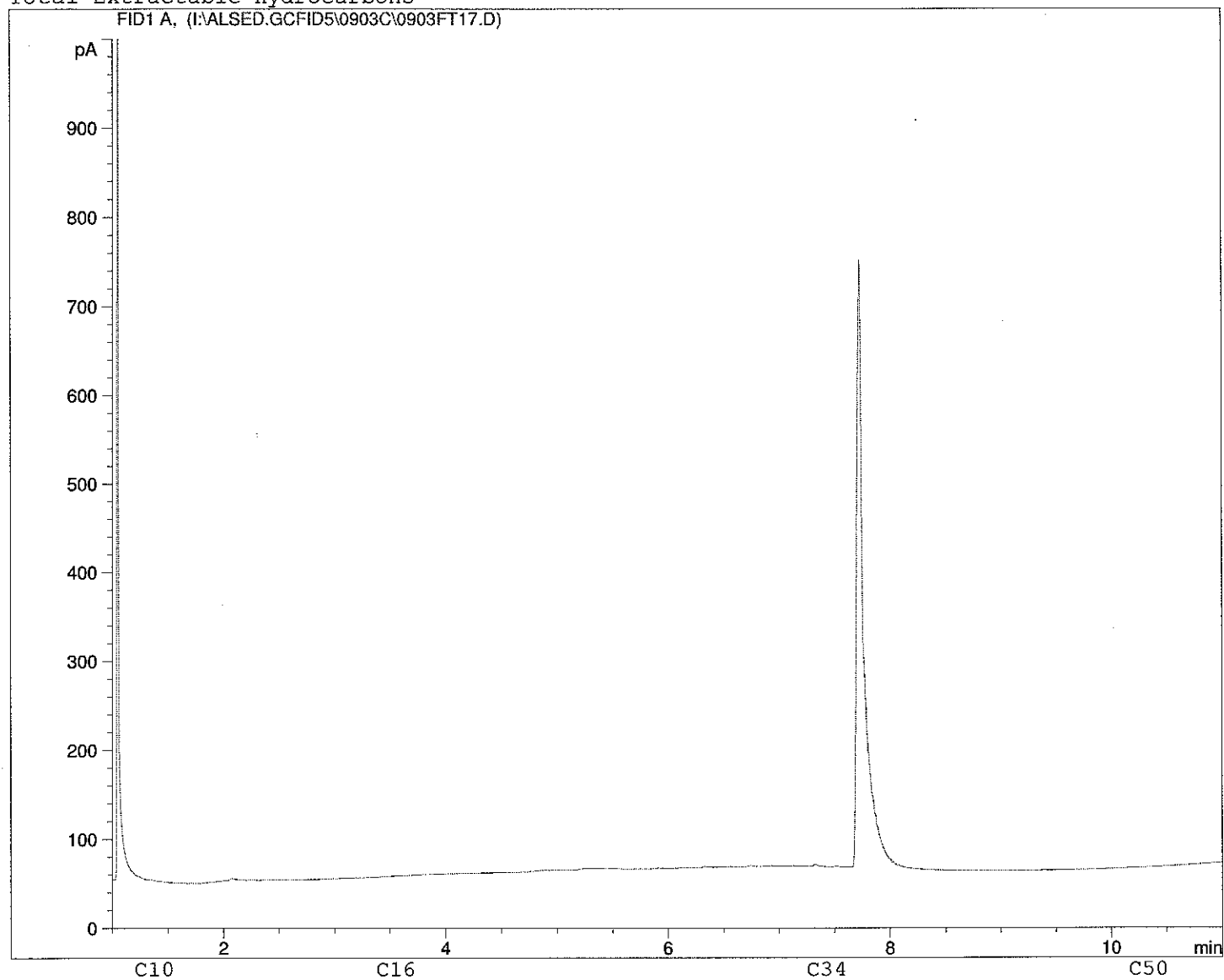
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS29  
Sample ID: L676396-185 30  
Injection Date: 9/4/2008 2:14:24 AM  
Instrument: 6890



# Total Extractable Hydrocarbons

FID1 A, (I:\ALSED.GC\FID5\0903C\0903FT17.D)



## Boiling Point Distribution Range of Petroleum Based Fuel Products

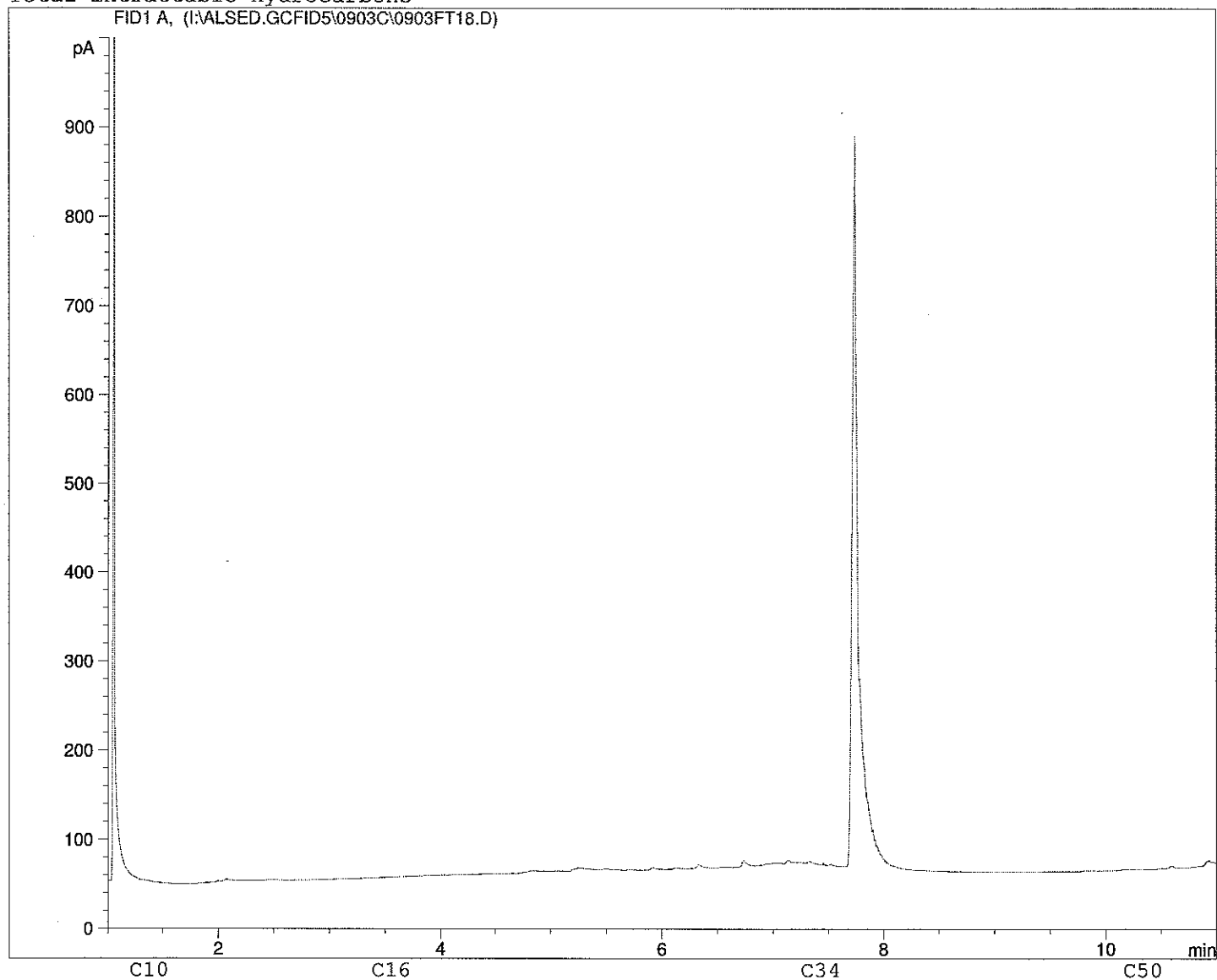
Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→																										
Mineral Spirits																											
#2 Diesel																											
JP5, Jet A																											
Heavy Diesel																											
Gas Oil, Fuel Oil																											
Lubricating Oils																											

Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

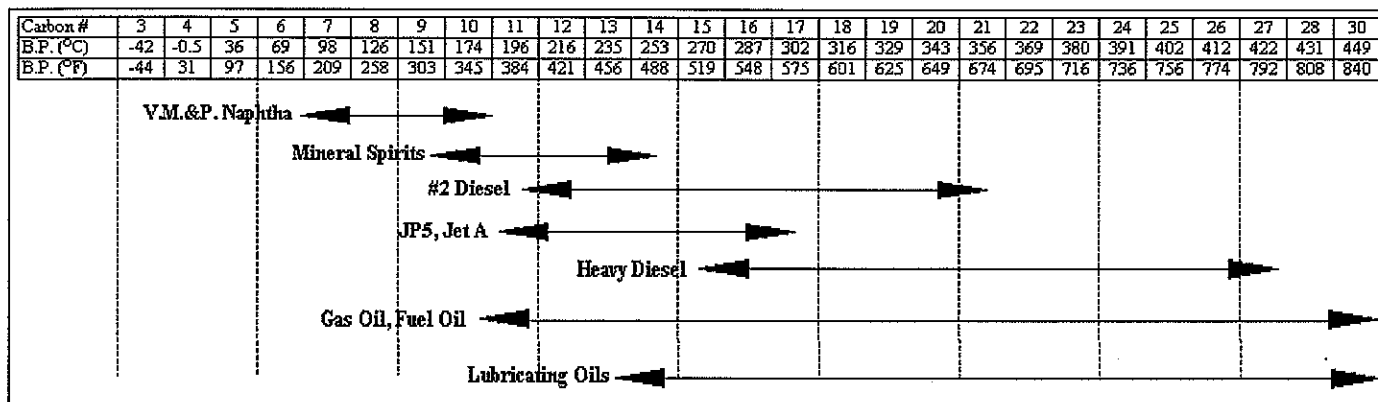
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Sample ID: L676396-188 30  
Injection Date: 9/4/2008 2:36:34 AM  
Instrument: 6890



# Total Extractable Hydrocarbons



Boiling Point Distribution Range of Petroleum Based Fuel Products



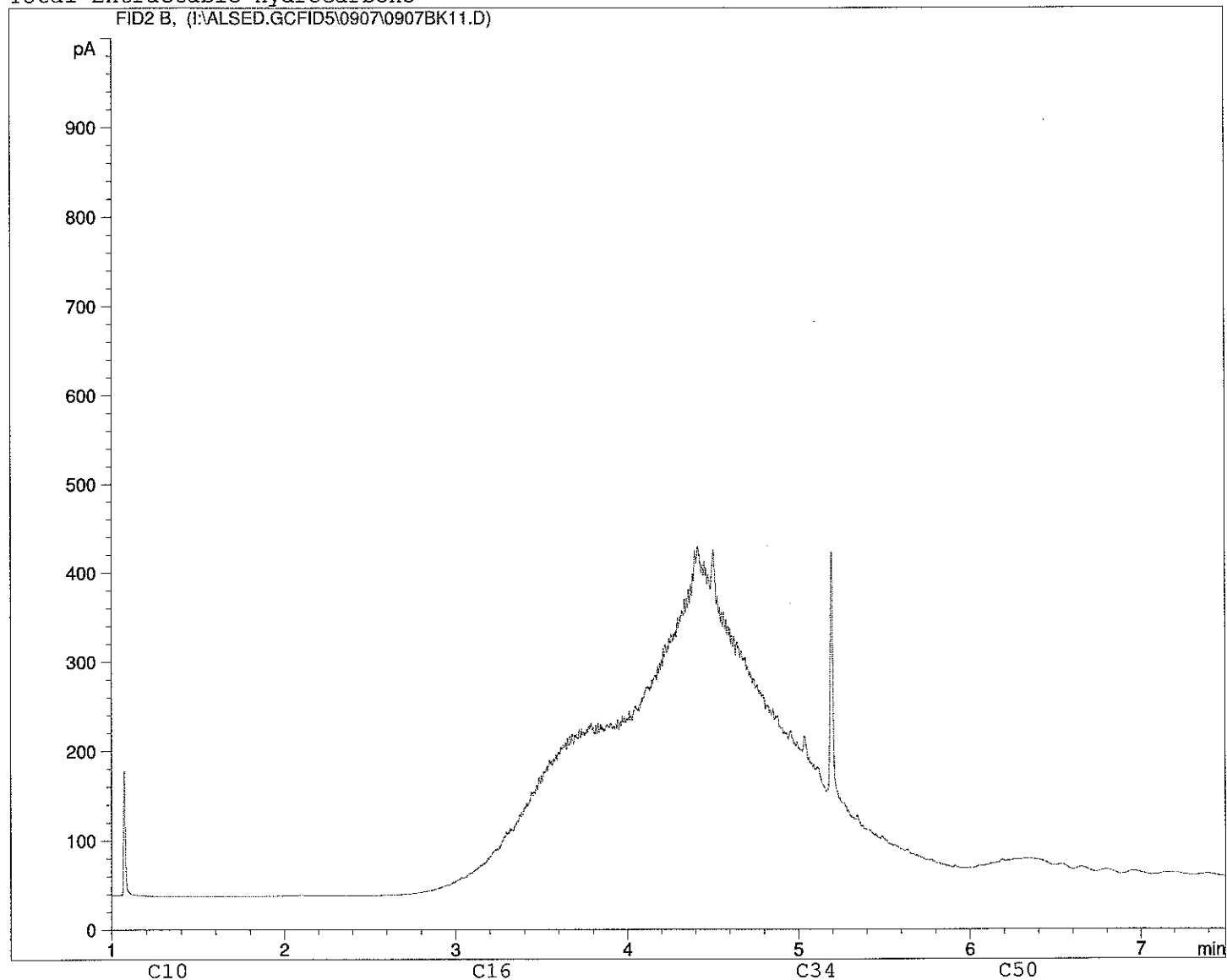
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08MW21 @ 0.6  
Sample ID: L676396-19 300  
Injection Date: 9/7/2008 8:54:05 PM  
Instrument: 6890

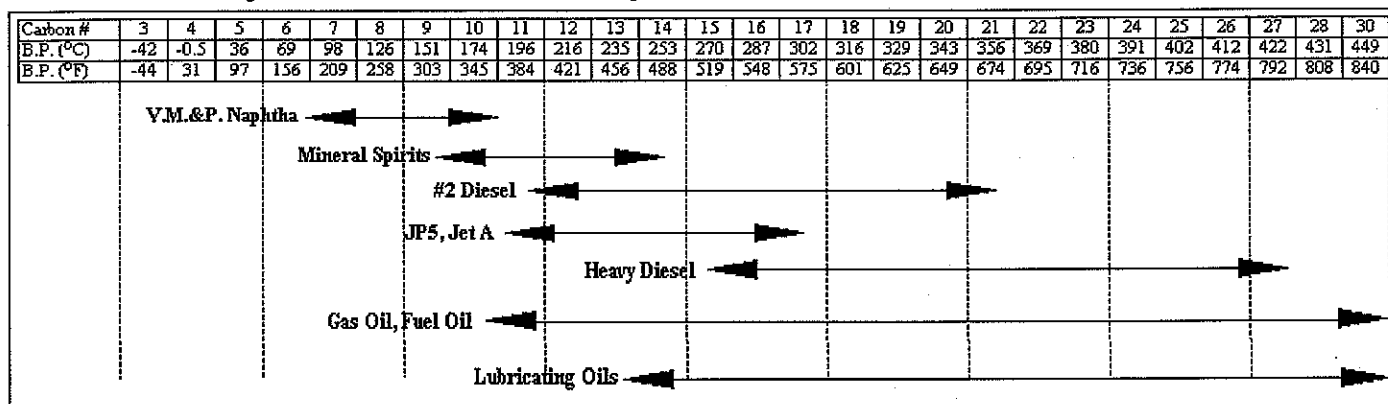


Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GC\FID5\0907\0907BK11.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products

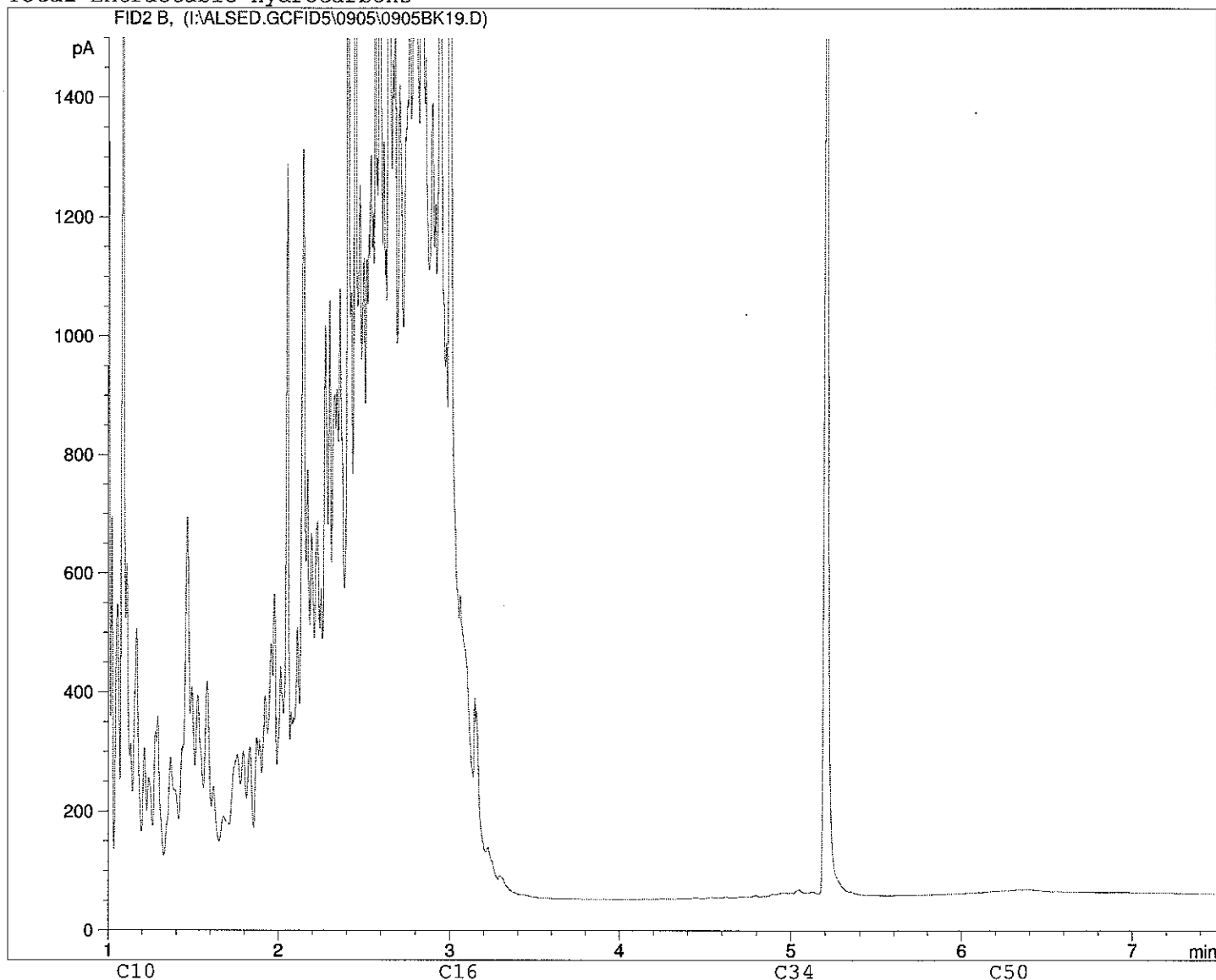


Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

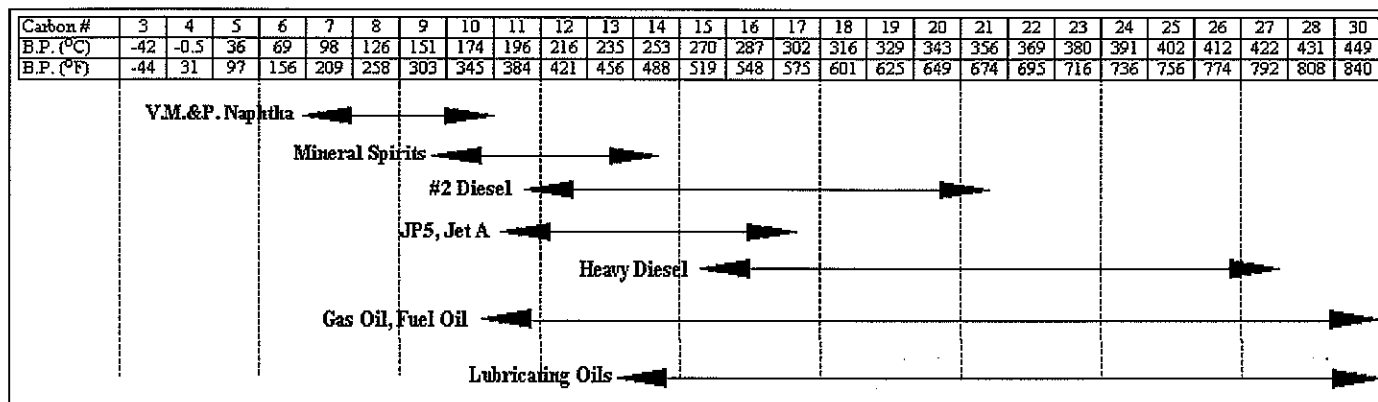
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Sample ID: L676396-192 30  
Injection Date: 9/6/2008 2:00:18 AM  
Instrument: 6890



Total Extractable Hydrocarbons



Boiling Point Distribution Range of Petroleum Based Fuel Products

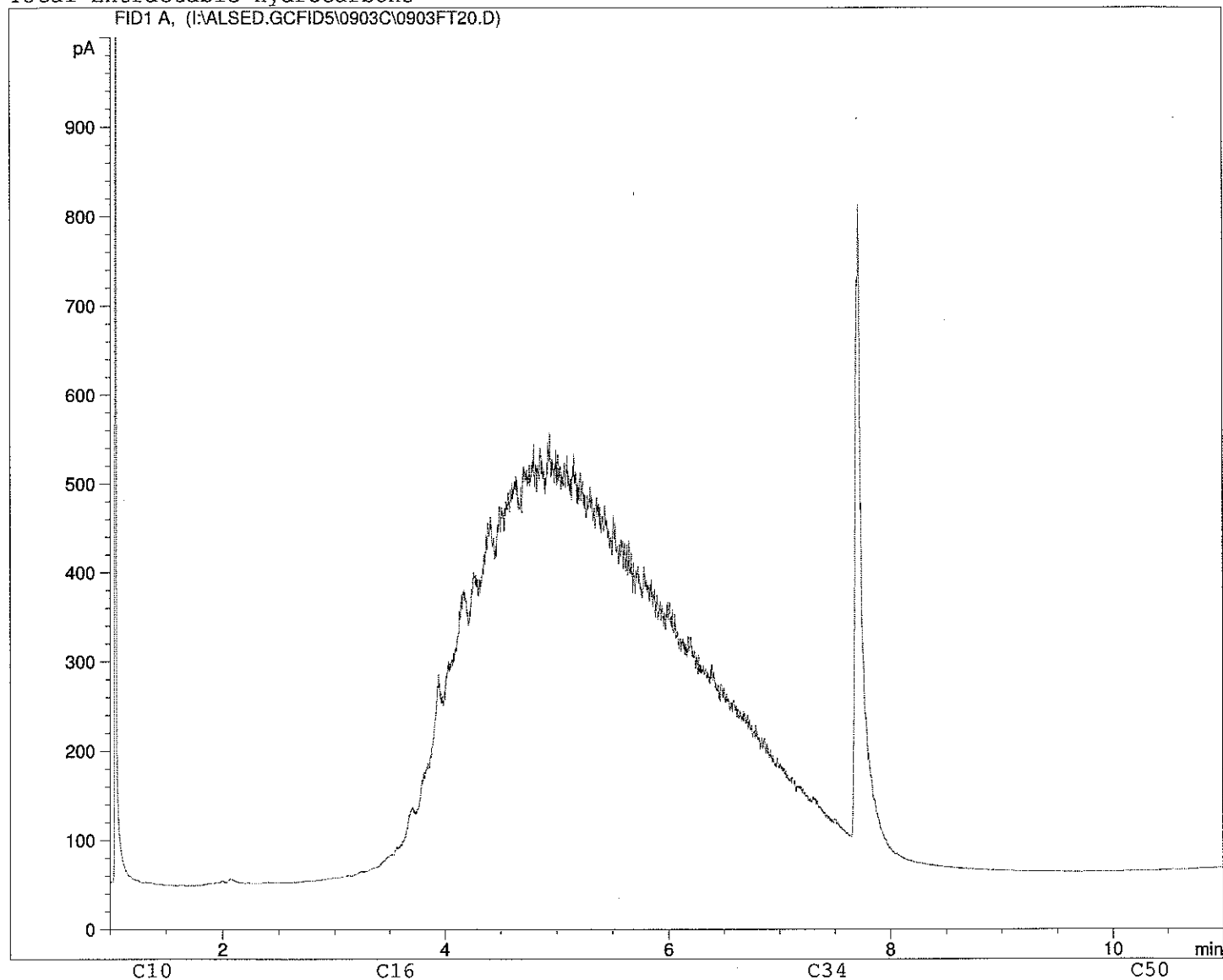


Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

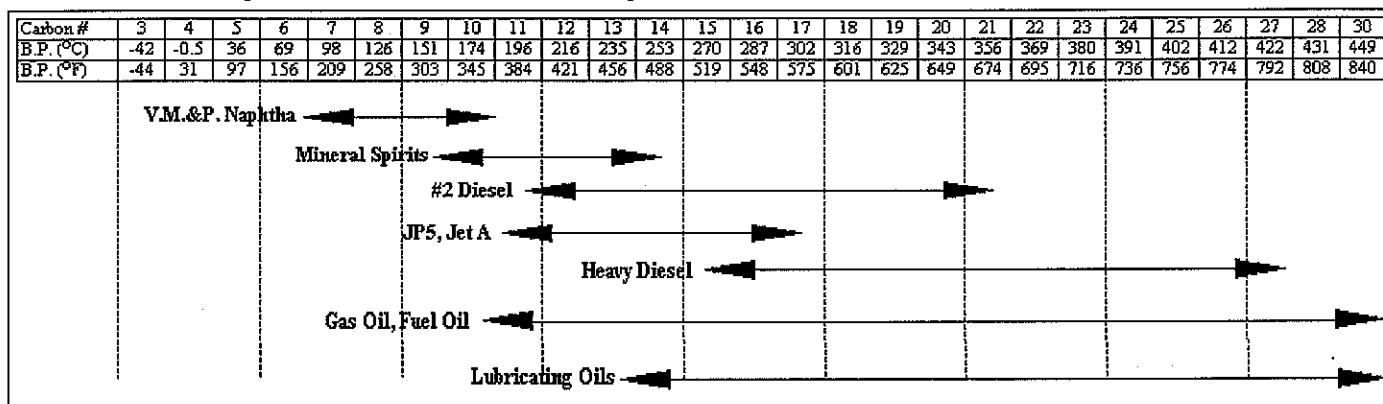
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Injection Date: 9/4/2008 3:20:55 AM  
Instrument: 6890



Total Extractable Hydrocarbons



Boiling Point Distribution Range of Petroleum Based Fuel Products



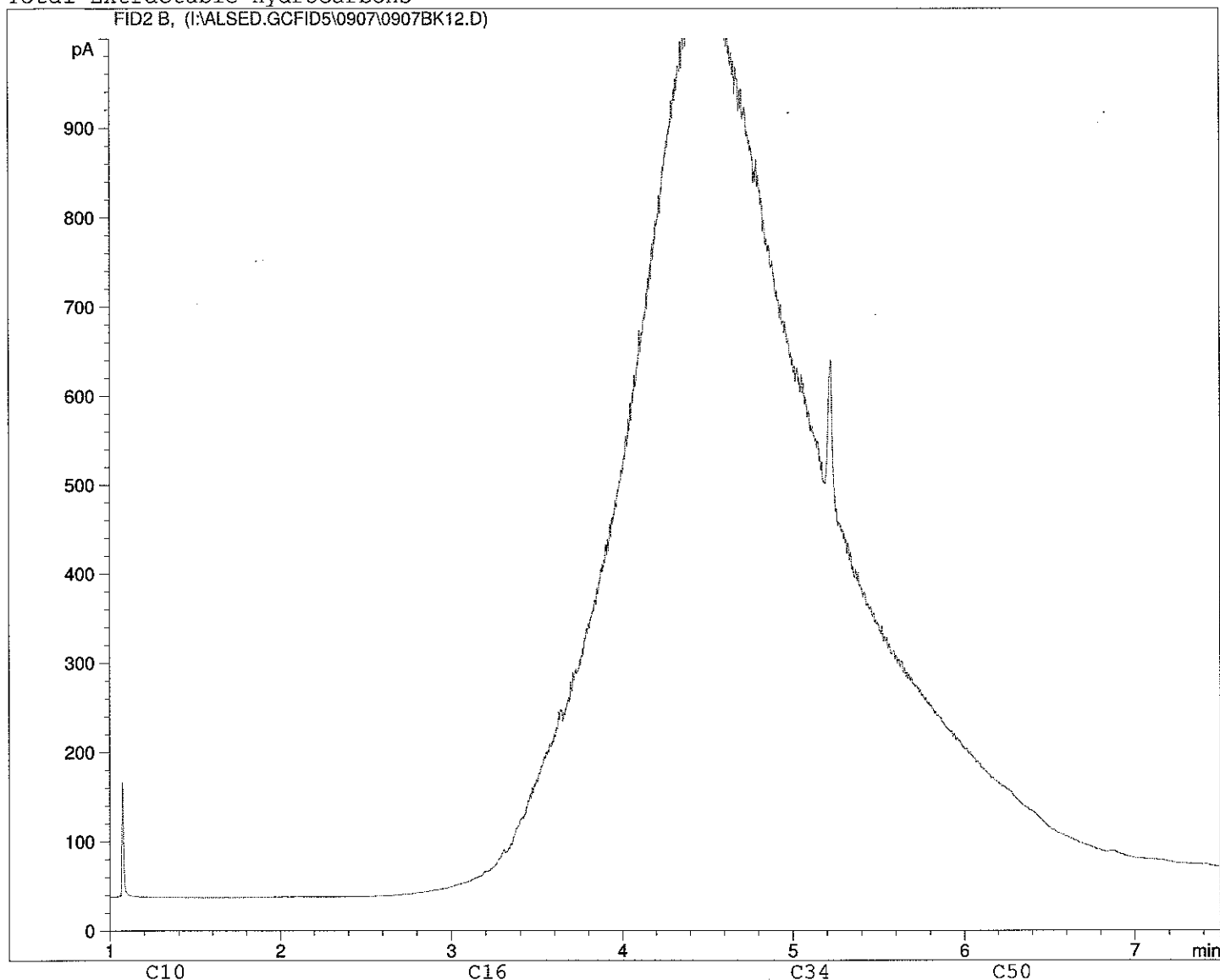
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Sample ID: L676396-196 300  
Injection Date: 9/7/2008 9:12:01 PM  
Instrument: 6890

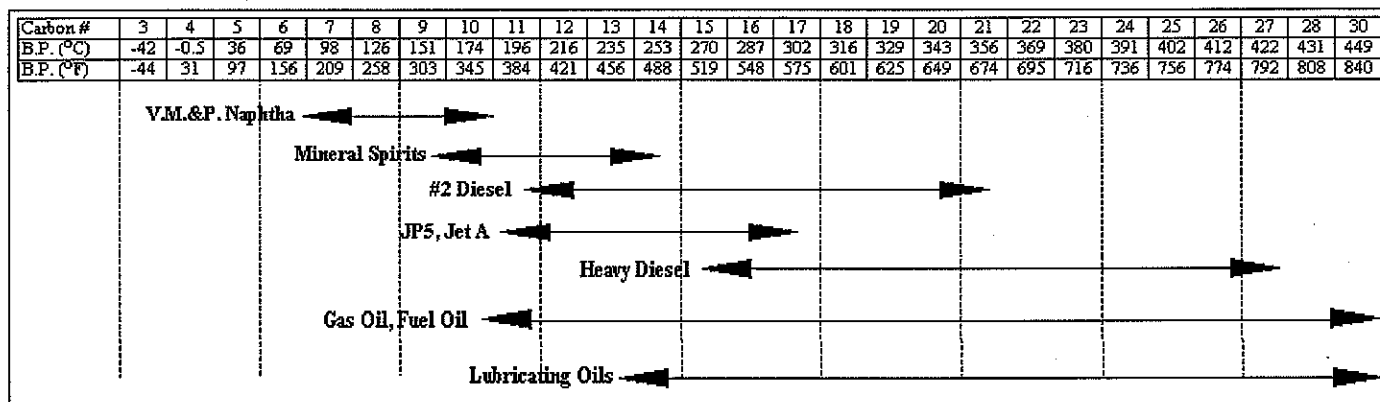


# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0907\0907BK12.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products



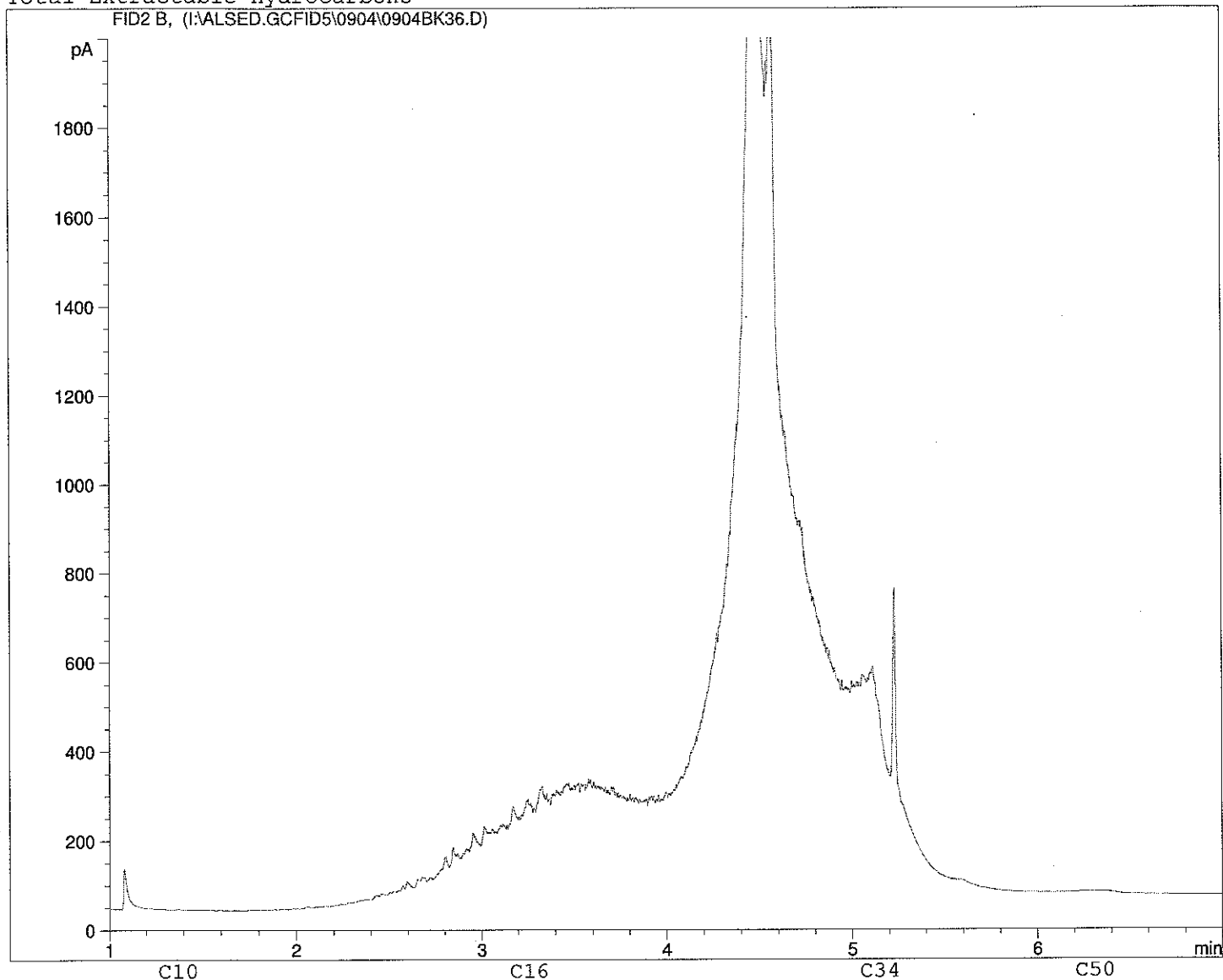
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Client ID: 08SS40  
Sample ID: L676396-197 150  
Injection Date: 9/5/2008 6:20:59 AM  
Instrument: 6890

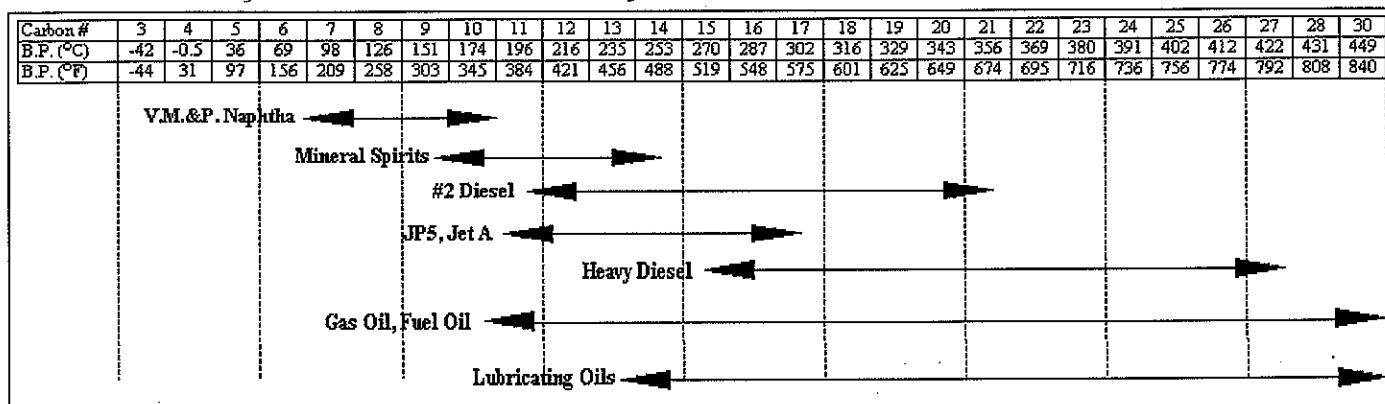


# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0904\0904BK36.D)



## Boiling Point Distribution Range of Petroleum Based Fuel Products



Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

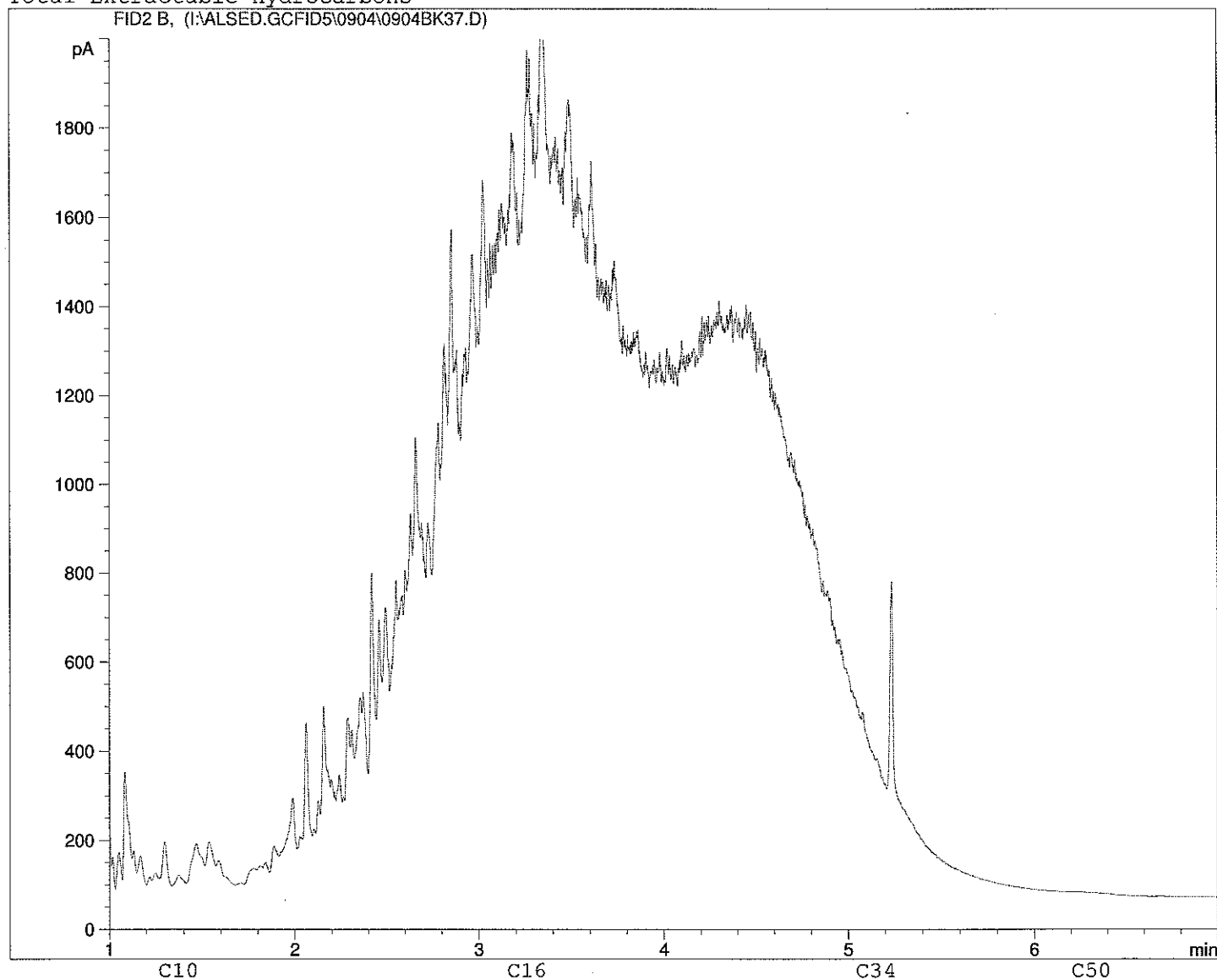
Client ID: 08SS41

Sample ID: L676396-198 150  
Injection Date: 9/5/2008 6:38:53 AM  
Instrument: 6890

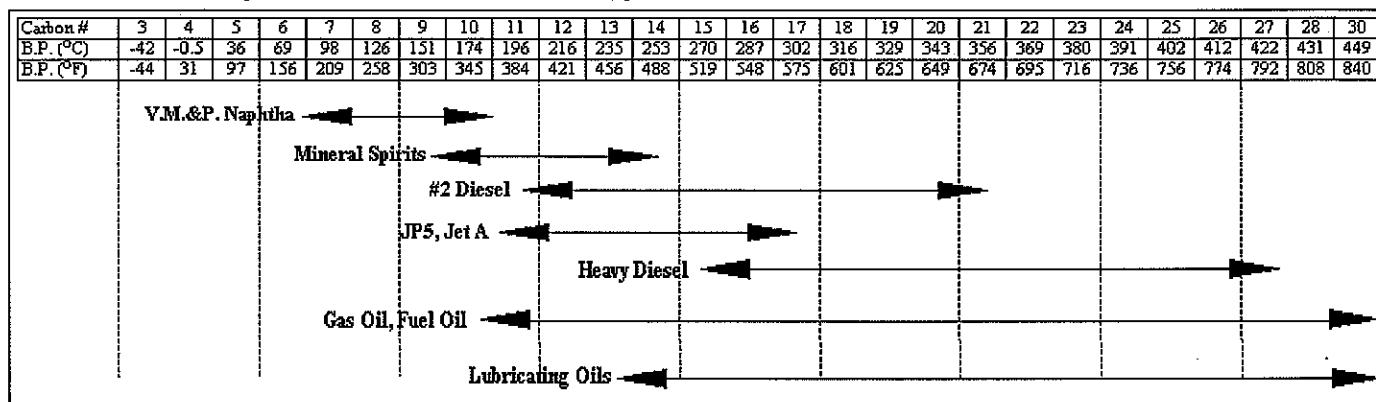


# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0904\0904BK37.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products



Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

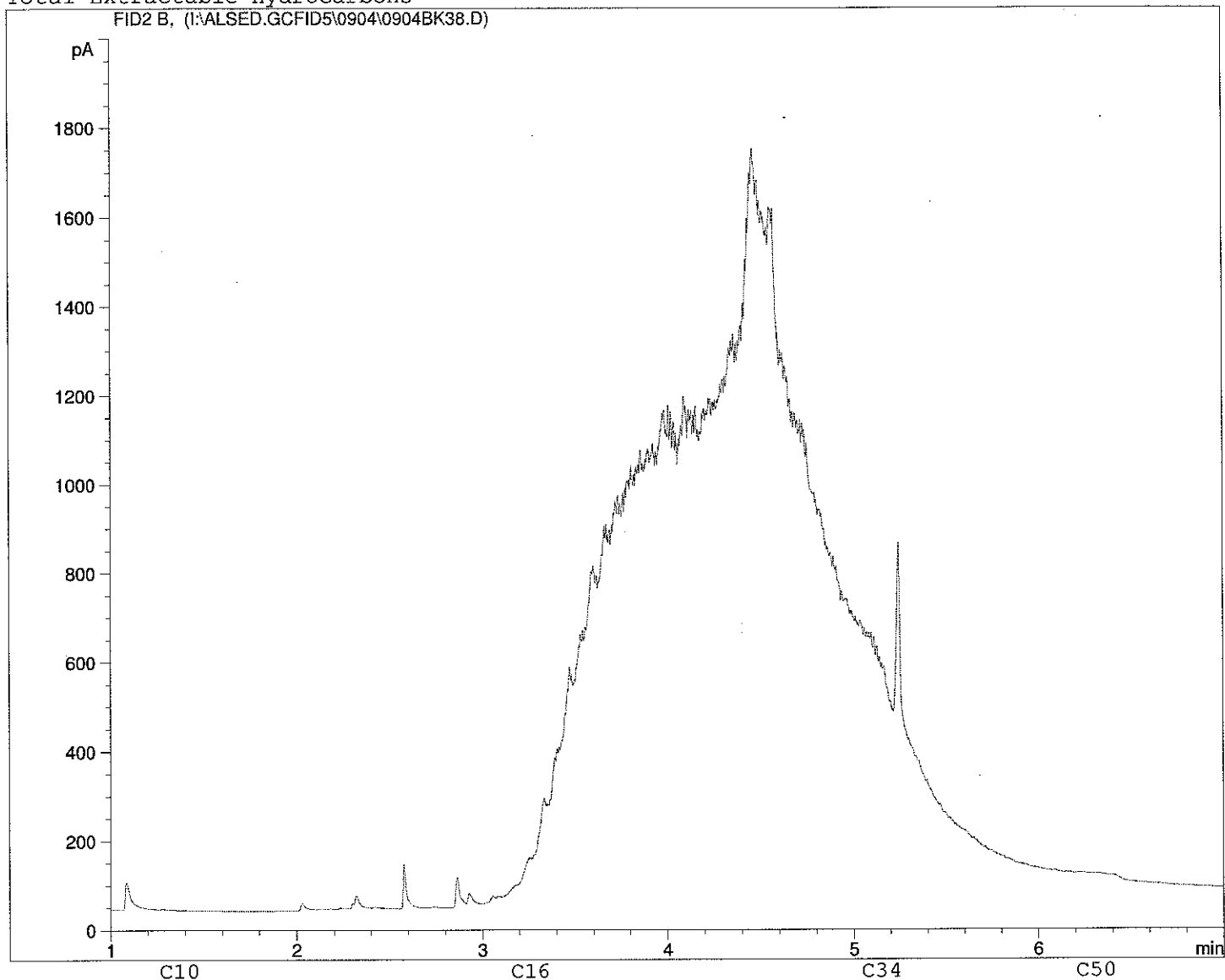
Client ID: 08SS42

Sample ID: L676396-199 150  
Injection Date: 9/5/2008 6:57:03 AM  
Instrument: 6890

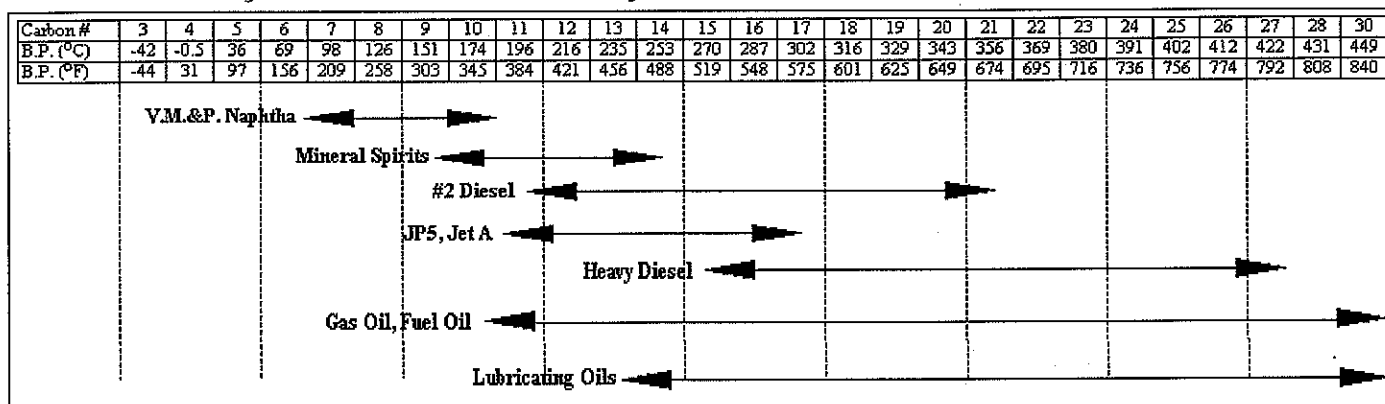


# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0904\0904BK38.D)



## Boiling Point Distribution Range of Petroleum Based Fuel Products

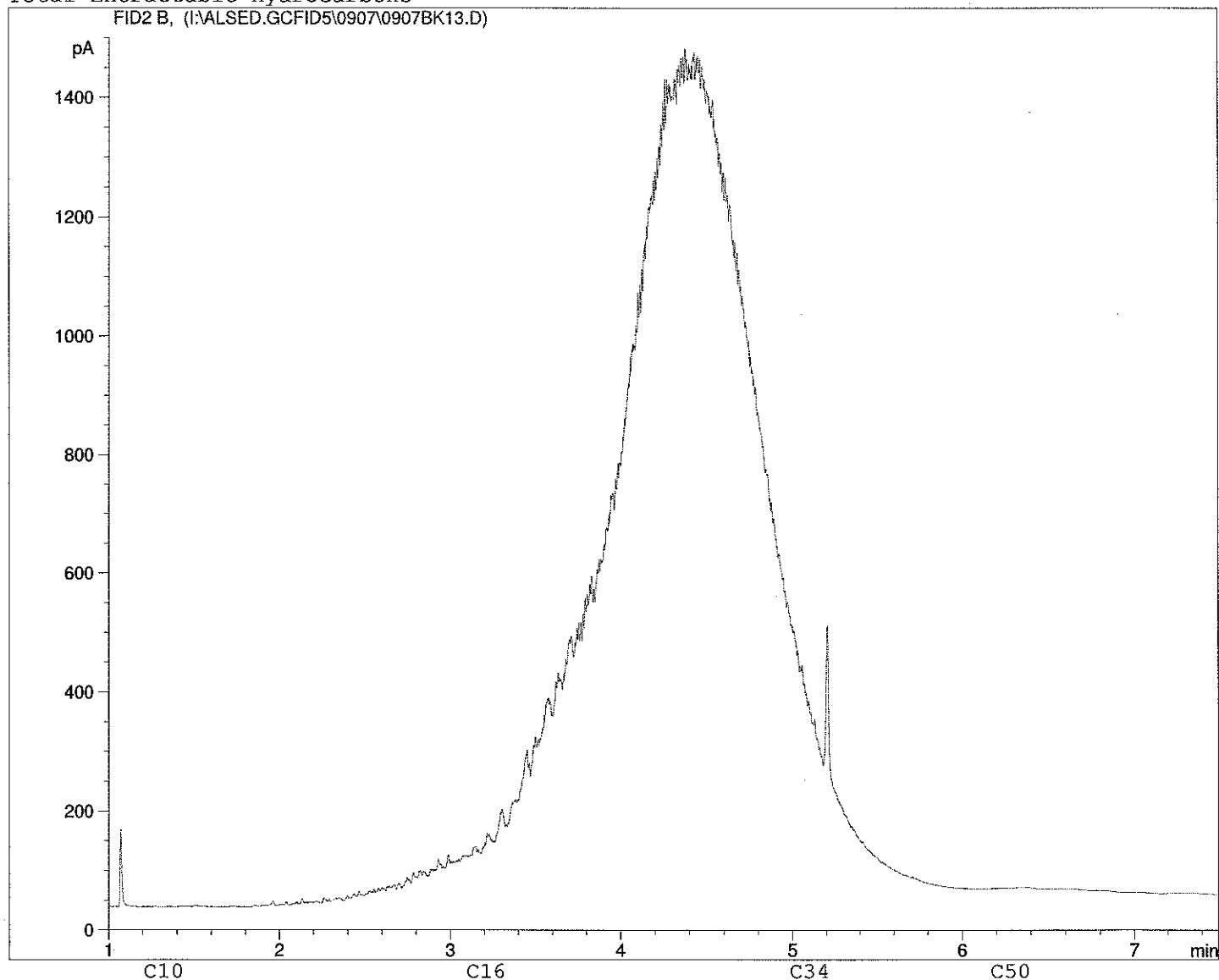


Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

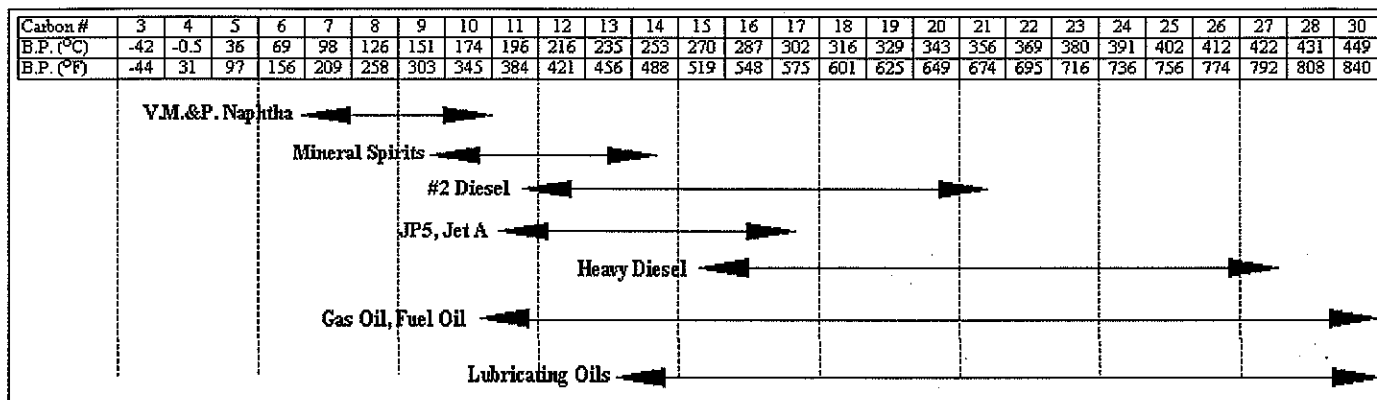
Client ID: 08SS43  
Sample ID: L676396-200 300  
Injection Date: 9/7/2008 9:30:10 PM  
Instrument: 6890



Total Extractable Hydrocarbons



Boiling Point Distribution Range of Petroleum Based Fuel Products



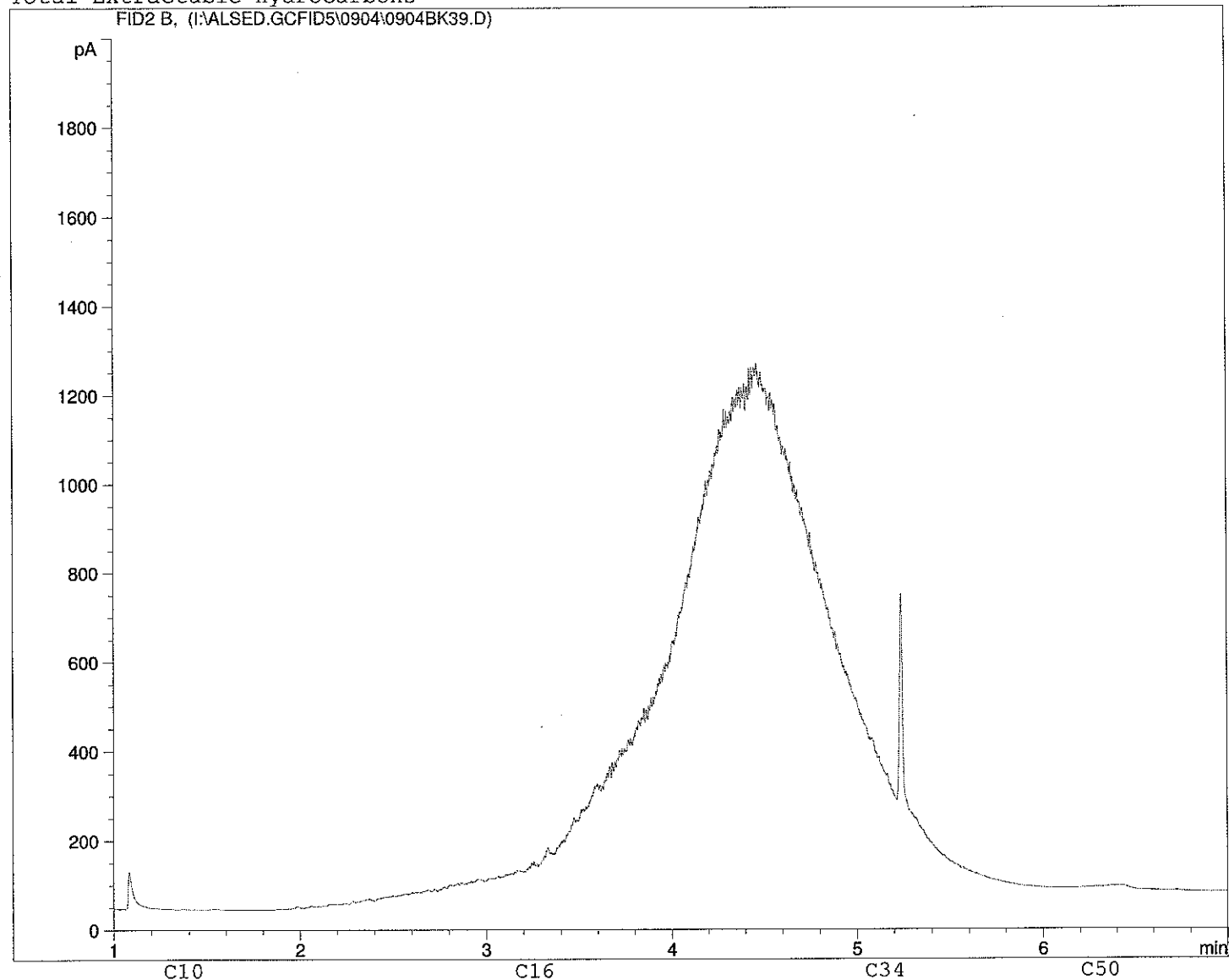
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS44

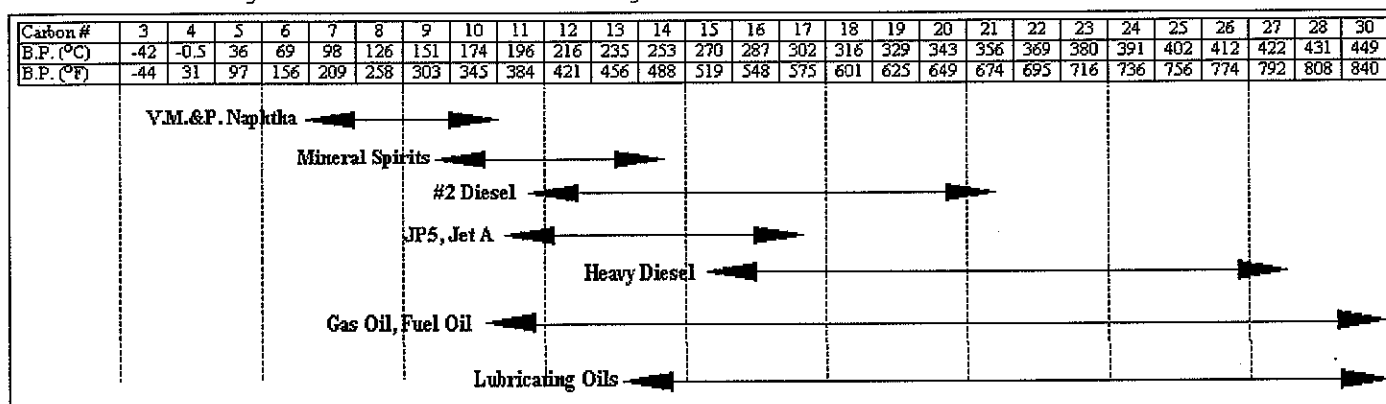
Sample ID: L676396-201 150  
Injection Date: 9/5/2008 7:15:00 AM  
Instrument: 6890



Total Extractable Hydrocarbons



Boiling Point Distribution Range of Petroleum Based Fuel Products



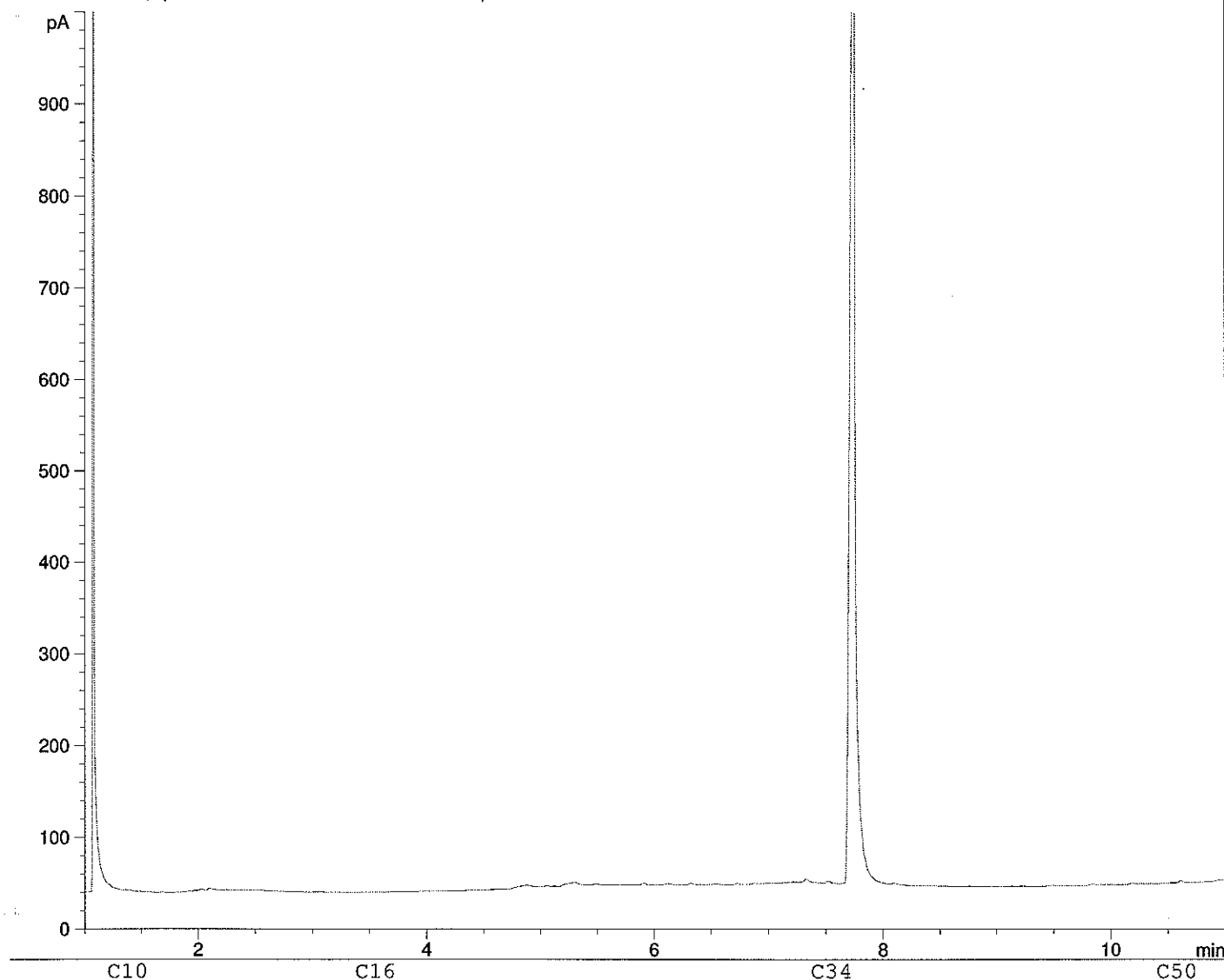
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS50  
Sample ID: L676396-207 30  
Injection Date: 9/4/2008 7:24:19 AM  
Instrument: 6890

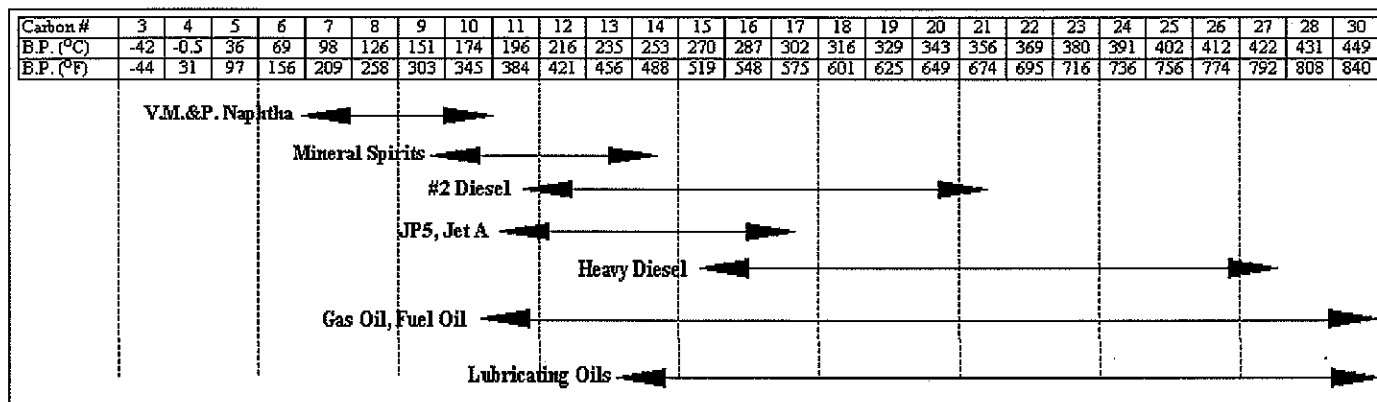


# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0903B\0903BK31.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products



Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

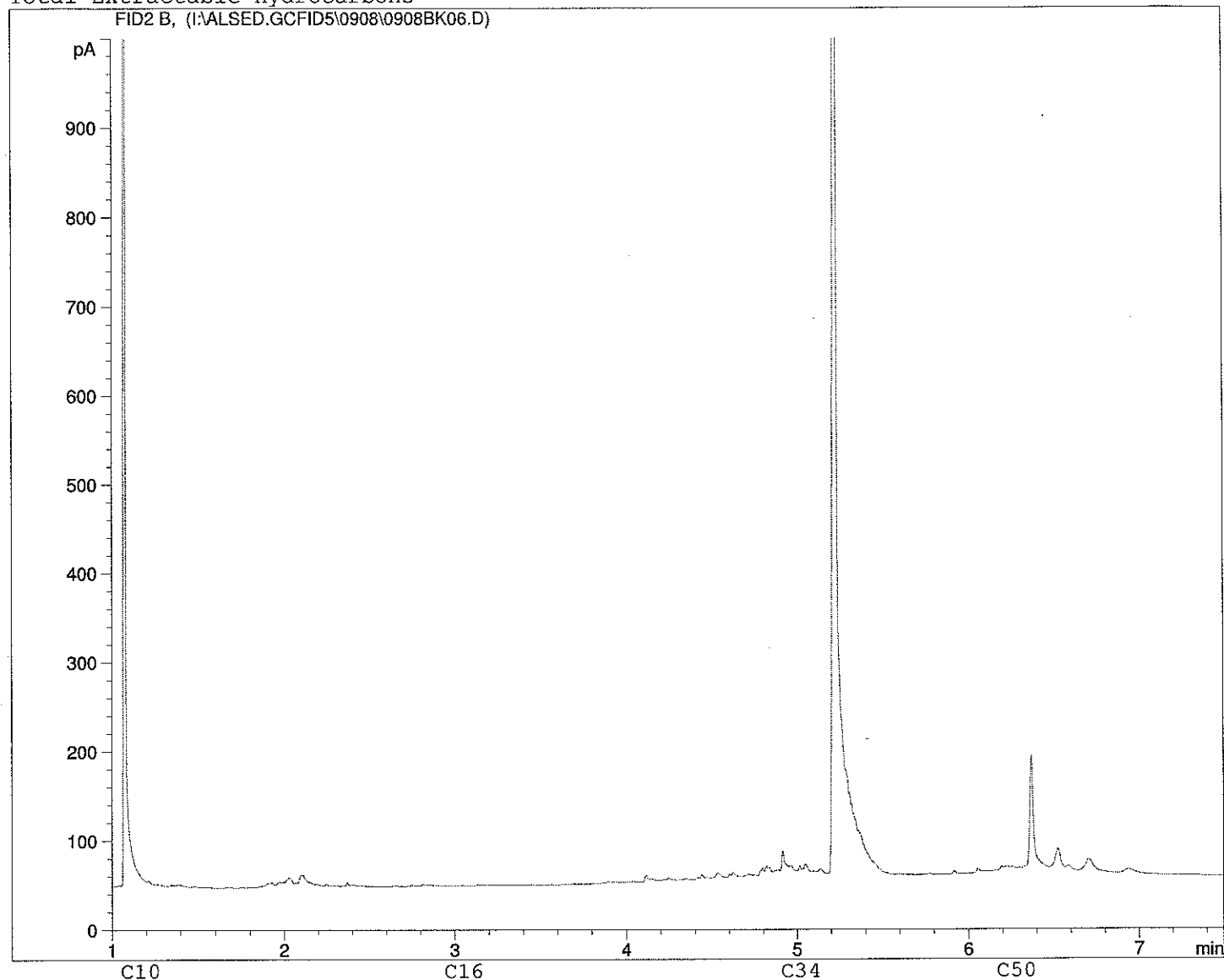
Client ID: 08SS53

Sample ID: L676396-210 30  
Injection Date: 9/8/2008 7:19:59 PM  
Instrument: 6890



# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GC\FID5\0908\0908BK06.D)



## Boiling Point Distribution Range of Petroleum Based Fuel Products

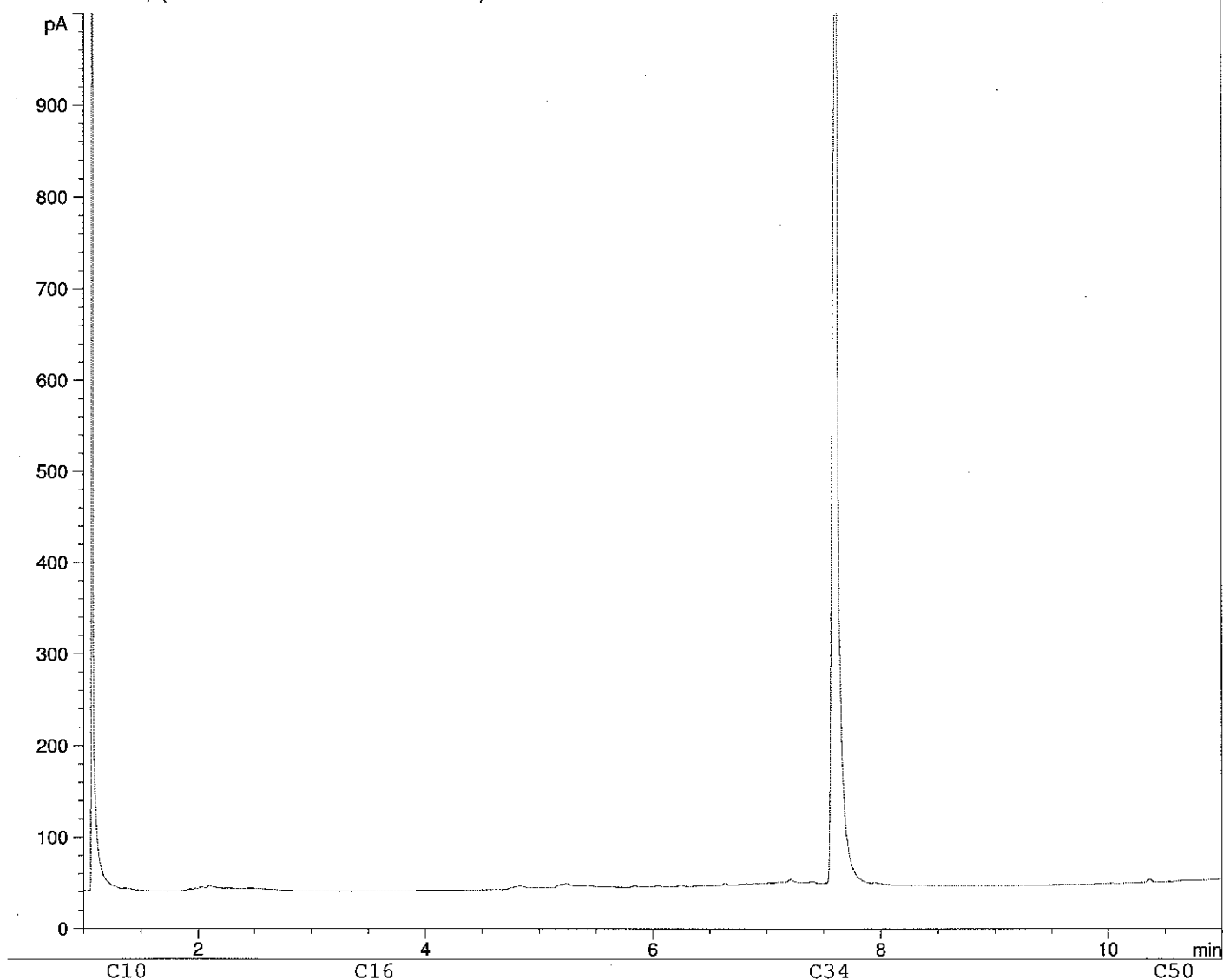
Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→																										
Mineral Spirits																											
#2 Diesel																											
JP5, Jet A																											
Heavy Diesel																											
Gas Oil, Fuel Oil																											
Lubricating Oils																											

Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS52D  
Sample ID: L676396-212 30  
Injection Date: 9/4/2008 8:30:45 AM  
Instrument: 6890



Total Extractable Hydrocarbons  
FID2 B, (I:\ALSED.GCFID5\0903B\0903BK34.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products

Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→																										
Mineral Spirits																											
#2 Diesel																											
JP5, Jet A																											
Heavy Diesel																											
Gas Oil, Fuel Oil																											
Lubricating Oils																											

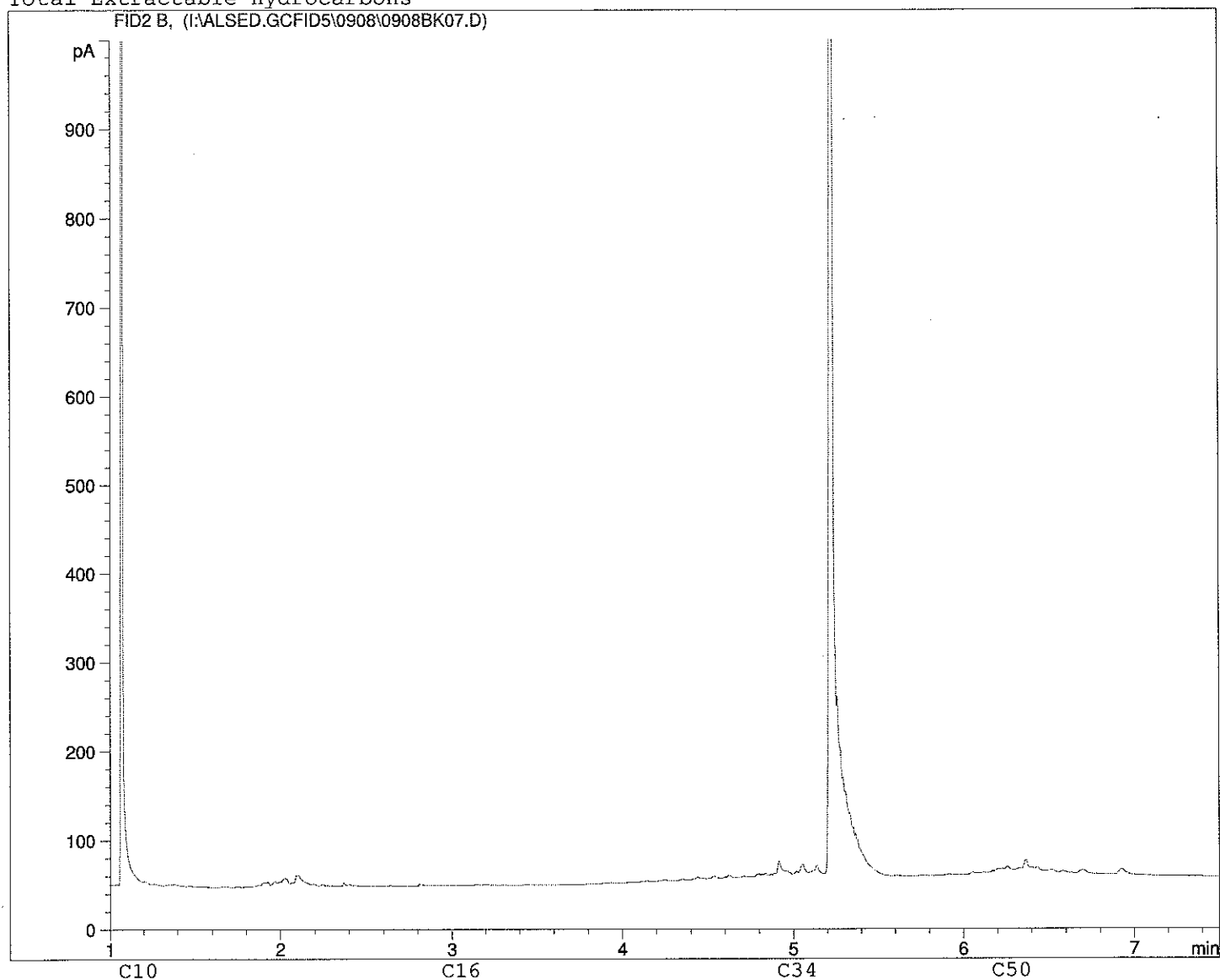
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS57  
Sample ID: L676396-214 30  
Injection Date: 9/8/2008 7:38:03 PM  
Instrument: 6890



# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0908\0908BK07.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products

Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Mineral Spirits	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
#2 Diesel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
JP5, Jet A	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Heavy Diesel	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Gas Oil, Fuel Oil	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Lubricating Oils	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→

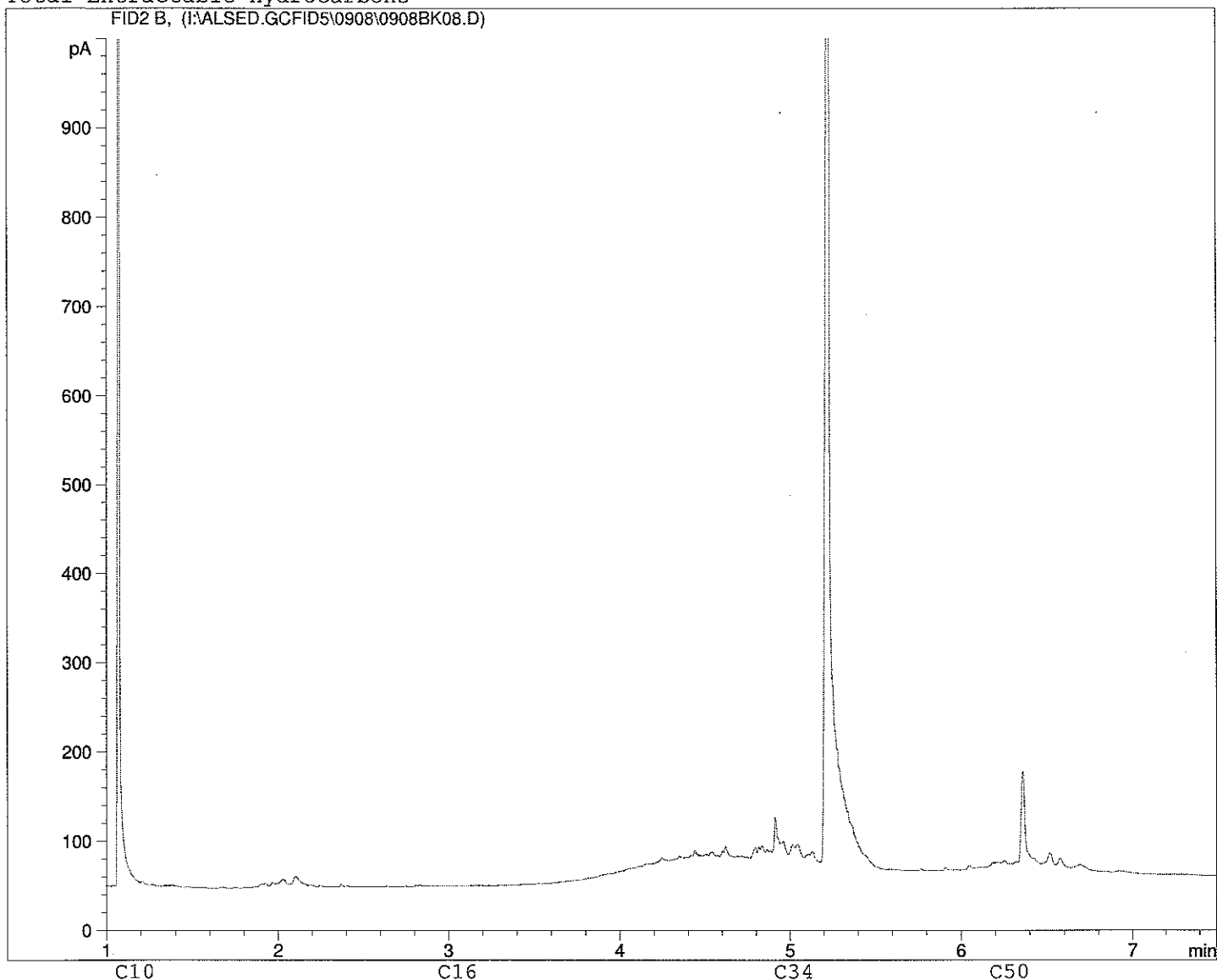
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS58  
Sample ID: L676396-215 30  
Injection Date: 9/8/2008 7:56:12 PM  
Instrument: 6890

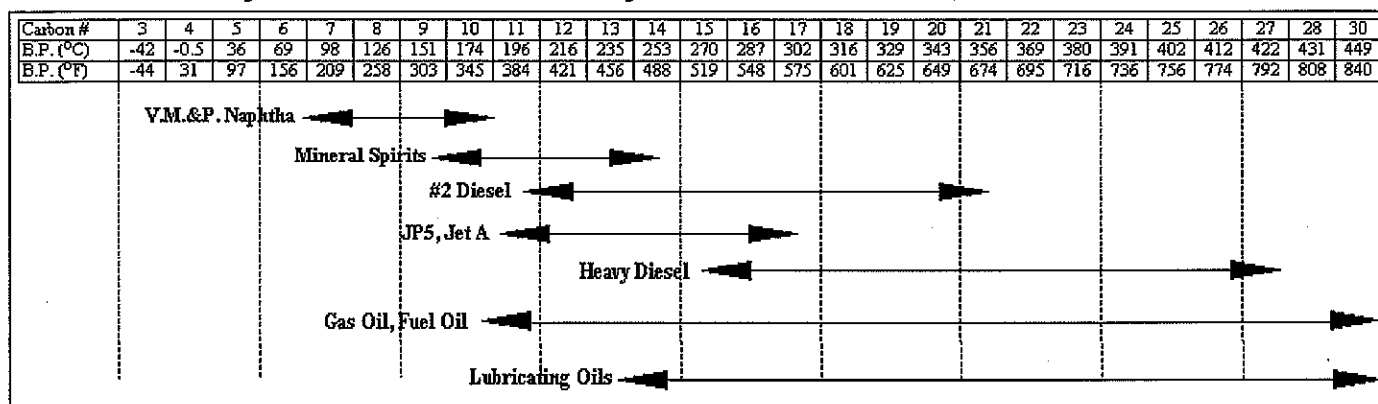


# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0908\0908BK08.D)



## Boiling Point Distribution Range of Petroleum Based Fuel Products



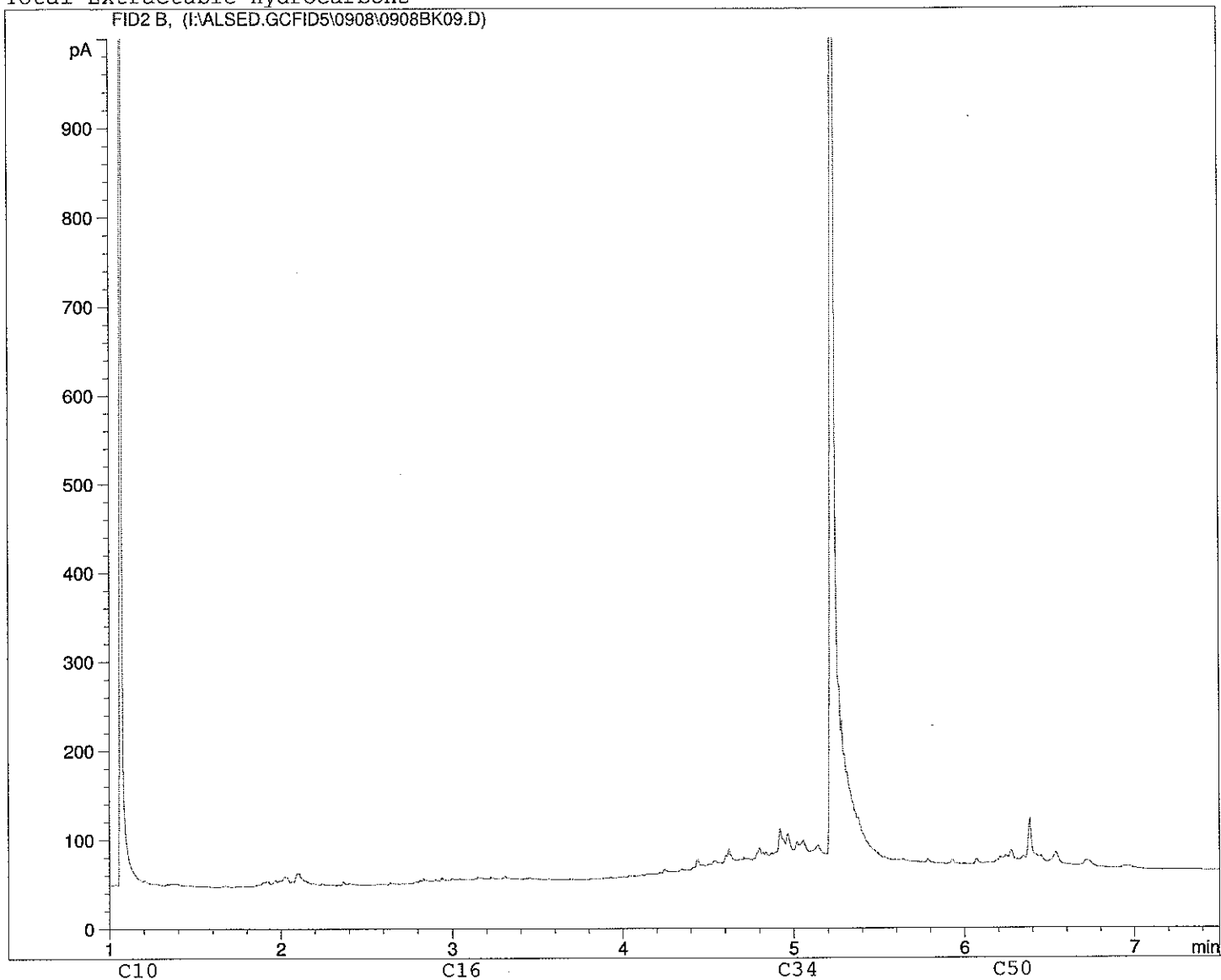
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS55

Sample ID: L676396-216 30  
Injection Date: 9/8/2008 8:14:16 PM  
Instrument: 6890



# Total Extractable Hydrocarbons



## Boiling Point Distribution Range of Petroleum Based Fuel Products

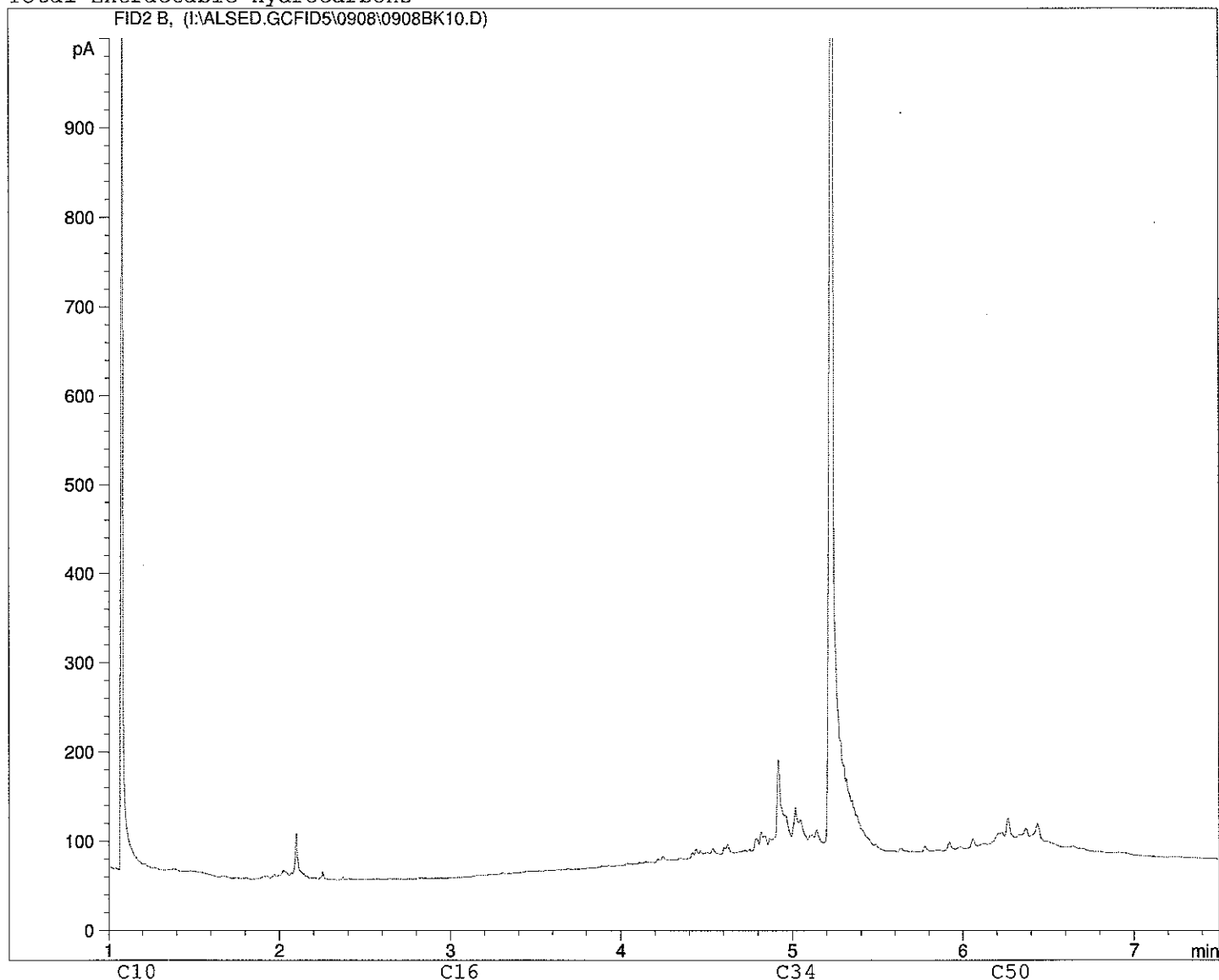
Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→																										
Mineral Spirits																											
#2 Diesel																											
JP5, Jet A																											
Heavy Diesel																											
Gas Oil, Fuel Oil																											
Lubricating Oils																											

Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

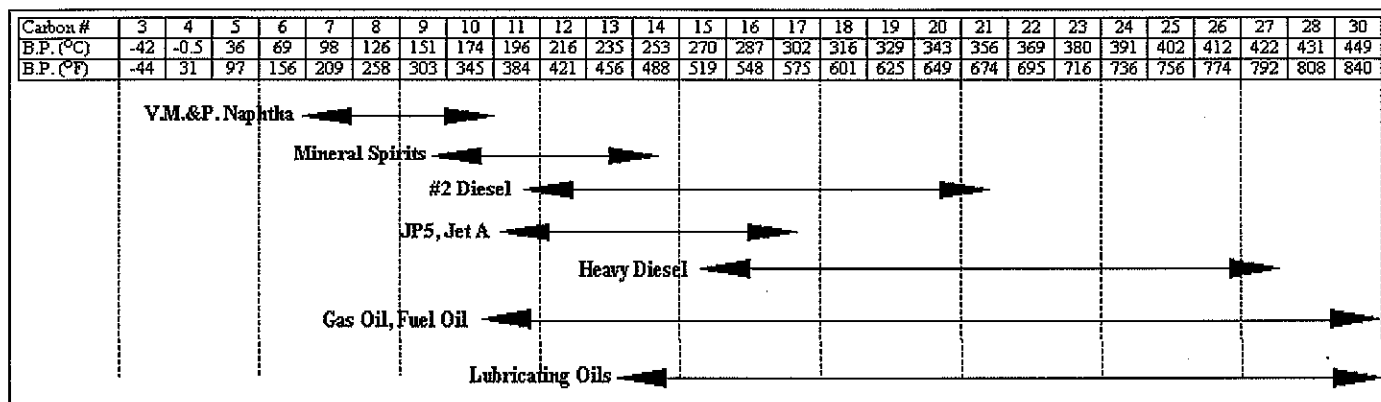
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Sample ID: L676396-217 30  
Injection Date: 9/8/2008 8:32:29 PM  
Instrument: 6890



# Total Extractable Hydrocarbons



Boiling Point Distribution Range of Petroleum Based Fuel Products



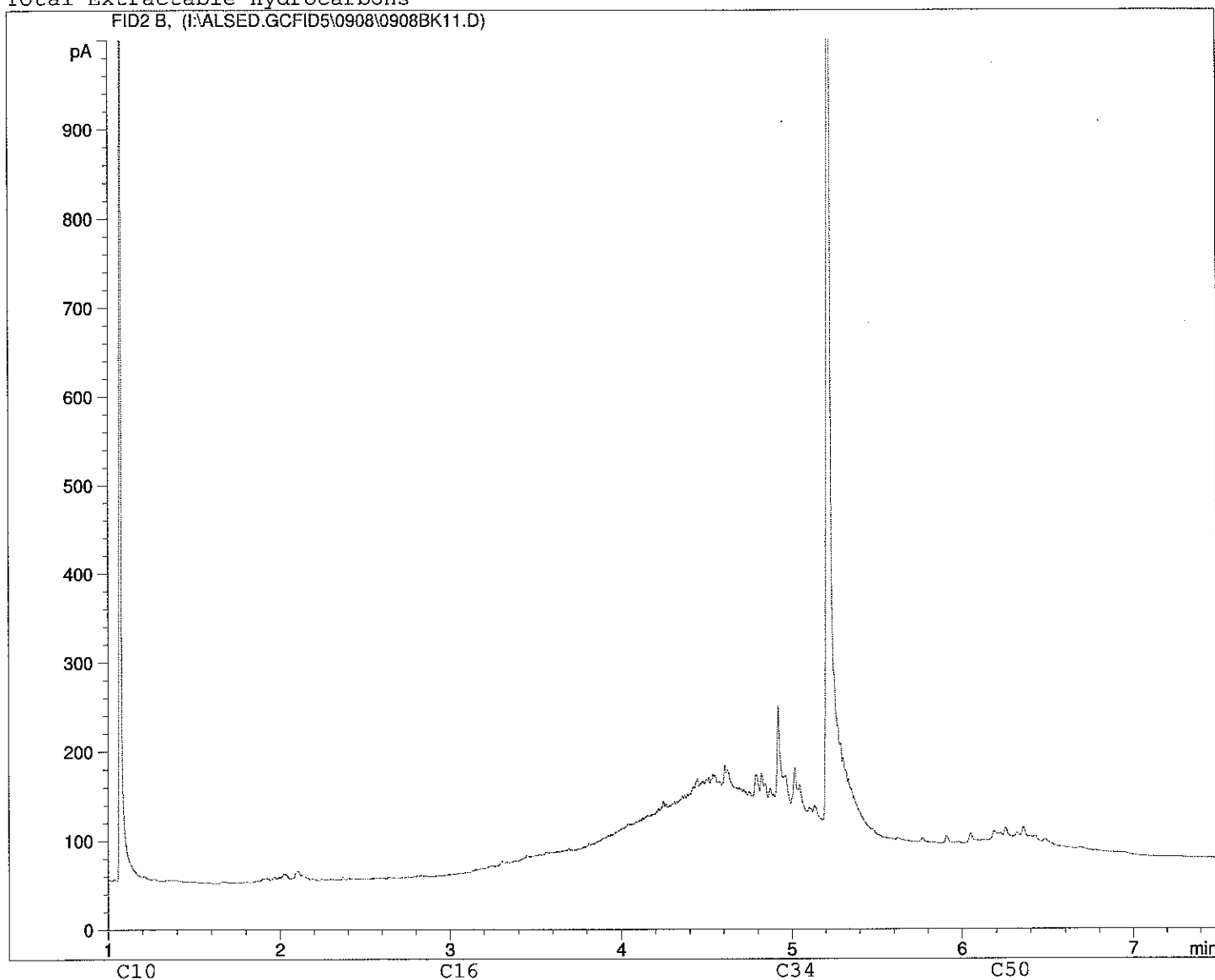
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS59D  
Sample ID: L676396-218  
Injection Date: 9/8/2008 8:50:32 PM  
Instrument: 6890



# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GC\FID5\0908\0908BK11.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products

Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→																										
Mineral Spirits																											
#2 Diesel																											
JP5, Jet A																											
Heavy Diesel																											
Gas Oil, Fuel Oil																											
Lubricating Oils																											

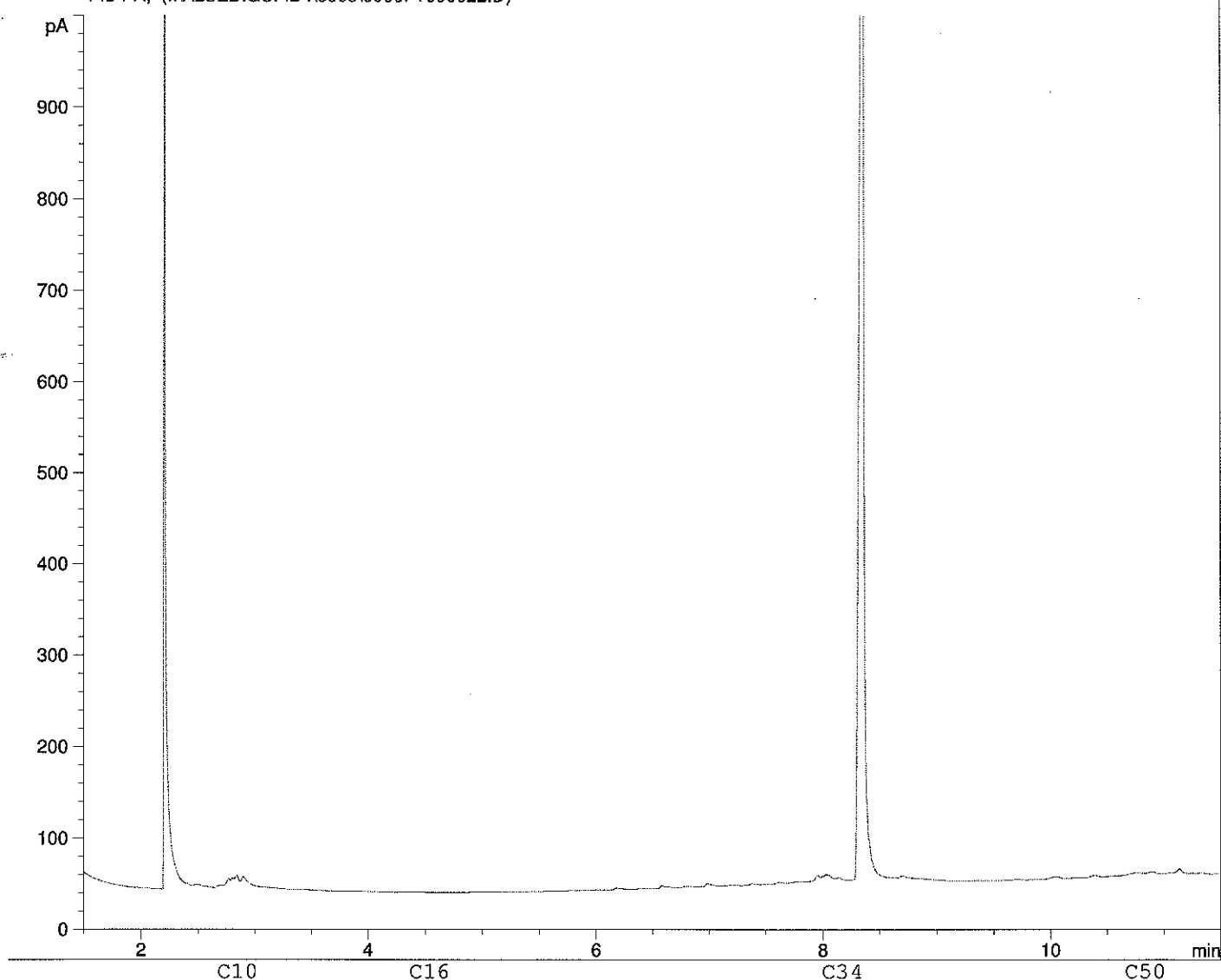
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08SS60  
Sample ID: L676396-219 30  
Injection Date: 9/6/2008 5:29:19 AM  
Instrument: 6890

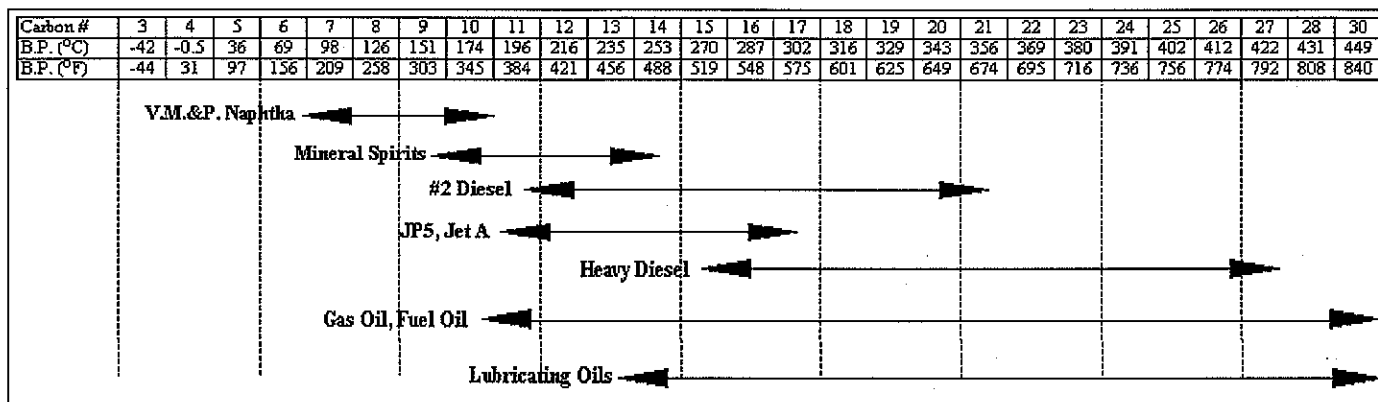


# Total Extractable Hydrocarbons

FID1 A, (I:\ALSED.GCFID4\0905\0905FT000022.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products



Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

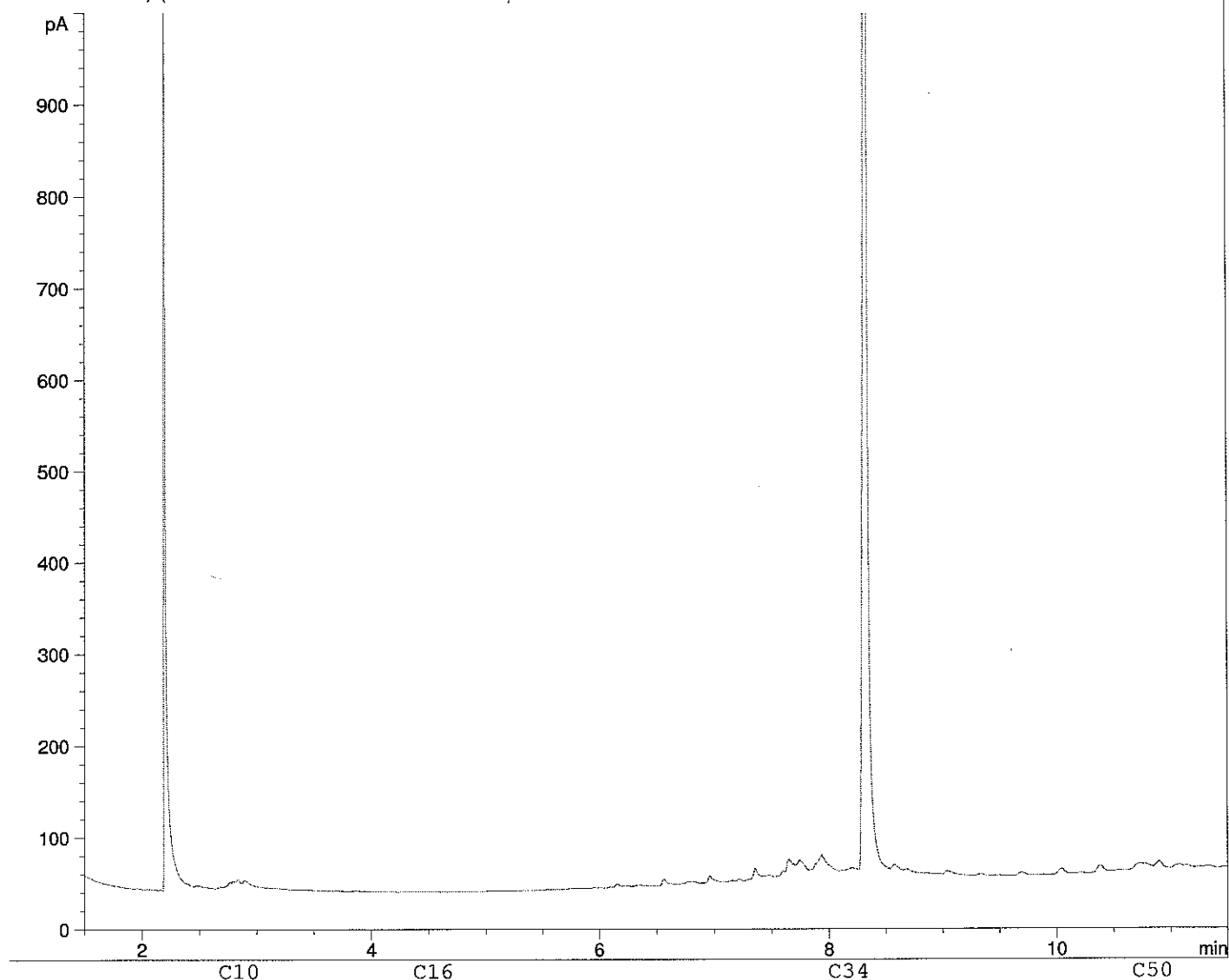
Client ID: 08SS61

Sample ID: L676396-220 20  
Injection Date: 9/6/2008 5:54:23 AM  
Instrument: 6890

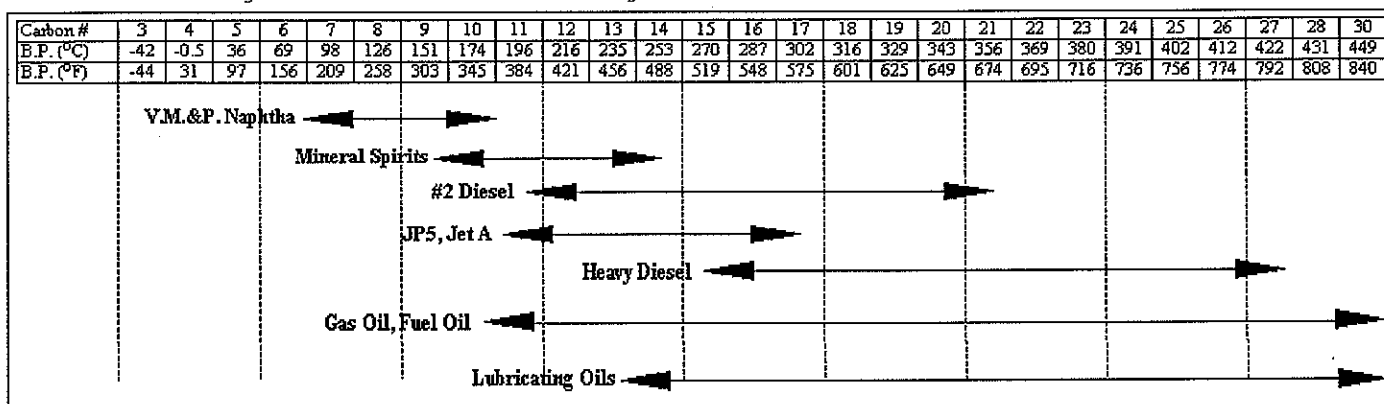


# Total Extractable Hydrocarbons

FID1 A, (I:\ALSED.GC\FID4\0905\0905FT000023.D)



## Boiling Point Distribution Range of Petroleum Based Fuel Products



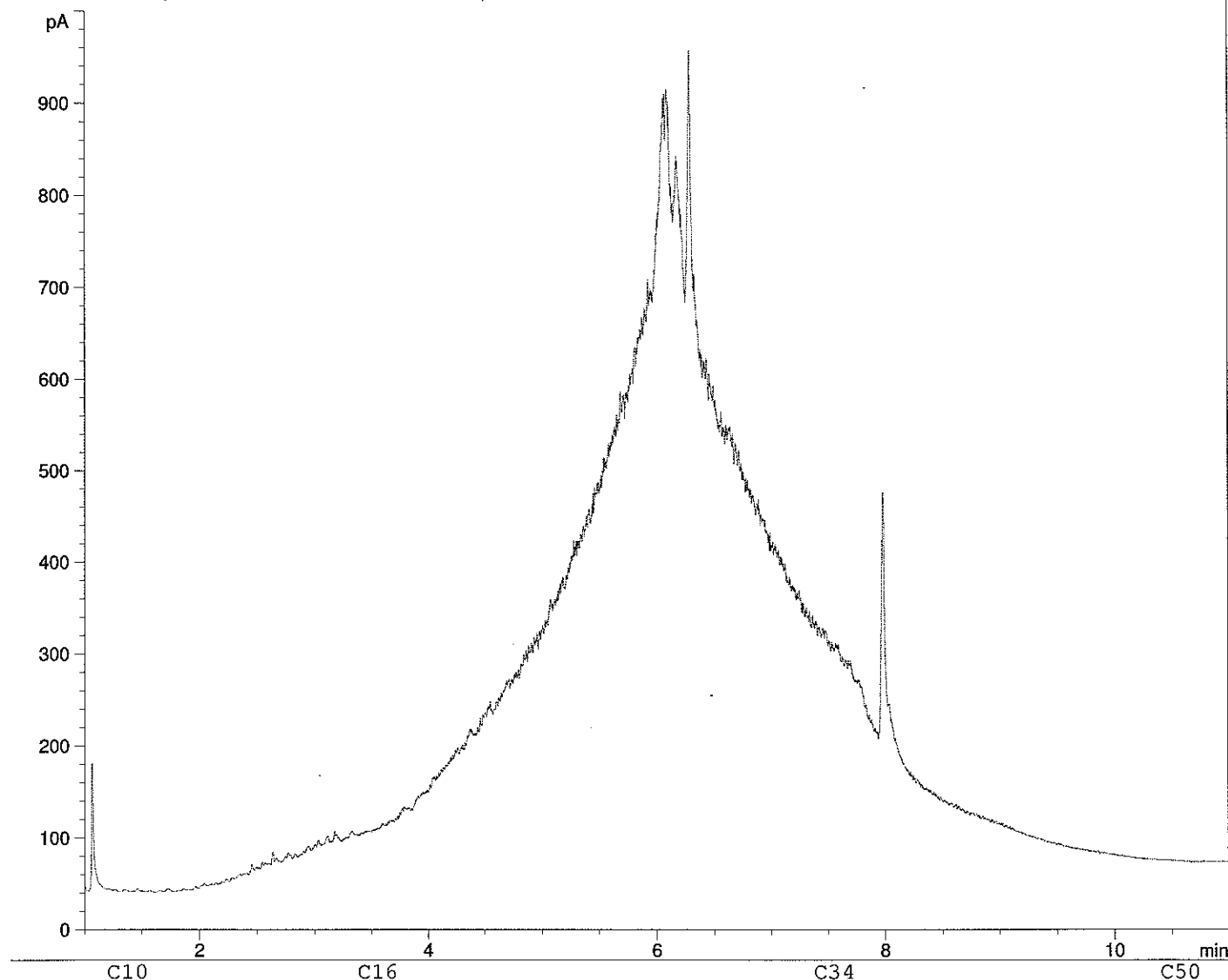
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08MW22 @ 0.6  
Sample ID: L676396-35 150  
Injection Date: 9/4/2008 4:43:11 PM  
Instrument: 6890

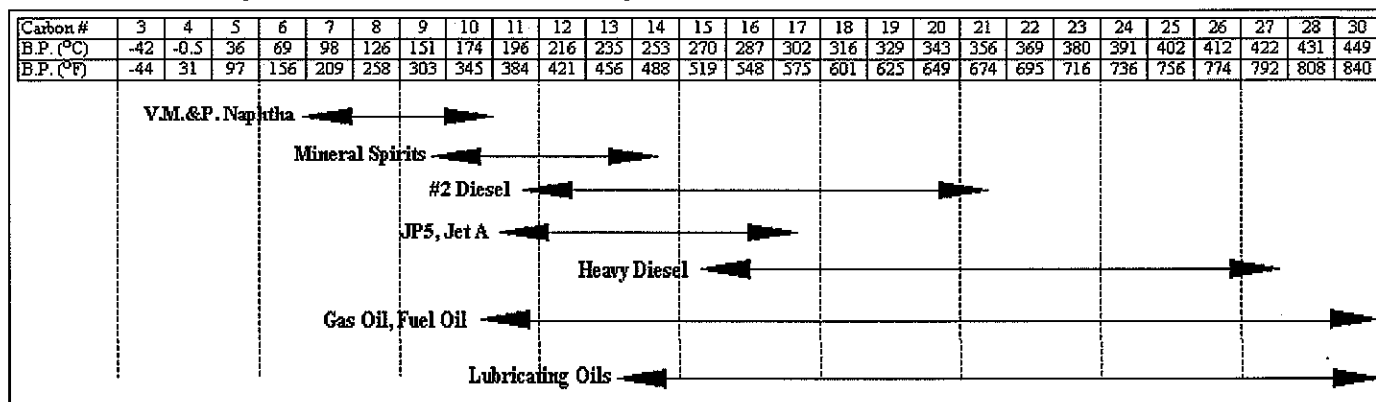


# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GC\FID5\0904B\0904BK01.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products



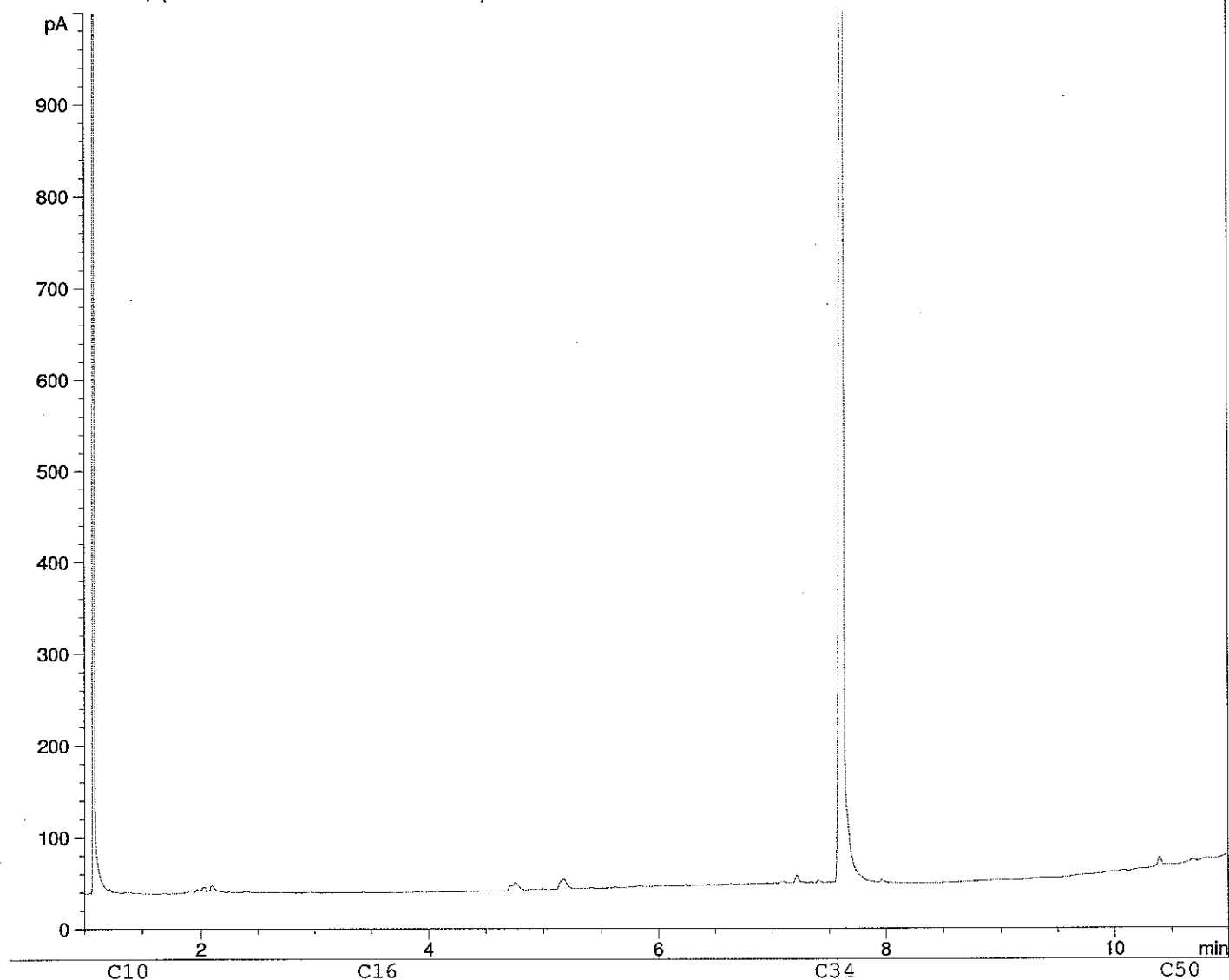
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08MW23 @ 0.6  
Sample ID: L676396-51 30  
Injection Date: 9/4/2008 1:07:58 AM  
Instrument: 6890



# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0903B\0903BK14.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products

Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→																										
Mineral Spirits																											
#2 Diesel																											
JP5, Jet A																											
Heavy Diesel																											
Gas Oil, Fuel Oil																											
Lubricating Oils																											

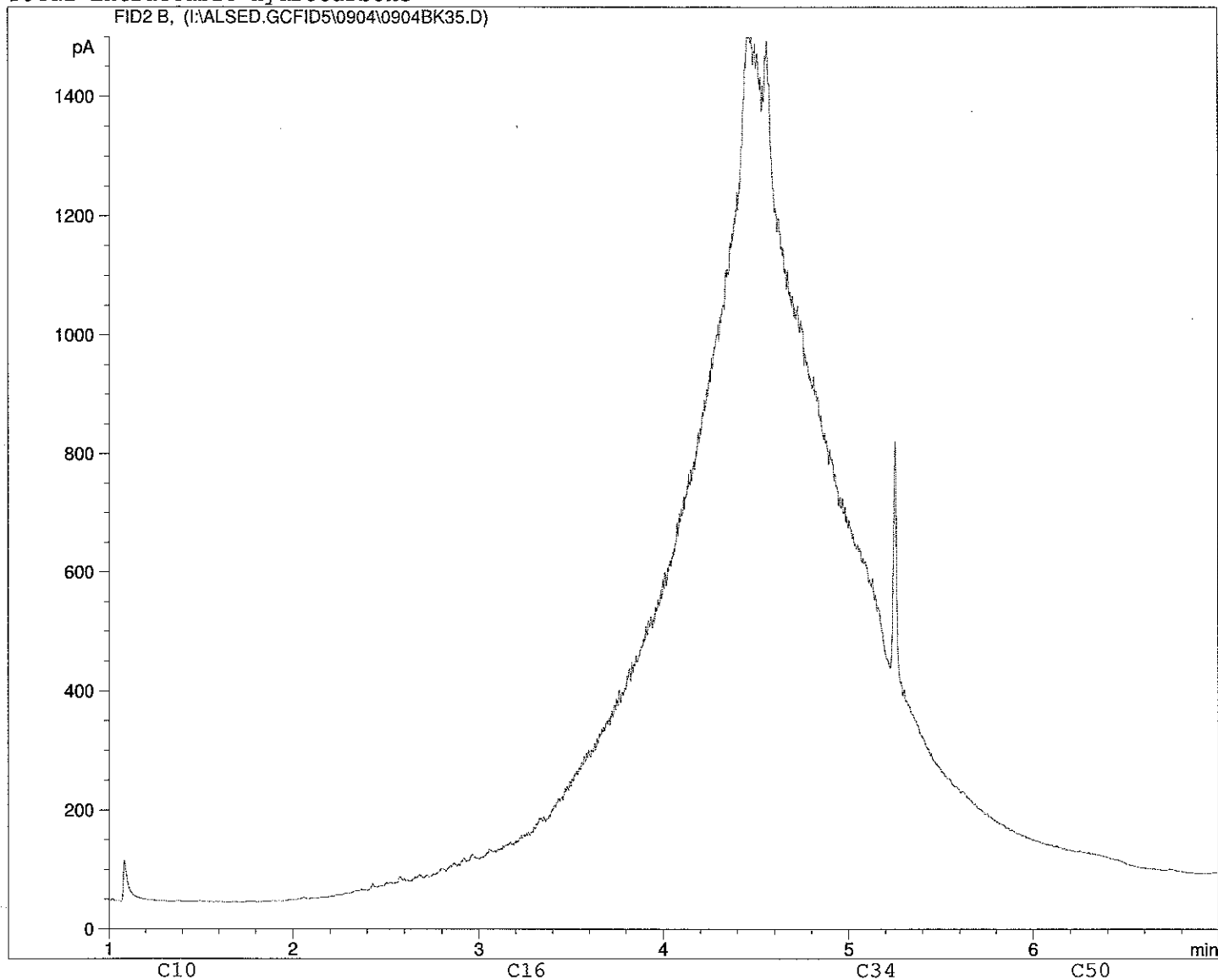
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08MW22D @ 0.6  
Sample ID: L676396-67 150  
Injection Date: 9/5/2008 6:03:01 AM  
Instrument: 6890

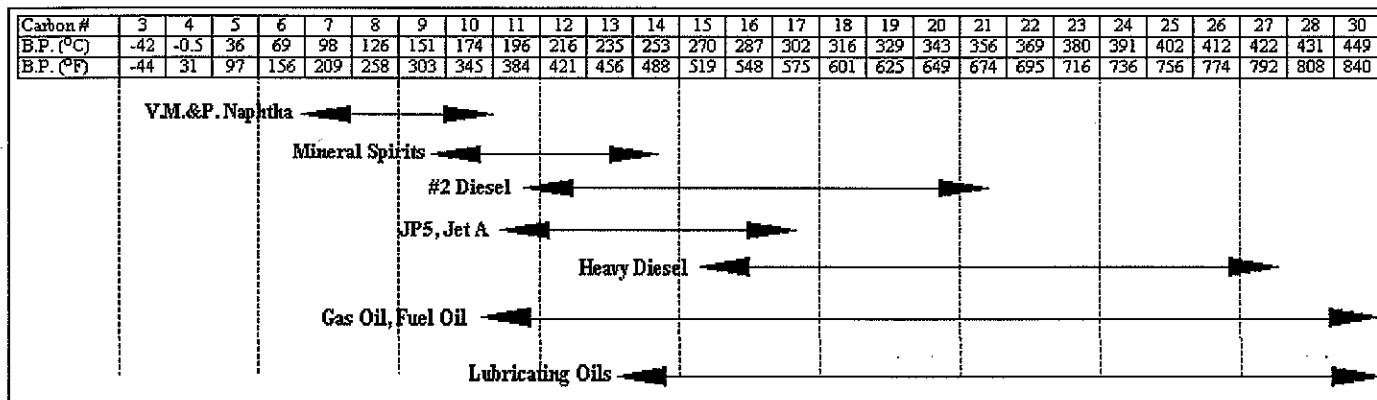


# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GCFID5\0904\0904BK35.D)



## Boiling Point Distribution Range of Petroleum Based Fuel Products



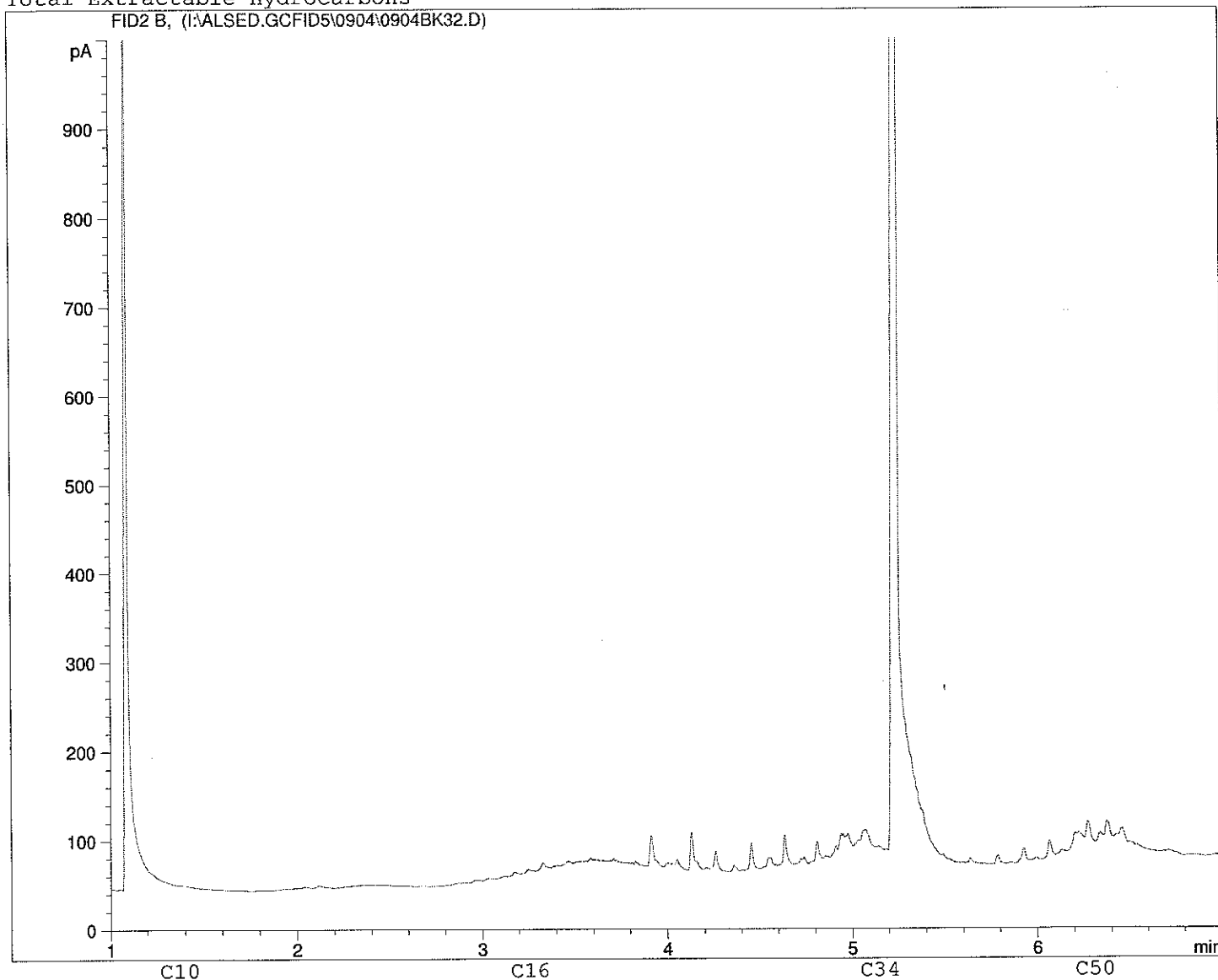
Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII

Client ID: 08MW13 @ 0.6  
Sample ID: L676396-68 30  
Injection Date: 9/5/2008 5:08:56 AM  
Instrument: 6890



# Total Extractable Hydrocarbons

FID2 B, (I:\ALSED.GC\FID5\0904\0904BK32.D)



Boiling Point Distribution Range of Petroleum Based Fuel Products

Carbon#	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840
VM.&P. Naphtha	→																										
Mineral Spirits																											
#2 Diesel																											
JP5, Jet A																											
Heavy Diesel																											
Gas Oil, Fuel Oil																											
Lubricating Oils																											

Adapted from: Drews, A.W., ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII



Environmental Division

Report to:		Report Format / Distribution			Service Requested: (rush - subject)		
Company: <u>EBA</u>		Standard: <input checked="" type="checkbox"/> Other: <input type="checkbox"/>			<input checked="" type="checkbox"/> Regular (Default)		
Contact: <u>BRANT SANG</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital <input type="checkbox"/>			Priority (2-3 Business Days) - 50%		
Address: <u>115,200 Rivercrest Drive SE</u>		Email 1: <u>htsang@eba.ca</u>			Emergency (1 Business Day) - 100		
<u>Calgary</u>		Email 2: <u>AMahgoub@eba.ca</u>			For Emergency < 1 Day, ASAP or 1		
Phone: <u>403-203-3305</u>		Fax: <u>403-203-3301</u>			Analysis Reque		
Invoice To: Same as Report? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No?		Client / Project Information:			(Indicate Filtered or Preser		
Company:		Job #: <u>C22101178</u>					
Contact:		PO / AFE:					
Address:		Legal Site Description:					
Phone:		Quote #: <u>Test Samples</u>					
Fax:		ALS Contact:					
Lab Work Order # (lab use only)		Sampler: <u>Jack</u>					
<u>11076396</u>							
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	Hold	BTEX FI-F4	Metals
	08 MW20 at 0.6	Aug 26/08	1:15	Soil		X	X
	08 MW20 at 1.2	Aug 26/08	1:25	Soil	X		
	08 MW20 at 1.8	Aug 26/08	1:30	Soil	X		
	08 MW20 at 2.4	Aug 26/08	1:40	Soil	X		
	08 MW20 at 3.1	Aug 26/08	1:50	Soil	X		
	08 MW20 at 3.7	Aug 26/08	2:00	Soil	X		
	08 MW20 at 4.3	Aug 26/08	2:10	Soil	X		
	08 MW20 at 4.9	Aug 26/08	2:15	Soil	X		
	08 MW20 at 5.5	Aug 26/08	2:20	Soil	X		
	08 MW20 at 6.1	Aug 26/08	2:25	Soil	X		
	08 MW20 at 6.7	Aug 26/08	2:30	Soil	X		
	08 MW20 at 7.3	Aug 26/08	2:30	Soil	X		

Special Instructions / Regulations / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION	
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<u>Jack Samuels</u>	<u>Aug 31/08</u>	<u>[Signature]</u>	<u>31 Aug 08</u>	<u>16:17</u>	<u>13.2°C</u>	

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Environmental Division

Report to:		Report Format / Distribution		Service Requested: (rush - subject)	
Company: <b>EBA</b>		Standard: <input checked="" type="checkbox"/> Other: <input type="checkbox"/>		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <b>Brian Tsang</b>		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital <input type="checkbox"/>		Priority (2-3 Business Days) - 50%	
Address: <b>115, 200 Rivercrest Drive SE</b>		Email 1: <b>btsang@eba.ca</b>		Emergency (1 Business Day) - 10%	
<b>Calgary</b>		Email 2: <b>amahgoub@eba.ca</b>		For Emergency < 1 Day, ASAP or	
Phone: <b>403-203-3355</b>		Fax: <b>403-203-3301</b>		Analysis Req	
Invoice To: Same as Report? <input checked="" type="checkbox"/> Yes No? <input type="checkbox"/>		Client / Project Information:		(Indicate Filtered or Preserved)	
Company:		Job #: <b>C22101178</b>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #:			
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <b>JACK</b>	
<b>Test Samples</b>					
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	
	08 MW 20 at 7.9	Aug 26/08	2:35	Soil	
	08 MW 20 at 8.5	Aug 26/08	2:40	Soil	
	08 MW 20 at 9.2	Aug 26/08	2:42	Soil	
	08 MW 20 at 9.8	Aug 26/08	2:43	Soil	
	08 MW 20 at 10.4	Aug 26/08	2:44	Soil	
	08 MW 20 at 11.0	Aug 26/08	2:45	Soil	
	08 MW 21 at 0.6	Aug 26/08	1:15	Soil	
	08 MW 21 at 1.2	Aug 26/08	1:20	Soil	
	08 MW 21 at 1.8	Aug 26/08	1:25	Soil	
	08 MW 21 at 2.4	Aug 26/08	1:30	Soil	
	08 MW 21 at 3.1	Aug 26/08	1:35	Soil	
	08 MW 21 at 3.7	Aug 26/08	1:40	Soil	

Special Instructions / Regulations / Hazardous Details

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION	
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<i>[Signature]</i>	Aug 21/08 3:50					

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Environmental Division

Report to:		Report Format / Distribution		Service Requested: (rush - subject)	
Company: <b>EBT</b>		Standard: <input checked="" type="checkbox"/> Other: <input type="checkbox"/>		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <b>Brian Tsang</b>		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital <input type="checkbox"/>		Priority (2-3 Business Days) - 50%	
Address: <b>115 Rivercrest Drive SE</b>		Email 1: <b>btsang@eba.ca</b>		Emergency (1 Business Day) - 10%	
<b>Calgary</b>		Email 2: <b>1mahgaub@eba.ca</b>		For Emergency < 1 Day, ASAP or	
Phone: <b>403-203-3355</b>		Fax: <b>403-203-3301</b>		Analysis Req	
Invoice To: Same as Report? <input checked="" type="radio"/> No? <input type="radio"/>		Client / Project Information:		(Indicate Filtered or Pres)	
Company:		Job #: <b>C22101178</b>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <b>Test Samples</b>			
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <b>Jack</b>	
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	
	08 MW21 at 4.3	Aug 26/08	1:45	Soil	
	08 MW21 at 4.9	Aug 26/08	1:50	Soil	
	08 MW21 at 5.5	Aug 26/08	1:55	Soil	
	08 MW21 at 6.1	Aug 26/08	2:00	Soil	
	08 MW21 at 6.7	Aug 26/08	2:30	Soil	
	08 MW21 at 7.3	Aug 26/08	2:40	Soil	
	08 MW21 at 7.9	Aug 26/08	2:50	Soil	
	08 MW21 at 8.5	Aug 26/08	3:00	Soil	
	08 MW21 at 9.2	Aug 26/08	3:05	Soil	
	08 MW21 at 9.8	Aug 26/08	3:10	Soil	
	08 MW22 at 0.6	Aug 26/08	3:20	Soil	
	08 MW22 at 1.2	Aug 26/08	3:30	Soil	

BTEX FI-F4  
metals  
Grain size  
Hold

Special Instructions / Regulations / Hazardous Details

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION	
Released by: <b>Jack Samuels</b>	Date & Time: <b>Aug 31/08</b>	Received by:	Date:	Time:	Temperature:	Verified by:
						Date & Time:



Report to:		Report Format / Distribution		Service Requested: (rush - subje	
Company: <b>EBA</b>		Standard: <input checked="" type="checkbox"/> Other:		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <b>Brian Tsang</b>		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital		Priority (2-3 Business Days) - 50%	
Address: <b>115, 200 Rivercrest Drive S.E.</b>		Email 1: <b>btsang@eba.ca</b>		Emergency (1 Business Day) - 10	
<b>Calgary</b>		Email 2: <b>A.Mahgoub@eba.ca</b>		For Emergency < 1 Day, ASAP or	
Phone: <b>403-203-3355</b>		Fax: <b>403-203-3301</b>		Analysis Rec	
Invoice To: Same as Report? <input checked="" type="checkbox"/> Yes / No?		Client / Project Information:		(Indicate Filtered or Press	
Company:		Job #: <b>C22101178</b>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <b>Test Samples</b>			
Fax:		ALS			
Lab Work Order #		Contact:		Sampler: <b>Jack</b>	
(lab use only)					
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	
	08 MW 22 at 1.8	Aug 26/08	3:40	Soil	
	08 MW 22 at 2.4		3:45	Soil	
	08 MW 22 at 3.1		3:50	Soil	
	08 MW 22 at 3.7		3:55	Soil	
	08 MW 22 at 4.3		4:00	Soil	
	08 MW 22 at 4.9		4:05	Soil	
	08 MW 22 at 5.5		4:10	Soil	
	08 MW 22 at 6.1		4:15	Soil	
	08 MW 22 at 6.7		4:20	Soil	
	08 MW 22 at 7.3		4:25	Soil	
	08 MW 22 at 7.9		4:30	Soil	
	08 MW 22 at 8.5		4:40	Soil	

BTEX FI-PY  
Detailed Salinity  
Hold

Special Instructions / Regulations / Hazardous Details

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION	
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<i>[Signature]</i>	Aug 31/08 3:50					

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Environmental Division

<b>Report to:</b>	<b>Report Format / Distribution</b>	<b>Service Requested:</b> (rush - subject)
Company: <u>EBT</u>	Standard: <input checked="" type="checkbox"/> Other:	<input checked="" type="checkbox"/> Regular (Default)
Contact: <u>BTsang</u>	Select: PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital	Priority (2-3 Business Days) - 50%
Address: <u>115,200 Rivercrest Drive SE</u>	Email 1: <u>btsang@eba.ca</u>	Emergency (1 Business Day) - 10%
<u>Calgary</u>	Email 2: <u>n.mahgoub@eba.ca</u>	For Emergency < 1 Day, ASAP or
Phone: <u>403-203-3355</u> Fax: <u>403-203-3301</u>		<b>Analysis Rec</b>

<b>Invoice To:</b> Same as Report? <input checked="" type="checkbox"/> No?	<b>Client / Project Information:</b>	(Indicate Filtered or Pres)
Company:	Job #: <u>C22101178</u>	
Contact:	PO / AFE:	
Address:	Legal Site Description:	
Phone:	Quote #: <u>Test Samples</u>	
Lab Work Order # (lab use only)	ALS Contact:	Sampler: <u>JACK</u>

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type						
	<u>08 MW 18 at 6.1</u>	<u>Aug 27/08</u>	<u>8:50</u>	<u>Soil</u>	<u>X</u>					
	<u>08 MW 18 at 6.7</u>		<u>9:00</u>		<u>X</u>					
	<u>08 MW 18 at 7.3</u>		<u>9:10</u>		<u>X</u>					
	<u>08 MW 18 at 7.9</u>		<u>9:20</u>		<u>X</u>					
	<u>08 MW 18 at 8.5</u>		<u>9:25</u>		<u>X</u>					
	<u>08 MW 18 at 9.2</u>		<u>9:30</u>		<u>X</u>					
	<u>08 MW 18 at 9.8</u>		<u>9:42</u>		<u>X</u>					
	<u>08 BH 19 at 0.6</u>		<u>4:04</u>		<u>X</u>					
	<u>08 BH 19 at 1.2</u>		<u>4:10</u>		<u>X</u>					
	<u>08 BH 19 at 1.8</u>		<u>4:15</u>		<u>X</u>					
	<u>08 BH 19 at 2.4</u>		<u>4:20</u>		<u>X</u>					
	<u>08 BH 19 at 3.1</u>		<u>4:25</u>		<u>X</u>					

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<b>SHIPMENT RELEASE (client use)</b>		<b>SHIPMENT RECEPTION (lab use only)</b>				<b>SHIPMENT VERIFICATION</b>	
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:
<u>[Signature]</u>	<u>Aug 31/08 3:50</u>						

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Report to:		Report Format / Distribution		Service Requested: (rush - subject)	
Company: <u>EBA</u>		Standard: <input checked="" type="checkbox"/> Standard Other: <input type="checkbox"/>		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <u>Brian T. Ang</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/>		Priority (2-3 Business Days) - 50%	
Address: <u>115, 2nd Rivercrest Drive SE</u>		Email 1: <u>brtsang@eba.ca</u>		Emergency (1 Business Day) - 10%	
Phone: <u>403-203-3355</u> Fax: <u>403-203-3301</u>		Email 2: <u>jsambisak@eba.ca</u>		For Emergency < 1 Day, ASAP or	
Invoice To: Same as Report? <input checked="" type="checkbox"/> No?		Client / Project Information:		Analysis Req	
Company:		Job # <u>C22101178</u>		(Indicate Filtered or Pres)	
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <u>TES Samples</u>			
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <u>Jack</u>	
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	
	<del>08 BH</del>				
	08 BH 17 at 9.2	<u>Aug 27/08</u>	3:15	Soil	
	08 BH 17 at 9.8		3:10		
	08 BH 17 at 4.3m		2:25		
	08 MW 18 at 0.6m		8:15		
	08 MW 18 at 1.2		8:20		
	08 MW 18 at 1.8		8:25		
	08 MW 18 at 2.4		8:30		
	08 MW 18 at 3.1		8:35		
	08 MW 18 at 3.7		8:40		
	08 MW 18 at 4.3		8:45		
	08 MW 18 at 4.9		8:46		
	08 MW 18 at 5.5		8:48		

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION	
Released by: <u>[Signature]</u>	Date & Time: <u>Aug 31/08 3:15</u>	Received by:	Date:	Time:	Temperature:	Verified by:
						Date & Time:



Environmental Division

<b>Report to:</b>		<b>Report Format / Distribution</b>		<b>Service Requested:</b> (rush - subject)	
Company: <u>EBA</u>		Standard: <u>      </u> Other: <u>      </u>		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <u>C22101178 Brian Tsang</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital <input checked="" type="checkbox"/>		Priority (2-3 Business Days) - 50%	
Address: <u>15,200 Rivercrest Drive SE</u>		Email 1: <u>btsang@eba.ca</u>		Emergency (1 Business Day) - 10%	
Phone: <u>403-203-3355</u> Fax: <u>403-203-3301</u>		Email 2: <u>dmaghoub@eba.ca</u>		For Emergency < 1 Day, ASAP or	
<b>Invoice To:</b> Same as Report? <input checked="" type="checkbox"/> Yes / No? <input type="checkbox"/>		<b>Client / Project Information:</b>		<b>Analysis Requested</b>	
Company:		Job #: <u>C22101178</u>		(Indicate Filtered or Pres)	
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote # <u>Test Samples</u>			
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <u>JACK</u>	
<b>Sample #</b>	<b>Sample Identification</b> (This description will appear on the report)	<b>Date</b>	<b>Time</b>	<b>Sample Type</b>	
	08 BH17 at 1.8	Aug 27/08	2:10	Soil	
	08 BH17 at 2.4		2:12		
	08 BH17 at 3.1		2:15		
	08 BH17 at 3.7		2:20		
	08 BH17 at 4.3		2:25		
	08 BH17 at 4.9		2:30		
	08 BH17 at 5.5		2:35		
	08 BH17 at 6.1		2:40		
	08 BH17 at 6.7		2:45		
	08 BH17 at 7.3		2:50		
	08 BH17 at 7.9		3:00		
	08 BH17 at 8.5		3:10		

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<b>SHIPMENT RELEASE (client use)</b>		<b>SHIPMENT RECEPTION (lab use only)</b>			<b>SHIPMENT VERIFICATION</b>	
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<u>[Signature]</u>	<u>Aug 31/08 3:50</u>					

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Environmental Division

Report to:		Report Format / Distribution		Service Requested: (rush - subject)	
Company: <u>EBA</u>		Standard: <input checked="" type="checkbox"/> Other: <input type="checkbox"/>		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <u>Brian Tsang</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/>		Priority (2-3 Business Days) - 50%	
Address: <u>115,200 River West Drive SE</u>		Email 1: <u>btsang@eba.ca</u>		Emergency (1 Business Day) - 10%	
<u>Calgary</u>		Email 2: <u>n.mahgoub@eba.ca</u>		For Emergency < 1 Day, ASAP or	
Phone: <u>403-203-3355</u>		Fax: <u>403-203-3301</u>		Analysis Rec	
Invoice To: Same as Report? <input checked="" type="checkbox"/> No? <input type="checkbox"/>		Client / Project Information:		(Indicate Filtered or Pres	
Company:		Job #: <u>C22101178</u>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <u>Test Samples</u>			
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <u>Jack</u>	
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	
	08 MW16 at 4.9	<u>Aug 27/08</u>	<u>11:30</u>	<u>Soil</u>	<u>HO</u>
	08 MW16 at 5.5		<u>11:35</u>		<u>BTEX FI-P4</u>
	08 MW16 at 6.1		<u>11:40</u>		<u>Metals</u>
	08 MW16 at 6.7		<u>11:42</u>		
	08 MW16 at 7.3		<u>11:45</u>		
	08 MW16 at 7.9		<u>11:48</u>		
	08 MW16 at 8.5		<u>11:50</u>		
	08 MW16 at 9.2		<u>11:55</u>		
	08 MW16 at 9.2		<u>12:00</u>		
	08 MW16 at 6.1m		<u>11:40</u>		
	08 BH17 at 0.6m		<u>2:00</u>		
	08 BH17 at 1.2m	<u>✓</u>	<u>2:05</u>	<u>✓</u>	

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION	
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<u>[Signature]</u>	<u>Aug 31/08 3:50</u>					

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Environmental Division

Report to:		Report Format / Distribution		Service Requested: (rush - subject)	
Company: <b>EBA</b>		Standard: <input checked="" type="checkbox"/> Other: <input type="checkbox"/>		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <b>Brian Tsang</b>		Select: PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/>		Priority (2-3 Business Days) - 50%	
Address: <b>115, 200 River Street Drive SE</b>		Email 1: <b>btsang@eba.ca</b>		Emergency (1 Business Day) - 10%	
<b>Culgox</b>		Email 2: <b>n.mahgoub@eba.ca</b>		For Emergency < 1 Day, ASAP or	
Phone: <b>403-203-3355</b> Fax: <b>403-203-3301</b>				Analysis Re:	
Invoice To: Same as Report? <input checked="" type="checkbox"/> Yes / No? <input type="checkbox"/>		Client / Project Information:		(Indicate Filtered or Pres)	
Company:		Job #: <b>C22101178</b>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <b>Test Samples</b>			
Fax:		ALS Contact:			
Lab Work Order # (lab use only)		Sampler: <b>SACK</b>			

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	Hold
	<b>08 MW 14 at 9.2m</b>	<b>Aug 27/08</b>	<b>10:40</b>	<b>Soil</b>	<b>X</b>
	<b>08 MW 14 at 9.8m</b>	<b>Aug 27/08</b>	<b>10:45</b>	<b>Soil</b>	<b>X</b>
	<b>08 MW BHSat 0.6</b>	<b>Aug 27/08</b>	<b>12:50</b>	<b>Soil</b>	<b>X</b>
	<b>08 MW BHSat 1.2</b>	<b>Aug 27/08</b>	<b>1:00</b>	<b>Soil</b>	<b>X</b>
	<b>08 MW BHSat 1.8</b>	<b>Aug 27/08</b>	<b>1:10</b>	<b>Soil</b>	<b>X</b>
	<b>08 MW BHSat 2.4</b>	<b>Aug 27/08</b>	<b>1:15</b>	<b>Soil</b>	<b>X</b>
	<b>08 MW BHSat 3.1</b>	<b>Aug 27/08</b>	<b>1:20</b>	<b>Soil</b>	<b>X</b>
	<b>08 MW BHSat 3.7</b>	<b>Aug 27/08</b>	<b>1:25</b>	<b>Soil</b>	<b>X</b>
	<b>08 BHSat 4.3</b>	<b>Aug 27/08</b>	<b>1:30</b>	<b>Soil</b>	<b>X</b>
	<b>08 BHSat 4.9</b>	<b>Aug 27/08</b>	<b>1:35</b>	<b>Soil</b>	<b>X</b>
	<b>08 BHSat 5.5</b>	<b>Aug 27/08</b>	<b>1:38</b>	<b>Soil</b>	<b>X</b>
	<b>08 BHSat 6.1</b>	<b>Aug 27/08</b>	<b>1:39</b>	<b>Soil</b>	<b>X</b>

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION	
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<i>[Signature]</i>	<b>Aug 31/08 350</b>					



**Environmental Division**

<b>Report to:</b>		<b>Report Format / Distribution</b>		<b>Service Requested:</b> (rush - subje																																									
Company: <u>EPA</u>		Standard: _____ Other: _____		<input checked="" type="checkbox"/> Regular (Default)																																									
Contact: <u>Brian Tsang</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/>		<input type="checkbox"/> Priority (2-3 Business Days) - 50%																																									
Address: <u>115,200 Rivercrest Drive SE</u>		Email 1: <u>btsang@alga.ca</u>		<input type="checkbox"/> Emergency (1 Business Day) - 10																																									
<u>Calgary</u>		Email 2: <u>amahgoub@alga.ca</u>		<input type="checkbox"/> For Emergency < 1 Day, ASAP or																																									
Phone: <u>403.203.3355</u>		Fax: <u>403.3301</u>		<b>Analysis Req</b>																																									
Invoice To: Same as Report? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No?		<b>Client / Project Information:</b>		(Indicate Filtered or Pres																																									
Company:		Job #: <u>C22101178</u>		<table border="1" style="width:100%; border-collapse: collapse;"> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>																																									
Contact:		PO / AFE:																																											
Address:		Legal Site Description:																																											
Phone:		Fax:		Quote #: <u>Test Samples</u>																																									
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <u>JACK</u>																																									

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	Hold	BTEX F1-F4	Grain Size			
	08 MW 14 at 1.2	Aug 27/08	9:45	Soil	X					
	08 MW 14 at 1.8	Aug 27/08	9:50	Soil	X					
	08 MW 14 at 2.4	Aug 27/08	10:00	Soil	X					
	08 MW 14 at 3.1	Aug 27/08	10:05	Soil	X					
	08 MW 14 at 3.7	Aug 27/08	10:10	Soil	X					
	08 MW 14 at 4.3	Aug 27/08	10:15	Soil	X					
	08 MW 14 at 4.9	Aug 27/08	10:20	Soil	X					
	08 MW 14 at 5.5	Aug 27/08	10:25	Soil	X					
	08 MW 14 at 6.1	Aug 27/08	10:30	Soil	X					
	08 MW 14 at 6.7	Aug 27/08	10:35	Soil	X					
	08 MW 14 at 7.3	Aug 27/08	10:38	Soil	X					
	08 MW 14 at 8.5	Aug 27/08	10:38	Soil						

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION	
Released by: <u>[Signature]</u>	Date & Time: <u>Aug 31/08 3:50</u>	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:

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Environmental Division

Report to:		Report Format / Distribution		Service Requested: (rush - subje	
Company: <b>EBA</b>		Standard: <input checked="" type="checkbox"/> Other:		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <b>Brian Tsang</b>		Select: PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital		Priority (2-3 Business Days) - 50%	
Address: <b>115,200 Rivercrest Drive SE</b>		Email 1: <b>btsang@eba.ca</b>		Emergency (1 Business Day) - 10	
City: <b>Calgary</b>		Email 2: <b>B.Mahgoub@eba.ca</b>		For Emergency < 1 Day, ASAP or	
Phone: <b>403-203-3355</b> Fax: <b>403-203-3301</b>				Analysis Rec	
Invoice To: Same as Report? <input checked="" type="checkbox"/> No?		Client / Project Information:		(Indicate Filtered or Pres	
Company:		Job #: <b>CT-101178</b>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <b>Test Samples</b>			
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <b>JACK</b>	
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	
	08 MW13 at 3.7	Aug 26/08	3:36	Soil	X
	08 MW13 at 4.3		3:38	Soil	X
	08 MW13 at 4.9		3:40	Soil	X
	08 MW13 at 5.5		3:45	Soil	X
	08 MW13 at 6.1		3:48	Soil	X
	08 MW13 at 6.7		3:49	Soil	X
	08 MW13 at 7.3		3:50	Soil	X
	08 MW13 at 7.9		3:52	Soil	X
	08 MW13 at 8.5		3:55	Soil	X
	08 MW13 at 9.2		3:56	Soil	X
	08 MW13 at 9.8		4:00	Soil	X
	08 MW14 at 0.6		9:45	Soil	X

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Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<i>[Signature]</i>	Aug 31/08 3:50					

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Environmental Division

<b>Report to:</b>		<b>Report Format / Distribution</b>			<b>Service Requested:</b> (rush - subje																																												
Company: <u>EBA</u>		Standard: <input checked="" type="checkbox"/> Other: <input type="checkbox"/>			<input checked="" type="checkbox"/> Regular (Default)																																												
Contact: <u>Brian Tsang</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital <input type="checkbox"/>			Priority (2-3 Business Days) - 50%																																												
Address: <u>115, 200 Rivercrest Drive SE</u>		Email 1: <u>btsang@eba.ca</u>			Emergency (1 Business Day) - 10																																												
<u>Culgox</u>		Email 2: <u>amahgen@eba.ca</u>			For Emergency < 1 Day, ASAP or																																												
Phone: <u>403-203-3355</u>		Fax: <u>403-203-3301</u>			<b>Analysis Re</b>																																												
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Company:		Job #: <u>C22101178</u>			<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>																																												
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Address:		Legal Site Description:																																															
Phone:		Fax:																																															
Lab Work Order # (lab use only)		Quote #: <u>Test Samples</u>																																															
ALS Contact:		Sampler: <u>Jack</u>																																															
<b>Sample #</b>	<b>Sample Identification</b> (This description will appear on the report)	<b>Date</b>	<b>Time</b>	<b>Sample Type</b>	<b>Hold</b>	<b>BTEX FI-G4</b>	<b>Metals</b>	<b>Lead</b>	<b>Deter./Salinity</b>																																								
	<u>08 MW23 at 6.7 m</u>	<u>Aug 26/08</u>	<u>5:20</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
	<u>08 MW23 at 7.3 m</u>	<u>Aug 26/08</u>	<u>5:25</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
	<u>08 MW23 at 7.9 m</u>	<u>Aug 26/08</u>	<u>5:30</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
	<u>08 MW23 at 8.5 m</u>	<u>Aug 26/08</u>	<u>5:35</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
	<u>08 MW23 at 9.2 m</u>	<u>Aug 26/08</u>	<u>5:40</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
	<u>08 MW23 at 9.8 m</u>	<u>Aug 26/08</u>	<u>5:45</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
	<u>08 MW22 d at 0.6 m</u>	<u>Aug 26/08</u>	<u>3:20</u>	<u>Soil</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																																										
	<u>08 MW13 at 0.6 m</u>	<u>Aug 27/08</u>	<u>3:20</u>	<u>Soil</u>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>																																								
	<u>08 MW13 at 1.2 m</u>	<u>Aug 27/08</u>	<u>3:25</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
	<u>08 MW13 at 1.8 m</u>	<u>Aug 27/08</u>	<u>3:30</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
	<u>08 MW13 at 2.4 m</u>	<u>Aug 27/08</u>	<u>3:32</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
	<u>08 MW13 at 3.1 m</u>	<u>Aug 27/08</u>	<u>3:35</u>	<u>Soil</u>	<input checked="" type="checkbox"/>																																												
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<b>SHIPMENT RELEASE (client use)</b>					<b>SHIPMENT RECEPTION (lab use only)</b>			<b>SHIPMENT VERIFICATION</b>																																									
Released by: <u>Jack Sambo</u>		Date & Time: <u>Aug 31/08 3:50</u>			Received by:		Date:		Time:																																								
					Temperature:		Verified by:		Date & Time:																																								



Environmental Division

Report to:		Report Format / Distribution		Service Requested: (rush - subject)	
Company: <u>EBA</u>		Standard: <u>✓</u> Other: <u>      </u>		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <u>115,200 Rivercrest Drive SE Calgary</u>		Select: PDF <u>✓</u> Excel <u>      </u> Digital <u>      </u>		Priority (2-3 Business Days) - 50%	
Address: <u>Brian Tsang</u>		Email 1: <u>btsang@eba.ca</u>		Emergency (1 Business Day) - 10%	
		Email 2: <u>anna.hgaub@eba.ca</u>		For Emergency < 1 Day, ASAP or	
Phone: <u>403-203-3355</u> Fax: <u>403-203-3301</u>				Analysis Req	
Invoice To: Same as Report? <input checked="" type="radio"/> Yes <input type="radio"/> No?		Client / Project Information:		(Indicate Filtered or Preserved)	
Company:		Job #: <u>C22101178</u>		<input type="checkbox"/>	
Contact:		PO / A/E:		<input type="checkbox"/>	
Address:		Legal Site Description:		<input type="checkbox"/>	
Phone:		Quote #: <u>Test Samples</u>		<input type="checkbox"/>	
Lab Work Order # (lab use only)		ALS Contact:		<input type="checkbox"/>	
		Sampler: <u>JACK</u>		<input type="checkbox"/>	
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	Hold
	08 MW 22 at 9.2	Aug 26/08	3:40	Soil	<input checked="" type="checkbox"/>
	08 MW 22 at 9.8	Aug 26/08	3:50	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 0.6	Aug 26/08	4:00	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 1.2	Aug 26/08	4:10	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 1.8	Aug 26/08	4:20	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 2.4	Aug 26/08	4:30	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 3.1	Aug 26/08	4:35	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 3.7	Aug 26/08	4:40	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 4.3	Aug 26/08	4:45	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 4.9	Aug 26/08	4:50	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 5.5	Aug 26/08	5:00	Soil	<input checked="" type="checkbox"/>
	08 MW 23 at 6.1	Aug 26/08	5:10	Soil	<input checked="" type="checkbox"/>

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION	
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<u>[Signature]</u>	<u>Aug 31/08 3:50</u>					

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Environmental Division

Report to:		Report Format / Distribution		Service Requested: (rush - subject)	
Company: <u>EBA</u>		Standard: <input checked="" type="checkbox"/> Other: <input type="checkbox"/>		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <u>Btsang</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/>		Priority (2-3 Business Days) - 50%	
Address: <u>115, 200 Rivercrest Drive SE</u>		Email 1: <u>btsang@eba.ca</u>		Emergency (1 Business Day) - 10%	
<u>Calgary</u>		Email 2: <u>n.mahgoub@eba.ca</u>		For Emergency < 1 Day, ASAP or	
Phone: <u>403-203-3355</u> Fax: <u>403-203-3301</u>				Analysis Req	
Invoice To: Same as Report? <input checked="" type="checkbox"/> Yes / No? <input type="checkbox"/>		Client / Project Information:		(Indicate Filtered or Prese	
Company:		Job #: <u>C27101178</u>		<div style="display: flex; justify-content: space-around; font-weight: bold;"> <span>BTEX H-F4</span> <span>Metals</span> <span>Detailed Sampling</span> <span>Hold</span> </div>	
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <u>Test Samples</u>			
Lab Work Order # (lab use only):		ALS Contact:		Sampler: <u>JAC</u>	

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	BTEX H-F4	Metals	Detailed Sampling	Hold
	<u>08BH19 at 4.3m</u>	<u>Aug 27/08</u>	<u>4:30</u>	<u>Soil</u>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	<u>08BH19 at 4.9</u>							<input checked="" type="checkbox"/>
	<u>08BH19 at 5.5</u>							<input checked="" type="checkbox"/>
	<u>08BH19 at 6.1</u>							<input checked="" type="checkbox"/>
	<u>08BH19 at 6.7</u>							<input checked="" type="checkbox"/>
	<u>08BH19 at 7.3</u>							<input checked="" type="checkbox"/>
	<u>08BH19 at 7.9</u>							<input checked="" type="checkbox"/>
	<u>08BH19 at 8.5</u>							<input checked="" type="checkbox"/>
	<u>08BH19 at 9.2</u>							<input checked="" type="checkbox"/>
	<u>08BH19 at 9.8</u>							<input checked="" type="checkbox"/>
	<u>08BH19d at 4.3m</u>		<u>4:30</u>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION	
Released by: <u>[Signature]</u>	Date & Time: <u>Aug 31/08 3:50</u>	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:



Environmental Division

Report to:		Report Format / Distribution		Service Requested: (rush - subje	
Company: <u>EBA</u>		Standard: <input checked="" type="checkbox"/> Other:		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <u>Brian Tsang</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital		Priority (2-3 Business Days) - 50%	
Address: <u>115, 200 Rivercrest Drive S.E.</u>		Email 1: <u>? Samblirsky@Eba.ca</u>		Emergency (1 Business Day) - 10%	
<u>Calgary</u>		Email 2: <u>BTsang@Eba.ca</u>		For Emergency < 1 Day, ASAP or	
Phone: <u>403-203-3355</u>		Fax: <u>403-203-3301</u>		Analysis Req	
Invoice To: Same as Report? <input checked="" type="checkbox"/> No?		Client / Project Information:		(Indicate Filtered or Pres	
Company:		Job #: <u>C22101178</u>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <u>Test Samples</u>			
Fax:		ALS Contact:			
Lab Work Order # (lab use only)		Sampler: <u>JAC</u>			

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	BTEX FI-FY	metals	VOCs	PAHs	lead	TRANSIZE
0855 24		Aug 23/08		Soil	X	X	X	X		
0855 25					X				X	
0855 26					X				X	X
0855 27					X		X	X		
0855 28					X	X				
0855 29					X				X	
0855 30					X				X	
0855 31					X	X				
0855 32					X	X				
0855 33					X	X				
0855 34					X				X	
0855 35					X				X	

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Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<u>Jack Samblirsky</u>	<u>Aug 31/08 3:50</u>					

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Company: <u>EPA</u>		Standard: <input checked="" type="checkbox"/> Other:		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <u>Brian Tsang</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital		Priority (2-3 Business Days) - 50%	
Address: <u>115, 200 R. West Crest Drive SE</u>		Email 1: <u>btsang@albacan.ca</u>		Emergency (1 Business Day) - 10%	
<u>Calgary</u>		Email 2: <u>amangosa@al.ca</u>		For Emergency < 1 Day, ASAP or	
Phone: <u>403-203-3355</u> Fax: <u>403-203-3341</u>				Analysis Req	
Invoice To: Same as Report? <input checked="" type="checkbox"/> No?		Client / Project Information:		(Indicate Filtered or Preserved)	
Company:		Job #: <u>C22101178</u>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <u>Test Samples</u>			
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <u>JACK</u>	
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	
	<u>08 SS 36</u>	<u>Aug 28/08</u>		<u>Spill</u>	
	<u>08 SS 33d</u>				
	<u>08 SS 37</u>				
	<u>08 SS 38</u>				
	<u>08 SS 39</u>				
	<u>08 SS 40</u>				
	<u>08 SS 41</u>				
	<u>08 SS 42</u>				
	<u>08 SS 43</u>				
	<u>08 SS 44</u>				
	<u>08 SS 45</u>				
	<u>08 SS 46</u>				

BTEX H-F4	Metals	Grainsize	Detailed Salinity	Lead	PAN
X	X	X	X		
X	X				
X	X				
X		X			
X	X				
X	X				
X			X		
X			X	X	
X				X	
X	X				
X	X	X	X	X	X

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Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:
<u>[Signature]</u>	<u>Aug 31/08 3:50</u>					

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Company: <u>EBA</u>		Standard: <input checked="" type="checkbox"/> Other:		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <u>Brian Tsang</u>		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital		Priority (2-3 Business Days) - 50%	
Address: <u>115,200 Rivercrest Drive SE</u>		Email 1: <u>btsang@ebara</u>		Emergency (1 Business Day) - 10%	
<u>Culver</u>		Email 2: <u>n.mahgaub@ebara</u>		For Emergency < 1 Day, ASAP or	
Phone: <u>403-203-3355</u>		Fax: <u>403-203-3301</u>		Analysis Req	
Invoice To: Same as Report? <input checked="" type="checkbox"/> Yes / No?		Client / Project Information:		(Indicate Filtered or Preserved)	
Company:		Job #: <u>C22101178</u>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <u>Test Samples</u>			
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <u>JACK</u>	
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	
	<u>0855 47</u>	<u>Aug 28</u>		<u>60:1</u>	<u>BTEX G-1-4</u>
	<u>0855 48</u>				<u>metals</u>
	<u>0855 49</u>				<u>VOCs</u>
	<u>0855 50</u>				<u>deteriorated Solubility</u>
	<u>0855 51</u>				<u>Lead</u>
	<u>0855 52</u>				<u>PATs</u>
	<u>0855 53</u>				<u>Grain Size</u>
	<u>0855 54</u>				
	<u>0855 55</u>				
	<u>0855 56</u>				
	<u>0855 57</u>				
	<u>0855 58</u>				

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SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)		SHIPMENT VERIFICATION	
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:
<u>JACK SHANKS</u>	<u>Aug 31/03</u>				
Verified by:	Date & Time:				

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Report to:		Report Format / Distribution			Service Requested: (rush - subject to availability)														
Company: <u>EPA</u>		Standard: <u>/</u> Other: <u>/</u>			<input checked="" type="checkbox"/> Regular (Default)														
Contact: <u>Brian Tsang</u>		Select: PDF <u>/</u> Excel <u>/</u> Digital <u>/</u>			Priority (2-3 Business Days) - 50%														
Address: <u>115,200 Rivercrest Drive SE</u>		Email 1: <u>btsang@epa.ca</u>			Emergency (1 Business Day) - 10%														
<u>Calgary</u>		Email 2: <u>J Mahgoub @epa.ca</u>			For Emergency < 1 Day, ASAP or														
Phone: <u>403-203-3355</u>		Fax: <u>403-203-3301</u>			Analysis Required														
Invoice To: Same as Report? <u>(Yes/No?)</u>		Client / Project Information:			(Indicate Filtered or Preserved)														
Company:		Job #: <u>C22101178</u>			<input type="checkbox"/>														
Contact:		PO / AFE:			<input type="checkbox"/>														
Address:		Legal Site Description:			<input type="checkbox"/>														
Phone:		Quote #: <u>Test Samples</u>			<input type="checkbox"/>														
Fax:		ALS Contact:			<input type="checkbox"/>														
Lab Work Order # (lab use only)		Sampler: <u>Jack</u>			<input type="checkbox"/>														
Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	<u>BTEX-FI-H</u>	<u>Metals</u>	<u>Lead</u>	<u>Gran Size</u>											
	<u>085555</u>	<u>Aug 28/08</u>		<u>Soil</u>	<u>X</u>	<u>X</u>													
	<u>085559</u>	<u>Aug 29/08</u>		<u>Soil</u>	<u>X</u>		<u>X</u>												
	<u>085559d</u>	<u>Aug 29/08</u>		<u>Soil</u>	<u>X</u>		<u>X</u>												
	<u>085560</u>	<u>Aug 29/08</u>		<u>Soil</u>	<u>X</u>			<u>X</u>											
	<u>085561</u>	<u>Aug 29/08</u>		<u>Soil</u>	<u>X</u>			<u>X</u>											
	<u>08562</u>	<u>Aug 29/08</u>		<u>Soil</u>	<u>X</u>	<u>X</u>													
Special Instructions / Regulations / Hazardous Details																			
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.																			
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Released by: <u>[Signature]</u>					Received by: <u>[Signature]</u>					Verified by: <u>[Signature]</u>					Date & Time: <u>Aug 31/08</u>				
Date & Time: <u>Aug 31/08</u>					Date: <u>Aug 31/08</u>					Time: <u>7:50</u>					Temperature: <u>75C</u>				

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## Environmental Division

### Certificate of Analysis

EBA ENG CONSULTANTS LTD

ATTN: BRIAN TSANG

115, 200 RIVERCREST DR SE

CALGARY AB T2C 2X5

Reported On: 02-FEB-09 03:29 PM

Lab Work Order #: **L676397**

Date Received: **31-AUG-08**

Project P.O. #:

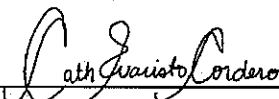
Job Reference: C22101178

Legal Site Desc:

CofC Numbers: 08-042155, 08-042156

Other Information:

Comments:

  
CATHERINE EVARISTO-CORDERO  
Senior Account 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.

ALS Canada Ltd. (formerly ETL Chemspec Analytical Ltd.)  
Part of the **ALS Laboratory Group**

9936-67 Avenue, Edmonton, AB T6E 0P5  
Phone: +1 780 413 5227 Fax: +1 780 437 2311 [www.alsglobal.com](http://www.alsglobal.com)  
A Campbell Brothers Limited Company

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-1 08MW01								
Sampled By: JACK on 29-AUG-08 @ 13:00								
Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Major Metals</b>								
Calcium (Ca)	115		0.5	mg/L		03-SEP-08	BOC	R717793
Potassium (K)	3.5		0.1	mg/L		03-SEP-08	BOC	R717793
Magnesium (Mg)	25.6		0.01	mg/L		03-SEP-08	BOC	R717793
Sodium (Na)	11.1		0.5	mg/L		03-SEP-08	BOC	R717793
Iron (Fe)	<0.005		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)	0.033		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>								
Silver (Ag)	0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)	<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)	0.430		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)	0.0015		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)	0.006		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)	0.633		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)	0.006		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)	0.0016		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)	0.0042		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.023		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
<b>CCME PAHs</b>								
Naphthalene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Quinoline	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acenaphthene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluorene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Phenanthrene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Anthracene	0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acridine	0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluoranthene	0.00002		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Pyrene	0.00003		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(a)anthracene	0.00002		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Chrysene	0.00002		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(b&j)fluoranthene	0.00003		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(k)fluoranthene	0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(a)pyrene	0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Indeno(1,2,3-cd)pyrene	0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Dibenzo(a,h)anthracene	0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Surr: Nitrobenzene d5	77		24-132	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr: 2-Fluorobiphenyl	66		37-123	%	04-SEP-08	05-SEP-08	SDH	R718728

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676397-1	08MW01								
Sampled By:	JACK on 29-AUG-08 @ 13:00								
Matrix:	WATER								
<b>CCME PAHs</b>									
Surr:	p-Terphenyl d14	78		41-143	%	04-SEP-08	05-SEP-08	SDH	R718728
<b>CCME Volatile HydroCarbon</b>									
<b>CCME Chlorinated Aliphatics</b>									
	1,1-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Methylene Chloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	trans-1,2-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,1-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Chloroform	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,2-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,1,1-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Carbon Tetrachloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Trichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,2-Dichloropropane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	cis-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	trans-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,1,2-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Tetrachloroethylene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,1,2,2-Tetrachloroethane	<0.002		0.002	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	1,2-Dichloroethane d4	82		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	Toluene d8	93		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	4-Bromofluorobenzene	86		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
<b>CCME monoaromatic hydrocarbons</b>									
	Benzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Thiophene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Toluene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Chlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Ethylbenzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	m+p-Xylenes	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	o-Xylene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Styrene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,3-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,4-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,2-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	1,2-Dichloroethane d4	82		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	Toluene d8	93		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	4-Bromofluorobenzene	86		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
676397-2	08MW02								
Sampled By:	JACK on 29-AUG-08 @ 13:10								
Matrix:	WATER								
<b>Dissolved Metals - CCME</b>									
<b>Dissolved Major Metals</b>									
	Calcium (Ca)	106		0.5	mg/L		03-SEP-08	BOC	R717793
	Potassium (K)	2.3		0.1	mg/L		03-SEP-08	BOC	R717793
	Magnesium (Mg)	23.7		0.01	mg/L		03-SEP-08	BOC	R717793
	Sodium (Na)	7.1		0.5	mg/L		03-SEP-08	BOC	R717793
	Iron (Fe)	0.005		0.005	mg/L		03-SEP-08	BOC	R717793
	Manganese (Mn)	0.022		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>									
	Silver (Ag)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
	Aluminum (Al)	<0.01		0.01	mg/L		04-SEP-08	SYF	R718417

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-2 08MW02								
Sampled By: JACK on 29-AUG-08 @ 13:10								
Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Trace Metals</b>								
Arsenic (As)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)	0.445		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)	0.0009		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)	0.002		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)	0.020		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)	0.004		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)	0.0020		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)	0.0042		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.004		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
<b>CCME PAHs</b>								
Naphthalene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Quinoline	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acenaphthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluorene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Phenanthrene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acridine	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluoranthene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Pyrene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(a)anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Chrysene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(b&j)fluoranthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(k)fluoranthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(a)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Indeno(1,2,3-cd)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Dibenzo(a,h)anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Surr: Nitrobenzene d5	83		24-132	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr: 2-Fluorobiphenyl	74		37-123	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr: p-Terphenyl d14	81		41-143	%	04-SEP-08	05-SEP-08	SDH	R718728
<b>CCME Volatile HydroCarbon</b>								
<b>CCME Chlorinated Aliphatics</b>								
1,1-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Methylene Chloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
trans-1,2-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Chloroform	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-2 08MW02								
Sampled By: JACK on 29-AUG-08 @ 13:10								
Matrix: WATER								
<b>CCME Volatile HydroCarbon</b>								
<b>CCME Chlorinated Aliphatics</b>								
1,1,1-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Carbon Tetrachloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Trichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichloropropane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
cis-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
trans-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,2-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Tetrachloroethylene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,2,2-Tetrachloroethane	<0.002		0.002	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 1,2-Dichloroethane d4	85		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: Toluene d8	92		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 4-Bromofluorobenzene	84		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
<b>CCME monoaromatic hydrocarbons</b>								
Benzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Thiophene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Toluene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Chlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Ethylbenzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
m+p-Xylenes	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
o-Xylene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Styrene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,3-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,4-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 1,2-Dichloroethane d4	85		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: Toluene d8	92		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 4-Bromofluorobenzene	84		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
676397-3 08MW03								
Sampled By: JACK on 29-AUG-08 @ 13:30								
Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Major Metals</b>								
Calcium (Ca)	96.5		0.5	mg/L		03-SEP-08	BOC	R717793
Potassium (K)	3.1		0.1	mg/L		03-SEP-08	BOC	R717793
Magnesium (Mg)	22.4		0.01	mg/L		03-SEP-08	BOC	R717793
Sodium (Na)	8.7		0.5	mg/L		03-SEP-08	BOC	R717793
Iron (Fe)	0.014		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)	0.010		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>								
Silver (Ag)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)	<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)	0.451		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)	0.004		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)	0.612		0.003	mg/L		04-SEP-08	SYF	R718417

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-3 08MW03								
Sampled By: JACK on 29-AUG-08 @ 13:30								
Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Trace Metals</b>								
Molybdenum (Mo)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)	0.0028		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)	0.0040		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.018		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
<b>CCME PAHs</b>								
Naphthalene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Quinoline	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acenaphthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluorene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Phenanthrene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acridine	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluoranthene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Pyrene	0.00005		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(a)anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Chrysene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(b&j)fluoranthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(k)fluoranthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(a)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Indeno(1,2,3-cd)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Dibenzo(a,h)anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Surr: Nitrobenzene d5	81		24-132	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr: 2-Fluorobiphenyl	71		37-123	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr: p-Terphenyl d14	76		41-143	%	04-SEP-08	05-SEP-08	SDH	R718728
<b>CCME Volatile HydroCarbon</b>								
<b>CCME Chlorinated Aliphatics</b>								
1,1-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Methylene Chloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
trans-1,2-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Chloroform	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,1-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Carbon Tetrachloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Trichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichloropropane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
cis-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
trans-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,2-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Tetrachloroethylene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,2,2-Tetrachloroethane	<0.002		0.002	mg/L	05-SEP-08	05-SEP-08	DDU	R718665

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-3	08MW03								
Sampled By:	JACK on 29-AUG-08 @ 13:30								
Matrix:	WATER								
<b>CCME Volatile HydroCarbon</b>									
<b>CCME Chlorinated Aliphatics</b>									
Surr:	1,2-Dichloroethane d4	85		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	Toluene d8	91		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	4-Bromofluorobenzene	86		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
<b>CCME monoaromatic hydrocarbons</b>									
	Benzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Thiophene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Toluene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Chlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Ethylbenzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	m+p-Xylenes	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	o-Xylene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Styrene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,3-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,4-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,2-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	1,2-Dichloroethane d4	85		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	Toluene d8	91		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	4-Bromofluorobenzene	86		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
676397-4	08MW04B								
Sampled By:	JACK on 29-AUG-08 @ 13:40								
Matrix:	WATER								
<b>Dissolved Metals - CCME</b>									
<b>Dissolved Major Metals</b>									
	Calcium (Ca)	78.2		0.5	mg/L		03-SEP-08	BOC	R717793
	Potassium (K)	1.3		0.1	mg/L		03-SEP-08	BOC	R717793
	Magnesium (Mg)	24.5		0.01	mg/L		03-SEP-08	BOC	R717793
	Sodium (Na)	55.7		0.5	mg/L		03-SEP-08	BOC	R717793
	Iron (Fe)	<0.005		0.005	mg/L		03-SEP-08	BOC	R717793
	Manganese (Mn)	0.538		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>									
	Silver (Ag)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
	Aluminum (Al)	<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
	Arsenic (As)	0.0014		0.0004	mg/L		04-SEP-08	SYF	R718417
	Boron (B)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
	Barium (Ba)	0.061		0.003	mg/L		04-SEP-08	SYF	R718417
	Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
	Cadmium (Cd)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
	Cobalt (Co)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
	Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
	Copper (Cu)	0.003		0.001	mg/L		04-SEP-08	SYF	R718417
	Lithium (Li)	0.536		0.003	mg/L		04-SEP-08	SYF	R718417
	Molybdenum (Mo)	0.015		0.005	mg/L		04-SEP-08	SYF	R718417
	Nickel (Ni)	0.006		0.002	mg/L		04-SEP-08	SYF	R718417
	Lead (Pb)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
	Antimony (Sb)	0.0005		0.0004	mg/L		04-SEP-08	SYF	R718417
	Selenium (Se)	0.0012		0.0004	mg/L		04-SEP-08	SYF	R718417
	Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
	Titanium (Ti)	0.001		0.001	mg/L		04-SEP-08	SYF	R718417
	Thallium (Tl)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
	Uranium (U)	0.0097		0.0001	mg/L		04-SEP-08	SYF	R718417

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676397-4 08MW04B								
Sampled By: JACK on 29-AUG-08 @ 13:40								
Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Trace Metals</b>								
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.026		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
<b>CCME PAHs</b>								
Naphthalene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Quinoline	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acenaphthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluorene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Phenanthrene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acridine	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluoranthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(a)anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Chrysene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(b&j)fluoranthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(k)fluoranthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(a)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Indeno(1,2,3-cd)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Dibenzo(a,h)anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Surr: Nitrobenzene d5	76		24-132	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr: 2-Fluorobiphenyl	74		37-123	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr: p-Terphenyl d14	81		41-143	%	04-SEP-08	05-SEP-08	SDH	R718728
<b>CCME Volatile HydroCarbon</b>								
<b>CCME Chlorinated Aliphatics</b>								
1,1-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Methylene Chloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
trans-1,2-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Chloroform	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,1-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Carbon Tetrachloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Trichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichloropropane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
cis-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
trans-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,2-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Tetrachloroethylene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,2,2-Tetrachloroethane	<0.002		0.002	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 1,2-Dichloroethane d4	84		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: Toluene d8	91		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 4-Bromofluorobenzene	84		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
<b>CCME monoaromatic hydrocarbons</b>								
Benzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Thiophene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Toluene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Chlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Ethylbenzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-4	08MW04B								
Sampled By:	JACK on 29-AUG-08 @ 13:40								
Matrix:	WATER								
<b>CCME Volatile HydroCarbon</b>									
<b>CCME monoaromatic hydrocarbons</b>									
m+p-Xylenes		<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
o-Xylene		<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Styrene		<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,3-Dichlorobenzene		<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,4-Dichlorobenzene		<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichlorobenzene		<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 1,2-Dichloroethane d4		84		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: Toluene d8		91		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 4-Bromofluorobenzene		84		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
676397-5	08MW05B								
Sampled By:	JACK on 29-AUG-08 @ 13:50								
Matrix:	WATER								
<b>Dissolved Metals - CCME</b>									
<b>Dissolved Major Metals</b>									
Calcium (Ca)		114		0.5	mg/L		03-SEP-08	BOC	R717793
Potassium (K)		3.8		0.1	mg/L		03-SEP-08	BOC	R717793
Magnesium (Mg)		29.0		0.01	mg/L		03-SEP-08	BOC	R717793
Sodium (Na)		10.7		0.5	mg/L		03-SEP-08	BOC	R717793
Iron (Fe)		1.51		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)		0.636		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>									
Silver (Ag)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)		<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)		0.0034		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)		0.420		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)		0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)		0.004		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)		0.542		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)		0.004		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)		0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)		<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)		0.0006		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)		0.0034		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)		0.019		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>									
Mercury (Hg)-Dissolved		<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
<b>CCME PAHs</b>									
Naphthalene		<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Quinoline		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acenaphthene		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L	Units	Extracted	Analyzed	By	Batch
676397-5	08MW05B								
Sampled By:	JACK on 29-AUG-08 @ 13:50								
Matrix:	WATER								
<b>CCME PAHs</b>									
	Fluorene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Phenanthrene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Acridine	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Fluoranthene	<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Pyrene	0.00002		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Benzo(a)anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Chrysene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Benzo(b&j)fluoranthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Benzo(k)fluoranthene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Benzo(a)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Indeno(1,2,3-cd)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
	Dibenzo(a,h)anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Surr:	Nitrobenzene d5	85		24-132	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr:	2-Fluorobiphenyl	77		37-123	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr:	p-Terphenyl d14	87		41-143	%	04-SEP-08	05-SEP-08	SDH	R718728
<b>CCME Volatile HydroCarbon</b>									
<b>CCME Chlorinated Aliphatics</b>									
	1,1-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Methylene Chloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	trans-1,2-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,1-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Chloroform	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,2-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,1,1-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Carbon Tetrachloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Trichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,2-Dichloropropane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	cis-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	trans-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,1,2-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Tetrachloroethylene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,1,2,2-Tetrachloroethane	<0.002		0.002	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	1,2-Dichloroethane d4	86		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	Toluene d8	93		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	4-Bromofluorobenzene	83		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
<b>CCME monoaromatic hydrocarbons</b>									
	Benzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Thiophene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Toluene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Chlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Ethylbenzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	m+p-Xylenes	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	o-Xylene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	Styrene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,3-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,4-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
	1,2-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	1,2-Dichloroethane d4	86		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	Toluene d8	93		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr:	4-Bromofluorobenzene	83		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-5	08MW05B								
Sampled By: JACK on 29-AUG-08 @ 13:50									
Matrix: WATER									
CCME Volatile HydroCarbon									
676397-6	08MW06B								
Sampled By: JACK on 29-AUG-08 @ 14:00									
Matrix: WATER									
Dissolved Metals - CCME									
Dissolved Major Metals									
Calcium (Ca)		117		0.5	mg/L		04-SEP-08	BOC	R718461
Potassium (K)		5.1		0.1	mg/L		04-SEP-08	BOC	R718461
Magnesium (Mg)		31.4		0.01	mg/L		04-SEP-08	BOC	R718461
Sodium (Na)		12.9		0.5	mg/L		04-SEP-08	BOC	R718461
Iron (Fe)		0.013		0.005	mg/L		04-SEP-08	BOC	R718461
Manganese (Mn)		0.043		0.001	mg/L		04-SEP-08	BOC	R718461
Dissolved Trace Metals									
Silver (Ag)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)		<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)		<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)		0.352		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)		0.0021		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)		<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)		0.009		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)		0.360		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)		0.004		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)		0.0002		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)		<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)		0.0037		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)		0.0053		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)		0.033		0.002	mg/L		04-SEP-08	SYF	R718417
Mercury (Hg) - Dissolved									
Mercury (Hg)-Dissolved		<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
CCME PAHs									
Naphthalene		<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Quinoline		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acenaphthene		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluorene		<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Phenanthrene		<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Anthracene		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Acridine		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Fluoranthene		<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Pyrene		<0.00001	RAMB	0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(a)anthracene		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Chrysene		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(b&j)fluoranthene		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Benzo(k)fluoranthene		<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676397-6 08MW06B								
Sampled By: JACK on 29-AUG-08 @ 14:00								
Matrix: WATER								
<b>CCME PAHs</b>								
Benzo(a)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Indeno(1,2,3-cd)pyrene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Dibenzo(a,h)anthracene	<0.00001		0.00001	mg/L	04-SEP-08	05-SEP-08	SDH	R718728
Surr: Nitrobenzene d5	86		24-132	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr: 2-Fluorobiphenyl	76		37-123	%	04-SEP-08	05-SEP-08	SDH	R718728
Surr: p-Terphenyl d14	88		41-143	%	04-SEP-08	05-SEP-08	SDH	R718728
<b>CCME Volatile HydroCarbon</b>								
<b>CCME Chlorinated Aliphatics</b>								
1,1-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Methylene Chloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
trans-1,2-Dichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Chloroform	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,1-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Carbon Tetrachloride	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Trichloroethene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichloropropane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
cis-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
trans-1,3-Dichloropropene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,2-Trichloroethane	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Tetrachloroethylene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,1,2,2-Tetrachloroethane	<0.002		0.002	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 1,2-Dichloroethane d4	85		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: Toluene d8	94		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 4-Bromofluorobenzene	83		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
<b>CCME monoaromatic hydrocarbons</b>								
Benzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Thiophene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Toluene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Chlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Ethylbenzene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
m+p-Xylenes	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
o-Xylene	<0.00050		0.00050	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Styrene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,3-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,4-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
1,2-Dichlorobenzene	<0.001		0.001	mg/L	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 1,2-Dichloroethane d4	85		77-119	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: Toluene d8	94		68-120	%	05-SEP-08	05-SEP-08	DDU	R718665
Surr: 4-Bromofluorobenzene	83		63-125	%	05-SEP-08	05-SEP-08	DDU	R718665
676397-7 08MW07B								
Sampled By: JACK on 29-AUG-08 @ 14:10								
Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Major Metals</b>								
Calcium (Ca)	94.2		0.5	mg/L		03-SEP-08	BOC	R717793
Potassium (K)	3.9		0.1	mg/L		03-SEP-08	BOC	R717793
Magnesium (Mg)	23.0		0.01	mg/L		03-SEP-08	BOC	R717793
Sodium (Na)	7.7		0.5	mg/L		03-SEP-08	BOC	R717793

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-7	08MW07B								
Sampled By:	JACK on 29-AUG-08 @ 14:10								
Matrix:	WATER								
<b>Dissolved Metals - CCME</b>									
<b>Dissolved Major Metals</b>									
Iron (Fe)		<0.005		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)		0.101		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>									
Silver (Ag)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)		<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)		<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)		0.329		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)		<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)		0.003		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)		0.347		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)		0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)		<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)		0.0042		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)		0.0027		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)		0.013		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>									
Mercury (Hg)-Dissolved		<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
676397-8	08MW08								
Sampled By:	JACK on 29-AUG-08 @ 14:20								
Matrix:	WATER								
<b>Dissolved Metals - CCME</b>									
<b>Dissolved Major Metals</b>									
Calcium (Ca)		97.5		0.5	mg/L		03-SEP-08	BOC	R717793
Potassium (K)		4.1		0.1	mg/L		03-SEP-08	BOC	R717793
Magnesium (Mg)		25.1		0.01	mg/L		03-SEP-08	BOC	R717793
Sodium (Na)		10.4		0.5	mg/L		03-SEP-08	BOC	R717793
Iron (Fe)		0.006		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)		0.170		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>									
Silver (Ag)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)		0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)		<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)		0.360		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)		<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)		0.004		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)		0.367		0.003	mg/L		04-SEP-08	SYF	R718417

# ALS LABORATORY GROUP ANALYTICAL REPORT

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-9	08MW10								
Sampled By:	JACK on 29-AUG-08 @ 14:30								
Matrix:	WATER								
676397-10	08MW11								
Sampled By:	JACK on 29-AUG-08 @ 14:40								
Matrix:	WATER								
<b>Dissolved Metals - CCME</b>									
<b>Dissolved Major Metals</b>									
Calcium (Ca)		87.6		0.5	mg/L		03-SEP-08	BOC	R717793
Potassium (K)		2.9		0.1	mg/L		03-SEP-08	BOC	R717793
Magnesium (Mg)		22.4		0.01	mg/L		03-SEP-08	BOC	R717793
Sodium (Na)		4.1		0.5	mg/L		03-SEP-08	BOC	R717793
Iron (Fe)		<0.005		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)		0.013		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>									
Silver (Ag)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)		<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)		<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)		0.428		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)		<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)		0.003		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)		0.393		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)		0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)		<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)		0.0214		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)		0.0040		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)		0.013		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>									
Mercury (Hg)-Dissolved		<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
676397-12	08MW14								
Sampled By:	JACK on 29-AUG-08 @ 15:30								
Matrix:	WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>									
<b>BTEX and F1 (C6-C10)</b>									
Benzene		<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Toluene		<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
EthylBenzene		<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Xylenes		<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1(C6-C10)		<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1-BTEX		<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
<b>F2 (&gt;C10-C16)</b>									
F2 (>C10-C16)		<0.2	DLHS	0.2	mg/L	03-SEP-08	04-SEP-08	YZH	R720050
Surr:	2-Bromobenzotrifluoride	104		47-153	%	03-SEP-08	04-SEP-08	YZH	R720050

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-12 08MW14 Sampled By: JACK on 29-AUG-08 @ 15:30 Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Major Metals</b>								
Calcium (Ca)	107		0.5	mg/L		03-SEP-08	BOC	R717793
Potassium (K)	3.6		0.1	mg/L		03-SEP-08	BOC	R717793
Magnesium (Mg)	22.2		0.01	mg/L		03-SEP-08	BOC	R717793
Sodium (Na)	10.4		0.5	mg/L		03-SEP-08	BOC	R717793
Iron (Fe)	0.005		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)	<0.001		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>								
Silver (Ag)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)	<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)	0.130		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)	0.007		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)	0.842		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)	0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)	0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)	0.0160		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)	0.0031		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.033		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
676397-13 08MW16 Sampled By: JACK on 29-AUG-08 @ 16:00 Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Toluene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
EthylBenzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Xylenes	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1(C6-C10)	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1-BTEX	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
<b>F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<2	DLHS	0.2	mg/L	03-SEP-08	04-SEP-08	YZH	R720050
Surr: 2-Bromobenzotrifluoride	127		47-153	%	03-SEP-08	04-SEP-08	YZH	R720050
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Trace Metals</b>								
Silver (Ag)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)	<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
676397-13 08MW16								
Sampled By: JACK on 29-AUG-08 @ 16:00								
Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Trace Metals</b>								
Boron (B)	0.07		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)	0.064		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)	0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)	0.003		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)	0.003		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)	0.446		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)	0.013		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)	0.0179		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)	0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)	0.0092		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.015		0.002	mg/L		04-SEP-08	SYF	R718417
Iron (Fe)-Dissolved	<0.005		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)-Dissolved	1.58		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
<b>Routine Water Analysis</b>								
<b>Chloride (Cl)</b>								
Chloride (Cl)	2		1	mg/L		02-SEP-08	KFA	R717243
<b>ICP metals and SO4 for routine water</b>								
Calcium (Ca)	132		0.5	mg/L		02-SEP-08	EOC	R717578
Potassium (K)	2.2		0.5	mg/L		02-SEP-08	EOC	R717578
Magnesium (Mg)	27.9		0.1	mg/L		02-SEP-08	EOC	R717578
Sodium (Na)	4		1	mg/L		02-SEP-08	EOC	R717578
Sulfate (SO4)	52.3		0.5	mg/L		02-SEP-08	EOC	R717578
<b>Ion Balance Calculation</b>								
Ion Balance	93.5			%		03-SEP-08		
TDS (Calculated)	478			mg/L		03-SEP-08		
Hardness (as CaCO3)	444			mg/L		03-SEP-08		
Nitrate+Nitrite-N	<0.1		0.1	mg/L		02-SEP-08	JXD	R717354
Nitrate-N	<0.1		0.1	mg/L		02-SEP-08	JXD	R717354
Nitrite-N	<0.05		0.05	mg/L		02-SEP-08	JXD	R717354
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.6		0.1	pH		02-SEP-08	CLTT	R717081
Conductivity (EC)	834		0.2	uS/cm		02-SEP-08	CLTT	R717081
Bicarbonate (HCO3)	525		5	mg/L		02-SEP-08	CLTT	R717081
Carbonate (CO3)	<5		5	mg/L		02-SEP-08	CLTT	R717081
Hydroxide (OH)	<5		5	mg/L		02-SEP-08	CLTT	R717081
Alkalinity, Total (as CaCO3)	430		5	mg/L		02-SEP-08	CLTT	R717081
676397-14 08MW18								
Sampled By: JACK on 29-AUG-08 @ 16:30								
Matrix: WATER								

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-14 08MW18								
Sampled By: JACK on 29-AUG-08 @ 16:30								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Toluene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
EthylBenzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Xylenes	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1(C6-C10)	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1-BTEX	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
<b>F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.2	DLHS	0.2	mg/L	03-SEP-08	04-SEP-08	YZH	R720050
Surr: 2-Bromobenzotrifluoride	115		47-153	%	03-SEP-08	04-SEP-08	YZH	R720050
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Trace Metals</b>								
Silver (Ag)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)	<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)	0.09		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)	0.060		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)	0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)	0.004		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)	0.432		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)	0.005		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)	0.0287		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)	0.0071		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.015		0.002	mg/L		04-SEP-08	SYF	R718417
Iron (Fe)-Dissolved	<0.005		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)-Dissolved	0.045		0.001	mg/L		04-SEP-08	BOC	R718461
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
<b>Routine Water Analysis</b>								
<b>Chloride (Cl)</b>								
Chloride (Cl)	3		1	mg/L		02-SEP-08	KFA	R717243
<b>ICP metals and SO4 for routine water</b>								
Calcium (Ca)	157		0.5	mg/L		02-SEP-08	EOC	R717578
Potassium (K)	1.9		0.5	mg/L		02-SEP-08	EOC	R717578
Magnesium (Mg)	33.7		0.1	mg/L		02-SEP-08	EOC	R717578
Sodium (Na)	7		1	mg/L		02-SEP-08	EOC	R717578
Sulfate (SO4)	80.0		0.5	mg/L		02-SEP-08	EOC	R717578
<b>Ion Balance Calculation</b>								
Ion Balance	99.9			%		03-SEP-08		
TDS (Calculated)	561			mg/L		03-SEP-08		
Hardness (as CaCO3)	531			mg/L		03-SEP-08		

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-14	08MW18								
Sampled By:	JACK on 29-AUG-08 @ 16:30								
Matrix:	WATER								
<b>Routine Water Analysis</b>									
Nitrate+Nitrite-N		0.6		0.1	mg/L		02-SEP-08	JXD	R717354
Nitrate-N		0.6		0.1	mg/L		02-SEP-08	JXD	R717354
Nitrite-N		<0.05		0.05	mg/L		02-SEP-08	JXD	R717354
<b>pH, Conductivity and Total Alkalinity</b>									
pH		7.6		0.1	pH		02-SEP-08	CLTT	R717081
Conductivity (EC)		959		0.2	uS/cm		02-SEP-08	CLTT	R717081
Bicarbonate (HCO3)		560		5	mg/L		02-SEP-08	CLTT	R717081
Carbonate (CO3)		<5		5	mg/L		02-SEP-08	CLTT	R717081
Hydroxide (OH)		<5		5	mg/L		02-SEP-08	CLTT	R717081
Alkalinity, Total (as CaCO3)		459		5	mg/L		02-SEP-08	CLTT	R717081
676397-15	08MW20								
Sampled By:	JACK on 29-AUG-08 @ 17:30								
Matrix:	WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>									
<b>BTEX and F1 (C6-C10)</b>									
Benzene		<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Toluene		<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
EthylBenzene		<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Xylenes		<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1(C6-C10)		<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1-BTEX		<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
<b>F2 (&gt;C10-C16)</b>									
F2 (>C10-C16)		<0.2	DLHS	0.2	mg/L	03-SEP-08	04-SEP-08	YZH	R720050
Surr:	2-Bromobenzotrifluoride	102		47-153	%	03-SEP-08	04-SEP-08	YZH	R720050
<b>Dissolved Metals - CCME</b>									
<b>Dissolved Trace Metals</b>									
Silver (Ag)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)		<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)		0.0015		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)		0.342		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)		0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)		0.003		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)		0.481		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)		<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)		0.005		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)		<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)		0.0028		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)		<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)		<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)		0.0035		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)		<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)		0.017		0.002	mg/L		04-SEP-08	SYF	R718417
Iron (Fe)-Dissolved		2.63		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)-Dissolved		0.598		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Mercury (Hg) - Dissolved</b>									

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-15 08MW20 Sampled By: JACK on 29-AUG-08 @ 17:30 Matrix: WATER <b>Dissolved Metals - CCME</b> <b>Mercury (Hg) - Dissolved</b> Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
<b>Routine Water Analysis</b> <b>Chloride (Cl)</b> Chloride (Cl)	3		1	mg/L		02-SEP-08	KFA	R717243
<b>ICP metals and SO4 for routine water</b> Calcium (Ca)	98.6		0.5	mg/L		02-SEP-08	EOC	R717578
Potassium (K)	2.0		0.5	mg/L		02-SEP-08	EOC	R717578
Magnesium (Mg)	27.9		0.1	mg/L		02-SEP-08	EOC	R717578
Sodium (Na)	5		1	mg/L		02-SEP-08	EOC	R717578
Sulfate (SO4)	44.5		0.5	mg/L		02-SEP-08	EOC	R717578
<b>Ion Balance Calculation</b> Ion Balance	103			%		03-SEP-08		
TDS (Calculated)	370			mg/L		03-SEP-08		
Hardness (as CaCO3)	361			mg/L		03-SEP-08		
Nitrate+Nitrite-N	0.2		0.1	mg/L		02-SEP-08	JXD	R717354
Nitrate-N	0.2		0.1	mg/L		02-SEP-08	JXD	R717354
Nitrite-N	<0.05		0.05	mg/L		02-SEP-08	JXD	R717354
<b>pH, Conductivity and Total Alkalinity</b> pH	7.9		0.1	pH		02-SEP-08	CLTT	R717081
Conductivity (EC)	658		0.2	uS/cm		02-SEP-08	CLTT	R717081
Bicarbonate (HCO3)	383		5	mg/L		02-SEP-08	CLTT	R717081
Carbonate (CO3)	<5		5	mg/L		02-SEP-08	CLTT	R717081
Hydroxide (OH)	<5		5	mg/L		02-SEP-08	CLTT	R717081
Alkalinity, Total (as CaCO3)	314		5	mg/L		02-SEP-08	CLTT	R717081
676397-16 08MW21 Sampled By: JACK on 29-AUG-08 @ 18:00 Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b> Benzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Toluene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
EthylBenzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Xylenes	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1(C6-C10)	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1-BTEX	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
<b>F2 (&gt;C10-C16)</b> F2 (>C10-C16)	<0.2	DLHS	0.2	mg/L	03-SEP-08	04-SEP-08	YZH	R720050
Surr: 2-Bromobenzotrifluoride	107		47-153	%	03-SEP-08	04-SEP-08	YZH	R720050
<b>Dissolved Metals - CCME</b> <b>Dissolved Major Metals</b> Calcium (Ca)	109		0.5	mg/L		03-SEP-08	BOC	R717793
Potassium (K)	3.7		0.1	mg/L		03-SEP-08	BOC	R717793
Magnesium (Mg)	30.4		0.01	mg/L		03-SEP-08	BOC	R717793
Sodium (Na)	9.3		0.5	mg/L		03-SEP-08	BOC	R717793
Iron (Fe)	0.007		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)	0.036		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b> Silver (Ag)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)	0.10		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-16 08MW21								
Sampled By: JACK on 29-AUG-08 @ 18:00								
Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Trace Metals</b>								
Boron (B)	0.06		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)	0.434		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)	0.004		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)	0.429		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)	0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)	0.0002		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)	0.0031		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)	0.0036		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.015		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
676397-17 08MW22								
Sampled By: JACK on 29-AUG-08 @ 18:30								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Toluene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
EthylBenzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Xylenes	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1(C6-C10)	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1-BTEX	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
<b>F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.2	DLHS	0.2	mg/L	03-SEP-08	04-SEP-08	YZH	R720050
Surr: 2-Bromobenzotrifluoride	114		47-153	%	03-SEP-08	04-SEP-08	YZH	R720050
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Trace Metals</b>								
Silver (Ag)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)	<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)	0.360		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)	0.004		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)	0.430		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)	0.004		0.002	mg/L		04-SEP-08	SYF	R718417

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-17 08MW22								
Sampled By: JACK on 29-AUG-08 @ 18:30								
Matrix: WATER								
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Trace Metals</b>								
Lead (Pb)	0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)	0.0051		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)	0.0042		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.018		0.002	mg/L		04-SEP-08	SYF	R718417
Iron (Fe)-Dissolved	<0.005		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)-Dissolved	0.157		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
<b>Routine Water Analysis</b>								
<b>Chloride (Cl)</b>								
Chloride (Cl)	4		1	mg/L		02-SEP-08	KFA	R717243
<b>ICP metals and SO4 for routine water</b>								
Calcium (Ca)	102		0.5	mg/L		02-SEP-08	EOC	R717578
Potassium (K)	2.4		0.5	mg/L		02-SEP-08	EOC	R717578
Magnesium (Mg)	27.9		0.1	mg/L		02-SEP-08	EOC	R717578
Sodium (Na)	6		1	mg/L		02-SEP-08	EOC	R717578
Sulfate (SO4)	44.6		0.5	mg/L		02-SEP-08	EOC	R717578
<b>Ion Balance Calculation</b>								
Ion Balance	94.2			%		03-SEP-08		
TDS (Calculated)	405			mg/L		03-SEP-08		
Hardness (as CaCO3)	370			mg/L		03-SEP-08		
Nitrate+Nitrite-N	1.6		0.1	mg/L		02-SEP-08	JXD	R717354
Nitrate-N	1.6		0.1	mg/L		02-SEP-08	JXD	R717354
Nitrite-N	<0.05		0.05	mg/L		02-SEP-08	JXD	R717354
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.8		0.1	pH		02-SEP-08	CLTT	R717081
Conductivity (EC)	722		0.2	uS/cm		02-SEP-08	CLTT	R717081
Bicarbonate (HCO3)	429		5	mg/L		02-SEP-08	CLTT	R717081
Carbonate (CO3)	<5		5	mg/L		02-SEP-08	CLTT	R717081
Hydroxide (OH)	<5		5	mg/L		02-SEP-08	CLTT	R717081
Alkalinity, Total (as CaCO3)	352		5	mg/L		02-SEP-08	CLTT	R717081
676397-18 08MW23								
Sampled By: JACK on 29-AUG-08 @ 19:00								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Toluene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
EthylBenzene	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
Xylenes	<0.00050		0.00050	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1(C6-C10)	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
F1-BTEX	<0.1		0.1	mg/L	02-SEP-08	02-SEP-08	DDU	R717545
<b>F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.2	DLHS	0.2	mg/L	03-SEP-08	04-SEP-08	YZH	R720050

## ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
676397-18 08MW23 Sampled By: JACK on 29-AUG-08 @ 19:00 Matrix: WATER BTEX, F1 (C6-C10) and F2 (>C10-C16) F2 (>C10-C16) Surr: 2-Bromobenzotrifluoride	114		47-153	%	03-SEP-08	04-SEP-08	YZH	R720050
<b>Dissolved Metals - CCME</b>								
<b>Dissolved Major Metals</b>								
Calcium (Ca)	105		0.5	mg/L		03-SEP-08	BOC	R717793
Potassium (K)	3.6		0.1	mg/L		03-SEP-08	BOC	R717793
Magnesium (Mg)	28.3		0.01	mg/L		03-SEP-08	BOC	R717793
Sodium (Na)	8.4		0.5	mg/L		03-SEP-08	BOC	R717793
Iron (Fe)	<0.005		0.005	mg/L		03-SEP-08	BOC	R717793
Manganese (Mn)	0.176		0.001	mg/L		03-SEP-08	BOC	R717793
<b>Dissolved Trace Metals</b>								
Silver (Ag)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Aluminum (Al)	<0.01		0.01	mg/L		04-SEP-08	SYF	R718417
Arsenic (As)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Boron (B)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Barium (Ba)	0.344		0.003	mg/L		04-SEP-08	SYF	R718417
Beryllium (Be)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Cadmium (Cd)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Cobalt (Co)	<0.002		0.002	mg/L		04-SEP-08	SYF	R718417
Chromium (Cr)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Copper (Cu)	0.004		0.001	mg/L		04-SEP-08	SYF	R718417
Lithium (Li)	0.445		0.003	mg/L		04-SEP-08	SYF	R718417
Molybdenum (Mo)	<0.005		0.005	mg/L		04-SEP-08	SYF	R718417
Nickel (Ni)	0.004		0.002	mg/L		04-SEP-08	SYF	R718417
Lead (Pb)	0.0003		0.0001	mg/L		04-SEP-08	SYF	R718417
Antimony (Sb)	<0.0004		0.0004	mg/L		04-SEP-08	SYF	R718417
Selenium (Se)	0.0030		0.0004	mg/L		04-SEP-08	SYF	R718417
Tin (Sn)	<0.05		0.05	mg/L		04-SEP-08	SYF	R718417
Titanium (Ti)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Thallium (Tl)	<0.0001		0.0001	mg/L		04-SEP-08	SYF	R718417
Uranium (U)	0.0040		0.0001	mg/L		04-SEP-08	SYF	R718417
Vanadium (V)	<0.001		0.001	mg/L		04-SEP-08	SYF	R718417
Zinc (Zn)	0.015		0.002	mg/L		04-SEP-08	SYF	R718417
<b>Mercury (Hg) - Dissolved</b>								
Mercury (Hg)-Dissolved	<0.00010		0.00010	mg/L		08-SEP-08	DEO	R719896
676397-19 08MW21D Sampled By: JACK on 29-AUG-08 @ 18:20 Matrix: WATER BTEX, F1 (C6-C10) and F2 (>C10-C16) BTEX and F1 (C6-C10) Benzene Toluene EthylBenzene Xylenes F1(C6-C10) F1-BTEX F2 (>C10-C16) F2 (>C10-C16) Surr: 2-Bromobenzotrifluoride	<0.00050 <0.00050 <0.00050 <0.00050 <0.1 <0.1 <0.2 109		0.00050 0.00050 0.00050 0.00050 0.1 0.1 0.2 47-153	mg/L mg/L mg/L mg/L mg/L mg/L mg/L %	02-SEP-08 02-SEP-08 02-SEP-08 02-SEP-08 02-SEP-08 02-SEP-08 03-SEP-08 03-SEP-08	02-SEP-08 02-SEP-08 02-SEP-08 02-SEP-08 02-SEP-08 02-SEP-08 04-SEP-08 04-SEP-08	DDU DDU DDU DDU DDU DDU YZH YZH	R717545 R717545 R717545 R717545 R717545 R717545 R720050 R720050

# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
<b>676397-21 TB1</b> Sampled By: JACK Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b> Benzene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 Toluene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 EthylBenzene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 Xylenes <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 F1(C6-C10) <0.1 0.1 mg/L 05-SEP-08 05-SEP-08 SPA R719255 F1-BTEX <0.1 0.1 mg/L 05-SEP-08 05-SEP-08 SPA R719255 <b>F2 (&gt;C10-C16)</b> F2 (>C10-C16) <0.05 0.05 mg/L 03-SEP-08 04-SEP-08 YZH R719935 Surr: 2-Bromobenzotrifluoride 89 47-153 % 03-SEP-08 04-SEP-08 YZH R719935								
<b>676397-22 TB2</b> Sampled By: JACK Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b> Benzene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 Toluene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 EthylBenzene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 Xylenes <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 F1(C6-C10) <0.1 0.1 mg/L 05-SEP-08 05-SEP-08 SPA R719255 F1-BTEX <0.1 0.1 mg/L 05-SEP-08 05-SEP-08 SPA R719255 <b>F2 (&gt;C10-C16)</b> F2 (>C10-C16) <0.05 0.05 mg/L 03-SEP-08 04-SEP-08 YZH R719935 Surr: 2-Bromobenzotrifluoride 87 47-153 % 03-SEP-08 04-SEP-08 YZH R719935								
<b>676397-23 TB3</b> Sampled By: JACK Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b> Benzene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 Toluene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 EthylBenzene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 Xylenes <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 F1(C6-C10) <0.1 0.1 mg/L 05-SEP-08 05-SEP-08 SPA R719255 F1-BTEX <0.1 0.1 mg/L 05-SEP-08 05-SEP-08 SPA R719255 <b>F2 (&gt;C10-C16)</b> F2 (>C10-C16) <0.05 0.05 mg/L 03-SEP-08 04-SEP-08 YZH R719935 Surr: 2-Bromobenzotrifluoride 89 47-153 % 03-SEP-08 04-SEP-08 YZH R719935								
<b>676397-24 FB1</b> Sampled By: JACK Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b> Benzene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 Toluene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 EthylBenzene <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 Xylenes <0.00050 0.00050 mg/L 05-SEP-08 05-SEP-08 SPA R719255 F1(C6-C10) <0.1 0.1 mg/L 05-SEP-08 05-SEP-08 SPA R719255								

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

## Reference Information

## Sample Parameter Qualifier key listed:

Qualifier	Description
DLHS	Detection Limit Adjusted: Insufficient volume; sample contains high sediment limiting volume analyzed.
RAMB	Result Adjusted For Method Blank

## Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Preparation Method Reference(Based On)	Analytical Method Reference(Based On)
BTX,F1-ED	Water	BTEX and F1 (C6-C10)	EPA 5030	EPA 5030/8015&8260-P&T GC-MS & FID
CL-ED	Water	Chloride (Cl)		APHA 4500 Cl E-Colorimetry
ETL-ROUTINE-ICP-ED	Water	ICP metals and SO4 for routine water		APHA 3120 B-ICP-OES
F2-ED	Water	F2 (>C10-C16)		EPA 3510/CCME PHC CWS-GC-FID
FE-DIS-ED	Water	Iron (Fe)-Dissolved		EPA 200.7
HG-D-CVAA-ED	Water	Mercury (Hg) - Dissolved		EPA 245.7 / EPA 245.1
IONBALANCE-ED	Water	Ion Balance Calculation		APHA 1030E
MET1-DIS-CCME-ED	Water	Dissolved Trace Metals		EPA 6020
MET2-DIS-ED	Water	Dissolved Major Metals		EPA 200.7
MN-DIS-ED	Water	Manganese (Mn)-Dissolved		EPA 200.7
N2N3-ED	Water	Nitrate+Nitrite-N		APHA 4500 NO3-H - COLORIMETRY
NO2-ED	Water	Nitrite-N		APHA 4500 NO2B-Colorimetry
NO3-ED	Water	Nitrate-N		APHA 4500 NO3H-Colorimetry
PAH-CCME-ED	Water	CCME PAHs	EPA 3510	EPA 3510/8270-GC/MS
PH/EC/ALK-ED	Water	pH, Conductivity and Total Alkalinity		APHA 4500-H, 2510, 2320
VOC-CLALI-CCME-ED	Water	CCME Chlorinated Aliphatics	EPA 5030	EPA 5021/8260-GC-MS
VOC-MAH-CCME-ED	Water	CCME monoaromatic hydrocarbons	EPA 5030	EPA 5021/8260-GC-MS

\*\* Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.

## Chain of Custody numbers:

08-042155                      08-042156

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA		

## Reference Information

### GLOSSARY OF REPORT TERMS

*Surr* - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in environmental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.

The reported surrogate recovery value provides a measure of method efficiency. The Laboratory control limits are determined under column heading D.L.

mg/kg (units) - unit of concentration based on mass, parts per million.

mg/L (units) - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

*Test results reported relate only to the samples as received by the laboratory.*

*UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.*

*UNLESS OTHERWISE STATED, SAMPLES ARE NOT CORRECTED FOR CLIENT FIELD BLANKS.*

*Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.*

*ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.*



Environmental Division

## ALS Laboratory Group Quality Control Report

Workorder: L676397

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**Client:** EBA ENG CONSULTANTS LTD  
115, 200 RIVERCREST DR SE  
CALGARY AB T2C 2X5  
**Contact:** BRIAN TSANG

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTX,F1-ED Water								
<b>Batch</b>	<b>R717545</b>							
<b>WG828508-2</b>	<b>LCS</b>							
Benzene			79		%		37-114	02-SEP-08
Toluene			87		%		38-115	02-SEP-08
EthylBenzene			85		%		38-109	02-SEP-08
Xylenes			86		%		35-112	02-SEP-08
F1(C6-C10)			67		%		21-187	02-SEP-08
<b>WG828508-1</b>	<b>MB</b>							
Benzene			<0.00050		mg/L		0.0005	02-SEP-08
Toluene			<0.00050		mg/L		0.0005	02-SEP-08
EthylBenzene			<0.00050		mg/L		0.0005	02-SEP-08
Xylenes			<0.00050		mg/L		0.0005	02-SEP-08
F1(C6-C10)			<0.1		mg/L		0.1	02-SEP-08
<b>WG828117-2</b>	<b>MS</b>	<b>L676397-18</b>						
Benzene			76		%		26-114	02-SEP-08
Toluene			86		%		29-113	02-SEP-08
EthylBenzene			84		%		28-107	02-SEP-08
Xylenes			84		%		28-105	02-SEP-08
<b>WG828117-3</b>	<b>MS</b>	<b>L676397-18</b>						
F1(C6-C10)			70		%		33-158	02-SEP-08
<b>Batch</b>	<b>R719255</b>							
<b>WG830345-1</b>	<b>DUP</b>	<b>L676397-23</b>						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	05-SEP-08
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	32	05-SEP-08
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	24	05-SEP-08
Xylenes		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	05-SEP-08
F1(C6-C10)		<0.1	<0.1	RPD-NA	mg/L	N/A	24	05-SEP-08
<b>WG830571-2</b>	<b>LCS</b>							
Benzene			79		%		37-114	05-SEP-08
Toluene			80		%		38-115	05-SEP-08
EthylBenzene			71		%		38-109	05-SEP-08
Xylenes			74		%		35-112	05-SEP-08
F1(C6-C10)			73		%		21-187	05-SEP-08
<b>WG830571-1</b>	<b>MB</b>							
Benzene			<0.00050		mg/L		0.0005	05-SEP-08
Toluene			<0.00050		mg/L		0.0005	05-SEP-08
EthylBenzene			<0.00050		mg/L		0.0005	05-SEP-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTX,F1-ED Water								
Batch	R719255							
WG830571-1	MB							
Xylenes			<0.00050		mg/L		0.0005	05-SEP-08
F1(C6-C10)			<0.1		mg/L		0.1	05-SEP-08
WG830345-2	MS	L677126-3						
Benzene			95		%		26-114	05-SEP-08
Toluene			75		%		29-113	05-SEP-08
EthylBenzene			52		%		28-107	05-SEP-08
Xylenes			55		%		28-105	05-SEP-08
WG830345-3	MS	L677126-3						
F1(C6-C10)			39		%		33-158	05-SEP-08
CL-ED Water								
Batch	R717243							
WG827860-2	LCS							
Chloride (Cl)			101		%		94-109	02-SEP-08
WG827860-3	LCS							
Chloride (Cl)			102		%		93-113	02-SEP-08
WG827860-1	MB							
Chloride (Cl)			<1		mg/L		1	02-SEP-08
WG827860-5	MS	L676390-28						
Chloride (Cl)			108		%		87-117	02-SEP-08
WG827860-7	MS	L676414-5						
Chloride (Cl)			106		%		87-117	02-SEP-08
ETL-ROUTINE-ICP-ED Water								
Batch	R717578							
WG828028-3	CRM	ION-915 WATER						
Calcium (Ca)			103		%		96-116	02-SEP-08
Magnesium (Mg)			105		%		91-113	02-SEP-08
Sulfate (SO4)			106		%		87-118	02-SEP-08
WG828028-2	LCS							
Calcium (Ca)			101		%		86-106	02-SEP-08
Potassium (K)			99		%		86-106	02-SEP-08
Magnesium (Mg)			108		%		88-108	02-SEP-08
Sodium (Na)			101		%		86-106	02-SEP-08
WG828028-1	MB							
Calcium (Ca)			<0.5		mg/L		2.5	02-SEP-08
Potassium (K)			<0.5		mg/L		2.5	02-SEP-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ETL-ROUTINE-ICP-ED		Water						
Batch	R717578							
WG828028-1	MB							
Magnesium (Mg)			<0.1		mg/L		0.5	02-SEP-08
Sodium (Na)			<1		mg/L		5	02-SEP-08
Sulfate (SO4)			<0.5		mg/L		2.5	02-SEP-08
WG828028-5	MS	L676390-20						
Calcium (Ca)			102		%		88-116	02-SEP-08
Potassium (K)			96		%		83-115	02-SEP-08
Magnesium (Mg)			97		%		91-117	02-SEP-08
Sodium (Na)			99		%		81-116	02-SEP-08
Sulfate (SO4)			94		%		82-111	02-SEP-08
WG828028-7	MS	L676390-40						
Calcium (Ca)			93		%		88-116	02-SEP-08
Potassium (K)			94		%		83-115	02-SEP-08
Magnesium (Mg)			97		%		91-117	02-SEP-08
Sodium (Na)			96		%		81-116	02-SEP-08
Sulfate (SO4)			94		%		82-111	02-SEP-08
WG828028-9	MS	L676519-6						
Calcium (Ca)			96		%		88-116	02-SEP-08
Potassium (K)			92		%		83-115	02-SEP-08
Magnesium (Mg)			97		%		91-117	02-SEP-08
Sodium (Na)			95		%		81-116	02-SEP-08
Sulfate (SO4)			93		%		82-111	02-SEP-08
F2-ED		Water						
Batch	R719935							
WG830348-3	DUP	L676397-22						
F2 (>C10-C16)		<0.05	<0.05	RPD-NA	mg/L	N/A	46	04-SEP-08
WG830348-2	LCS							
F2 (>C10-C16)			83		%		38-152	04-SEP-08
WG830348-1	MB							
F2 (>C10-C16)			<0.05		mg/L		0.05	04-SEP-08
Batch	R720050							
WG830057-2	LCS							
F2 (>C10-C16)			81		%		38-152	04-SEP-08
WG830057-1	MB							
F2 (>C10-C16)			<0.05		mg/L		0.05	04-SEP-08
FE-DIS-ED		Water						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
FE-DIS-ED									
Water									
Batch	R717793								
WG828652-2	CRM	EU-H-2 OPTWATER							
Iron (Fe)-Dissolved			107		%		80-120	03-SEP-08	
WG828652-1	MB								
Iron (Fe)-Dissolved			<0.005		mg/L		0.005	03-SEP-08	
HG-D-CVAA-ED									
Water									
Batch	R719896								
WG830918-4	DUP	L676397-8							
Mercury (Hg)-Dissolved			<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	08-SEP-08
WG830918-2	LCS								
Mercury (Hg)-Dissolved			91		%		80-120	08-SEP-08	
WG830918-3	LCSD	WG830918-2							
Mercury (Hg)-Dissolved			91	91	%	1.0	20	08-SEP-08	
WG830918-1	MB								
Mercury (Hg)-Dissolved			<0.00010		mg/L		0.0001	08-SEP-08	
WG830918-5	MS	L676397-8							
Mercury (Hg)-Dissolved			93		%		70-130	08-SEP-08	
MET1-DIS-CCME-ED									
Water									
Batch	R718417								
WG828560-2	CRM	1643E WATER							
Aluminum (Al)			97		%		80-120	03-SEP-08	
Arsenic (As)			98		%		80-120	03-SEP-08	
Boron (B)			98		%		80-120	03-SEP-08	
Barium (Ba)			98		%		80-120	03-SEP-08	
Beryllium (Be)			96		%		80-120	03-SEP-08	
Cadmium (Cd)			102		%		80-120	03-SEP-08	
Cobalt (Co)			98		%		80-120	03-SEP-08	
Chromium (Cr)			100		%		80-120	03-SEP-08	
Copper (Cu)			101		%		80-120	03-SEP-08	
Lithium (Li)			100		%		80-120	03-SEP-08	
Molybdenum (Mo)			103		%		80-120	03-SEP-08	
Nickel (Ni)			93		%		80-120	03-SEP-08	
Lead (Pb)			105		%		80-120	03-SEP-08	
Antimony (Sb)			102		%		80-120	03-SEP-08	
Selenium (Se)			102		%		80-120	03-SEP-08	
Thallium (Tl)			103		%		80-120	03-SEP-08	
Vanadium (V)			99		%		80-120	03-SEP-08	

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET1-DIS-CCME-ED		Water						
<b>Batch</b>	<b>R718417</b>							
<b>WG828560-2</b>	<b>CRM</b>	<b>1643E WATER</b>						
Zinc (Zn)			103		%		80-120	03-SEP-08
<b>WG828560-3</b>	<b>DUP</b>	<b>L676397-10</b>						
Silver (Ag)		<0.0001	<0.0001	RPD-NA	mg/L	N/A	26	04-SEP-08
Aluminum (Al)		<0.01	<0.01	RPD-NA	mg/L	N/A	14	04-SEP-08
Arsenic (As)		<0.0004	<0.0004	RPD-NA	mg/L	N/A	10	04-SEP-08
Boron (B)		<0.05	<0.05	RPD-NA	mg/L	N/A	10	04-SEP-08
Barium (Ba)		0.428	0.434		mg/L	1.3	9.8	04-SEP-08
Beryllium (Be)		<0.001	<0.001	RPD-NA	mg/L	N/A	10	04-SEP-08
Cadmium (Cd)		<0.0001	<0.0001	RPD-NA	mg/L	N/A	12	04-SEP-08
Cobalt (Co)		<0.002	<0.002	RPD-NA	mg/L	N/A	6.7	04-SEP-08
Chromium (Cr)		<0.005	<0.005	RPD-NA	mg/L	N/A	16	04-SEP-08
Copper (Cu)		0.003	0.003	J	mg/L	0.000	0.004	04-SEP-08
Lithium (Li)		0.393	0.399		mg/L	1.5	10	04-SEP-08
Molybdenum (Mo)		<0.005	<0.005	RPD-NA	mg/L	N/A	9.7	04-SEP-08
Nickel (Ni)		0.002	0.003	J	mg/L	0.001	0.008	04-SEP-08
Lead (Pb)		<0.0001	<0.0001	RPD-NA	mg/L	N/A	10	04-SEP-08
Antimony (Sb)		<0.0004	<0.0004	RPD-NA	mg/L	N/A	9.8	04-SEP-08
Selenium (Se)		0.0214	0.0211		mg/L	1.3	15	04-SEP-08
Tin (Sn)		<0.05	<0.05	RPD-NA	mg/L	N/A	10	04-SEP-08
Titanium (Ti)		<0.001	<0.001	RPD-NA	mg/L	N/A	22	04-SEP-08
Thallium (Tl)		<0.0001	<0.0001	RPD-NA	mg/L	N/A	11	04-SEP-08
Uranium (U)		0.0040	0.0040		mg/L	0.53	10	04-SEP-08
Vanadium (V)		<0.001	<0.001	RPD-NA	mg/L	N/A	23	04-SEP-08
Zinc (Zn)		0.013	0.014	J	mg/L	0.001	0.008	04-SEP-08
<b>WG828560-1</b>	<b>MB</b>							
Silver (Ag)			<0.0001		mg/L		0.0005	03-SEP-08
Aluminum (Al)			<0.01		mg/L		0.05	03-SEP-08
Arsenic (As)			<0.0004		mg/L		0.002	03-SEP-08
Boron (B)			<0.05		mg/L		0.25	03-SEP-08
Barium (Ba)			<0.003		mg/L		0.015	03-SEP-08
Beryllium (Be)			<0.001		mg/L		0.001	03-SEP-08
Cadmium (Cd)			<0.0001		mg/L		0.0005	03-SEP-08
Cobalt (Co)			<0.002		mg/L		0.01	03-SEP-08
Chromium (Cr)			<0.005		mg/L		0.025	03-SEP-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET1-DIS-CCME-ED	Water							
<b>Batch</b>	<b>R718417</b>							
<b>WG828560-1</b>	<b>MB</b>							
Copper (Cu)			<0.001		mg/L		0.005	03-SEP-08
Lithium (Li)			<0.003		mg/L		0.015	03-SEP-08
Molybdenum (Mo)			<0.005		mg/L		0.025	03-SEP-08
Nickel (Ni)			<0.002		mg/L		0.01	03-SEP-08
Lead (Pb)			<0.0001		mg/L		0.0005	03-SEP-08
Antimony (Sb)			<0.0004		mg/L		0.002	03-SEP-08
Selenium (Se)			<0.0004		mg/L		0.002	03-SEP-08
Tin (Sn)			<0.05		mg/L		0.25	03-SEP-08
Titanium (Ti)			<0.001		mg/L		0.005	03-SEP-08
Thallium (Tl)			<0.0001		mg/L		0.0005	03-SEP-08
Uranium (U)			<0.0001		mg/L		0.0005	03-SEP-08
Vanadium (V)			<0.001		mg/L		0.005	03-SEP-08
Zinc (Zn)			<0.002		mg/L		0.01	03-SEP-08
<b>WG828560-4</b>	<b>MS</b>	<b>L676397-10</b>						
Silver (Ag)			92		%		22-143	04-SEP-08
Aluminum (Al)			99		%		79-120	04-SEP-08
Arsenic (As)			95		%		90-113	04-SEP-08
Boron (B)			98		%		75-121	04-SEP-08
Beryllium (Be)			103		%		76-125	04-SEP-08
Cadmium (Cd)			100		%		86-112	04-SEP-08
Cobalt (Co)			91		%		86-113	04-SEP-08
Chromium (Cr)			99		%		80-113	04-SEP-08
Copper (Cu)			92		%		88-108	04-SEP-08
Molybdenum (Mo)			96		%		81-116	04-SEP-08
Nickel (Ni)			95		%		86-110	04-SEP-08
Lead (Pb)			97		%		86-116	04-SEP-08
Antimony (Sb)			102		%		85-116	04-SEP-08
Selenium (Se)			103		%		82-127	04-SEP-08
Tin (Sn)			100		%		91-118	04-SEP-08
Titanium (Ti)			99		%		85-118	04-SEP-08
Thallium (Tl)			99		%		84-118	04-SEP-08
Uranium (U)			98		%		85-124	04-SEP-08
Vanadium (V)			99		%		86-115	04-SEP-08
Zinc (Zn)			102		%		74-125	04-SEP-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET2-DIS-ED		Water						
Batch R717793								
WG828652-2 CRM		EU-H-2 OPTWATER						
Calcium (Ca)			103		%		80-120	03-SEP-08
Potassium (K)			101		%		80-120	03-SEP-08
Magnesium (Mg)			104		%		80-120	03-SEP-08
Sodium (Na)			105		%		80-120	03-SEP-08
Iron (Fe)			107		%		80-120	03-SEP-08
Manganese (Mn)			109		%		80-120	03-SEP-08
WG828652-3 DUP		L676397-5						
Calcium (Ca)		114	110		mg/L	3.5	12	03-SEP-08
Potassium (K)		3.8	3.6		mg/L	3.0	11	03-SEP-08
Magnesium (Mg)		29.0	28.4		mg/L	2.1	9.5	03-SEP-08
Sodium (Na)		10.7	10.5		mg/L	1.8	10	03-SEP-08
Iron (Fe)		1.51	1.47		mg/L	2.8	9.8	03-SEP-08
Manganese (Mn)		0.636	0.621		mg/L	2.3	10	03-SEP-08
WG828652-1 MB								
Calcium (Ca)			<0.5		mg/L		2.5	03-SEP-08
Potassium (K)			<0.1		mg/L		0.5	03-SEP-08
Magnesium (Mg)			<0.01		mg/L		0.05	03-SEP-08
Sodium (Na)			<0.5		mg/L		2.5	03-SEP-08
Iron (Fe)			<0.005		mg/L		0.025	03-SEP-08
Manganese (Mn)			<0.001		mg/L		0.005	03-SEP-08
WG828652-4 MS		L676397-5						
Calcium (Ca)			87	E	%		70-130	03-SEP-08
Potassium (K)			94		%		70-130	03-SEP-08
Magnesium (Mg)			100		%		70-130	03-SEP-08
Sodium (Na)			99		%		70-130	03-SEP-08
Iron (Fe)			104		%		70-130	03-SEP-08
Manganese (Mn)			100		%		70-130	03-SEP-08
WG828652-6 MS		L675927-1						
Calcium (Ca)			101		%		70-130	03-SEP-08
Potassium (K)			92		%		70-130	03-SEP-08
Magnesium (Mg)			93		%		70-130	03-SEP-08
Sodium (Na)			93		%		70-130	03-SEP-08
Iron (Fe)			105		%		70-130	03-SEP-08
Manganese (Mn)			104		%		70-130	03-SEP-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET2-DIS-ED		Water						
Batch	R717793							
WG828652-8	MS	L675929-1						
Calcium (Ca)			111		%		70-130	03-SEP-08
Potassium (K)			103		%		70-130	03-SEP-08
Magnesium (Mg)			102		%		70-130	03-SEP-08
Sodium (Na)			104		%		70-130	03-SEP-08
Iron (Fe)			115		%		70-130	03-SEP-08
Manganese (Mn)			113		%		70-130	03-SEP-08
Batch	R718461							
WG829266-2	CRM	EU-H-2 OPTWATER						
Calcium (Ca)			114		%		80-120	04-SEP-08
Magnesium (Mg)			115		%		80-120	04-SEP-08
Sodium (Na)			118		%		80-120	04-SEP-08
Potassium (K)			104		%		80-120	04-SEP-08
Iron (Fe)			101		%		80-120	04-SEP-08
Manganese (Mn)			103		%		80-120	04-SEP-08
WG829266-1	MB							
Calcium (Ca)			<0.5		mg/L		2.5	04-SEP-08
Potassium (K)			<0.1		mg/L		0.5	04-SEP-08
Magnesium (Mg)			<0.01		mg/L		0.05	04-SEP-08
Sodium (Na)			<0.5		mg/L		2.5	04-SEP-08
Iron (Fe)			<0.005		mg/L		0.025	04-SEP-08
Manganese (Mn)			<0.001		mg/L		0.005	04-SEP-08
WG829266-4	MS	L677011-1						
Calcium (Ca)			73	E	%		70-130	04-SEP-08
Potassium (K)			122		%		70-130	04-SEP-08
Magnesium (Mg)			106		%		70-130	04-SEP-08
Sodium (Na)			114		%		70-130	04-SEP-08
Iron (Fe)			114		%		70-130	04-SEP-08
Manganese (Mn)			110		%		70-130	04-SEP-08
MN-DIS-ED		Water						
Batch	R717793							
WG828652-2	CRM	EU-H-2 OPTWATER						
Manganese (Mn)-Dissolved			109		%		80-120	03-SEP-08
WG828652-1	MB							
Manganese (Mn)-Dissolved			<0.001		mg/L		0.001	03-SEP-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MN-DIS-ED		Water						
Batch	R718461							
WG829266-2	CRM	EU-H-2 OPTWATER						
Manganese (Mn)-Dissolved			103		%		80-120	04-SEP-08
WG829266-1	MB							
Manganese (Mn)-Dissolved			<0.001		mg/L		0.001	04-SEP-08
N2N3-ED		Water						
Batch	R717354							
WG827726-3	LCS							
Nitrate+Nitrite-N			101		%		87-113	02-SEP-08
WG827726-2	MB							
Nitrate+Nitrite-N			<0.1		mg/L		0.1	02-SEP-08
WG827726-5	MS	L676390-22						
Nitrate+Nitrite-N			98		%		84-118	02-SEP-08
WG827726-7	MS	L676414-5						
Nitrate+Nitrite-N			95		%		84-118	02-SEP-08
NO2-ED		Water						
Batch	R717354							
WG827726-3	LCS							
Nitrite-N			102		%		94-114	02-SEP-08
WG827726-2	MB							
Nitrite-N			<0.05		mg/L		0.05	02-SEP-08
WG827726-5	MS	L676390-22						
Nitrite-N			108		%		88-113	02-SEP-08
WG827726-7	MS	L676414-5						
Nitrite-N			105		%		88-113	02-SEP-08
PAH-CCME-ED		Water						
Batch	R718728							
WG828970-3	LCS							
Naphthalene			76		%		42-119	05-SEP-08
Quinoline			91		%		53-121	05-SEP-08
Acenaphthene			87		%		49-124	05-SEP-08
Fluorene			90		%		53-126	05-SEP-08
Phenanthrene			94		%		57-128	05-SEP-08
Anthracene			92		%		55-125	05-SEP-08
Acridine			96		%		56-127	05-SEP-08
Fluoranthene			96		%		55-129	05-SEP-08
Pyrene			95		%		54-131	05-SEP-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-CCME-ED		Water						
Batch	R718728							
WG828970-3	LCS							
Benzo(a)anthracene			96		%		58-129	05-SEP-08
Chrysene			94		%		62-128	05-SEP-08
Benzo(b&j)fluoranthene			96		%		56-129	05-SEP-08
Benzo(k)fluoranthene			91		%		56-129	05-SEP-08
Benzo(a)pyrene			95		%		47-132	05-SEP-08
Indeno(1,2,3-cd)pyrene			90		%		49-135	05-SEP-08
Dibenzo(a,h)anthracene			87		%		48-134	05-SEP-08
WG828970-2	MB							
Naphthalene			0.00001		mg/L		0.00001	05-SEP-08
Quinoline			<0.00001		mg/L		0.00001	05-SEP-08
Acenaphthene			0.00001		mg/L		0.00001	05-SEP-08
Fluorene			0.00002	A	mg/L		0.00001	05-SEP-08
Phenanthrene			0.00004	A	mg/L		0.00001	05-SEP-08
Anthracene			<0.00001		mg/L		0.00001	05-SEP-08
Acridine			<0.00001		mg/L		0.00001	05-SEP-08
Fluoranthene			<0.00001		mg/L		0.00001	05-SEP-08
Pyrene			<0.00001		mg/L		0.00001	05-SEP-08
Benzo(a)anthracene			<0.00001		mg/L		0.00001	05-SEP-08
Chrysene			<0.00001		mg/L		0.00001	05-SEP-08
Benzo(b&j)fluoranthene			<0.00001		mg/L		0.00001	05-SEP-08
Benzo(k)fluoranthene			<0.00001		mg/L		0.00001	05-SEP-08
Benzo(a)pyrene			<0.00001		mg/L		0.00001	05-SEP-08
Indeno(1,2,3-cd)pyrene			<0.00001		mg/L		0.00001	05-SEP-08
Dibenzo(a,h)anthracene			<0.00001		mg/L		0.00001	05-SEP-08

COMMENTS: Blank hits are less than 5 times the method detection limit and do not adversely affect data quality.

PH/EC/ALK-ED		Water						
Batch	R717081							
WG827577-5	DUP	L676397-13						
pH		7.6	7.6	J	pH	0.0	0.2	02-SEP-08
Conductivity (EC)		834	829		uS/cm	0.59	7.1	02-SEP-08
Bicarbonate (HCO3)		525	513		mg/L	2.2	26	02-SEP-08
Carbonate (CO3)		<5	<5	RPD-NA	mg/L	N/A	26	02-SEP-08
Hydroxide (OH)		<5	<5	RPD-NA	mg/L	N/A	26	02-SEP-08
Alkalinity, Total (as CaCO3)		430	420		mg/L	2.2	6.5	02-SEP-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-ED		Water						
Batch	R717081							
WG827577-2	LCS							
Conductivity (EC)			102		%		94-106	02-SEP-08
WG827577-3	LCS							
pH			7.0		pH		6.9-7.1	02-SEP-08
WG827577-4	LCS							
Alkalinity, Total (as CaCO3)			100		%		90-110	02-SEP-08
WG827577-1	MB							
Bicarbonate (HCO3)			<5		mg/L		5	02-SEP-08
Carbonate (CO3)			<5		mg/L		5	02-SEP-08
Hydroxide (OH)			<5		mg/L		5	02-SEP-08
Alkalinity, Total (as CaCO3)			<5		mg/L		5	02-SEP-08
VOC-CLALI-CCME-ED		Water						
Batch	R718665							
WG829939-2	LCS							
1,1-Dichloroethene			78		%		70-130	05-SEP-08
Methylene Chloride			90		%		70-130	05-SEP-08
Chloroform			91		%		70-130	05-SEP-08
1,2-Dichloroethane			118		%		70-130	05-SEP-08
1,1,1-Trichloroethane			95		%		70-130	05-SEP-08
Carbon Tetrachloride			95		%		70-130	05-SEP-08
Trichloroethene			100		%		70-130	05-SEP-08
WG829939-1	MB							
1,1-Dichloroethene			<0.001		mg/L		0.001	05-SEP-08
Methylene Chloride			<0.001		mg/L		0.001	05-SEP-08
trans-1,2-Dichloroethene			<0.001		mg/L		0.001	05-SEP-08
1,1-Dichloroethane			<0.001		mg/L		0.001	05-SEP-08
Chloroform			<0.001		mg/L		0.001	05-SEP-08
1,2-Dichloroethane			<0.001		mg/L		0.001	05-SEP-08
1,1,1-Trichloroethane			<0.001		mg/L		0.001	05-SEP-08
Carbon Tetrachloride			<0.001		mg/L		0.001	05-SEP-08
Trichloroethene			<0.001		mg/L		0.001	05-SEP-08
1,2-Dichloropropane			<0.001		mg/L		0.001	05-SEP-08
cis-1,3-Dichloropropene			<0.001		mg/L		0.001	05-SEP-08
trans-1,3-Dichloropropene			<0.001		mg/L		0.001	05-SEP-08
1,1,2-Trichloroethane			<0.001		mg/L		0.001	05-SEP-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>VOC-CLALI-CCME-ED</b>								
Water								
<b>Batch R718665</b>								
<b>WG829939-1 MB</b>								
Tetrachloroethylene			<0.001		mg/L		0.001	05-SEP-08
1,1,2,2-Tetrachloroethane			<0.002		mg/L		0.002	05-SEP-08
<b>VOC-MAH-CCME-ED</b>								
Water								
<b>Batch R718665</b>								
<b>WG829939-2 LCS</b>								
Benzene			94		%		70-130	05-SEP-08
Toluene			89		%		70-130	05-SEP-08
Ethylbenzene			89		%		70-130	05-SEP-08
m+p-Xylenes			121		%		70-130	05-SEP-08
o-Xylene			118		%		70-130	05-SEP-08
Styrene			101		%		70-130	05-SEP-08
1,4-Dichlorobenzene			87		%		70-130	05-SEP-08
<b>WG829939-1 MB</b>								
Benzene			<0.00050		mg/L		0.0005	05-SEP-08
Thiophene			<0.001		mg/L		0.001	05-SEP-08
Toluene			<0.00050		mg/L		0.0005	05-SEP-08
Chlorobenzene			<0.001		mg/L		0.001	05-SEP-08
Ethylbenzene			<0.00050		mg/L		0.0005	05-SEP-08
m+p-Xylenes			<0.00050		mg/L		0.0005	05-SEP-08
o-Xylene			<0.00050		mg/L		0.0005	05-SEP-08
Styrene			<0.001		mg/L		0.001	05-SEP-08
1,3-Dichlorobenzene			<0.001		mg/L		0.001	05-SEP-08
1,4-Dichlorobenzene			<0.001		mg/L		0.001	05-SEP-08
1,2-Dichlorobenzene			<0.001		mg/L		0.001	05-SEP-08

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## Legend:

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Limit	99% Confidence Interval (Laboratory Control Limits)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

## Sample Parameter Qualifier Definitions:

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Qualifier	Description
A	Method Blank exceeds ALS DQO. Refer to narrative comments for further information.
E	Matrix Spike recovery outside ALS DQO due to analyte background in sample.
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.



Environmental Division

Report to:		Report Format / Distribution		Service Requested: (rush - subject to availability)	
Company: <b>BBA</b>		Standard: <input checked="" type="checkbox"/> Other: <input type="checkbox"/>		<input checked="" type="checkbox"/> Regular (Default)	
Contact: <b>Brian Tsang</b>		Select: PDF <input checked="" type="checkbox"/> Excel <input checked="" type="checkbox"/> Digital <input type="checkbox"/>		Priority (2-3 Business Days) - 50% Surcharge	
Address: <b>115,200 Rivercrest Drive S.E.</b>		Email 1: <b>btsang@bba.ca</b>		Emergency (1 Business Day) - 100% Surcharge	
City: <b>Calgary</b>		Email 2: <b>n.margoub@bba.ca</b>		For Emergency < 1 Day, ASAP or Weekend - Contact ALS	
Phone: <b>403-203-3355</b>		Fax: <b>403-203-3301</b>		Analysis Request <input checked="" type="checkbox"/>	
Invoice To: Same as Report? <input checked="" type="checkbox"/> No? <input type="checkbox"/>		Client / Project Information:		(Indicate Filtered or Preserved, F/P)	
Company:		Job #: <b>C72101173</b>			
Contact:		PO / AFE:			
Address:		Legal Site Description:			
Phone:		Quote #: <b>Test Samples</b>			
Lab Work Order # (lab use only)		ALS Contact:		Sampler: <b>Sub</b>	
<b>U676397</b>					

Sample #	Sample Identification (This description will appear on the report)	Date	Time	Sample Type	Dissolved Metals	PAH	VOCs	BTEX FI-F2	Number of Containers
08 MW01		Aug 29/08	1:00	Water	X	X	X		6
08 MW02		Aug 29/08	1:10	Water	X	X	X		6
08 MW03		Aug 29/08	1:30	Water	X	X	X		6
08 MW04B		Aug 29/08	1:40	Water	X	X	X		6
08 MW05B		Aug 29/08	1:50	Water	X	X	X		6
08 MW06B		Aug 29/08	2:00	Water	X	X	X		6
08 MW07B		Aug 29/08	2:10	Water	X				1
08 MW08		Aug 29/08	2:20	Water	X				1
08 MW10		Aug 29/08	2:30	Water	X				1
08 MW11		Aug 29/08	2:40	Water	X				1
08 MW12		Aug 29/08	2:00	Water	X				1
08 MW14		Aug 29/08	3:30	Water	X		X		6

Special Instructions / Regulations / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)		SHIPMENT RECEPTION (lab use only)			SHIPMENT VERIFICATION (lab use only)		
Released by:	Date & Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date & Time:
<i>[Signature]</i>	Aug 30/08 3:50	<i>[Signature]</i>	31 August	16:20	11.3°C		

Observations: Yes / No ?  
If Yes attach SIF

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - REPORT COPY, PINK - FILE COPY, YELLOW - CLIENT COPY

GENF 18.00 Front



# ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



## Environmental Division

### ANALYTICAL REPORT

EBA ENG CONSULTANTS LTD

ATTN: NAYEF MAHGOUB

115, 200 RIVERCREST DR SE

CALGARY AB T2C 2X5

Reported On: 28-MAR-08 05:16 PM

Lab Work Order #: **L612590**

Date Received: **24-MAR-08**

Project P.O. #:

Job Reference: C22101178

Legal Site Desc:

CofC Numbers: C081194

Other Information:

Comments:

STEPHANIE ERIN HOEPPNER  
General Manager, Calgary

For any questions about this report please contact your Account Manager:

**PATRICIA MEGAN GOODSON**

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.

**ALS Canada Ltd. (Formerly ETL Chemspec Analytical Ltd.)**

Part of the **ALS Laboratory Group**

Bay 2, 1313-44 Ave. N.E., Calgary, AB T2E 6L5

Phone: +1 403 291 9897 Fax: +1 403 291 0298 [www.alsglobal.com](http://www.alsglobal.com)

A Campbell Brothers Limited Company

# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-1 08MW01								
Sampled By: JACK SAMBIRSKY on 22-MAR-08 @ 08:00								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	26-MAR-08	27-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	7.8		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.50		0.07	mg/L		25-MAR-08		
Nitrate-N	0.50		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	21.7		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.81		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	692		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	436		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	358		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	98.0			%		27-MAR-08		
TDS (Calculated)	388			mg/L		27-MAR-08		
Hardness (as CaCO3)	359			mg/L		27-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	106		0.1	mg/L		27-MAR-08	EHP	R644948
Iron (Fe)-Dissolved	0.153		0.03	mg/L		27-MAR-08	EHP	R644948
Magnesium (Mg)-Dissolved	22.8		0.1	mg/L		27-MAR-08	EHP	R644948
Potassium (K)-Dissolved	2.54		0.5	mg/L		27-MAR-08	EHP	R644948
Sodium (Na)-Dissolved	10.6		1	mg/L		27-MAR-08	EHP	R644948
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.0050	DLA	0.005	mg/L		27-MAR-08	MAT	R645225
Antimony (Sb)-Dissolved	<0.00010	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Arsenic (As)-Dissolved	0.00116	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Barium (Ba)-Dissolved	0.383	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Beryllium (Be)-Dissolved	<0.00050	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Bismuth (Bi)-Dissolved	<0.00050	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Boron (B)-Dissolved	0.024	DLA	0.01	mg/L		27-MAR-08	MAT	R645225
Cadmium (Cd)-Dissolved	0.000053	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Chromium (Cr)-Dissolved	0.00063	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Cobalt (Co)-Dissolved	0.00065	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Copper (Cu)-Dissolved	0.00566	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Lead (Pb)-Dissolved	<0.00010	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Manganese (Mn)-Dissolved	0.142	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Molybdenum (Mo)-Dissolved	0.00139	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Nickel (Ni)-Dissolved	0.00121	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Selenium (Se)-Dissolved	0.0017	DLA	0.001	mg/L		27-MAR-08	MAT	R645225
Silver (Ag)-Dissolved	<0.000010	DLA	0.00001	mg/L		27-MAR-08	MAT	R645225
Strontium (Sr)-Dissolved	0.287	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225

## ALS LABORATORY GROUP ANALYTICAL REPORT

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# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-2 08MW02								
Sampled By: JACK SAMBIRSKY on 22-MAR-08 @ 08:20								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	26-MAR-08	27-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	7.6		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.48		0.07	mg/L		25-MAR-08		
Nitrate-N	0.48		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	20.0		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.79		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	681		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	424		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	348		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	98.4			%		27-MAR-08		
TDS (Calculated)	376			mg/L		27-MAR-08		
Hardness (as CaCO3)	350			mg/L		27-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	103		0.1	mg/L		27-MAR-08	EHP	R644948
Iron (Fe)-Dissolved	0.174		0.03	mg/L		27-MAR-08	EHP	R644948
Magnesium (Mg)-Dissolved	22.5		0.1	mg/L		27-MAR-08	EHP	R644948
Potassium (K)-Dissolved	2.25		0.5	mg/L		27-MAR-08	EHP	R644948
Sodium (Na)-Dissolved	10.2		1	mg/L		27-MAR-08	EHP	R644948
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.0050	DLA	0.005	mg/L		27-MAR-08	MAT	R645225
Antimony (Sb)-Dissolved	0.00010	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Arsenic (As)-Dissolved	0.00116	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Barium (Ba)-Dissolved	0.373	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Beryllium (Be)-Dissolved	<0.00050	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Bismuth (Bi)-Dissolved	<0.00050	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Boron (B)-Dissolved	0.025	DLA	0.01	mg/L		27-MAR-08	MAT	R645225
Cadmium (Cd)-Dissolved	0.000053	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Chromium (Cr)-Dissolved	0.00243	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Cobalt (Co)-Dissolved	0.00064	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Copper (Cu)-Dissolved	0.00117	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Lead (Pb)-Dissolved	<0.00010	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Manganese (Mn)-Dissolved	0.137	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Molybdenum (Mo)-Dissolved	0.00135	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Nickel (Ni)-Dissolved	0.00112	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Selenium (Se)-Dissolved	0.0016	DLA	0.001	mg/L		27-MAR-08	MAT	R645225
Silver (Ag)-Dissolved	<0.000010	DLA	0.00001	mg/L		27-MAR-08	MAT	R645225
Strontium (Sr)-Dissolved	0.287	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225

## ALS LABORATORY GROUP ANALYTICAL REPORT

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# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-3 08MW03								
Sampled By: JACK SAMBIRSKY on 22-MAR-08 @ 08:40								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	26-MAR-08	27-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	4.4		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.24		0.07	mg/L		25-MAR-08		
Nitrate-N	0.24		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	19.3		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.81		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	635		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	402		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	329		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	101			%		27-MAR-08		
TDS (Calculated)	355			mg/L		27-MAR-08		
Hardness (as CaCO3)	338			mg/L		27-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	99.7		0.1	mg/L		27-MAR-08	EHP	R644948
Iron (Fe)-Dissolved	0.208		0.03	mg/L		27-MAR-08	EHP	R644948
Magnesium (Mg)-Dissolved	21.7		0.1	mg/L		27-MAR-08	EHP	R644948
Potassium (K)-Dissolved	2.87		0.5	mg/L		27-MAR-08	EHP	R644948
Sodium (Na)-Dissolved	8.9		1	mg/L		27-MAR-08	EHP	R644948
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	0.0293	DLA	0.005	mg/L		27-MAR-08	MAT	R645225
Antimony (Sb)-Dissolved	0.00016	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Arsenic (As)-Dissolved	0.00279	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Barium (Ba)-Dissolved	0.357	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Beryllium (Be)-Dissolved	<0.00050	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Bismuth (Bi)-Dissolved	<0.00050	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Boron (B)-Dissolved	0.020	DLA	0.01	mg/L		27-MAR-08	MAT	R645225
Cadmium (Cd)-Dissolved	0.000053	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Chromium (Cr)-Dissolved	0.00051	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Cobalt (Co)-Dissolved	0.00059	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Copper (Cu)-Dissolved	0.00703	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Lead (Pb)-Dissolved	0.00018	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Manganese (Mn)-Dissolved	0.145	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Molybdenum (Mo)-Dissolved	0.00154	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Nickel (Ni)-Dissolved	0.00131	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Selenium (Se)-Dissolved	0.0047	DLA	0.001	mg/L		27-MAR-08	MAT	R645225
Silver (Ag)-Dissolved	<0.000010	DLA	0.00001	mg/L		27-MAR-08	MAT	R645225
Strontium (Sr)-Dissolved	0.264	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225

## ALS LABORATORY GROUP ANALYTICAL REPORT

[illegible]

# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-4 08MW04B								
Sampled By: JACK SAMBIRSKY on 21-MAR-08 @ 17:00								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	27-MAR-08	28-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	4.4		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.55		0.07	mg/L		25-MAR-08		
Nitrate-N	0.55		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	48.0		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.74		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	739		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	435		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	356		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	101			%		27-MAR-08		
TDS (Calculated)	420			mg/L		27-MAR-08		
Hardness (as CaCO3)	394			mg/L		27-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	111		0.1	mg/L		27-MAR-08	EHP	R644948
Iron (Fe)-Dissolved	<0.030		0.03	mg/L		27-MAR-08	EHP	R644948
Magnesium (Mg)-Dissolved	28.4		0.1	mg/L		27-MAR-08	EHP	R644948
Potassium (K)-Dissolved	3.73		0.5	mg/L		27-MAR-08	EHP	R644948
Sodium (Na)-Dissolved	8.6		1	mg/L		27-MAR-08	EHP	R644948
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.0050	DLA	0.005	mg/L		27-MAR-08	MAT	R645225
Antimony (Sb)-Dissolved	<0.00010	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Arsenic (As)-Dissolved	0.00133	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Barium (Ba)-Dissolved	0.329	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Beryllium (Be)-Dissolved	<0.00050	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Bismuth (Bi)-Dissolved	<0.00050	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Boron (B)-Dissolved	0.016	DLA	0.01	mg/L		27-MAR-08	MAT	R645225
Cadmium (Cd)-Dissolved	<0.000050	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Chromium (Cr)-Dissolved	<0.00050	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Cobalt (Co)-Dissolved	0.00143	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Copper (Cu)-Dissolved	0.00327	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Lead (Pb)-Dissolved	<0.00010	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Manganese (Mn)-Dissolved	0.259	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225
Molybdenum (Mo)-Dissolved	0.000868	DLA	0.00005	mg/L		27-MAR-08	MAT	R645225
Nickel (Ni)-Dissolved	0.00183	DLA	0.0005	mg/L		27-MAR-08	MAT	R645225
Selenium (Se)-Dissolved	0.0108	DLA	0.001	mg/L		27-MAR-08	MAT	R645225
Silver (Ag)-Dissolved	<0.000010	DLA	0.00001	mg/L		27-MAR-08	MAT	R645225
Strontium (Sr)-Dissolved	0.272	DLA	0.0001	mg/L		27-MAR-08	MAT	R645225

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-5 08MW05B								
Sampled By: JACK SAMBIRSKY on 21-MAR-08 @ 17:30								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	27-MAR-08	28-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	JDV	R644808
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	4.7		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.90		0.07	mg/L		25-MAR-08		
Nitrate-N	0.90		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	57.2		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.71		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	752		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	433		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	355		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	96.2			%		28-MAR-08		
TDS (Calculated)	428			mg/L		28-MAR-08		
Hardness (as CaCO3)	381			mg/L		28-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	107		0.1	mg/L		26-MAR-08	EHP	R644511
Iron (Fe)-Dissolved	2.03		0.03	mg/L		26-MAR-08	EHP	R644511
Magnesium (Mg)-Dissolved	27.7		0.1	mg/L		26-MAR-08	EHP	R644511
Potassium (K)-Dissolved	3.33		0.5	mg/L		26-MAR-08	EHP	R644511
Sodium (Na)-Dissolved	10.6		1	mg/L		26-MAR-08	EHP	R644511
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.025	DLA	0.025	mg/L		28-MAR-08	SHT	R645756
Antimony (Sb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Arsenic (As)-Dissolved	0.00398	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Barium (Ba)-Dissolved	0.381	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Beryllium (Be)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Bismuth (Bi)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Boron (B)-Dissolved	<0.050	DLA	0.05	mg/L		28-MAR-08	SHT	R645756
Cadmium (Cd)-Dissolved	<0.00025	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Chromium (Cr)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Cobalt (Co)-Dissolved	0.00188	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Copper (Cu)-Dissolved	0.0177	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Lead (Pb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Manganese (Mn)-Dissolved	0.294	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Molybdenum (Mo)-Dissolved	0.00095	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Nickel (Ni)-Dissolved	0.0033	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Selenium (Se)-Dissolved	<0.0050	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Silver (Ag)-Dissolved	<0.000050	DLA	0.00005	mg/L		28-MAR-08	SHT	R645756
Strontium (Sr)-Dissolved	0.171	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756

## ALS LABORATORY GROUP ANALYTICAL REPORT

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# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-6 08MW06B								
Sampled By: JACK SAMBIRSKY on 21-MAR-08 @ 18:00								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	27-MAR-08	28-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	4.2		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.81		0.07	mg/L		25-MAR-08		
Nitrate-N	0.81		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	64.1		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.73		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	786		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	452		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	371		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	95.6			%		28-MAR-08		
TDS (Calculated)	449			mg/L		28-MAR-08		
Hardness (as CaCO3)	398			mg/L		28-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	110		0.1	mg/L		26-MAR-08	EHP	R644511
Iron (Fe)-Dissolved	0.044		0.03	mg/L		26-MAR-08	EHP	R644511
Magnesium (Mg)-Dissolved	30.0		0.1	mg/L		26-MAR-08	EHP	R644511
Potassium (K)-Dissolved	3.32		0.5	mg/L		26-MAR-08	EHP	R644511
Sodium (Na)-Dissolved	11.0		1	mg/L		26-MAR-08	EHP	R644511
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.025	DLA	0.025	mg/L		28-MAR-08	SHT	R645756
Antimony (Sb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Arsenic (As)-Dissolved	0.00115	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Barium (Ba)-Dissolved	0.355	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Beryllium (Be)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Bismuth (Bi)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Boron (B)-Dissolved	<0.050	DLA	0.05	mg/L		28-MAR-08	SHT	R645756
Cadmium (Cd)-Dissolved	<0.00025	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Chromium (Cr)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Cobalt (Co)-Dissolved	0.00180	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Copper (Cu)-Dissolved	0.00742	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Lead (Pb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Manganese (Mn)-Dissolved	0.226	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Molybdenum (Mo)-Dissolved	0.00076	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Nickel (Ni)-Dissolved	0.0028	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Selenium (Se)-Dissolved	<0.0050	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Silver (Ag)-Dissolved	<0.000050	DLA	0.00005	mg/L		28-MAR-08	SHT	R645756
Strontium (Sr)-Dissolved	0.165	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-7 08MW07B								
Sampled By: JACK SAMBIRSKY on 22-MAR-08 @ 09:00								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	27-MAR-08	28-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	2.8		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.23		0.07	mg/L		25-MAR-08		
Nitrate-N	0.23		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	31.5		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.88		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	638		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	392		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	322		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	97.1			%		28-MAR-08		
TDS (Calculated)	356			mg/L		28-MAR-08		
Hardness (as CaCO3)	325			mg/L		28-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	92.4		0.1	mg/L		26-MAR-08	EHP	R644511
Iron (Fe)-Dissolved	<0.030		0.03	mg/L		26-MAR-08	EHP	R644511
Magnesium (Mg)-Dissolved	22.8		0.1	mg/L		26-MAR-08	EHP	R644511
Potassium (K)-Dissolved	3.94		0.5	mg/L		26-MAR-08	EHP	R644511
Sodium (Na)-Dissolved	8.7		1	mg/L		26-MAR-08	EHP	R644511
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.025	DLA	0.025	mg/L		28-MAR-08	SHT	R645756
Antimony (Sb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Arsenic (As)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Barium (Ba)-Dissolved	0.299	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Beryllium (Be)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Bismuth (Bi)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Boron (B)-Dissolved	<0.050	DLA	0.05	mg/L		28-MAR-08	SHT	R645756
Cadmium (Cd)-Dissolved	<0.00025	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Chromium (Cr)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Cobalt (Co)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Copper (Cu)-Dissolved	0.00556	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Lead (Pb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Manganese (Mn)-Dissolved	0.0272	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Molybdenum (Mo)-Dissolved	0.00084	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Nickel (Ni)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Selenium (Se)-Dissolved	<0.0050	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Silver (Ag)-Dissolved	<0.000050	DLA	0.00005	mg/L		28-MAR-08	SHT	R645756
Strontium (Sr)-Dissolved	0.127	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-8 08MW08								
Sampled By: JACK SAMBIRSKY on 22-MAR-08 @ 09:20								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	27-MAR-08	28-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	3.7		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.15		0.07	mg/L		25-MAR-08		
Nitrate-N	0.15		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	35.8		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.83		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	644		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	385		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	316		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	98.3			%		28-MAR-08		
TDS (Calculated)	359			mg/L		28-MAR-08		
Hardness (as CaCO3)	324			mg/L		28-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	90.2		0.1	mg/L		26-MAR-08	EHP	R644511
Iron (Fe)-Dissolved	<0.030		0.03	mg/L		26-MAR-08	EHP	R644511
Magnesium (Mg)-Dissolved	24.1		0.1	mg/L		26-MAR-08	EHP	R644511
Potassium (K)-Dissolved	4.07		0.5	mg/L		26-MAR-08	EHP	R644511
Sodium (Na)-Dissolved	10.6		1	mg/L		26-MAR-08	EHP	R644511
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.025	DLA	0.025	mg/L		28-MAR-08	SHT	R645756
Antimony (Sb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Arsenic (As)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Barium (Ba)-Dissolved	0.278	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Beryllium (Be)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Bismuth (Bi)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Boron (B)-Dissolved	<0.050	DLA	0.05	mg/L		28-MAR-08	SHT	R645756
Cadmium (Cd)-Dissolved	<0.00025	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Chromium (Cr)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Cobalt (Co)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Copper (Cu)-Dissolved	0.00299	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Lead (Pb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Manganese (Mn)-Dissolved	0.0365	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Molybdenum (Mo)-Dissolved	0.00081	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Nickel (Ni)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Selenium (Se)-Dissolved	<0.0050	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Silver (Ag)-Dissolved	<0.000050	DLA	0.00005	mg/L		28-MAR-08	SHT	R645756
Strontium (Sr)-Dissolved	0.148	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-9 08MW09								
Sampled By: JACK SAMBIRSKY on 22-MAR-08 @ 09:40								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	27-MAR-08	28-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	4.2		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.53		0.07	mg/L		25-MAR-08		
Nitrate-N	0.53		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	33.8		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.78		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	696		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	427		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	350		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	96.6			%		28-MAR-08		
TDS (Calculated)	388			mg/L		28-MAR-08		
Hardness (as CaCO3)	362			mg/L		28-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	101		0.1	mg/L		26-MAR-08	EHP	R644511
Iron (Fe)-Dissolved	<0.030		0.03	mg/L		26-MAR-08	EHP	R644511
Magnesium (Mg)-Dissolved	26.6		0.1	mg/L		26-MAR-08	EHP	R644511
Potassium (K)-Dissolved	3.20		0.5	mg/L		26-MAR-08	EHP	R644511
Sodium (Na)-Dissolved	6.5		1	mg/L		26-MAR-08	EHP	R644511
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.025	DLA	0.025	mg/L		28-MAR-08	SHT	R645756
Antimony (Sb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Arsenic (As)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Barium (Ba)-Dissolved	0.343	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Beryllium (Be)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Bismuth (Bi)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Boron (B)-Dissolved	<0.050	DLA	0.05	mg/L		28-MAR-08	SHT	R645756
Cadmium (Cd)-Dissolved	<0.00025	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Chromium (Cr)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Cobalt (Co)-Dissolved	0.00117	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Copper (Cu)-Dissolved	0.00283	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Lead (Pb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Manganese (Mn)-Dissolved	0.145	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Molybdenum (Mo)-Dissolved	0.00132	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Nickel (Ni)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Selenium (Se)-Dissolved	<0.0050	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Silver (Ag)-Dissolved	<0.000050	DLA	0.00005	mg/L		28-MAR-08	SHT	R645756
Strontium (Sr)-Dissolved	0.195	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-10 08MW10								
Sampled By: JACK SAMBIRSKY on 21-MAR-08 @ 18:30								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	27-MAR-08	28-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	3.9		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.17		0.07	mg/L		25-MAR-08		
Nitrate-N	0.17		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	51.4		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.93		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	647		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	368		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	301		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	95.2			%		28-MAR-08		
TDS (Calculated)	363			mg/L		28-MAR-08		
Hardness (as CaCO3)	322			mg/L		28-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	92.8		0.1	mg/L		26-MAR-08	EHP	R644511
Iron (Fe)-Dissolved	<0.030		0.03	mg/L		26-MAR-08	EHP	R644511
Magnesium (Mg)-Dissolved	21.9		0.1	mg/L		26-MAR-08	EHP	R644511
Potassium (K)-Dissolved	4.25		0.5	mg/L		26-MAR-08	EHP	R644511
Sodium (Na)-Dissolved	7.7		1	mg/L		26-MAR-08	EHP	R644511
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.025	DLA	0.025	mg/L		28-MAR-08	SHT	R645756
Antimony (Sb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Arsenic (As)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Barium (Ba)-Dissolved	0.529	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Beryllium (Be)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Bismuth (Bi)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Boron (B)-Dissolved	<0.050	DLA	0.05	mg/L		28-MAR-08	SHT	R645756
Cadmium (Cd)-Dissolved	<0.00025	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Chromium (Cr)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Cobalt (Co)-Dissolved	0.00058	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Copper (Cu)-Dissolved	0.00490	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Lead (Pb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Manganese (Mn)-Dissolved	0.124	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Molybdenum (Mo)-Dissolved	0.00236	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Nickel (Ni)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Selenium (Se)-Dissolved	<0.0050	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Silver (Ag)-Dissolved	<0.000050	DLA	0.00005	mg/L		28-MAR-08	SHT	R645756
Strontium (Sr)-Dissolved	0.151	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-11 08MW11								
Sampled By: JACK SAMBIRSKY on 21-MAR-08 @ 18:45								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	27-MAR-08	28-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	1.5		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.08		0.07	mg/L		25-MAR-08		
Nitrate-N	0.08		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	16.4		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.90		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	559		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	365		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	299		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	99.0			%		28-MAR-08		
TDS (Calculated)	311			mg/L		28-MAR-08		
Hardness (as CaCO3)	299			mg/L		28-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	82.4		0.1	mg/L		26-MAR-08	EHP	R644511
Iron (Fe)-Dissolved	<0.030		0.03	mg/L		26-MAR-08	EHP	R644511
Magnesium (Mg)-Dissolved	22.7		0.1	mg/L		26-MAR-08	EHP	R644511
Potassium (K)-Dissolved	2.98		0.5	mg/L		26-MAR-08	EHP	R644511
Sodium (Na)-Dissolved	5.7		1	mg/L		26-MAR-08	EHP	R644511
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.025	DLA	0.025	mg/L		28-MAR-08	SHT	R645756
Antimony (Sb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Arsenic (As)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Barium (Ba)-Dissolved	0.372	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Beryllium (Be)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Bismuth (Bi)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Boron (B)-Dissolved	<0.050	DLA	0.05	mg/L		28-MAR-08	SHT	R645756
Cadmium (Cd)-Dissolved	<0.00025	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Chromium (Cr)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Cobalt (Co)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Copper (Cu)-Dissolved	0.00602	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Lead (Pb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Manganese (Mn)-Dissolved	0.0355	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Molybdenum (Mo)-Dissolved	0.00176	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Nickel (Ni)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Selenium (Se)-Dissolved	0.0061	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Silver (Ag)-Dissolved	<0.000050	DLA	0.00005	mg/L		28-MAR-08	SHT	R645756
Strontium (Sr)-Dissolved	0.225	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756

# ALS LABORATORY GROUP ANALYTICAL REPORT

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# **ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-12 08MW12								
Sampled By: JACK SAMBIRSKY on 21-MAR-08 @ 19:00								
Matrix: WATER								
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>								
F2 (>C10-C16)	<0.05		0.05	mg/L	27-MAR-08	28-MAR-08	JUN	R645372
<b>BTEX and F1 (C6-C10)</b>								
Benzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Toluene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
EthylBenzene	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
Xylenes	<0.00050		0.0005	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1(C6-C10)	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
F1-BTEX	<0.1		0.1	mg/L	25-MAR-08	25-MAR-08	LSV	R644571
<b>Major Ions &amp; Trace Dissolved Metals</b>								
Chloride (Cl)	1.9		0.1	mg/L		27-MAR-08	JF	R644388
Nitrate and Nitrite as N	0.10		0.07	mg/L		25-MAR-08		
Nitrate-N	0.10		0.05	mg/L		24-MAR-08	JF	R644388
Nitrite-N	<0.05		0.05	mg/L		24-MAR-08	JF	R644388
Sulphate (SO4)	23.3		0.5	mg/L		24-MAR-08	JF	R644388
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.92		0.01	pH		24-MAR-08	MAT	R644357
Conductivity (EC)	583		3	uS/cm		24-MAR-08	MAT	R644357
Bicarbonate (HCO3)	363		5	mg/L		24-MAR-08	MAT	R644357
Carbonate (CO3)	<5		5	mg/L		24-MAR-08	MAT	R644357
Hydroxide (OH)	<5		5	mg/L		24-MAR-08	MAT	R644357
Alkalinity, Total (as CaCO3)	298		5	mg/L		24-MAR-08	MAT	R644357
<b>Ion Balance Calculation</b>								
Ion Balance	99.4			%		28-MAR-08		
TDS (Calculated)	322			mg/L		28-MAR-08		
Hardness (as CaCO3)	309			mg/L		28-MAR-08		
<b>Dissolved Metals by ICPOES</b>								
Calcium (Ca)-Dissolved	87.1		0.1	mg/L		26-MAR-08	EHP	R644511
Iron (Fe)-Dissolved	<0.030		0.03	mg/L		26-MAR-08	EHP	R644511
Magnesium (Mg)-Dissolved	22.2		0.1	mg/L		26-MAR-08	EHP	R644511
Potassium (K)-Dissolved	3.16		0.5	mg/L		26-MAR-08	EHP	R644511
Sodium (Na)-Dissolved	4.7		1	mg/L		26-MAR-08	EHP	R644511
<b>Dissolved Metals by ICPMS</b>								
Aluminum (Al)-Dissolved	<0.025	DLA	0.025	mg/L		28-MAR-08	SHT	R645756
Antimony (Sb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Arsenic (As)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Barium (Ba)-Dissolved	0.449	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Beryllium (Be)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Bismuth (Bi)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Boron (B)-Dissolved	<0.050	DLA	0.05	mg/L		28-MAR-08	SHT	R645756
Cadmium (Cd)-Dissolved	<0.00025	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Chromium (Cr)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Cobalt (Co)-Dissolved	0.00054	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Copper (Cu)-Dissolved	0.00146	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Lead (Pb)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Manganese (Mn)-Dissolved	0.101	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Molybdenum (Mo)-Dissolved	0.00224	DLA	0.00025	mg/L		28-MAR-08	SHT	R645756
Nickel (Ni)-Dissolved	<0.0025	DLA	0.0025	mg/L		28-MAR-08	SHT	R645756
Selenium (Se)-Dissolved	0.0066	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Silver (Ag)-Dissolved	<0.00050	DLA	0.00005	mg/L		28-MAR-08	SHT	R645756
Strontium (Sr)-Dissolved	0.222	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756

**ALS LABORATORY GROUP ANALYTICAL REPORT**

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	By	Batch
L612590-12 08MW12								
Sampled By: JACK SAMBIRSKY on 21-MAR-08 @ 19:00								
Matrix: WATER								
<b>Major Ions &amp; Trace Dissolved Metals</b>								
<b>Dissolved Metals by ICPMS</b>								
Titanium (Ti)-Dissolved	<0.0050	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Thallium (Tl)-Dissolved	<0.00050	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Tin (Sn)-Dissolved	0.00056	DLA	0.0005	mg/L		28-MAR-08	SHT	R645756
Uranium (U)-Dissolved	0.00250	DLA	0.00005	mg/L		28-MAR-08	SHT	R645756
Vanadium (V)-Dissolved	<0.0050	DLA	0.005	mg/L		28-MAR-08	SHT	R645756
Zinc (Zn)-Dissolved	0.074	DLA	0.025	mg/L		28-MAR-08	SHT	R645756
* Refer to Referenced Information for Qualifiers (if any) and Methodology.								

## Reference Information

**Sample Parameter Qualifier key listed:**

Qualifier	Description
DLA	Detection Limit Adjusted For Dilution

**Methods Listed (if applicable):**

ALS Test Code	Matrix	Test Description	Preparation Method Reference(Based On)	Analytical Method Reference(Based On)
BTX,F1-CL	Water	BTEX and F1 (C6-C10)	EPA 5030B	EPA 5030/8015& 8260-P&T GC-MS/FID
CL-CL	Water	Chloride (Cl)		APHA 4110 B-Ion Chromatography
F2-CL	Water	F2	EPA 3550B	EPA 3510/8000-GC-FID
IONBALANCE-CL	Water	Ion Balance Calculation		APHA 1030E
MET-DIS-ICP-CL	Water	Dissolved Metals by ICPOES		EPA SW-846 3005A/6010B
his analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).				
MET-DIS-LOW-MS-CL	Water	Dissolved Metals by ICPMS		EPA SW-846 3005A/6020A
N2N3-CALC-CL	Water	Nitrate+Nitrite		CALCULATION
NO2-CL	Water	Nitrite-N		APHA 4110 B-Ion Chromatography
NO3-IC-CL	Water	Nitrate-N		APHA 4110 B-Ion Chromatography
PH/EC/ALK-CL	Water	pH, Conductivity and Total Alkalinity		APHA 4500H,2510,2320
SO4-CL	Water	Sulfate (SO4)		APHA 4110 B-Ion Chromatography

\*\* Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies.

**Chain of Custody numbers:**

C081194

*The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:*

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
CL	ALS LABORATORY GROUP - CALGARY, ALBERTA, CANADA		

## Reference Information

### GLOSSARY OF REPORT TERMS

*Surr* - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in environmental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds. The reported surrogate recovery value provides a measure of method efficiency. The Laboratory control limits are determined under column heading D.L.

mg/kg (units) - unit of concentration based on mass, parts per million

mg/L (units) - unit of concentration based on volume, parts per million

< - Less than

D.L. - Detection Limit

N/A - Result not available. Refer to qualifier code and definition for explanation

*Test results reported relate only to the samples as received by the laboratory.*

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

UNLESS OTHERWISE STATED, SAMPLES ARE NOT CORRECTED FOR CLIENT FIELD BLANKS.

Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.

**ALS Routine Water Chemistry Report**

L612590

Lab ID	Sample ID				Lab ID	Sample ID			
L612590-1	08MW01				L612590-2	08MW02			
Sample Date: 22-MAR-08					Sample Date: 22-MAR-08				
Matrix: WATER					Matrix: WATER				
	Result	UNITS	MEQ/L	MEQ %		Result	UNITS	MEQ/L	MEQ %
Ion Balance	98.0	%			Ion Balance	98.4	%		
<b>Routine Anions</b>					<b>Routine Anions</b>				
Bicarbonate	436	mg/L	7.15	46	Bicarbonate	424	mg/L	6.95	46
Carbonate	<5	mg/L	0	0	Carbonate	<5	mg/L	0	0
Hydroxide	<5	mg/L	0	0	Hydroxide	<5	mg/L	0	0
Chloride	7.8	mg/L	0.22	1	Chloride	7.6	mg/L	0.21	1
Sulfate	21.7	mg/L	0.45	3	Sulfate	20.0	mg/L	0.42	3
Nitrate+Nitrite-N		mg/L	0.04	0	Nitrate+Nitrite-N		mg/L	0.03	0
<b>Anion Sum</b>			7.85	51	<b>Anion Sum</b>			7.61	50
<b>Routine Cations</b>					<b>Routine Cations</b>				
Calcium	106	mg/L	5.29	34	Calcium	103	mg/L	5.14	34
Magnesium	22.8	mg/L	1.88	12	Magnesium	22.5	mg/L	1.85	12
Sodium	10.6	mg/L	0.46	3	Sodium	10.2	mg/L	0.44	3
Potassium	2.54	mg/L	0.06	0	Potassium	2.25	mg/L	0.06	0
Ammonium	0	mg/L	0	0	Ammonium	0	mg/L	0	0
<b>Cation Sum</b>			7.69	49	<b>Cation Sum</b>			7.49	50
L612590-3	08MW03				L612590-4	08MW04B			
Sample Date: 22-MAR-08					Sample Date: 21-MAR-08				
Matrix: WATER					Matrix: WATER				
	Result	UNITS	MEQ/L	MEQ %		Result	UNITS	MEQ/L	MEQ %
Ion Balance	101	%			Ion Balance	101	%		
<b>Routine Anions</b>					<b>Routine Anions</b>				
Bicarbonate	402	mg/L	6.59	46	Bicarbonate	435	mg/L	7.13	43
Carbonate	<5	mg/L	0	0	Carbonate	<5	mg/L	0	0
Hydroxide	<5	mg/L	0	0	Hydroxide	<5	mg/L	0	0
Chloride	4.4	mg/L	0.12	1	Chloride	4.4	mg/L	0.12	1
Sulfate	19.3	mg/L	0.40	3	Sulfate	48.0	mg/L	1	6
Nitrate+Nitrite-N		mg/L	0.02	0	Nitrate+Nitrite-N		mg/L	0.04	0
<b>Anion Sum</b>			7.13	50	<b>Anion Sum</b>			8.29	50
<b>Routine Cations</b>					<b>Routine Cations</b>				
Calcium	99.7	mg/L	4.98	35	Calcium	111	mg/L	5.54	33
Magnesium	21.7	mg/L	1.79	12	Magnesium	28.4	mg/L	2.34	14
Sodium	8.9	mg/L	0.39	3	Sodium	8.6	mg/L	0.37	2
Potassium	2.87	mg/L	0.07	1	Potassium	3.73	mg/L	0.1	1
Ammonium	0	mg/L	0	0	Ammonium	0	mg/L	0	0
<b>Cation Sum</b>			7.22	50	<b>Cation Sum</b>			8.35	50

**ALS Routine Water Chemistry Report**

L612590

Lab ID      Sample ID					Lab ID      Sample ID				
L612590-5      08MW05B					L612590-6      08MW06B				
Sample Date: 21-MAR-08					Sample Date: 21-MAR-08				
Matrix:      WATER					Matrix:      WATER				
	Result	UNITS	MEQ/L	MEQ %		Result	UNITS	MEQ/L	MEQ %
Ion Balance	96.2	%			Ion Balance	95.6	%		
<b>Routine Anions</b>					<b>Routine Anions</b>				
Bicarbonate	433	mg/L	7.10	43	Bicarbonate	452	mg/L	7.41	42
Carbonate	<5	mg/L	0	0	Carbonate	<5	mg/L	0	0
Hydroxide	<5	mg/L	0	0	Hydroxide	<5	mg/L	0	0
Chloride	4.7	mg/L	0.13	1	Chloride	4.2	mg/L	0.12	1
Sulfate	57.2	mg/L	1.19	7	Sulfate	64.1	mg/L	1.33	8
Nitrate+Nitrite-N		mg/L	0.06	0	Nitrate+Nitrite-N		mg/L	0.06	0
<b>Anion Sum</b>			8.48	51	<b>Anion Sum</b>			8.92	51
<b>Routine Cations</b>					<b>Routine Cations</b>				
Calcium	107	mg/L	5.34	32	Calcium	110	mg/L	5.49	31
Magnesium	27.7	mg/L	2.28	14	Magnesium	30.0	mg/L	2.47	14
Sodium	10.6	mg/L	0.46	3	Sodium	11.0	mg/L	0.48	3
Potassium	3.33	mg/L	0.09	1	Potassium	3.32	mg/L	0.08	0
Ammonium	0	mg/L	0	0	Ammonium	0	mg/L	0	0
<b>Cation Sum</b>			8.17	49	<b>Cation Sum</b>			8.52	49
L612590-7      08MW07B					L612590-8      08MW08				
Sample Date: 22-MAR-08					Sample Date: 22-MAR-08				
Matrix:      WATER					Matrix:      WATER				
	Result	UNITS	MEQ/L	MEQ %		Result	UNITS	MEQ/L	MEQ %
Ion Balance	97.1	%			Ion Balance	98.3	%		
<b>Routine Anions</b>					<b>Routine Anions</b>				
Bicarbonate	392	mg/L	6.42	45	Bicarbonate	385	mg/L	6.31	44
Carbonate	<5	mg/L	0	0	Carbonate	<5	mg/L	0	0
Hydroxide	<5	mg/L	0	0	Hydroxide	<5	mg/L	0	0
Chloride	2.8	mg/L	0.08	1	Chloride	3.7	mg/L	0.10	1
Sulfate	31.5	mg/L	0.66	5	Sulfate	35.8	mg/L	0.75	5
Nitrate+Nitrite-N		mg/L	0.02	0	Nitrate+Nitrite-N		mg/L	0.01	0
<b>Anion Sum</b>			7.18	51	<b>Anion Sum</b>			7.17	50
<b>Routine Cations</b>					<b>Routine Cations</b>				
Calcium	92.4	mg/L	4.61	33	Calcium	90.2	mg/L	4.50	32
Magnesium	22.8	mg/L	1.88	13	Magnesium	24.1	mg/L	1.98	14
Sodium	8.7	mg/L	0.38	3	Sodium	10.6	mg/L	0.46	3
Potassium	3.94	mg/L	0.10	1	Potassium	4.07	mg/L	0.10	1
Ammonium	0	mg/L	0	0	Ammonium	0	mg/L	0	0
<b>Cation Sum</b>			6.97	49	<b>Cation Sum</b>			7.05	50

**ALS Routine Water Chemistry Report**

L612590

Lab ID	Sample ID					Lab ID	Sample ID				
L612590-9	08MW09					L612590-10	08MW10				
Sample Date: 22-MAR-08						Sample Date: 21-MAR-08					
Matrix: WATER						Matrix: WATER					
		Result	UNITS	MEQ/L	MEQ %			Result	UNITS	MEQ/L	MEQ %
Ion Balance		96.6	%			Ion Balance		95.2	%		
<b>Routine Anions</b>						<b>Routine Anions</b>					
Bicarbonate		427	mg/L	7.00	45	Bicarbonate		368	mg/L	6.03	43
Carbonate		<5	mg/L	0	0	Carbonate		<5	mg/L	0	0
Hydroxide		<5	mg/L	0	0	Hydroxide		<5	mg/L	0	0
Chloride		4.2	mg/L	0.12	1	Chloride		3.9	mg/L	0.11	1
Sulfate		33.8	mg/L	0.70	5	Sulfate		51.4	mg/L	1.07	8
Nitrate+Nitrite-N			mg/L	0.04	0	Nitrate+Nitrite-N			mg/L	0.01	0
<b>Anion Sum</b>				7.86	51	<b>Anion Sum</b>				7.22	51
<b>Routine Cations</b>						<b>Routine Cations</b>					
Calcium		101	mg/L	5.04	33	Calcium		92.8	mg/L	4.63	33
Magnesium		26.6	mg/L	2.19	14	Magnesium		21.9	mg/L	1.80	13
Sodium		6.5	mg/L	0.28	2	Sodium		7.7	mg/L	0.33	2
Potassium		3.20	mg/L	0.08	1	Potassium		4.25	mg/L	0.11	1
Ammonium		0	mg/L	0	0	Ammonium		0	mg/L	0	0
<b>Cation Sum</b>				7.59	49	<b>Cation Sum</b>				6.88	49
L612590-11	08MW11					L612590-12	08MW12				
Sample Date: 21-MAR-08						Sample Date: 21-MAR-08					
Matrix: WATER						Matrix: WATER					
		Result	UNITS	MEQ/L	MEQ %			Result	UNITS	MEQ/L	MEQ %
Ion Balance		99.0	%			Ion Balance		99.4	%		
<b>Routine Anions</b>						<b>Routine Anions</b>					
Bicarbonate		365	mg/L	5.98	47	Bicarbonate		363	mg/L	5.95	46
Carbonate		<5	mg/L	0	0	Carbonate		<5	mg/L	0	0
Hydroxide		<5	mg/L	0	0	Hydroxide		<5	mg/L	0	0
Chloride		1.5	mg/L	0.04	0	Chloride		1.9	mg/L	0.05	0
Sulfate		16.4	mg/L	0.34	3	Sulfate		23.3	mg/L	0.49	4
Nitrate+Nitrite-N			mg/L	0.01	0	Nitrate+Nitrite-N			mg/L	0.01	0
<b>Anion Sum</b>				6.37	50	<b>Anion Sum</b>				6.49	50
<b>Routine Cations</b>						<b>Routine Cations</b>					
Calcium		82.4	mg/L	4.11	32	Calcium		87.1	mg/L	4.35	34
Magnesium		22.7	mg/L	1.87	15	Magnesium		22.2	mg/L	1.83	14
Sodium		5.7	mg/L	0.25	2	Sodium		4.7	mg/L	0.20	2
Potassium		2.98	mg/L	0.08	1	Potassium		3.16	mg/L	0.08	1
Ammonium		0	mg/L	0	0	Ammonium		0	mg/L	0	0
<b>Cation Sum</b>				6.30	50	<b>Cation Sum</b>				6.46	50



**Environmental Division**

**ALS Laboratory Group Quality Control Report**

Workorder: L612590

Report Date: 28-MAR-08

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Client: EBA ENG CONSULTANTS LTD  
115, 200 RIVERCREST DR SE  
CALGARY AB T2C 2X5

Contact: NAYEF MAHGOUB

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<u>BTX,F1-CL</u>		<u>Water</u>						
Batch	R644571							
WG744574-4	LCS							
Benzene			105		%		81-120	25-MAR-08
EthylBenzene			106		%		82-120	25-MAR-08
Toluene			110		%		82-119	25-MAR-08
F1(C6-C10)			89		%		80-119	25-MAR-08
Xylenes			107		%		81-124	25-MAR-08
WG744574-1	MB							
Benzene			<0.00050		mg/L		0.0005	25-MAR-08
EthylBenzene			<0.00050		mg/L		0.0005	25-MAR-08
Toluene			<0.00050		mg/L		0.0005	25-MAR-08
F1(C6-C10)			<0.1		mg/L		0.1	25-MAR-08
Xylenes			<0.00050		mg/L		0.0005	25-MAR-08
WG744574-3	MS	L612590-4						
Benzene			97		%		74-127	25-MAR-08
EthylBenzene			94		%		67-132	25-MAR-08
Toluene			100		%		68-131	25-MAR-08
F1(C6-C10)			78		%		66-127	25-MAR-08
Xylenes			96		%		68-136	25-MAR-08
Batch	R644808							
WG744590-2	DUP	L612461-2						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	26-MAR-08
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	26-MAR-08
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	26-MAR-08
F1(C6-C10)		<0.1	<0.1	RPD-NA	mg/L	N/A	26	26-MAR-08
Xylenes		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	26-MAR-08
WG744590-4	LCS							
Benzene			114		%		81-120	26-MAR-08
EthylBenzene			107		%		82-120	26-MAR-08
Toluene			109		%		82-119	26-MAR-08
F1(C6-C10)			90		%		80-119	26-MAR-08
Xylenes			113		%		81-124	26-MAR-08
WG744590-1	MB							
Benzene			<0.00050		mg/L		0.0005	25-MAR-08
EthylBenzene			<0.00050		mg/L		0.0005	25-MAR-08
Toluene			<0.00050		mg/L		0.0005	25-MAR-08

## ALS Laboratory Group Quality Control Report

Workorder: L612590

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<u>BTX,F1-CL</u>		<u>Water</u>						
Batch	R644808							
WG744590-1	MB							
F1(C6-C10)			<0.1		mg/L		0.1	25-MAR-08
Xylenes			<0.00050		mg/L		0.0005	25-MAR-08
<u>CL-CL</u>		<u>Water</u>						
Batch	R644388							
WG744189-7	DUP	L612590-12						
Chloride (Cl)		1.9	1.9		mg/L	3.3	13	24-MAR-08
<u>F2-CL</u>		<u>Water</u>						
Batch	R645372							
WG745291-12	DUP	L612617-1						
F2 (>C10-C16)		<0.05	<0.05	RPD-NA	mg/L	N/A	33	28-MAR-08
WG745291-3	DUP	L612422-9						
F2 (>C10-C16)		<0.05	<0.05	RPD-NA	mg/L	N/A	33	27-MAR-08
WG745291-7	DUP	L612422-30						
F2 (>C10-C16)		<0.05	<0.05	RPD-NA	mg/L	N/A	33	27-MAR-08
WG745291-11	MB							
F2 (>C10-C16)			<0.05		mg/L		0.05	28-MAR-08
WG745291-2	MB							
F2 (>C10-C16)			<0.05		mg/L		0.05	26-MAR-08
WG745291-6	MB							
F2 (>C10-C16)			<0.05		mg/L		0.05	27-MAR-08
WG745291-14	MS	L612590-9						
F2 (>C10-C16)			100		%		61-140	28-MAR-08
WG745291-4	MS	L612422-10						
F2 (>C10-C16)			111		%		61-140	27-MAR-08
WG745291-9	MS	L612422-31						
F2 (>C10-C16)			99		%		61-140	27-MAR-08
<u>MET-DIS-ICP-CL</u>		<u>Water</u>						
Batch	R644511							
WG744485-3	CRM	QCS-A						
Aluminum (Al)-Dissolved			98		%		85-115	26-MAR-08
Antimony (Sb)-Dissolved			97		%		85-115	26-MAR-08
Arsenic (As)-Dissolved			99		%		85-115	26-MAR-08
Barium (Ba)-Dissolved			97		%		85-115	26-MAR-08
Beryllium (Be)-Dissolved			99		%		85-115	26-MAR-08

## ALS Laboratory Group Quality Control Report

Workorder: L612590

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-DIS-ICP-CL</b>	<b>Water</b>							
<b>Batch</b>	<b>R644511</b>							
<b>WG744485-3</b>	<b>CRM</b>	<b>QCS-A</b>						
Bismuth (Bi)-Dissolved			98		%		85-115	26-MAR-08
Boron (B)-Dissolved			99		%		85-115	26-MAR-08
Cadmium (Cd)-Dissolved			98		%		85-115	26-MAR-08
Calcium (Ca)-Dissolved			99		%		85-115	26-MAR-08
Chromium (Cr)-Dissolved			99		%		85-115	26-MAR-08
Cobalt (Co)-Dissolved			99		%		85-115	26-MAR-08
Copper (Cu)-Dissolved			99		%		85-115	26-MAR-08
Iron (Fe)-Dissolved			99		%		85-115	26-MAR-08
Lead (Pb)-Dissolved			97		%		85-115	26-MAR-08
Lithium (Li)-Dissolved			99		%		85-115	26-MAR-08
Magnesium (Mg)-Dissolved			95		%		85-115	26-MAR-08
Manganese (Mn)-Dissolved			96		%		85-115	26-MAR-08
Molybdenum (Mo)-Dissolved			98		%		85-115	26-MAR-08
Nickel (Ni)-Dissolved			99		%		85-115	26-MAR-08
Phosphorus (P)-Dissolved			97		%		85-115	26-MAR-08
Potassium (K)-Dissolved			99		%		85-115	26-MAR-08
Selenium (Se)-Dissolved			98		%		85-115	26-MAR-08
Silicon (Si)-Dissolved			103		%		85-115	26-MAR-08
Silver (Ag)-Dissolved			95		%		85-115	26-MAR-08
Sodium (Na)-Dissolved			98		%		85-115	26-MAR-08
Strontium (Sr)-Dissolved			96		%		85-115	26-MAR-08
Thallium (Tl)-Dissolved			98		%		85-115	26-MAR-08
Tin (Sn)-Dissolved			97		%		85-115	26-MAR-08
Titanium (Ti)-Dissolved			99		%		85-115	26-MAR-08
Vanadium (V)-Dissolved			99		%		85-115	26-MAR-08
Zinc (Zn)-Dissolved			103		%		85-115	26-MAR-08
<b>WG744485-6</b>	<b>DUP</b>	<b>L612425-3</b>						
Aluminum (Al)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Antimony (Sb)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Arsenic (As)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Barium (Ba)-Dissolved		1.53	1.51		mg/L	1.1	26	26-MAR-08
Beryllium (Be)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	26-MAR-08
Bismuth (Bi)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08

## ALS Laboratory Group Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b><u>MET-DIS-ICP-CL</u></b>		<b><u>Water</u></b>						
Batch	R644511							
WG744485-6	DUP	L612425-3						
Boron (B)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	26	26-MAR-08
Cadmium (Cd)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Calcium (Ca)-Dissolved		89.7	88.7		mg/L	1.1	26	26-MAR-08
Chromium (Cr)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Cobalt (Co)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Copper (Cu)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Iron (Fe)-Dissolved		5.32	5.24		mg/L	1.4	26	26-MAR-08
Lead (Pb)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	26-MAR-08
Lithium (Li)-Dissolved		0.017	0.017	J	mg/L	0.000	0.04	26-MAR-08
Magnesium (Mg)-Dissolved		42.2	41.9		mg/L	0.76	26	26-MAR-08
Manganese (Mn)-Dissolved		0.747	0.738		mg/L	1.2	26	26-MAR-08
Molybdenum (Mo)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Nickel (Ni)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	26-MAR-08
Phosphorus (P)-Dissolved		<0.30	<0.30	RPD-NA	mg/L	N/A	26	26-MAR-08
Potassium (K)-Dissolved		2.63	2.60	J	mg/L	0.03	2	26-MAR-08
Selenium (Se)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Silicon (Si)-Dissolved		5.88	5.81		mg/L	1.2	26	26-MAR-08
Silver (Ag)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Sodium (Na)-Dissolved		23.0	22.7		mg/L	1.2	26	26-MAR-08
Strontium (Sr)-Dissolved		0.627	0.620		mg/L	1.0	26	26-MAR-08
Sulfur (S)-Dissolved		4.9	4.8	J	mg/L	0.0	4	26-MAR-08
Thallium (Tl)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Tin (Sn)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Vanadium (V)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Zinc (Zn)-Dissolved		0.0097	0.0090	J	mg/L	0.0007	0.02	26-MAR-08
WG744485-7	DUP	L612590-5						
Aluminum (Al)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Antimony (Sb)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Arsenic (As)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Barium (Ba)-Dissolved		0.392	0.393		mg/L	0.36	26	26-MAR-08
Beryllium (Be)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	26-MAR-08
Bismuth (Bi)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08

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<b><u>MET-DIS-ICP-CL</u></b>		<b><u>Water</u></b>						
Batch	R644511							
WG744485-7	DUP	L612590-5						
Boron (B)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	26	26-MAR-08
Cadmium (Cd)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Calcium (Ca)-Dissolved		107	107		mg/L	0.059	26	26-MAR-08
Chromium (Cr)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Cobalt (Co)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Copper (Cu)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Iron (Fe)-Dissolved		2.03	2.04		mg/L	0.40	26	26-MAR-08
Lead (Pb)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	26-MAR-08
Lithium (Li)-Dissolved		0.020	0.020	J	mg/L	0.000	0.04	26-MAR-08
Magnesium (Mg)-Dissolved		27.7	28.1		mg/L	1.5	26	26-MAR-08
Manganese (Mn)-Dissolved		0.602	0.604		mg/L	0.38	26	26-MAR-08
Molybdenum (Mo)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Nickel (Ni)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	26-MAR-08
Phosphorus (P)-Dissolved		<0.30	<0.30	RPD-NA	mg/L	N/A	26	26-MAR-08
Potassium (K)-Dissolved		3.33	3.34	J	mg/L	0.01	2	26-MAR-08
Selenium (Se)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Silicon (Si)-Dissolved		6.27	6.33		mg/L	0.97	26	26-MAR-08
Silver (Ag)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Sodium (Na)-Dissolved		10.6	10.6		mg/L	0.11	26	26-MAR-08
Strontium (Sr)-Dissolved		0.312	0.313		mg/L	0.31	26	26-MAR-08
Sulfur (S)-Dissolved		17.9	18.3		mg/L	1.8	26	26-MAR-08
Thallium (Tl)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Tin (Sn)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Vanadium (V)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Zinc (Zn)-Dissolved		0.0986	0.0996		mg/L	0.94	26	26-MAR-08
WG744485-9	DUP	L612842-1						
Aluminum (Al)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Antimony (Sb)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Arsenic (As)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Barium (Ba)-Dissolved		0.048	0.049	J	mg/L	0.001	0.04	26-MAR-08
Beryllium (Be)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	26-MAR-08
Bismuth (Bi)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08

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<b><u>MET-DIS-ICP-CL</u></b>	<b><u>Water</u></b>							
Batch	R644511							
WG744485-9	DUP	L612842-1						
Boron (B)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	26	26-MAR-08
Cadmium (Cd)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Calcium (Ca)-Dissolved		41.4	41.5		mg/L	0.33	26	26-MAR-08
Chromium (Cr)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Cobalt (Co)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Copper (Cu)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Iron (Fe)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Lead (Pb)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	26-MAR-08
Lithium (Li)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Magnesium (Mg)-Dissolved		14.2	14.4		mg/L	1.8	26	26-MAR-08
Manganese (Mn)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	26-MAR-08
Molybdenum (Mo)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Nickel (Ni)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	26-MAR-08
Phosphorus (P)-Dissolved		<0.30	<0.30	RPD-NA	mg/L	N/A	26	26-MAR-08
Potassium (K)-Dissolved		2.01	2.04	J	mg/L	0.03	2	26-MAR-08
Selenium (Se)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Silicon (Si)-Dissolved		0.098	0.098	J	mg/L	0.001	0.2	26-MAR-08
Silver (Ag)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Sodium (Na)-Dissolved		18.0	18.1		mg/L	0.50	26	26-MAR-08
Strontium (Sr)-Dissolved		0.199	0.201		mg/L	1.1	26	26-MAR-08
Sulfur (S)-Dissolved		23.9	23.8		mg/L	0.57	26	26-MAR-08
Thallium (Tl)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	26-MAR-08
Tin (Sn)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	26-MAR-08
Vanadium (V)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	26-MAR-08
Zinc (Zn)-Dissolved		0.0107	0.0100	J	mg/L	0.0007	0.02	26-MAR-08
WG744485-1	MB							
Aluminum (Al)-Dissolved			<0.20		mg/L		0.2	26-MAR-08
Antimony (Sb)-Dissolved			<0.20		mg/L		0.2	26-MAR-08
Arsenic (As)-Dissolved			<0.20		mg/L		0.2	26-MAR-08
Barium (Ba)-Dissolved			<0.010		mg/L		0.01	26-MAR-08
Beryllium (Be)-Dissolved			<0.0050		mg/L		0.005	26-MAR-08
Bismuth (Bi)-Dissolved			<0.20		mg/L		0.2	26-MAR-08

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<b><u>MET-DIS-ICP-CL</u></b>	<b><u>Water</u></b>							
Batch	R644511							
WG744485-1	MB							
Boron (B)-Dissolved			<0.10		mg/L		0.1	26-MAR-08
Cadmium (Cd)-Dissolved			<0.010		mg/L		0.01	26-MAR-08
Calcium (Ca)-Dissolved			<0.10		mg/L		0.1	26-MAR-08
Chromium (Cr)-Dissolved			<0.010		mg/L		0.01	26-MAR-08
Cobalt (Co)-Dissolved			<0.010		mg/L		0.01	26-MAR-08
Copper (Cu)-Dissolved			<0.010		mg/L		0.01	26-MAR-08
Iron (Fe)-Dissolved			<0.030		mg/L		0.03	26-MAR-08
Lead (Pb)-Dissolved			<0.050		mg/L		0.05	26-MAR-08
Lithium (Li)-Dissolved			<0.010		mg/L		0.01	26-MAR-08
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	26-MAR-08
Manganese (Mn)-Dissolved			<0.0050		mg/L		0.005	26-MAR-08
Molybdenum (Mo)-Dissolved			<0.030		mg/L		0.03	26-MAR-08
Nickel (Ni)-Dissolved			<0.050		mg/L		0.05	26-MAR-08
Phosphorus (P)-Dissolved			<0.30		mg/L		0.3	26-MAR-08
Potassium (K)-Dissolved			<0.50		mg/L		0.5	26-MAR-08
Selenium (Se)-Dissolved			<0.20		mg/L		0.2	26-MAR-08
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	26-MAR-08
Silver (Ag)-Dissolved			<0.010		mg/L		0.01	26-MAR-08
Sodium (Na)-Dissolved			<1.0		mg/L		1	26-MAR-08
Strontium (Sr)-Dissolved			<0.0050		mg/L		0.005	26-MAR-08
Sulfur (S)-Dissolved			<1.0		mg/L		1	26-MAR-08
Thallium (Tl)-Dissolved			<0.20		mg/L		0.2	26-MAR-08
Tin (Sn)-Dissolved			<0.030		mg/L		0.03	26-MAR-08
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	26-MAR-08
Vanadium (V)-Dissolved			<0.030		mg/L		0.03	26-MAR-08
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	26-MAR-08
Batch	R644948							
WG744861-6	CRM	QCS-A						
Aluminum (Al)-Dissolved			100		%		85-115	27-MAR-08
Antimony (Sb)-Dissolved			98		%		85-115	27-MAR-08
Arsenic (As)-Dissolved			101		%		85-115	27-MAR-08
Barium (Ba)-Dissolved			99		%		85-115	27-MAR-08
Beryllium (Be)-Dissolved			101		%		85-115	27-MAR-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b><u>MET-DIS-ICP-CL</u></b>	<b><u>Water</u></b>							
Batch	R644948							
WG744861-6 CRM		QCS-A						
Bismuth (Bi)-Dissolved			100		%		85-115	27-MAR-08
Boron (B)-Dissolved			101		%		85-115	27-MAR-08
Cadmium (Cd)-Dissolved			101		%		85-115	27-MAR-08
Calcium (Ca)-Dissolved			103		%		85-115	27-MAR-08
Chromium (Cr)-Dissolved			102		%		85-115	27-MAR-08
Cobalt (Co)-Dissolved			100		%		85-115	27-MAR-08
Copper (Cu)-Dissolved			98		%		85-115	27-MAR-08
Iron (Fe)-Dissolved			101		%		85-115	27-MAR-08
Lead (Pb)-Dissolved			99		%		85-115	27-MAR-08
Lithium (Li)-Dissolved			94		%		85-115	27-MAR-08
Magnesium (Mg)-Dissolved			95		%		85-115	27-MAR-08
Manganese (Mn)-Dissolved			101		%		85-115	27-MAR-08
Molybdenum (Mo)-Dissolved			100		%		85-115	27-MAR-08
Nickel (Ni)-Dissolved			101		%		85-115	27-MAR-08
Phosphorus (P)-Dissolved			99		%		85-115	27-MAR-08
Potassium (K)-Dissolved			99		%		85-115	27-MAR-08
Selenium (Se)-Dissolved			99		%		85-115	27-MAR-08
Silicon (Si)-Dissolved			104		%		85-115	27-MAR-08
Silver (Ag)-Dissolved			99		%		85-115	27-MAR-08
Sodium (Na)-Dissolved			98		%		85-115	27-MAR-08
Strontium (Sr)-Dissolved			99		%		85-115	27-MAR-08
Thallium (Tl)-Dissolved			99		%		85-115	27-MAR-08
Tin (Sn)-Dissolved			100		%		85-115	27-MAR-08
Titanium (Ti)-Dissolved			101		%		85-115	27-MAR-08
Vanadium (V)-Dissolved			102		%		85-115	27-MAR-08
Zinc (Zn)-Dissolved			102		%		85-115	27-MAR-08
WG744861-8 DUP		L612590-2						
Aluminum (Al)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Antimony (Sb)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Arsenic (As)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Barium (Ba)-Dissolved		0.414	0.416		mg/L	0.64	26	27-MAR-08
Beryllium (Be)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	27-MAR-08
Bismuth (Bi)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08

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<b>MET-DIS-ICP-CL</b>		<b>Water</b>						
Batch	R644948							
WG744861-8	DUP	L612590-2						
Boron (B)-Dissolved		<0.10	<0.10	RPD-NA	mg/L	N/A	26	27-MAR-08
Cadmium (Cd)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Calcium (Ca)-Dissolved		103	104		mg/L	1.2	26	27-MAR-08
Chromium (Cr)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Cobalt (Co)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Copper (Cu)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Iron (Fe)-Dissolved		0.174	0.175	J	mg/L	0.001	0.12	27-MAR-08
Lead (Pb)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	27-MAR-08
Lithium (Li)-Dissolved		0.017	0.017	J	mg/L	0.000	0.04	27-MAR-08
Magnesium (Mg)-Dissolved		22.5	22.7		mg/L	0.86	26	27-MAR-08
Manganese (Mn)-Dissolved		0.165	0.167		mg/L	1.1	26	27-MAR-08
Molybdenum (Mo)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	27-MAR-08
Nickel (Ni)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	27-MAR-08
Phosphorus (P)-Dissolved		<0.30	<0.30	RPD-NA	mg/L	N/A	26	27-MAR-08
Potassium (K)-Dissolved		2.25	2.29	J	mg/L	0.04	2	27-MAR-08
Selenium (Se)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Silicon (Si)-Dissolved		6.40	6.44		mg/L	0.52	26	27-MAR-08
Silver (Ag)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Sodium (Na)-Dissolved		10.2	10.3		mg/L	0.75	26	27-MAR-08
Strontium (Sr)-Dissolved		0.307	0.309		mg/L	0.78	26	27-MAR-08
Sulfur (S)-Dissolved		7.0	7.0	J	mg/L	0.0	4	27-MAR-08
Thallium (Tl)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Tin (Sn)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	27-MAR-08
Titanium (Ti)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Vanadium (V)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	27-MAR-08
Zinc (Zn)-Dissolved		0.0962	0.0958		mg/L	0.51	26	27-MAR-08
WG744861-9	DUP	L612966-8						
Aluminum (Al)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Antimony (Sb)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Arsenic (As)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Barium (Ba)-Dissolved		0.152	0.150		mg/L	1.2	26	27-MAR-08
Beryllium (Be)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	27-MAR-08
Bismuth (Bi)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b><u>MET-DIS-ICP-CL</u></b>		<b><u>Water</u></b>						
<b>Batch</b>	<b>R644948</b>							
<b>WG744861-9</b>	<b>DUP</b>	<b>L612966-8</b>						
Boron (B)-Dissolved		0.61	0.61	J	mg/L	0.00	0.4	27-MAR-08
Cadmium (Cd)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Calcium (Ca)-Dissolved		267	263		mg/L	1.4	26	27-MAR-08
Chromium (Cr)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Cobalt (Co)-Dissolved		0.018	0.018	J	mg/L	0.000	0.04	27-MAR-08
Copper (Cu)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Iron (Fe)-Dissolved		5.56	5.46		mg/L	1.9	26	27-MAR-08
Lead (Pb)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	27-MAR-08
Lithium (Li)-Dissolved		0.051	0.049	J	mg/L	0.002	0.04	27-MAR-08
Magnesium (Mg)-Dissolved		92.7	92.2		mg/L	0.58	26	27-MAR-08
Manganese (Mn)-Dissolved		2.06	2.04		mg/L	1.1	26	27-MAR-08
Molybdenum (Mo)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	27-MAR-08
Nickel (Ni)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	27-MAR-08
Phosphorus (P)-Dissolved		<0.30	<0.30	RPD-NA	mg/L	N/A	26	27-MAR-08
Potassium (K)-Dissolved		45.5	43.7		mg/L	4.0	26	27-MAR-08
Selenium (Se)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Silicon (Si)-Dissolved		7.13	7.02		mg/L	1.6	26	27-MAR-08
Silver (Ag)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Sodium (Na)-Dissolved		387	379		mg/L	2.2	26	27-MAR-08
Strontium (Sr)-Dissolved		1.36	1.35		mg/L	1.3	26	27-MAR-08
Sulfur (S)-Dissolved		186	186		mg/L	0.094	26	27-MAR-08
Thallium (Tl)-Dissolved		<0.20	<0.20	RPD-NA	mg/L	N/A	26	27-MAR-08
Tin (Sn)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	27-MAR-08
Titanium (Ti)-Dissolved		0.010	<0.010	RPD-NA	mg/L	N/A	26	27-MAR-08
Vanadium (V)-Dissolved		<0.030	<0.030	RPD-NA	mg/L	N/A	26	27-MAR-08
Zinc (Zn)-Dissolved		0.0835	0.0832		mg/L	0.36	26	27-MAR-08
<b>WG744861-1</b>	<b>MB</b>							
Aluminum (Al)-Dissolved			<0.20		mg/L		0.2	27-MAR-08
Antimony (Sb)-Dissolved			<0.20		mg/L		0.2	27-MAR-08
Arsenic (As)-Dissolved			<0.20		mg/L		0.2	27-MAR-08
Barium (Ba)-Dissolved			<0.010		mg/L		0.01	27-MAR-08
Beryllium (Be)-Dissolved			<0.0050		mg/L		0.005	27-MAR-08
Bismuth (Bi)-Dissolved			<0.20		mg/L		0.2	27-MAR-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<u>MET-DIS-ICP-CL</u>		<u>Water</u>						
Batch	R644948							
WG744861-1	MB							
Boron (B)-Dissolved			<0.10		mg/L		0.1	27-MAR-08
Cadmium (Cd)-Dissolved			<0.010		mg/L		0.01	27-MAR-08
Calcium (Ca)-Dissolved			<0.10		mg/L		0.1	27-MAR-08
Chromium (Cr)-Dissolved			<0.010		mg/L		0.01	27-MAR-08
Cobalt (Co)-Dissolved			<0.010		mg/L		0.01	27-MAR-08
Copper (Cu)-Dissolved			<0.010		mg/L		0.01	27-MAR-08
Iron (Fe)-Dissolved			<0.030		mg/L		0.03	27-MAR-08
Lead (Pb)-Dissolved			<0.050		mg/L		0.05	27-MAR-08
Lithium (Li)-Dissolved			<0.010		mg/L		0.01	27-MAR-08
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	27-MAR-08
Manganese (Mn)-Dissolved			<0.0050		mg/L		0.005	27-MAR-08
Molybdenum (Mo)-Dissolved			<0.030		mg/L		0.03	27-MAR-08
Nickel (Ni)-Dissolved			<0.050		mg/L		0.05	27-MAR-08
Phosphorus (P)-Dissolved			<0.30		mg/L		0.3	27-MAR-08
Potassium (K)-Dissolved			<0.50		mg/L		0.5	27-MAR-08
Selenium (Se)-Dissolved			<0.20		mg/L		0.2	27-MAR-08
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-MAR-08
Silver (Ag)-Dissolved			<0.010		mg/L		0.01	27-MAR-08
Sodium (Na)-Dissolved			<1.0		mg/L		1	27-MAR-08
Strontium (Sr)-Dissolved			<0.0050		mg/L		0.005	27-MAR-08
Sulfur (S)-Dissolved			<1.0		mg/L		1	27-MAR-08
Thallium (Tl)-Dissolved			<0.20		mg/L		0.2	27-MAR-08
Tin (Sn)-Dissolved			<0.030		mg/L		0.03	27-MAR-08
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	27-MAR-08
Vanadium (V)-Dissolved			<0.030		mg/L		0.03	27-MAR-08
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	27-MAR-08
<u>MET-DIS-LOW-MS-CL</u>		<u>Water</u>						
Batch	R645225							
WG745105-6	DUP	L612590-4						
Aluminum (Al)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	27-MAR-08
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	26	27-MAR-08
Arsenic (As)-Dissolved		0.00133	0.00135		mg/L	1.8	26	27-MAR-08
Barium (Ba)-Dissolved		0.329	0.324		mg/L	1.4	26	27-MAR-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-DIS-LOW-MS-CL</b>		<b>Water</b>						
Batch	R645225							
WG745105-6	DUP	L612590-4						
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	27-MAR-08
Bismuth (Bi)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	27-MAR-08
Boron (B)-Dissolved		0.016	0.015	J	mg/L	0.001	0.04	27-MAR-08
Cadmium (Cd)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	26	27-MAR-08
Calcium (Ca)-Dissolved		93.6	92.3		mg/L	1.5	26	27-MAR-08
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	27-MAR-08
Cobalt (Co)-Dissolved		0.00143	0.00137		mg/L	4.2	26	27-MAR-08
Copper (Cu)-Dissolved		0.00327	0.00318		mg/L	2.9	26	27-MAR-08
Lead (Pb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	26	27-MAR-08
Lithium (Li)-Dissolved		0.0211	0.0209	J	mg/L	0.0002	0.02	27-MAR-08
Magnesium (Mg)-Dissolved		24.6	24.5		mg/L	0.61	26	27-MAR-08
Manganese (Mn)-Dissolved		0.259	0.253		mg/L	2.4	26	27-MAR-08
Molybdenum (Mo)-Dissolved		0.000868	0.000792		mg/L	9.0	26	27-MAR-08
Nickel (Ni)-Dissolved		0.00183	0.00199	J	mg/L	0.00016	0.002	27-MAR-08
Potassium (K)-Dissolved		3.02	3.04		mg/L	0.61	26	27-MAR-08
Selenium (Se)-Dissolved		0.0108	0.0104		mg/L	3.6	26	27-MAR-08
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	26	27-MAR-08
Sodium (Na)-Dissolved		7.10	7.00		mg/L	1.5	26	27-MAR-08
Strontium (Sr)-Dissolved		0.272	0.270		mg/L	0.70	26	27-MAR-08
Thallium (Tl)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	26	27-MAR-08
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	26	27-MAR-08
Titanium (Ti)-Dissolved		0.0011	<0.0010	RPD-NA	mg/L	N/A	26	27-MAR-08
Uranium (U)-Dissolved		0.00383	0.00377		mg/L	1.4	26	27-MAR-08
Vanadium (V)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	26	27-MAR-08
Zinc (Zn)-Dissolved		0.0938	0.0928		mg/L	1.1	26	27-MAR-08
WG745105-1	MB							
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	27-MAR-08
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-08
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-08
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-08
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-08
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-08
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-MAR-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<u>MET-DIS-LOW-MS-CL</u>		<u>Water</u>						
Batch	R645225							
WG745105-1	MB							
Cadmium (Cd)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-08
Calcium (Ca)-Dissolved			<0.030		mg/L		0.03	27-MAR-08
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-08
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-08
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-08
Lead (Pb)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-08
Lithium (Li)-Dissolved			<0.0050		mg/L		0.005	27-MAR-08
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	27-MAR-08
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-08
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-MAR-08
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-MAR-08
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-MAR-08
Selenium (Se)-Dissolved			<0.0010		mg/L		0.001	27-MAR-08
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-08
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	27-MAR-08
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-08
Thallium (Tl)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-08
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-MAR-08
Titanium (Ti)-Dissolved			<0.0010		mg/L		0.001	27-MAR-08
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-MAR-08
Vanadium (V)-Dissolved			<0.0010		mg/L		0.001	27-MAR-08
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	27-MAR-08
Batch	R645756							
WG745860-2	CRM	CVS						
Aluminum (Al)-Dissolved			105		%		85-115	28-MAR-08
Antimony (Sb)-Dissolved			106		%		85-115	28-MAR-08
Arsenic (As)-Dissolved			102		%		85-115	28-MAR-08
Barium (Ba)-Dissolved			98		%		85-115	28-MAR-08
Beryllium (Be)-Dissolved			109		%		85-115	28-MAR-08
Bismuth (Bi)-Dissolved			94		%		85-115	28-MAR-08
Boron (B)-Dissolved			103		%		85-115	28-MAR-08
Cadmium (Cd)-Dissolved			103		%		85-115	28-MAR-08
Calcium (Ca)-Dissolved			100		%		85-115	28-MAR-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b><u>MET-DIS-LOW-MS-CL</u></b>		<b><u>Water</u></b>						
Batch	R645756							
WG745860-2	CRM	CVS						
Chromium (Cr)-Dissolved			100		%		85-115	28-MAR-08
Cobalt (Co)-Dissolved			101		%		85-115	28-MAR-08
Copper (Cu)-Dissolved			107		%		85-115	28-MAR-08
Lead (Pb)-Dissolved			97		%		85-115	28-MAR-08
Lithium (Li)-Dissolved			108		%		85-115	28-MAR-08
Magnesium (Mg)-Dissolved			101		%		85-115	28-MAR-08
Manganese (Mn)-Dissolved			105		%		85-115	28-MAR-08
Molybdenum (Mo)-Dissolved			104		%		85-115	28-MAR-08
Nickel (Ni)-Dissolved			109		%		85-115	28-MAR-08
Potassium (K)-Dissolved			101		%		85-115	28-MAR-08
Selenium (Se)-Dissolved			100		%		85-115	28-MAR-08
Silver (Ag)-Dissolved			111		%		85-115	28-MAR-08
Sodium (Na)-Dissolved			103		%		85-115	28-MAR-08
Strontium (Sr)-Dissolved			101		%		85-115	28-MAR-08
Thallium (Tl)-Dissolved			96		%		85-115	28-MAR-08
Tin (Sn)-Dissolved			95		%		85-115	28-MAR-08
Titanium (Ti)-Dissolved			109		%		85-115	28-MAR-08
Uranium (U)-Dissolved			95		%		85-115	28-MAR-08
Vanadium (V)-Dissolved			101		%		85-115	28-MAR-08
Zinc (Zn)-Dissolved			99		%		85-115	28-MAR-08
WG745860-4	DUP	L612590-10						
Aluminum (Al)-Dissolved		<0.025	<0.025	RPD-NA	mg/L	N/A	26	28-MAR-08
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	28-MAR-08
Arsenic (As)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	28-MAR-08
Barium (Ba)-Dissolved		0.529	0.519		mg/L	1.8	26	28-MAR-08
Beryllium (Be)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	26	28-MAR-08
Bismuth (Bi)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	26	28-MAR-08
Boron (B)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	26	28-MAR-08
Cadmium (Cd)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	26	28-MAR-08
Calcium (Ca)-Dissolved		59.5	63.7		mg/L	6.9	26	28-MAR-08
Chromium (Cr)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	26	28-MAR-08
Cobalt (Co)-Dissolved		0.00058	0.00061	J	mg/L	0.00003	0.002	28-MAR-08
Copper (Cu)-Dissolved		0.00490	0.00497	J	mg/L	0.00007	0.002	28-MAR-08

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<u>MET-DIS-LOW-MS-CL</u>		<u>Water</u>						
Batch	R645756							
WG745860-4	DUP	L612590-10						
Lead (Pb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	28-MAR-08
Lithium (Li)-Dissolved		<0.025	<0.025	RPD-NA	mg/L	N/A	26	28-MAR-08
Magnesium (Mg)-Dissolved		14.4	15.3		mg/L	5.6	26	28-MAR-08
Manganese (Mn)-Dissolved		0.124	0.133		mg/L	6.8	26	28-MAR-08
Molybdenum (Mo)-Dissolved		0.00236	0.00253	J	mg/L	0.00016	0.001	28-MAR-08
Nickel (Ni)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	26	28-MAR-08
Potassium (K)-Dissolved		2.74	2.94		mg/L	6.9	26	28-MAR-08
Selenium (Se)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	28-MAR-08
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	26	28-MAR-08
Sodium (Na)-Dissolved		4.77	5.22		mg/L	9.0	26	28-MAR-08
Strontium (Sr)-Dissolved		0.151	0.164		mg/L	8.1	26	28-MAR-08
Thallium (Tl)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	26	28-MAR-08
Tin (Sn)-Dissolved		0.00064	0.00067	J	mg/L	0.00004	0.002	28-MAR-08
Titanium (Ti)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	28-MAR-08
Uranium (U)-Dissolved		0.00232	0.00221		mg/L	4.6	26	28-MAR-08
Vanadium (V)-Dissolved		<0.0050	<0.0050	RPD-NA	mg/L	N/A	26	28-MAR-08
Zinc (Zn)-Dissolved		0.066	0.072	J	mg/L	0.006	0.1	28-MAR-08
WG745860-1	MB							
Aluminum (Al)-Dissolved			<0.0050		mg/L		0.005	28-MAR-08
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-08
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-08
Barium (Ba)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-08
Beryllium (Be)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-08
Bismuth (Bi)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-08
Boron (B)-Dissolved			<0.010		mg/L		0.01	28-MAR-08
Cadmium (Cd)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-08
Calcium (Ca)-Dissolved			<0.030		mg/L		0.03	28-MAR-08
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-08
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-08
Copper (Cu)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-08
Lead (Pb)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-08
Lithium (Li)-Dissolved			<0.0050		mg/L		0.005	28-MAR-08
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	28-MAR-08

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<u>MET-DIS-LOW-MS-CL</u>		<u>Water</u>						
Batch	R645756							
WG745860-1	MB							
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-08
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	28-MAR-08
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	28-MAR-08
Potassium (K)-Dissolved			<0.050		mg/L		0.05	28-MAR-08
Selenium (Se)-Dissolved			<0.0010		mg/L		0.001	28-MAR-08
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	28-MAR-08
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	28-MAR-08
Strontium (Sr)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-08
Thallium (Tl)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-08
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	28-MAR-08
Titanium (Ti)-Dissolved			<0.0010		mg/L		0.001	28-MAR-08
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	28-MAR-08
Vanadium (V)-Dissolved			<0.0010		mg/L		0.001	28-MAR-08
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	28-MAR-08
<u>NO2-CL</u>		<u>Water</u>						
Batch	R644388							
WG744189-6	DUP	L612590-1						
Nitrite-N		<0.05	<0.05	RPD-NA	mg/L	N/A	16	24-MAR-08
WG744189-2	LCS							
Nitrite-N			103		%		89-111	24-MAR-08
WG744189-1	MB							
Nitrite-N			<0.05		mg/L		0.05	24-MAR-08
<u>NO3-IC-CL</u>		<u>Water</u>						
Batch	R644388							
WG744189-3	DUP	L612425-11						
Nitrate-N		<0.05	<0.05	RPD-NA	mg/L	N/A	16	24-MAR-08
WG744189-5	DUP	L612499-12						
Nitrate-N		0.23	0.24	J	mg/L	0.01	0.2	24-MAR-08
WG744189-6	DUP	L612590-1						
Nitrate-N		0.50	0.53		mg/L	5.4	16	24-MAR-08
WG744189-7	DUP	L612590-12						
Nitrate-N		0.10	0.12	J	mg/L	0.02	0.2	24-MAR-08
WG744189-2	LCS							
Nitrate-N			99		%		89-109	24-MAR-08
WG744189-1	MB							

## ALS Laboratory Group Quality Control Report

Workorder: L612590

Report Date: 28-MAR-08

Page 17 of 19

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b><u>NO3-IC-CL</u></b>		<b><u>Water</u></b>						
Batch	R644388							
WG744189-1	MB							
Nitrate-N			<0.05		mg/L		0.05	24-MAR-08
WG744189-4	MS	L612425-11						
Nitrate-N			96		%		76-117	24-MAR-08
<b><u>PH/EC/ALK-CL</u></b>		<b><u>Water</u></b>						
Batch	R644357							
WG744284-3	DUP	L612545-2						
Alkalinity, Total (as CaCO3)		1050	1050		mg/L	0.061	6.5	24-MAR-08
Bicarbonate (HCO3)		1280	1280		mg/L	0.061	6.5	24-MAR-08
Carbonate (CO3)		<5	<5	RPD-NA	mg/L	N/A	6.5	24-MAR-08
Conductivity (EC)		65200	65000		uS/cm	0.31	9.8	24-MAR-08
Hydroxide (OH)		<5	<5	RPD-NA	mg/L	N/A	6.5	24-MAR-08
pH		7.90	7.92	J	pH	0.02	0.2	24-MAR-08
WG744284-4	DUP	L612590-12						
Alkalinity, Total (as CaCO3)		298	297		mg/L	0.35	6.5	24-MAR-08
Bicarbonate (HCO3)		363	362		mg/L	0.35	6.5	24-MAR-08
Carbonate (CO3)		<5	<5	RPD-NA	mg/L	N/A	6.5	24-MAR-08
Conductivity (EC)		583	584		uS/cm	0.17	9.8	24-MAR-08
Hydroxide (OH)		<5	<5	RPD-NA	mg/L	N/A	6.5	24-MAR-08
pH		7.92	7.91	J	pH	0.01	0.2	24-MAR-08
WG744284-1	LCS							
Alkalinity, Total (as CaCO3)			95		%		90-108	24-MAR-08
Conductivity (EC)			102		%		90-108	24-MAR-08
pH			7.01		pH		6.86-7.16	24-MAR-08
<b><u>SO4-CL</u></b>		<b><u>Water</u></b>						
Batch	R644388							
WG744189-3	DUP	L612425-11						
Sulphate (SO4)		<0.5	<0.5	RPD-NA	mg/L	N/A	13	24-MAR-08
WG744189-6	DUP	L612590-1						
Sulphate (SO4)		21.7	21.5		mg/L	0.81	13	24-MAR-08
WG744189-7	DUP	L612590-12						
Sulphate (SO4)		23.3	23.2		mg/L	0.52	13	24-MAR-08
WG744189-2	LCS							
Sulphate (SO4)			102		%		91-110	24-MAR-08
WG744189-1	MB							
Sulphate (SO4)			<0.5		mg/L		0.5	24-MAR-08

## ALS Laboratory Group Quality Control Report

Workorder: L612590

Report Date: 28-MAR-08

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<u>SO4-CL</u>	<u>Water</u>							
Batch	R644388							
WG744189-4	MS	L612425-11	102		%		80-113	24-MAR-08
Sulphate (SO4)								

## **ALS Laboratory Group Quality Control Report**

Workorder: L612590

Report Date: 28-MAR-08

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### **Legend:**

---

Limit	99% Confidence Interval (Laboratory Control Limits)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

### **Sample Parameter Qualifier Definitions:**

---

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.



Environmental Division

<b>REPORT TO:</b>		<b>REPORT FORMAT / DISTRIBUTION</b>		<b>SERVICE REQUESTED</b>	
COMPANY: <u>EBA</u>		STANDARD _____ OTHER _____		<input checked="" type="checkbox"/> REGULAR SERVICE (DEFAULT)	
CONTACT: <u>Mayer Mahgoub</u>		PDF <input checked="" type="checkbox"/> EXCEL <input checked="" type="checkbox"/> CUSTOM _____ FAX _____		RUSH SERVICE (2-3 DAYS)	
ADDRESS: <u>115, 200 Rivercrest Drive SE</u>		EMAIL 1: <u>nmahgoub@eba.ca</u>		PRIORITY SERVICE (1 DAY or ASAP)	
<u>Calgary, Alberta</u>		EMAIL 2: <u>jsambirsky@eba.ca</u>		EMERGENCY SERVICE (<1 DAY / WEEKEND) - CONTACT ALS	
PHONE: <u>203-3355</u> FAX: <u>203-3301</u>		<b>ANALYSIS REQUEST</b>			
INVOICE TO: SAME AS REPORT ? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		INDICATE BOTTLES: FILTERED / PRESERVED (F/P) → → →			
COMPANY:		CLIENT / PROJECT INFORMATION:			
CONTACT:		JOB #: <u>C22101178</u>			
ADDRESS:		PO / AFE:			
		Legal Site Description:			
PHONE:		QUOTE #:			
Lab Work Order #		Test Samples		SAMPLER (Initials): <u>Jack Sambirsky</u>	
Sample #	SAMPLE IDENTIFICATION (This description will appear on the report)	DATE	TIME	SAMPLE TYPE	
1	08 MW 01	March 22	8:00	Water	
2	08 MW 02	March 22	8:20	Water	
3	08 MW 03	March 22	8:40	Water	
4	08 MW 04B	March 21	5:00	Water	
5	08 MW 05B	March 21	5:30	Water	
6	08 MW 06B	March 21	6:00	Water	
7	08 MW 07B	March 22	9:00	Water	
8	08 MW 08	March 22	9:20	Water	
9	08 MW 09	March 22	9:40	Water	
10	08 MW 10	March 21	6:30	Water	
GUIDELINES / REGULATIONS		SPECIAL INSTRUCTIONS / HAZARDOUS DETAILS			
Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.					
By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the reverse page of the white report copy.					
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	SAMPLE CONDITION (lab use only)	
<u>Jack Sambirsky</u>		<u>Joe M...</u>	<u>Mar 24/08</u>	TEMPERATURE	SAMPLES RECEIVED IN GOOD CONDITION ? YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME:	<u>-1°C</u>	(If no provide details)
			<u>09:15</u>		



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COC # C081195

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**Environmental Division**

RELINQUISHED BY: <i>[Signature]</i>	DATE & TIME:	RECEIVED BY: <i>[Signature]</i>	DATE & TIME: <i>Mar 24/08</i>	SAMPLE CONDITION (lab use only)	
RELINQUISHED BY:	DATE & TIME:	RECEIVED BY:	DATE & TIME: <i>09:15</i>	TEMPERATURE: <i>7°C</i>	SAMPLES RECEIVED IN GOOD CONDITION <input checked="" type="radio"/> YES <input type="radio"/> NO (If no provide details)

# APPENDIX C

## APPENDIX C HYDRAULIC CONDUCTIVITY RESULTS

**EBA Engineering Consultants Ltd. Slug Test Analysis Report**

115, 200 Rivercrest Drive SE

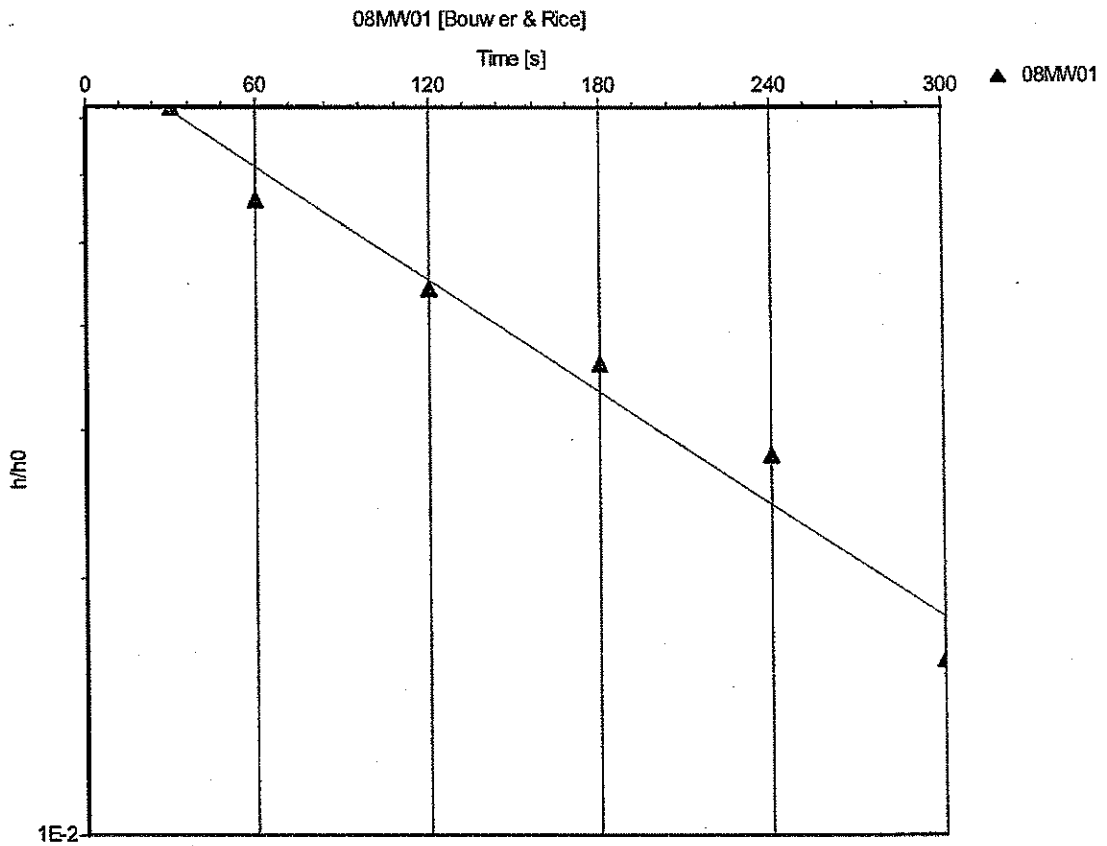
Calgary, AB

(403) 203-3305

Project: Wood Buffalo Park

Number: C22101178

Client: Public Works and Government Services Canada

Slug Test: 08MW01Analysis Method: Bouwer & RiceAnalysis Results:

Conductivity: 1.12E-6 [m/s]

<u>Test parameters:</u>	Test Well:	08MW01	Aquifer Thickness:	1.295 [m]
	Casing radius:	0.0254 [m]	Gravel Pack Porosity (%)	25
	Screen length:	3.1 [m]		
	Boring radius:	0.0762 [m]		
	r <sub>(eff)</sub> :	0.044 [m]		

Comments:

Evaluated by: Jan Czamecki

Evaluation Date: 4/3/2008



# EBA Engineering Consultants Ltd. Slug Test Analysis Report

115, 200 Rivercrest Drive SE

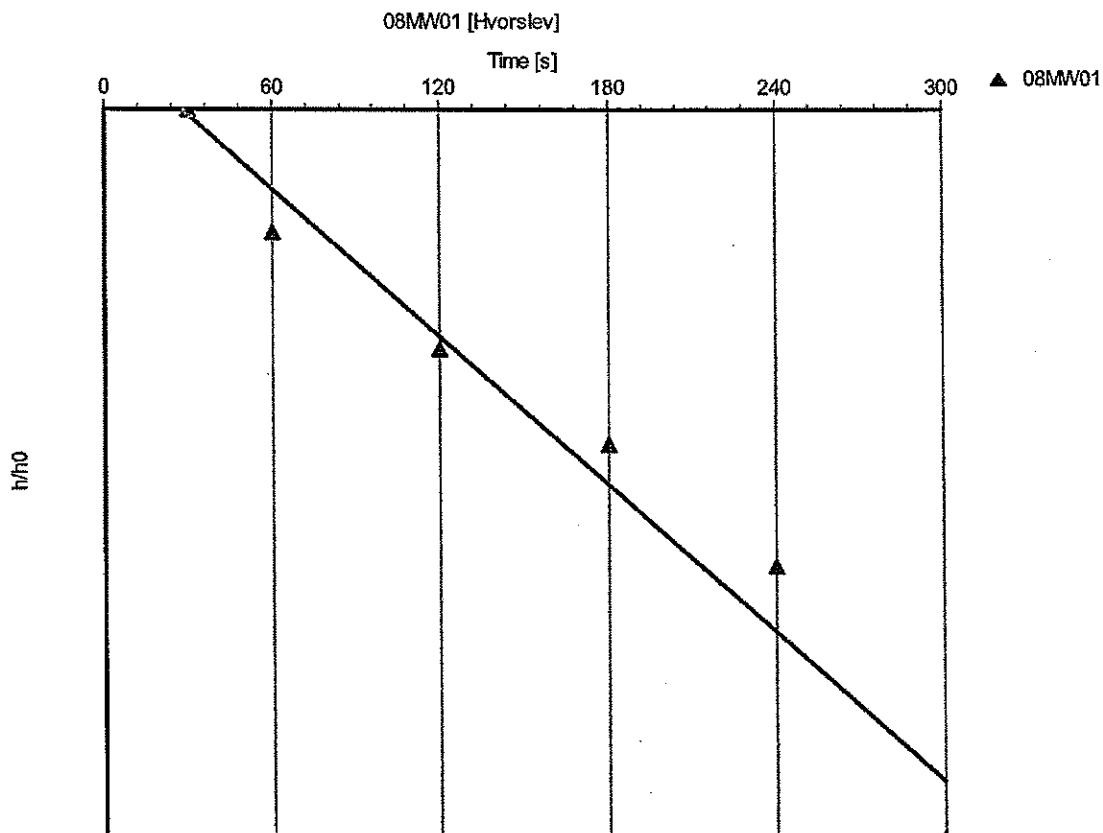
Calgary, AB

(403) 203-3305

Project: Wood Buffalo Park

Number: C22101178

Client: Public Works and Government Services Canada



Slug Test: 08MW01

Analysis Method: Hvorslev

## Analysis Results:

Conductivity: 1.98E-6 [m/s]

## Test parameters:

Test Well: 08MW01

Aquifer Thickness: 1.295 [m]

Casing radius: 0.0254 [m]

Screen length: 3.1 [m]

Boring radius: 0.0762 [m]

## Comments:

Evaluated by: Jan Czarnecki

Evaluation Date: 4/3/2008

**EBA Engineering Consultants Ltd. Slug Test Analysis Report**

115, 200 Rivercrest Drive SE

Calgary, AB

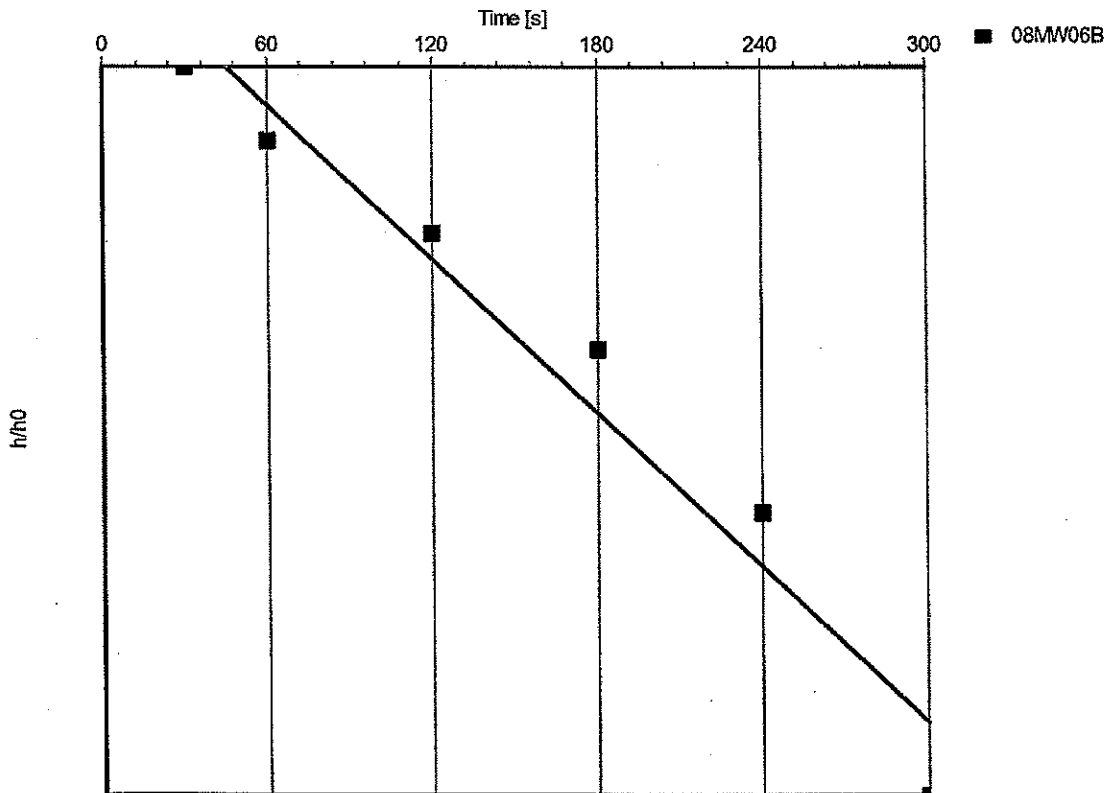
(403) 203-3305

Project: Wood Buffalo Park

Number: C22101178

Client: Public Works and Government Services Canada

08MW06B [Bouwer &amp; Rice]

Slug Test: 08MW06BAnalysis Method: Bouwer & RiceAnalysis Results:

Conductivity: 1.58E-6 [m/s]

Test parameters:

Test Well: 08MW06B

Aquifer Thickness: 1.6 [m]

Casing radius: 0.0254 [m]

Gravel Pack Porosity (%) 25

Screen length: 3.1 [m]

Boring radius: 0.0762 [m]

r(eff): 0.044 [m]

Comments:

Evaluated by: Jan Czamecki

Evaluation Date: 4/3/2008

**EBA Engineering Consultants Ltd. Slug Test Analysis Report**

115, 200 Rivercrest Drive SE

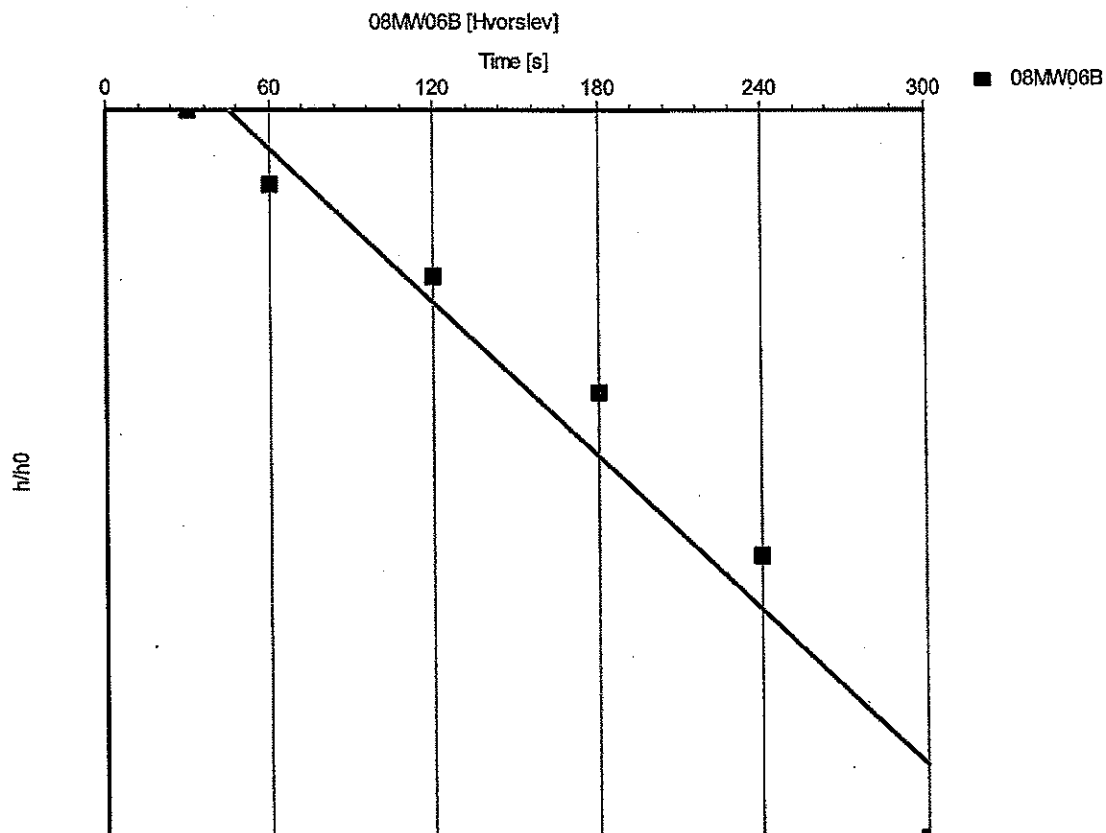
Calgary, AB

(403) 203-3305

Project: Wood Buffalo Park

Number: C22101178

Client: Public Works and Government Services Canada

**Slug Test:** 08MW06B**Analysis Method:** Hvorslev**Analysis Results:****Conductivity:** 2.46E-6 [m/s]

<b>Test parameters:</b>	<b>Test Well:</b>	08MW06B	<b>Aquifer Thickness:</b>	1.6 [m]
	<b>Casing radius:</b>	0.0254 [m]		
	<b>Screen length:</b>	3.1 [m]		
	<b>Boring radius:</b>	0.0762 [m]		

**Comments:**

Evaluated by: Jan Czamecki

Evaluation Date: 4/3/2008

**EBA Engineering Consultants Ltd. Slug Test Analysis Report**

115, 200 Rivercrest Drive SE

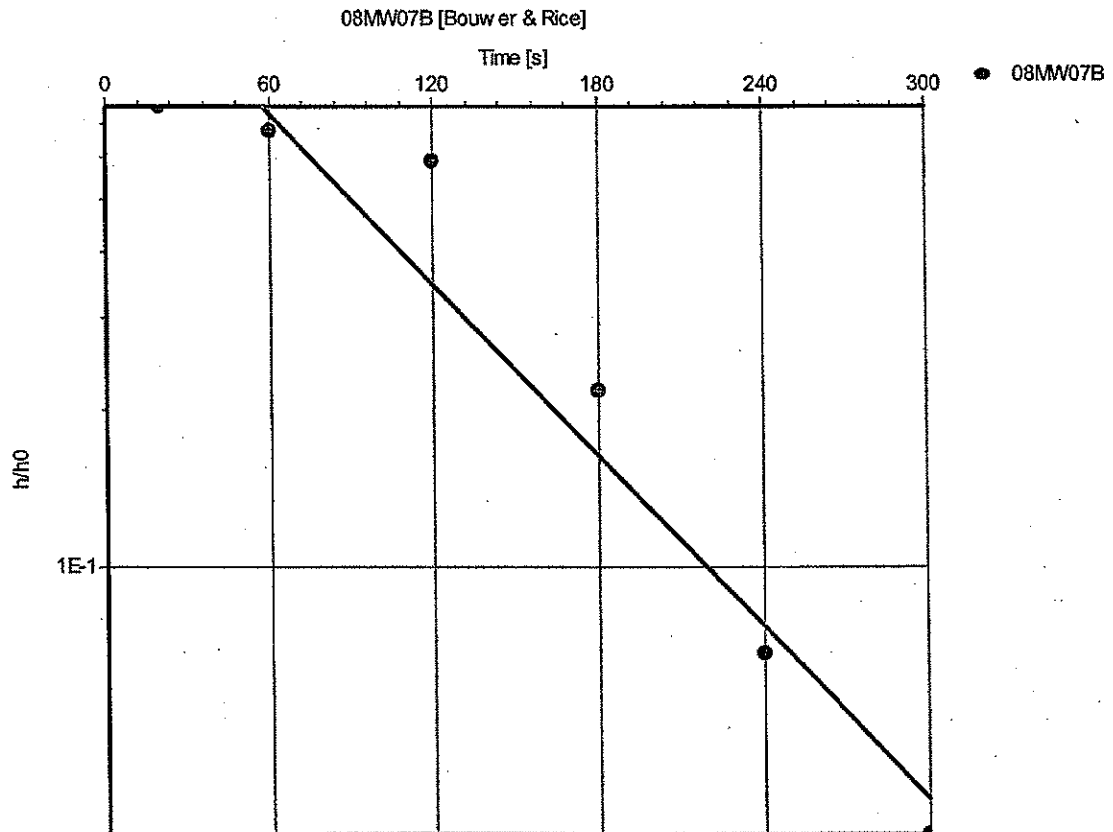
Calgary, AB

(403) 203-3305

Project: Wood Buffalo Park

Number: C22101178

Client: Public Works and Government Services Canada

Slug Test: 08MW07BAnalysis Method: Bouwer & RiceAnalysis Results:

Conductivity: 2.71E-6 [m/s]

<u>Test parameters:</u>	Test Well:	08MW07B	Aquifer Thickness:	1.175 [m]
	Casing radius:	0.0254 [m]	Gravel Pack Porosity (%)	25
	Screen length:	3.1 [m]		
	Boring radius:	0.0762 [m]		
	r(eff):	0.044 [m]		

Comments:

Evaluated by: Jan Czamecki

Evaluation Date: 4/3/2008

**EBA Engineering Consultants Ltd. Slug Test Analysis Report**

115, 200 Rivercrest Drive SE

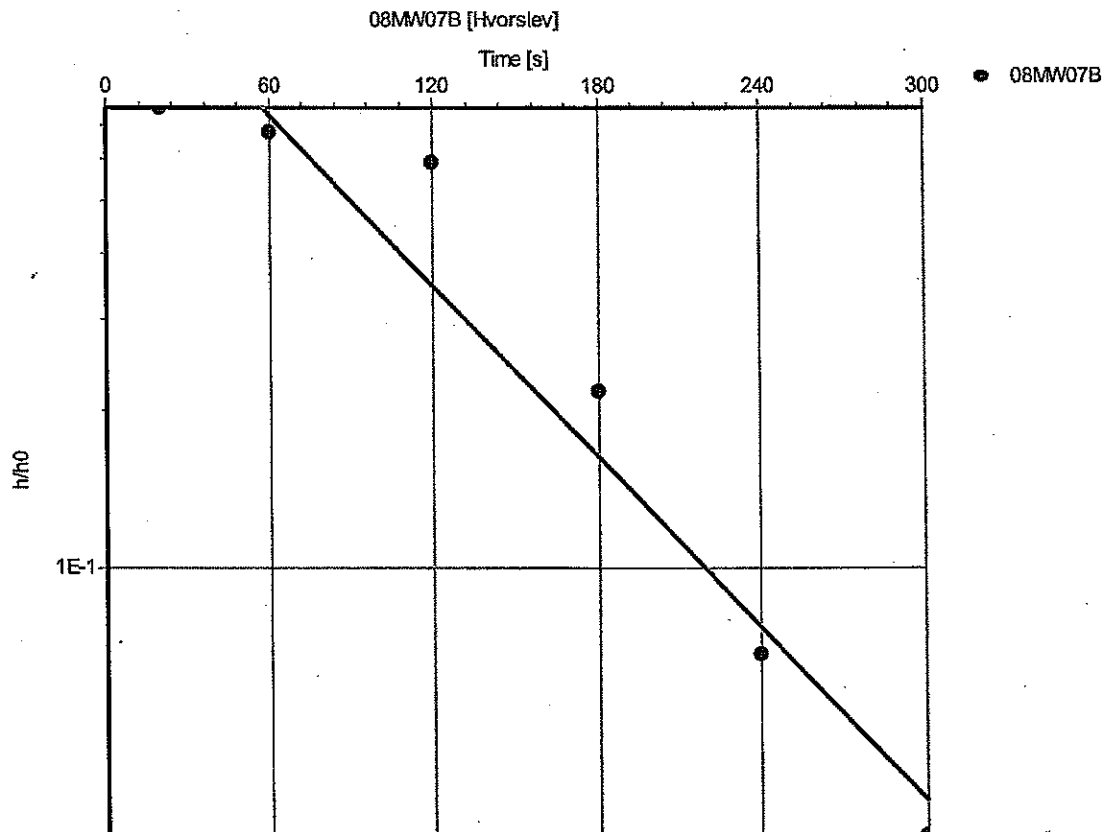
Calgary, AB

(403) 203-3305

Project: Wood Buffalo Park

Number: C22101178

Client: Public Works and Government Services Canada

**Slug Test:** 08MW07B**Analysis Method:** Hvorslev**Analysis Results:**

Conductivity: 4.84E-6 [m/s]

<b>Test parameters:</b>	Test Well:	08MW07B	Aquifer Thickness:	1.175 [m]
	Casing radius:	0.0254 [m]		
	Screen length:	3.1 [m]		
	Boring radius:	0.0762 [m]		

**Comments:**

Evaluated by: Jan Czamecki

Evaluation Date: 4/3/2008

**EBA Engineering Consultants Ltd. Slug Test Analysis Report**

115, 200 Rivercrest Drive SE

Calgary, AB

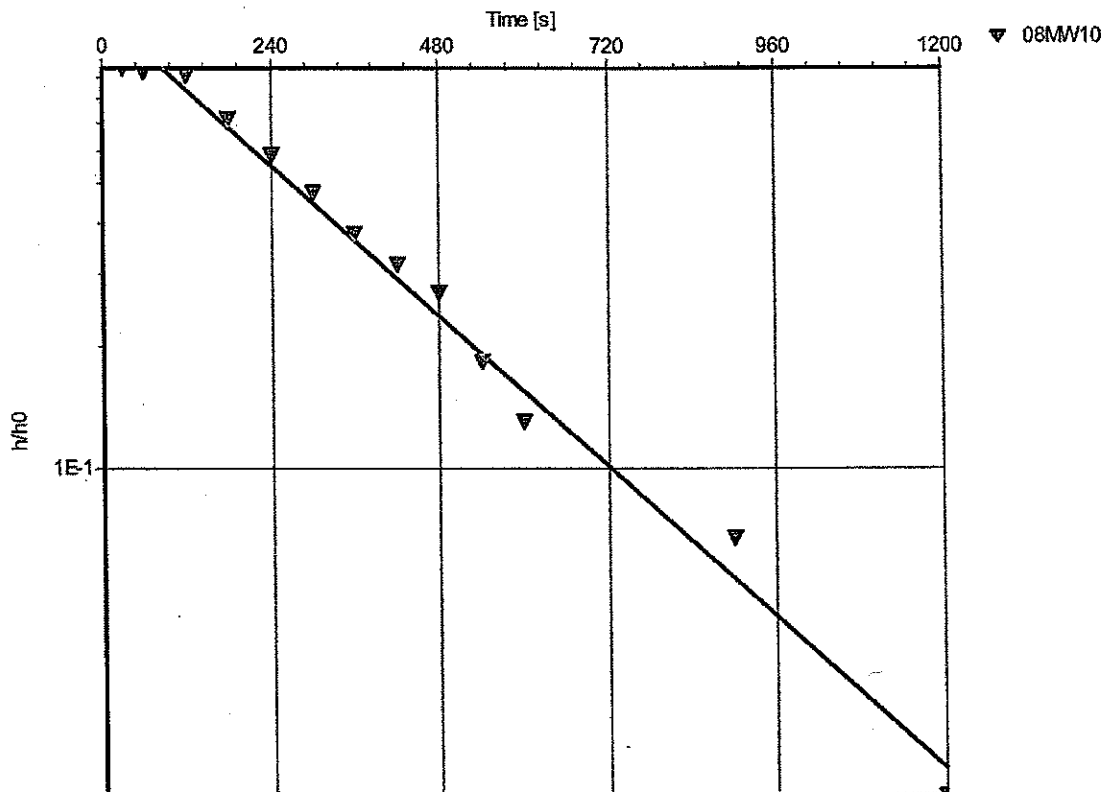
(403) 203-3305

Project: Wood Buffalo Park

Number: C22101178

Client: Public Works and Government Services Canada

08MW10 [Bouwer &amp; Rice]

Slug Test: 08MW10Analysis Method: Bouwer & RiceAnalysis Results:

Conductivity: 5.83E-7 [m/s]

<u>Test parameters:</u>	Test Well:	08MW10	Aquifer Thickness:	0.762 [m]
	Casing radius:	0.0254 [m]	Gravel Pack Porosity (%)	25
	Screen length:	3.1 [m]		
	Boring radius:	0.0762 [m]		
	r(eff):	0.044 [m]		

Comments:

Evaluated by: Jan Czamecki

Evaluation Date: 4/3/2008

**EBA Engineering Consultants Ltd. Slug Test Analysis Report**

115, 200 Rivercrest Drive SE

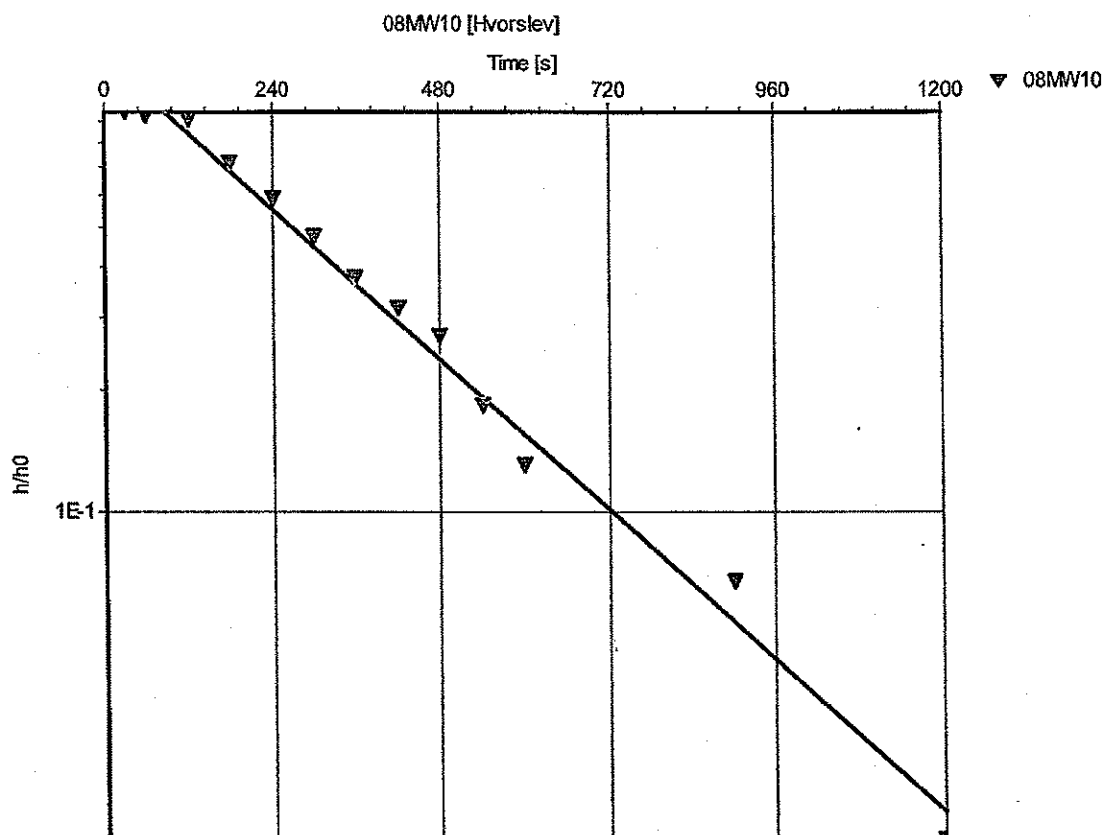
Calgary, AB

(403) 203-3305

Project: Wood Buffalo Park

Number: C22101178

Client: Public Works and Government Services Canada

Slug Test: 08MW10Analysis Method: HvorslevAnalysis Results:

Conductivity: 1.37E-6 [m/s]

Test parameters:

Test Well: 08MW10

Casing radius: 0.0254 [m]

Screen length: 3.1 [m]

Boring radius: 0.0762 [m]

Aquifer Thickness: 0.762 [m]

Comments:

Evaluated by: Jan Czamecki

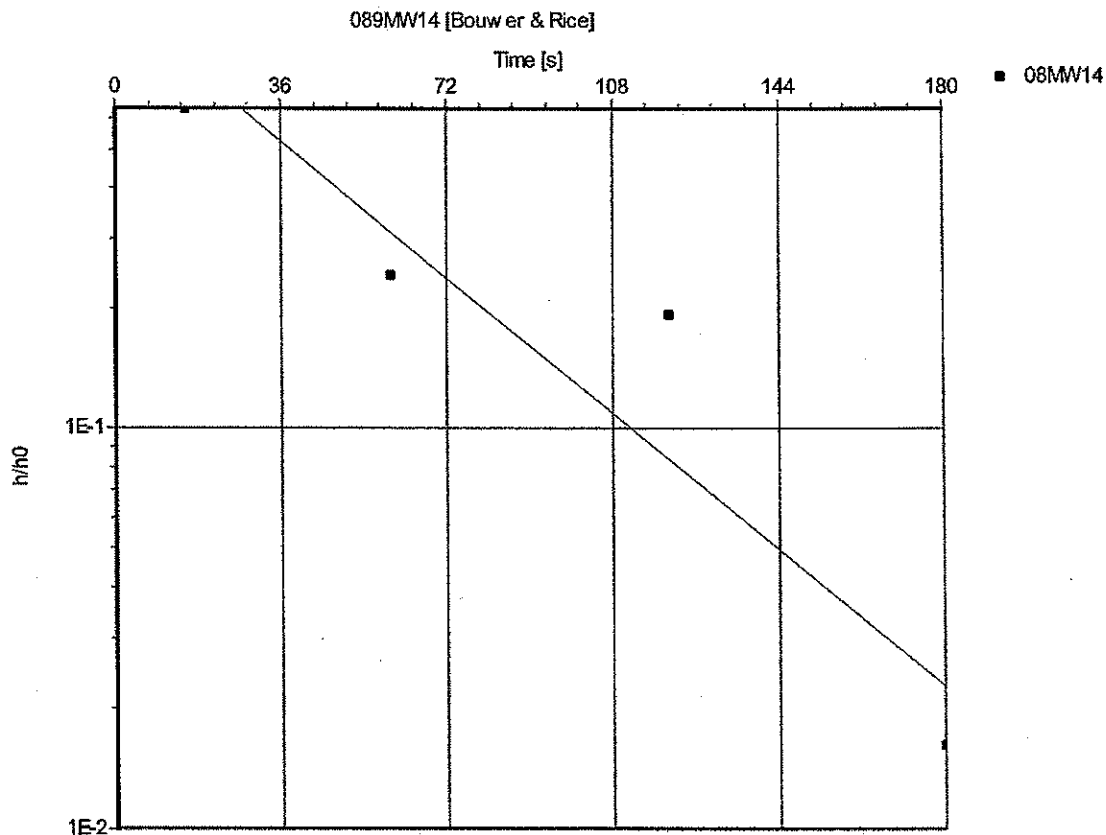
Evaluation Date: 4/3/2008



**EBA** Engineering Consultants Ltd  
Riverbend Atrium One #115, 200 Rivercrest Drive SE  
Calgary, AB T2C 2X5 CANADA

### Slug Test Analysis Report

Project: Garden River Parks Canada  
Number: C22101178  
Client: Parks Canada



Slug Test: 089MW14

Analysis Method: Bouwer & Rice

Analysis Results:

Conductivity: 1.11E-5 [m/s]

Test parameters:

Test Well: 089MW14  
Casing radius: 0.0254 [m]  
Screen length: 3 [m]  
Boring radius: 0.0762 [m]  
  
r(eff): 0.041 [m]

Aquifer Thickness: 0.712 [m]  
Gravel Pack Porosity (%) 20

Comments:

Automatic fit

Figure

Evaluated by: Jay X  
Evaluation 10/6/2008



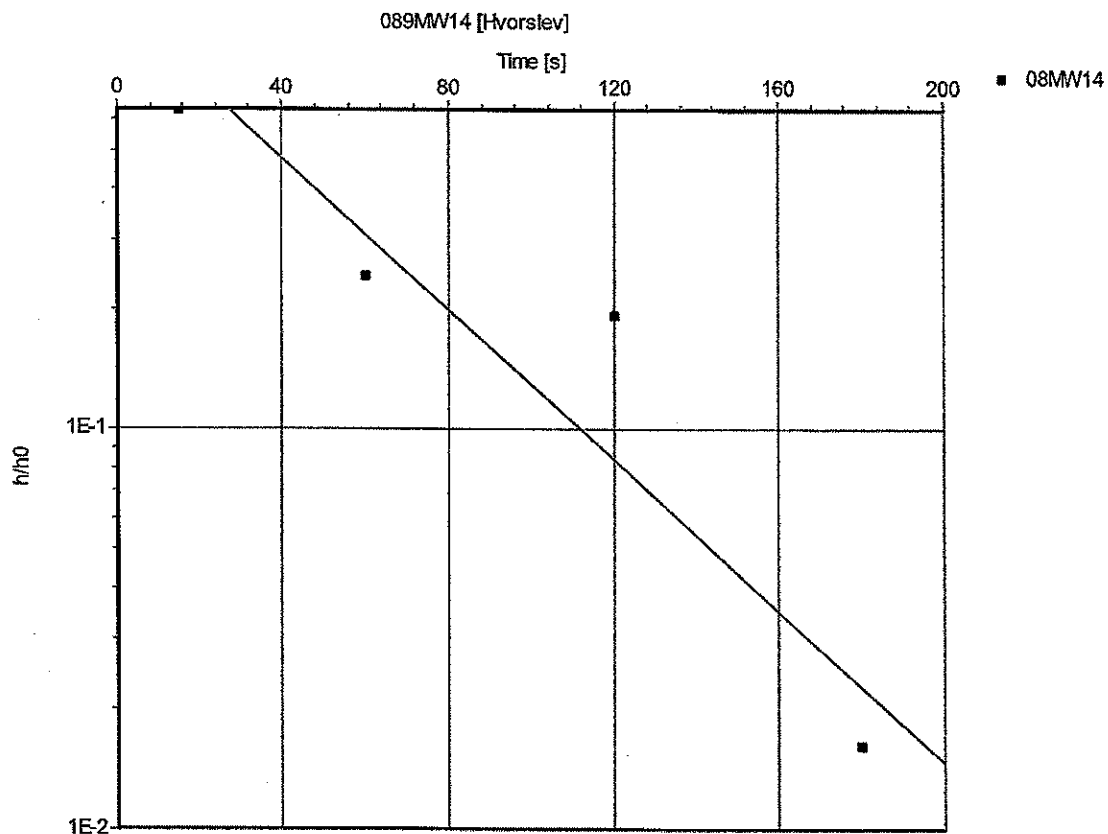
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Riverbend Atrium One #115, 200 Rivercrest Drive SE  
Calgary, AB T2C 2X5 CANADA

### Slug Test Analysis Report

Project: Garden River Parks Canada

Number: C22101178

Client: Parks Canada



Slug Test: 089MW14

Analysis Method: Hvorslev

Analysis Results:

Conductivity: 8.63E-6 [m/s]

Test parameters:

Test Well: 08MW14  
Casing radius: 0.0254 [m]  
Screen length: 3 [m]  
Boring radius: 0.0762 [m]

Aquifer Thickness: 0.712 [m]

Comments:

Automatic fit

Figure

Evaluated by: Jay X

Evaluation: 10/6/2008



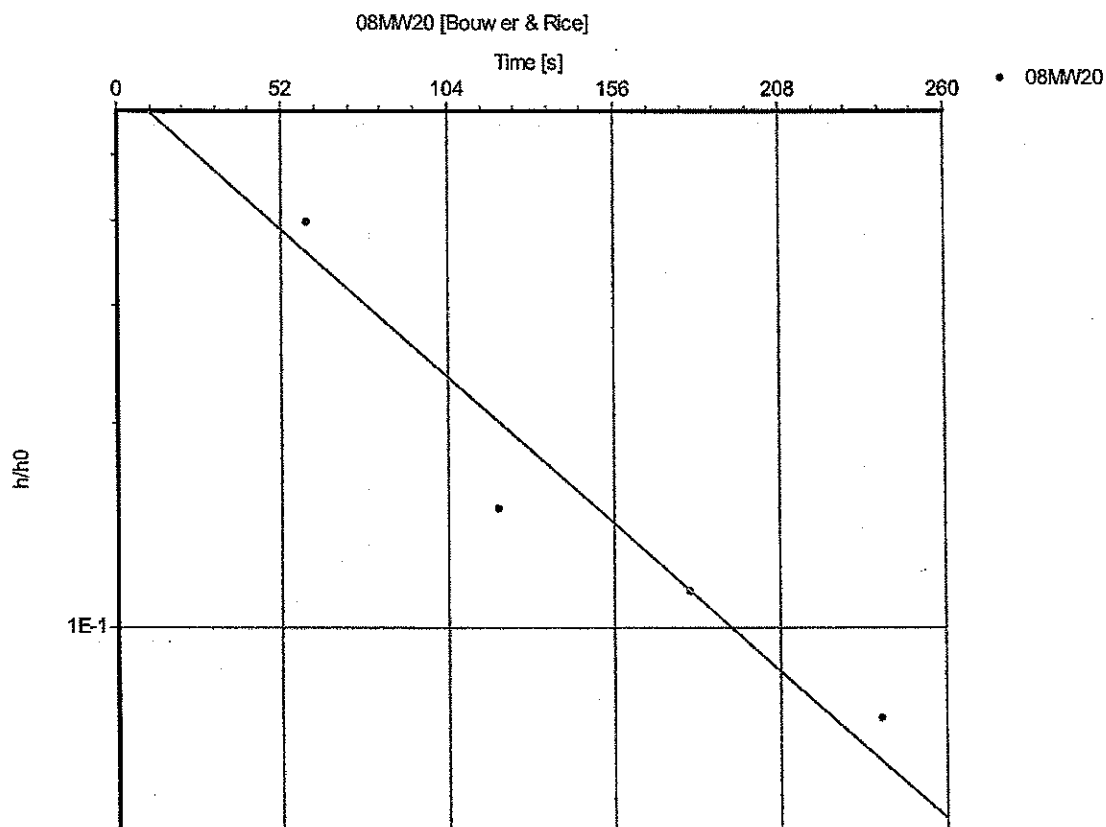
**EBA** Engineering Consultants Ltd  
Riverbend Atrium One #115, 200 Rivercrest Drive SE  
Calgary, AB T2C 2X5 CANADA

### Slug Test Analysis Report

Project: Garden River Parks Canada

Number: C22101178

Client: Parks Canada



Slug Test: 08MW20

Analysis Method: Bouwer & Rice

Analysis Results:

Conductivity: 7.01E-6 [m/s]

Test parameters:

Test Well: 08MW20  
Casing radius: 0.0254 [m]  
Screen length: 3 [m]  
Boring radius: 0.0762 [m]  
  
r(eff): 0.041 [m]

Aquifer Thickness: 2.176 [m]  
Gravel Pack Porosity (%) 20

Comments:

Automatic fit

Figure

Evaluated by: Jay X

Evaluation 10/6/2008



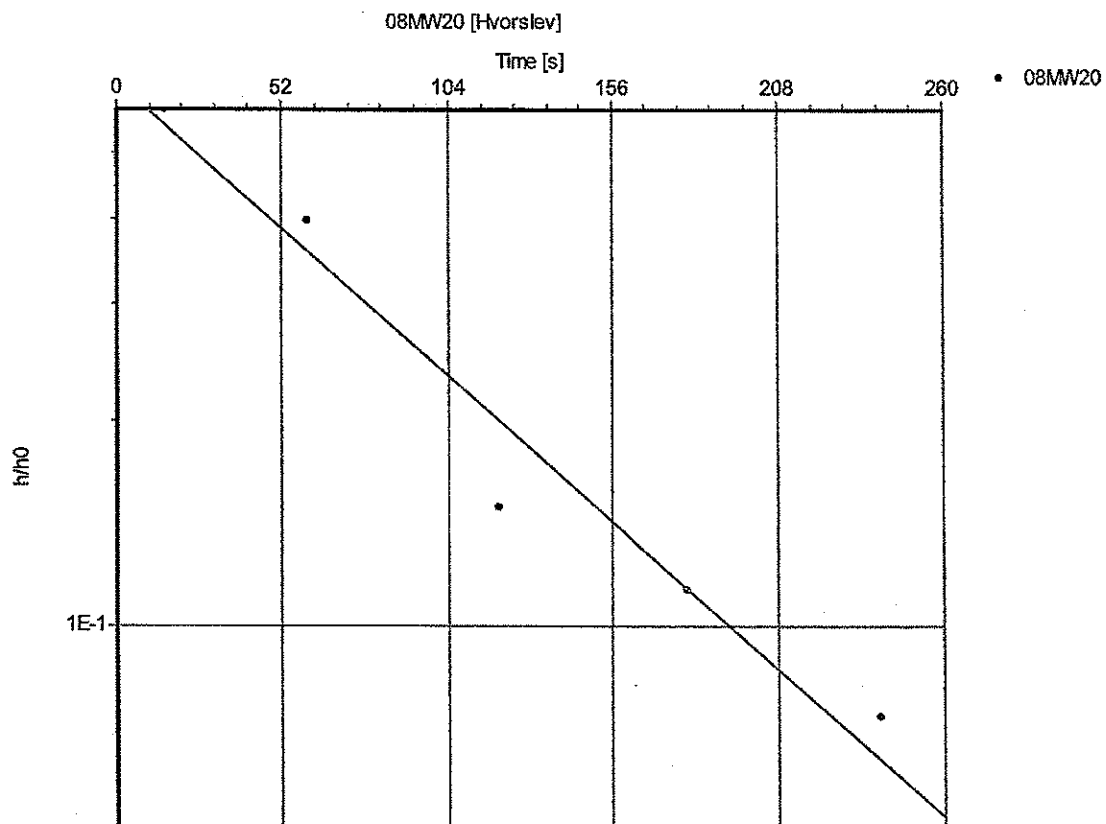
**EBA** Engineering Consultants Ltd  
Riverbend Atrium One #115, 200 Rivercrest Drive SE  
Calgary, AB T2C 2X5 CANADA

### Slug Test Analysis Report

Project: Garden River Parks Canada

Number: C22101178

Client: Parks Canada



Slug Test: 08MW20

Analysis Method: Hvorslev

Analysis Results:

Conductivity: 3.82E-6 [m/s]

<u>Test parameters:</u>	Test Well:	08MW20	Aquifer Thickness:	2.176 [m]
	Casing radius:	0.0254 [m]		
	Screen length:	3 [m]		
	Boring radius:	0.0762 [m]		

Comments: Automatic fit

Figure

Evaluated by: Jay X

Evaluation 10/8/2008

# APPENDIX D

## APPENDIX D QUALITY CONTROL/QUALITY ASSURANCE OF FIELD SAMPLING PROGRAM

**Quality Control/Quality Assurance of Field Sampling Program  
Contaminant Site Assessment  
Community of Garden River, Wood Buffalo National Park, Alberta**

## **1.0 INTRODUCTION**

Quality assurance/quality control (QA/QC) programs for environmental sampling are implemented to assess and/or quantify field, laboratory and data reduction quality.

Field quality control includes procedures and documentation, as discussed in the methodology section of the report, and sometimes collection of quality assurance samples, discussed in the section below.

Laboratory QA/QC reports are required by environmental laboratories accredited by the Canadian Association of Environmental Analytical Laboratories (CAELA) and can be requested to be attached to the laboratory data or requested from the lab directly. Laboratory QA/QC data reviewed by the assessor is generally limited to percentage recovery of added surrogates. The detection limits of the analytical methods are presented on the analytical reports.

Data QA/QC can be evaluated by a variety of methods, some qualitative and some quantitative, using methods defined in Canadian Council of Ministers of the Environment (CCME) "Soil Data Quality Objectives (DQOs)" or United States Environmental Protection Agency (USEPA) "Attainment of Clean-up Objectives." For upstream oil and gas sites, analytical results are reviewed and compared to what would be expected for the material type and situation based upon the assessors experience. Discrepancies are investigated by either analyzing additional samples or re-analysis of the same sample. For a statistically designed program, the DQO would quantitatively define the overall level of uncertainty allowed for the entire project taking into account sampling variability, uncertainty allowed for the entire project taking into account sampling variability, uncertainty in laboratory procedures, and any statistical procedures used to evaluate the data.

## **2.0 FIELD QUALITY ASSURANCE SAMPLING METHODS**

Field quality assurance sampling programs are used to measure the precision and accuracy of the field sampling using blanks, duplicates, spike, or replicate samples. The type of sample used depends upon the objective and budget of the sampling plan, the matrix (soil or water), and type of potential contaminant.

### **Soils**

The goal of field quality samples should be to evaluate the precision and accuracy of sampling, but this is often difficult to do because of the variability of concentrations within

the soil. Some sampling programs collect sufficient samples to define the population distribution of various parameters in the soils, or take sufficient replicate samples that the data can be summarized statistically. However, this is costly and not warranted if a sample is much higher or lower than the soil quality objective (SQO).

Duplicate or split samples are used to evaluate precision for soils. Duplicate samples are collected at the same location and time but without being mixed in a common container. Split samples are those that have been placed in a common container, thoroughly mixed, and then placed in two laboratory containers. Duplicate samples are more commonly collected. The data is usually compared by relative percent difference (RPD). RPD is calculated as follows:  $RPD = [(V1-V2)/(V1+V2)/2] * 100\%$ .

In poor precision situations, the results cannot be distinguished whether it is due to the non-homogeneous nature of the samples or poor sampling method or laboratory technique. Therefore, the data is usually used for flagging data to double check rather than for taking corrective actions.

For contaminant assessments, approximately 1 duplicate sample for every ten soil samples are collected for duplicate analysis. The sample locations chosen vary between materials expected to have less variability (control subsoil) and more variability (suspected impacts visible in field). The data is provided in the attached table and RPDs calculated. The target RPD is also affected by expected soil variability and background concentrations. A preferred target RPD for hydrocarbons is less than 75% and any over 100% are flagged as possible data issues.

Cross-contamination, if caused, is usually by sampling error such as not trimming the samples if collected off a solid stem auger, and is evaluated by reviewing the drilling the records and notes on sample quality compared to the laboratory results. Higher potential exists for cross-contamination between layers if one is using an auger rather than a coring tube, or if one is below the water table.

### **Groundwater**

For routine water quality or salinity, either no quality assurance samples are generally collected, or approximately 10% of the samples are collected for duplicate analysis. The duplicate analysis is compared by RPD, similar to the soils, but the target RPD is less than 20% difference.

For organic compounds, quality assurance samples are generally collected and analyzed per sampling event. For suspected hydrocarbon impacts, the main organic analyzed would be benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds, and possibly alcohols or other volatile compounds if they were used on the site and that are also common in the laboratory or field environment.

Usually, clean disposable polyethylene bailers, dedicated to each monitoring well, are used for sampling groundwater. In this case, equipment blanks are not usually done. However,

if other equipment is used for sampling and equipment blank consisting of water running over the sampling equipment after it has been decontaminated, might be analyzed.

### 3.0 RESULTS

Duplicate soil samples were collected from boreholes 08SS52, 08SS33, 08SS59, 08MW16, 08BH17, 08BH19, and 08MW22. Duplicate soil samples were analyzed for petroleum hydrocarbons (PHCs), detailed salinity, and metals. Duplicated groundwater samples were collected from monitoring well 08MW21 and analyzed for PHCs. The lab results and the calculated RPDs are presented in Tables D1 (soil) and D2 (groundwater).

Most duplicate soil samples had RPDs below 75%. The duplicate soil samples collected from 08SS59 did not meet the target RPD of 75% for three of the PHC results. Since PHC results from other duplicate samples met the target RPD value, it is assumed that heterogeneous soil is the likely factor for the exceeding 75%. The RPD value of one metal result (chromium) from 08MW16 was 100%, but all other duplicate sample metal results had RPDs below 40%.

Analytical results for the duplicate groundwater samples were below laboratory detection limit and cannot be assessed using RPD.

### 4.0 CONCLUSION

The QA/QC of the field sampling methods is considered to be acceptable for the purpose of this assessment.

TABLE D1: QA/QC ANALYTICAL RESULTS FOR SOIL SAMPLES																							
Parameters	Units	Detection Limits	Former Septic Tile Field			Garden River Airstrip			Garden River Trading			Northlands School Historic AST						Church			Garden River Public Works		
			08SS52	08SS52D	RPD <sup>1</sup>	08SS33	08SS33D	RPD <sup>1</sup>	08SS59	08SS59D	RPD <sup>1</sup>	08MW16	08MW16D	RPD <sup>1</sup>	08BH17	08BH17D	RPD <sup>1</sup>	08BH19	08BH19D	RPD <sup>1</sup>	08MW22	08MW22D	RPD <sup>1</sup>
			0 - 0.6 m	0 - 0.6 m		0 - 0.6 m	0 - 0.6 m		0 - 0.6 m	0 - 0.6 m		6.1 m	6.1 m		4.3 m	4.3 m		4.3 m	4.3 m		0.6 m	0.6 m	
Hydrocarbons																							
Benzene	mg/kg	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-		<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Toluene	mg/kg	0.01	<0.01	<0.01	-	<0.01	<0.01	-	0.08	0.04	67	<0.01	<0.01	-		<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Ethylbenzene	mg/kg	0.01	<0.01	<0.01	-	<0.01	<0.01	-	0.02	<0.01	-	<0.01	<0.01	-		<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Xylenes	mg/kg	0.02	<0.02	<0.02	-	<0.02	<0.02	-	0.12	0.05	82	0.04	0.04	0		<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-
F1 (C <sub>6</sub> to C <sub>10</sub> )	mg/kg	5	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-
F2 (C <sub>10</sub> to C <sub>14</sub> )	mg/kg	20	<20	<20	-	<20	<20	-	<20	<20	-	30	40	-29	<20	<20	-	<20	<20	-	540	450	18
F3 (C <sub>16</sub> to C <sub>34</sub> )	mg/kg	20	<20	<20	-	<20	<20	-	90	300	-108	<20	<20	-	<20	<20	-	<20	<20	-	14,000	12,000	15
F4 (C <sub>34</sub> to C <sub>50</sub> )	mg/kg	20	<20	30	-	<20	<20	-	50	110	-75	<20	<20	-	<20	<20	-	<20	<20	-	2,600	2,300	12
F4 (C <sub>34+</sub> )HGT	mg/kg	500									-			-							10,000	12,000	-18
Total Hydrocarbons (TEH)	mg/kg	20	<20	30	-	<20	<20	-	140	410	-98	30	40	-29	<20	<20	-	<20	<20	-	17,000	15,000	13
Soil Moisture Content	%	0.1	7.5	7.6	-1	9.3	11	-17	23	20	14	3.3	3.4	-3	3.9	7.6	-64	20	20	0	11	10	10
Routine																							
pH	pH-unit	0.1																7.3	7.6	-4			
Electrical Conductivity (EC)	dS/m	0.01																0.29	0.41	-34			
Sodium Adsorption Ratio (SAR)	Ratio	0.1																0.3	0.4	-29			
Saturation	%	0.1																36.2	43.7	-19			
Soluble Salts																							
Calcium (Ca)	mg/kg	2																21	26	-21			
Magnesium (Mg)	mg/kg	1																4	6	-40			
Sodium (Na)	mg/kg	0.9																3.3	5.4	-48			
Potassium (K)	mg/kg	0.9																<0.7	1.7	-			
Chloride (Cl)	mg/kg	9																<7	18	-			
Sulphate (SO <sub>4</sub> )	mg/kg	3																16	32	-67			
Metals																							
Antimony (Sb)	mg/kg	20	<0.2	<0.2	-	<0.2	<0.2	-				<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2	-
Arsenic (As)	mg/kg	0.2	6.7	6.3	6	8.7	6.6	27				5.0	4.7	6	5.9	5.2	13	8.7	14.4	-49	6.3	6.6	-5
Barium (Ba)	mg/kg	5	272	219	22	194	173	11				79	115	-37	109	88	21	227	285	-23	132	152	-14
Beryllium (Be)	mg/kg	1	<1	<1	-	<1	<1	-				<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-
Cadmium (Cd)	mg/kg	0.5	<0.5	<0.5	-	<0.5	<0.5	-				<0.5	<0.5	-	<0.5	<0.5	-	<0.5	0.6	-	<0.5	<0.5	-
Chromium (Cr)	mg/kg	0.5	20.4	19.8	3	23.9	22.0	8				16.5	5.5	100	6.9	7.1	-3	14.4	20.3	-34	9.7	11.4	-16
Cobalt (Co)	mg/kg	1	9	7	25	9	9	0				4	4	0	4	4	0	6	7	-15	5	5	0
Copper (Cu)	mg/kg	2	12	11	9	14	9	43				7	6	15	8	8	0	16	25	-44	13	14	-7
Lead (Pb)	mg/kg	5	11	9	20	9	8	12	15	23	-42	<5	<5	-	<5	<5	-	8	11	-32	6	7	-15
Mercury (Hg)	mg/kg	0.05	<0.05	<0.05	-	<0.05	<0.05	-				<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05	-
Molybdenum (Mo)	mg/kg	1	<1	<1	-	<1	<1	-				3	<1	-	<1	<1	-	1	2	-67	1	1	0
Nickel (Ni)	mg/kg	2	16	16	0	20	17	16				13	10	26	11	10	10	19	25	-27	15	16	-6
Selenium (Se)	mg/kg	0.2	0.4	0.4	0	0.4	0.3	29				0.3	0.3	0	<0.2	<0.2	-	0.4	0.6	-40	0.3	0.3	0
Silver (Ag)	mg/kg	1	<1	<1	-	<1	<1	-				<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-
Thallium (Tl)	mg/kg	1	<1	<1	-	<1	<1	-				<1	<1	-	<1	<1	-	<1	<1	-	<1	<1	-
Tin (Sn)	mg/kg	5	<5	<5	-	<5	<5	-				<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	-
Uranium (U)	mg/kg	2	<2	<2	-	<2	<2	-				<2	<2	-	<2	<2	-	<2	<2	-	<2	<2	-
Vanadium (V)	mg/kg	1	40	37	8	42	38	10				15	15	0	17	17	0	30	38	-24	22	24	-9
Zinc (Zn)	mg/kg	10	70	70	0	70	60	15				30	30	0	40	40	0	80	110	-32	80	90	-12
Laboratory Identification No.			L676396-209	L676396-212		L676396-189	L676396-193		L676396-217	L676396-218		L676396-123	L676396-130		L676396-137	L676396-147		L676396-169	L676396-179		L676396-35	L676396-67	
Notes:																							

<sup>1</sup> RPD - Relative percent difference calculated by: RPD = |(V1-V2)/((V1+V2)/2)|\*100%.

"-" Denotes calculation of RPD not possible because values below method detection limit.

**BOLD** - RPD >75%.



**TABLE D2: QA/QC ANALYTICAL RESULTS FOR GROUNDWATER**

Parameters	Units	Detection Limits	08MW21	08MW21D	RPD <sup>1</sup>
			31-Aug-08	31-Aug-08	
<u>Volatile Hydrocarbons</u>					
Benzene	mg/L	0.0005	<0.00050	<0.00050	-
Toluene	mg/L	0.0005	<0.00050	<0.00050	-
Ethylbenzene	mg/L	0.0005	<0.00050	<0.00050	-
Xylenes	mg/L	0.0005	<0.00050	<0.00050	-
F1 (C <sub>6</sub> to C <sub>10</sub> )	mg/L	0.1	<0.1	<0.1	-
F2 (C <sub>10</sub> to C <sub>16</sub> )	mg/L	0.1	<0.2	<0.2	-
<u>Laboratory Identification No.</u>			L676397-16	L676397-19	

Notes:

<sup>1</sup> RPD - Relative percent difference calculated by:  $RPD = [(V1-V2)/((V1+V2)/2)]*100\%$ .

"-" Denotes calculation of RPD not possible because values below method detection limit.

**BOLD** - RPD >20%.

# APPENDIX E

## APPENDIX E REMEDIATION ACTION PLAN – PUBLIC WORKS YARD

## REMEDIAL ACTION PLAN (RAP) FOR PUBLIC WORKS YARD

### 1.0 AREA AND CONTAMINANTS OF CONCERN

EBA Engineering Consultants Ltd. (EBA) conducted a contaminant site assessment in 2008 (see main report for details) at the Public Works Yard in the Community of Garden River, Alberta. Ten soil samples were collected from the Garden River Public Works Yard and all exceeded applicable guidelines for one or more petroleum hydrocarbon (PHC) fractions F1, F2, F3, and F4. The samples were collected from locations east and south of the Public Works building adjacent to the waste oil above-ground storage tank (AST) and the propane tanks, north of the public works trailer near the propane tank and barrel storage areas, and the equipment parking area. The groundwater samples collected from locations adjacent to the barrel storage area had iron concentrations greater than 2008 Health Canada Guidelines for Canadian Drinking Water Quality (CDWQ) and the 2008 Alberta Tier 1 Guideline.

EBA's drilling plan was limited by utilities and site conditions; therefore, only broad estimates of the area and volume of impacted soil can be made. The area of soil with PHC impacts was estimated to be 1,800 m<sup>2</sup>. The volume of impacted soil estimated to be approximately 4,000 m<sup>3</sup> based on an estimated 1.5 m<sup>3</sup> of surficial stained soil with a 50% contingency for additional impacted soil to be present at a greater depth.

### 2.0 OBJECTIVES FOR REMEDIATION

The objectives for remediation are to remove and treat/dispose soil at the site to meet the 2007 Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health and/or 2008 Alberta Tier 1 Soil and Groundwater Remediation Guidelines (residential/parkland, coarse-textured surface soils).

### 3.0 POTENTIAL REMEDIAL OPTIONS

Potential remedial options include the following:

- Excavate and remove soil to an approved landfill, likely in High Level or Rainbow Lake. The work would involve specification, tendering and award, mobilization of equipment to site, excavation and confirmatory testing of excavation, hauling and disposal of soil to the landfill, and backfilling of the excavation with clean soil and compaction and surface reclamation. Advantages to this method are that it results in quick and immediate removal of impacted soil and reclamation of the site. The technology is easy to implement. The disadvantages are high cost due to distance to an appropriate landfill. The approximate Class D cost estimate is as follows:

Task	Estimate
Specification and Tendering	\$50,000
Trailer / Camp Costs for Contractor / Consultant	\$100,000
Contractor Mob / Demob	\$50,000
Confirmatory Sampling / Supervisor	\$100,000
Tipping Fees at \$30/tonne (\$60/m <sup>3</sup> ) for 4,000 m <sup>3</sup>	\$240,000
Excavation Costs \$10/m <sup>3</sup> for 4,000/m <sup>3</sup>	\$40,000
Hauling Costs \$1,000/10 m <sup>3</sup> load or \$100/m <sup>3</sup> )	\$400,000
Backfilling (assume free local source of fill)	\$80,000
<b>TOTAL (Class D estimate)</b>	<b>\$1,060,000</b>

- Excavate and landfarm impacted soil within an engineered landfarm in the community. The work involves specification writing, tendering and award, mobilization of equipment to site, construction of landfarm, excavation of soil and placement in landfarm, backfilling and reclaiming excavation, tilling soil until remedial objectives are met, and decommissioning landfarm. The advantages of this method are it is economical. The disadvantages are that it is difficult to successfully treat soils with high F3 and F4 concentrations using this method and it may be a multi-year remedial program. The approximate Class D cost estimate is as follows:

Task	Estimate
Specification and Tendering	\$50,000
Trailer / Camp Costs for Contractor Consultant	\$100,000
Contractor Mob / Demob	\$50,000
Confirmatory Sampling / Supervisor	\$100,000
Landfarm Area Construction (not including liner)	\$100,000
Excavation Costs (\$10/m <sup>3</sup> for 4,000/m <sup>3</sup> )	\$40,000
Hauling Costs to Landfarm (\$10/m <sup>3</sup> )	\$40,000
Backfilling (assume free source of fill)	\$80,000
Tilling	\$100,000
Decommissioning of landfill	\$100,000
<b>Subtotal (Class D estimate, not including liner)</b>	<b>\$760,000</b>
Liner Cost 9 m <sup>2</sup> installed at 12,000 m <sup>2</sup>	\$108,000
<b>TOTAL (Class D estimate with liner)</b>	<b>\$868,000</b>

- Treat soil in situ using chemical oxidation. The work involves conducting an initial pilot trial to determine the viability of this approach, specification writing, tendering and award, mobilization of equipment to site, soil treatment, and verification testing.

A variation of this method would be to combine this method with landfarming as chemical oxidation makes hydrocarbons more amenable for biotreatment. Advantages to this method are that it could be quick to treat, if the method is determined to be viable and it may represent a cost savings over hauling to a landfill. Disadvantages include potential failure of the pilot trial and subsequent delay and a small increase of costs overall for treatment as well as increased sodium adsorption ratio (SAR) of treated soils. The approximate Class D cost estimate is as follows:

Task	Estimate
Pilot Trial	\$25,000
Specification and Tendering	\$50,000
Trailer / Camp Costs for Contractor Consultant	\$100,000
Contractor Mob / Demob Chemical Delivery	\$100,000
Confirmatory Sampling / Supervisor	\$100,000
Mixing Costs (assume two passes)	\$100,000
Chemical Costs (assume \$1,100 / m <sup>3</sup> )	\$400,000
<b>TOTAL</b>	<b>\$875,000</b>

#### 4.0 RECOMMENDED TREATMENT OPTION

EBA recommends conducting a pilot trial for chemical oxidation as an initial course of action for the following reasons:

- Landfarming alone is unlikely to work given the high F3 and F4 concentrations at the site.
- The large volume of impacted soil makes the cost of landfilling the soil at least 20% greater.
- The potential cost savings on remediation outweigh the small cost of an unsuccessful pilot trial.

It is likely a pilot trial will result in one of two outcomes:

- Not economical in comparison to landfilling. Recommend to landfill soil following the pilot trial.
- Economical to proceed on the basis of in-situ chemical oxidation alone.

## 5.0 STEPS IN A PILOT TRIAL

The following go-forward actions are recommended for a pilot trial:

- Step 1: Treatment design and determination of appropriate chemical oxidation products for use in trial.
- Step 2: Obtaining soil from the site for a trial.
- Step 3: Conduct trial.
- Step 4: Evaluation of trial and provide recommendation for further work.

If the pilot trial is found to be successful, the following steps are recommended:

- Step 1: As volumes are tentative, a performance-based specification will need to be written based on a volume estimate of between 2,000 m<sup>3</sup> and 4,000 m<sup>3</sup>.
- Step 2: Provide camp and trailers.
- Step 3: Mob / demob consultant and contractor to site.
- Step 4: Mix chemical in soil with excavator and allu bucket.
- Step 5: Following a two to four week time period after mixing sample soil.
- Step 6: If results are not achieved, add more chemical, remix and sample.
- Step 7: Demob from site.
- Step 8: Prepare report.

If pilot trial is unsuccessful, the following steps are recommended for landfilling the soil:

- Step 1: As volumes are tentative, a performance-based specification will need to be written for a volume estimate.
- Step 2: Provide camp and trailer.
- Step 3: Mob / demob consultant and contractor.
- Step 4: Excavate soil and conduct confirmatory sampling. Haul soil to landfill.
- Step 5: When excavation boundaries are reached, haul fill to site, backfill and compact.
- Step 6: Demob from site.
- Step 7: Prepare report.

## 6.0 COST ESTIMATE

The approximate cost for undertaking a pilot trial is estimated to be \$25,000 and is broken down as follows

- Step 1: \$3,000 fees.
- Step 2: \$4,000 fees and \$6,000 disbursements to travel to site and transport soil back south.
- Step 3: \$5,000 fees and \$3,000 disbursements in chemical oxidation products and soil disposal costs.
- Step 4: \$4,000 report and recommendation.

Further work to successfully treat the soil, following the pilot trial will vary depending on the outcome. The worst outcome would be to haul soil off site to a landfill, likely to be in the \$1,000,000 range +/- 40%.

## 7.0 SCHEDULE

The proposed schedule for the pilot trial is as follows assuming that the trials could start by March 15, 2009 or sooner:

- Treatment design beginning in winter 2009 and complete by spring 2009.
- Obtain soil and conduct trial beginning and ending in spring 2009.
- Evaluation report and recommendation in spring 2009.

Work to remediate the site could proceed in 2009 and the schedule would be as follows:

- Prepare specifications in late spring 2009.
- Award contract early summer 2009.
- Camp set up by end of July 2009.
- Mob / Demob to site by beginning of August 2009.
- One to two month field program of either in situ treatment or excavation landfilling.
- Demob from site fall 2009.
- Report in late fall 2009.

# APPENDIX F

APPENDIX F REMEDIATION ACTION PLAN – AIRSTRIP

## REMEDIAL ACTION PLAN (RAP) FOR AIRSTRIP

### 1.0 AREA AND CONTAMINANTS OF CONCERN

EBA Engineering Consultants Ltd. (EBA) conducted a contaminated site assessment in 2008 (see main report for details) at the airstrip in the Community of Garden River, Alberta. One soil sample, which was collected from the Garden River Airstrip, at locations adjacent to fuel drums near the eastern end, exceeded the applicable guidelines for petroleum hydrocarbon (PHC) fractions F1 and F2. This sample had a high combustible vapour concentration (CVC) [5% lower explosive limit (LEL)].

Soil with PHC impacts at the Garden River Airstrip was associated with fuel storage at the eastern edge of the airstrip. The volume of impacted soil is estimated to be approximately 500 m<sup>3</sup>.

### 2.0 OBJECTIVES FOR REMEDIATION

The objectives for remediation are to remove and treat/dispose soil at the site to meet the 2007 Canadian Council of Ministers of the Environment (CCME) Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health and/or 2008 Alberta Tier 1 Soil and Groundwater Remediation Guidelines (residential/parkland, coarse-textured surface soils).

### 3.0 POTENTIAL REMEDIAL OPTIONS

Potential remedial options include the following:

- Excavate and remove soil to an approved landfill, likely in High Level or Rainbow Lake. The work would involve specification, tendering and award, mobilization of equipment to site, excavation and confirmatory testing of excavation, hauling and disposal of soil to the landfill, and backfilling of the excavation with clean soil and compaction and reclamation. Advantages to this method are that it is quick to remove impacted soil and reclaim the site. The technology is easy to implement. The disadvantages are high cost due to distance to an appropriate landfill. The cost if conducted at the same time as the Public Works Yard would be approximately \$250/m<sup>3</sup>. If done separately, costs would be much higher as common costs, such as a camp for workers could not be shared over the two projects.
- Excavate and landfarm impacted soil within an engineered landfarm. The work involves specification writing, tendering and award, mobilization of equipment to site, construction of landfarm, excavation of soil and placement in landfarm, backfilling and reclaiming excavation, tilling soil until remedial objectives are met, and decommissioning the landfarm. The advantages of this method are it is economical and

bioremediation is a proven and easy to implement technology. The disadvantages are that it will be a multi-year remedial program. The cost of this option, if done at the same time as the remediation at the Public Works Yard would be approximately \$200/m<sup>3</sup>. If done separately, the costs would be higher.

- Treat soil on site using in-situ chemical oxidation. The work involves specification writing, tendering and award, mobilization of equipment to site, soil treatment, and verification testing. Advantages to this method are that it could be relatively quick to treat hydrocarbons. As equipment needs are minimal (large backhoe with allu mixing bucket), it is likely that local area equipment can be utilized. Disadvantages include potential failure to remediate the hydrocarbon economically, so therefore, a pilot trial is recommended. The cost for this option is estimated to be approximately \$200/m<sup>3</sup> if done at the same time as the Public Works Yard but greater if done separately.

#### 4.0 RECOMMENDED TREATMENT OPTION

EBA recommends treating the soil at the airstrip in situ through either chemical oxidation or landfarming for the following reasons:

- The large distance to transport impacted soil makes the cost of landfilling the soil more costly.
- The potential cost savings of remediation greatly outweigh the small cost of a unsuccessful pilot trial, if chemical oxidation is chosen as an option.
- While landfarming is similar in cost to chemical oxidation, it may not be effective to treat the soils at the Public Works yard and it would be preferable to treat the soils at both sites at the same time and in the same manner to save costs.

#### 5.0 STEPS IN A PILOT TRIAL

Please see RAP for Public Works Yard

#### 6.0 COST ESTIMATE

Please see RAP for Public Works Yard for details. The additional costs (above those estimate for the Public Works Yard) to treat the soils at the airport is estimated to be \$200,000, if done at the same time as the Public Works Yard.

#### 7.0 SCHEDULE

Please see RAP for Public Works Yard

# APPENDIX G

APPENDIX G CCME NATIONAL CLASSIFICATION SYSTEM FOR CONTAMINATED SITES

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

<b>Subject Site:</b>	<b>Test Site</b>	
Civic Address: (or other description of location)	On the north shore of the Peace River, approximately 220 km east of High Level, Alberta, in Wood Buffalo National Park	
Site Common Name : (if applicable)	Community of Garden River	
Site Owner or Custodian: (Organization and Contact Person)	Parks Canada Agency	
Legal description or metes and bounds:	N 58°42.5', W113°52.0'	
Approximate Site area:		
PID(s) : (or Parcel Identification Numbers [PIN] if untitled Crown land)	Garden River Public Works Yard (FCSI #00022200)	
Centre of site: (provide latitude/longitude or UTM coordinates)	Latitude:	_____ degrees _____ min _____ secs
	Longitude:	_____ degrees _____ min _____ secs
	UTM Coordinate:	Northing 6512253.105 Easting 681506.6544
Site Land Use:	Current:	Commercial/Industrial
	Proposed:	
<b>Site Plan</b>	To delineate the bounds of the Site a site plan <b>MUST</b> be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.	
Provide a brief description of the Site:	<p>The Garden River Public Works Yard is located east of the community of Garden River (see attached Site Plan).</p>	

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

Affected media and Contaminants of Potential Concern (COPC):	The concentration of petroleum hydrocarbon fractions F2, F3, and F4 in soil samples exceeded Alberta Environment 2008 Soil and Groundwater Remediation Guidelines. The groundwater concentrations of Cadmium, Iron, and Selenium in four monitoring wells exceeded Canadian Council of Ministers of the Environment 2007 Canadian Water Quality Guidelines for the protection of aquatic life. The concentration of dissolved Manganese in one monitoring well exceeded Health Canada 2008 Guidelines for Canadian Drinking Water Quality.
--	--

Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade

**A**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	Cathy Hamlen, Ph.D. A.Ag.
Date Scoring Completed:	6-Feb-09

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance		Seventeen soil samples and four groundwater monitoring wells were assessed. Refer to <i>Contaminated Site Assessment, Initial and Detailed Testing Programs, Wood Buffalo National Park, Various Locations in the Community of Garden River, Alberta</i> (EBA Consulting Engineers Ltd., 2009).	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline).  Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at <a href="http://www.ccme.ca/publications/ceqg_rceq.html?category_id=124">http://www.ccme.ca/publications/ceqg_rceq.html?category_id=124</a> .  For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_recom/index_e.html">http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_recom/index_e.html</a> .	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	No			
Yes No Do Not Know	0			
B. Groundwater	Yes			
Yes No Do Not Know	2			
C. Surface water	No			
Yes No Do Not Know	0			
D. Sediment	No			
Yes No Do Not Know	0			
"Known" -score	2			
"Potential" - score	—			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?  High Medium Low Do Not Know	High	Petroleum hydrocarbon fractions F2 (soil) is Medium and F3 and F4 (soil) are Low; Cadmium and Lead (groundwater) are High, Selenium (groundwater) is Medium, and Manganese (groundwater) is Low.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site.  The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file.  <i>See Attached Reference Material for Contaminant Hazard Rankings.</i>	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
"Known" -score	8			
"Potential" - score	—			
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?  Mobile NAPL High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	Medium (10x to 100x)	The maximum petroleum hydrocarbon fraction F2 concentration in soil was 69.2 times higher than Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines, the maximum F3 concentration in soil was 96.7 times higher, and the maximum F4 concentration was 8.2 times higher. The maximum groundwater Manganese concentration was 11.96 times higher than Health Canada 2008 Guideline for Canadian Drinking Water Quality, and the groundwater Lead concentration was 8.8 times higher. The maximum groundwater Cadmium concentration was 1.03 times higher than the CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life, the maximum groundwater Selenium concentration was 5.1 times higher than the 2007 CCME guideline.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME environmental quality guidelines</i> . Ranking should be based on contaminant with greatest exceedance of CCME guidelines. Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks.  Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria.  Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
"Known" -score	4			
"Potential" - score	—			

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
4. Contaminant Quantity (known or strongly suspected)				
What is the known or strongly suspected quantity of all contaminants?  >10 hectare (ha) or 5000 m <sup>3</sup> 2 to 10 ha or 1000 to 5000 m <sup>3</sup> <2 ha or 1000 m <sup>3</sup> Do Not Know	2 to 10 ha or 1000 to 5000 m <sup>3</sup>	The soil concentrations of petroleum hydrocarbon fractions F2 to F4 that exceeded Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines and the groundwater monitoring wells with concentrations of COPC exceeding CCME 2007 Canadian Water Quality Guidelines for the protection of aquatic life covered an area of approximately 1,620 m <sup>2</sup> .	Measure or estimate the area or quantity of total contamination (i.e. all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
"Known" - score	6			
"Potential" - score	---			
5. Modifying Factors				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?  				

Contaminant Characteristic Total

Raw Total Scores- "Known"	22
Raw Total Scores- "Potential"	0
Raw Combined Total Scores	22
Total Score (Raw Combined / 40 * 33)	18.2

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
1. Groundwater Movement				
A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.				
i) For potable groundwater environments 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For non-potable environments (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non-potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.	12	Manganese and Lead concentrations in groundwater exceeded aesthetic objectives for drinking water (Health Canada 2008 Guidelines for Canadian Drinking Water Quality). The Cadmium and Selenium concentrations in groundwater exceed guideline for protection of freshwater aquatic (CCME 2007). The hydraulic conductivity of the site ranged between 7.01 x 10 <sup>-6</sup> m/s and 3.82 x 10 <sup>-6</sup> m/s.	Review chemical data and evaluate groundwater quality.  The evaluation method concentrates on 1) a potable or non-potable groundwater environment, the groundwater flow system and its potential to be an exposure pathway to known or potential receptors  An aquifer is defined as a geologic unit that yields groundwater in useable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas); evaluation of a non-potable environment will be based on a site specific basis.	The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries.  Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links.  Note that for potable groundwater that also daylight into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered.
ii) Same as (i) except the information is not known but <u>strongly suspected</u> based on indirect observations.	0		Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils.	
iii) Meets GCDWQ for potable environments meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for non-potable environments or Absence of groundwater exposure pathway (i.e., there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0		Seeps and springs are considered part of the groundwater pathway.  In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.	<b>Selected References</b>  <u>Potable Environments</u>  Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/owh-sant/pubs/water/gau/doc_sup-sppu/sum_guide-res_recom/index_e.html">www.hc-sc.gc.ca/owh-sant/pubs/water/gau/doc_sup-sppu/sum_guide-res_recom/index_e.html</a>  <u>Non-Potable Environments</u>  Canadian Water Quality Guidelines for Protection of Aquatic Life. CCME. 1999 <a href="http://www.ccme.ca">www.ccme.ca</a>  Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.
Score	0			
NOTE: If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)				
B. Potential for groundwater pathway.				
a. Relative Mobility  High Moderate Low Insignificant Do Not Know			Organics Koc (L/kg) Koc < 500 (i.e., log Koc < 2.7) Koc = 500 to 5000 (i.e., log Koc = 2.7 to 3.7) Koc = 5,000 to 100,000 (i.e., log Koc = 3.7 to 5) Koc > 100,000 (i.e., log Koc > 5)  Metals with higher mobility at acidic conditions pH < 5 pH = 5 to 6 pH > 6  Metals with higher mobility at alkaline conditions pH > 8.5 pH = 7.5 to 8.5 pH < 7.5	Reference: US EPA Soil Screening Guidance (Part 5 - Table 39)  If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and precipitation infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.
Score	2			
b. Presence of engineered sub-surface containment?  No containment Partial containment Full containment Do Not Know			Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved. Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for Full Containment scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, the category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.	Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links.
Score	1.5			<b>Selected Resources:</b> United States Environmental Protection Agency (USEPA) 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128. Environment Canada - Ontario Region - Natural Attenuation Technical Assistance Bulletins (TABs) Number 18-21.
c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway  3 m or less including no confining layer or discontinuous confining layer 3 to 10 m > 10 m Do Not Know			The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow.  Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway. The evaluation of this category is based on: 1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or 2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (e.g., water table aquifer, first hydrostratigraphic unit or other groundwater pathway).	
Score	0.5			
d. Hydraulic conductivity of confining layer  >10 <sup>-4</sup> cm/s or no confining layer 10 <sup>-4</sup> to 10 <sup>-6</sup> cm/s <10 <sup>-6</sup> cm/s Do Not Know			Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on: 1) The presence and hydraulic conductivity (K) of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or 2) The presence and permeability (K) of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.	
Score	0.5			

### Test Site

CCME National Classification System for Contaminated Sites  
(2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>c. Topography</b> Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	1		Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).	
<b>d. Run-off potential</b> High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score < 0.6) Low (0.2 < rainfall run-off score < 0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	0.4		<b>Rainfall</b> Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 607 mm = 0.7 score). The former definition of annual rainfall did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor. <b>Permeability</b> For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.	Selected Sources: Environment Canada web page link <a href="http://www.msc.ec.gc.ca">www.msc.ec.gc.ca</a> Snow to rainfall conversion apply ratio of 15 (snow):1 (water)
<b>e. Flood potential</b> 1 in 2 years 1 in 10 years 1 in 50 years Do Not Know	0.5		Review published data such as flood plain mapping or flood potential (e.g., spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.	
Potential surface water pathway total	6.9			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Surface water pathway total	8			
<b>3. Surface Soils (potential for dust, dermal and ingestion exposure)</b>				
<b>A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)</b>				
COPCs measured in surface soils exceed the CCME soil quality guideline. Strongly suspected that soils exceed guidelines COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	12 9 0 12	Ten surface samples of soil (0 - 0.6 m depth) had concentrations of petroleum hydrocarbon fractions F2 thru F4 that exceeded Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines. The risk is high since the area included gravel parking areas without vegetative cover.	Collect all available information on quality of surface soils (i.e., top 1.5 metres) at the site. Evaluate data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (i.e., agricultural, residential/peri-urban, commercial, or industrial), and soil texture if applicable (i.e., coarse or fine).	Selected References: CCME, 1999, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health <a href="http://www.ccme.ca">www.ccme.ca</a>
NOTE: If a score is assigned here for Demonstrated Concentrations In Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)				
<b>B. Potential for a surface soils (top 1.5 m) migration pathway</b>				
<b>a. Are the soils in question covered?</b> Exposed Vegetated Landscaped Paved Do Not Know	4		Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.
<b>b. For what proportion of the year does the site remain covered by snow?</b> 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	3		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
Potential surface soil pathway total	7			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Soil pathway total	12			

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>4. Vapour</b>				
<b>A. Demonstrated COPCs in vapour.</b>				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	The concentration of petroleum hydrocarbons (fraction F2) exceeded Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines in seven soil samples. The sample were collected as close as 20 m east of the Public Works Building.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0			
Score	9			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)				
<b>B. Potential for COPCs in vapour</b>				
a. Relative Volatility based on Henry's Law Constant, H <sup>*</sup> (dimensionless) High (H <sup>*</sup> > 1.0E-1) Moderate (H <sup>*</sup> = 1.0E-1 to 1.0E-3) Low (H <sup>*</sup> < 1.0E-3) Not Volatile Do Not Know			Reference: US EPA Soil Screening Guidance (Part 5 - Table 3d)  Provided in Attached Reference Materials	If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5.
Score	2.5			
b. What is the soil grain size? Fine Coarse Do Not Know			Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours.  Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter (D50 < 75 µm). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter (D50 > 75 µm).	
Score	3			
c. Is the depth to the source less than 10m? Yes No Do Not Know			Review groundwater depths below grade for the site.	
Score	2			
d. Are there any preferential pathways? Yes No Do Not Know			Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.	Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Score	2			
Potential vapour pathway total	9.5	Note: If a "known" score is provided, the "potential" score is disallowed.		
Allowed Potential score	9			
Vapour pathway total	9			
<b>5. Sediment Movement</b>				
<b>A. Demonstrated migration of sediments containing COPCs</b>				
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	Public Works employees are expected to drive vehicles and walk over impacted ground. Sediment movement is considered to be likely.	Review sediment assessment reports. Evidence of migration of contaminants in sediments may usually not be considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.	
Strongly suspected (based on observations and/or modelling)	9			
Sediments have been contained and there is no indication that sediments will migrate in future. or Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0			
Score	12			
Score	12			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				

## (ii) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>8. Potential for sediment migration</b>				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?			Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
Yes				
No	4			
Do Not Know				
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?			Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.	
Yes				
No	4			
Do Not Know				
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?			Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional	
Yes				
No	4			
Do Not Know				
Potential sediment pathway total	12			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Sediment pathway total	12			
<b>6. Modifying Factors</b>				
Are there subsurface utility conduits in the area affected by contamination?			Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Yes	No			
No		No underground facilities were located in August 2008.		
Do Not Know				
Known	0			
Potential	0			

## Migration Potential Total

Raw "known" total	50
Raw "potential" total	0.0
Raw combined total	50.0
Total (max 33)	25.8

Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Human</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site)	22		*Where adverse effects on humans are documented, the site should be automatically designated Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10	The maximum petroleum hydrocarbon fraction F2 concentration in soil was 69.2 times higher than Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines, the maximum F3 concentration in soil was 96.7 times higher, and the maximum F4 concentration was 8.2 times higher. The samples were collected from the surface of the site.	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this is typically either >10 <sup>-6</sup> or >10 <sup>-5</sup> ). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 ug/dL) or other health based testing.	Selected References: Health Canada- Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Health Screening Level Risk Assessment <a href="http://www.hc-sc.gc.ca/ehp/contaminated_sites/index_e.html">http://www.hc-sc.gc.ca/ehp/contaminated_sites/index_e.html</a> United States Environmental Protection Agency, Integrated Risk Information System (IRIS) <a href="http://www.epa.gov/iris">http://www.epa.gov/iris</a>
No quantified or suspected exposures/impacts in humans.	0		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10 <sup>-6</sup> or 10 <sup>-5</sup> ).	
Score	22			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
<b>B. Potential for human exposure</b>				
a) Land use (provides an indication of potential human exposure scenarios)			Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
Agricultural Residential / Parkland Commercial Industrial Do Not Know				
Score	1.5			
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination)			Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know				
Score	1			
<b>B. Potential for human exposure</b>				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).			If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2008) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know				
Score	3			
ii) Inhalation (i.e., Inhalation of dust, vapour)			If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances relative to buildings. Refer to (ii) Migration Potential worksheet, 4B) Potential for COPCs in Vapour for a definition of volatility.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion.
Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know				Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.
Score	3			General Notes: Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Dust - Is there is contaminated surface soil (e.g. top 1.5 m). Indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent Do Not Know Texture			Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2008)) then these soils are more likely to generate dusts.	Selected References: Canadian Council of Ministers of the Environment (CCME), 2006, Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332 <a href="http://www.ccme.ca">http://www.ccme.ca</a> Golder, 2004, Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
Score	0			
Inhalation total	3			

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for human exposure</b>				
ii) Ingestion (i.e., ingestion of food items, water and soils [for children]). Including traditional foods. Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future). 0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know Score 2 Is an alternative water supply readily available? Yes No Do Not Know Score 1 Is human ingestion of contaminated soils possible? Yes No Do Not Know Score 3 Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings? Yes No Do Not Know Score 1 Ingestion total 7 Human Health Total "Potential" Score 15.5 Allowed "Potential" Score —		Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.	Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce eliminate exposure.  The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of end and contaminant transport.  If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.  Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.	Selected References: Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/hec/assess/water/publications/drinking_water_quality_guidelines/hqc.htm">www.hc-sc.gc.ca/hec/assess/water/publications/drinking_water_quality_guidelines/hqc.htm</a> Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable. Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.
<b>2. Human Exposure Modifying Factors</b>				
a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.) Yes No Do Not Know Known Potential Raw Human "known" total Raw Human "potential" total Raw Human Exposure Total Score Human Health Total (max 22)	Yes 6 28 0 28 22.0	Potable water supply is local. Strong reliance of community on local foods which include fish from Peace River.		
<b>3. Ecological</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site. Same as above, but "Strongly Suspected" based on observations or indirect evidence. No quantified or suspected exposures/impacts in terrestrial or aquatic organisms Score 18 12 0 18 18		The concentrations of petroleum hydrocarbon fractions F2 thru F4 exceeded Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines in surface soil samples (0 to 0.8 m depth). Groundwater concentrations of Cadmium, Lead, and Selenium were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life and the site is approximately 0.5 km north of the Peace River.	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).  This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients > 1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.  This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects, such as site observations, tissue testing, toxicity testing and quantitative community assessments.	CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a> CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Use <a href="http://www.ccme.ca">www.ccme.ca</a> Ecological receptors - review; Canadian Council on Ecological Areas <a href="http://www.ccea.org">www.ccea.org</a> Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundance. Further discussion of ecological assessment endpoints is provided in <i>Framework for Ecological Risk Assessment: General Guidance</i> (CCME 1996). Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as Internet links.
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)				

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>a) Terrestrial</b> <b>i) Land use</b> Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know Score	1.5		Review zoning and land use maps. If the proposed future land use is <i>more intensive</i> than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration).  Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
<b>ii) Uptake potential</b> Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know Score	1		If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
<b>iii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water)</b> Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know Score Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know Score Can the contamination identified bioaccumulate? Yes No Do Not Know Score Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score	1 1 1 1.5		Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.  Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.  Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics worksheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines. It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link <a href="http://www.ccea.org">www.ccea.org</a>	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
Raw Terrestrial Total Potential Allowed Terrestrial Total Potential	7 —	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>b) Aquatic</b> <b>i) Classification of aquatic environment</b> Sensitive Typical Not Applicable (no aquatic environment present) Do Not Know Score	2		"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species.  "Typical aquatic environments" include those in areas other than those listed above.	
<b>ii) Uptake potential</b> Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know Score Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score	1 1.5		Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.  It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: <a href="http://www.ccea.org">www.ccea.org</a> .  Bioaccumulation of food items is possible if:	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and lens and other aquatic environments.

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	1		1) The Log(flow) of the contaminant is greater than 4 (as per the chemical characteristics work sheet and concentrations in sediments exceed the CCME ISQG. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Raw Aquatic Total Potential Allowed Aquatic Total Potential	5.5 —	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
<b>4. Ecological Exposure Modifying Factors</b>				
a) Known occurrence of a species at risk.  Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	Do Not Know — 1	Not known if a species at risk is present at the site.	Consult any ecological risk assessment reports. If information is not present, utilize on-line database such as Eco Explorer, Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act ( <a href="http://www.sar.gov.ca/species/schedule1_a_srm74d1">http://www.sar.gov.ca/species/schedule1_a_srm74d1</a> ). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BC MWLAP, 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection <a href="http://srmwww.gov.bc.ca/strick/red-blue.htm">http://srmwww.gov.bc.ca/strick/red-blue.htm</a>
b) Potential Impact of aesthetics (e.g., enrichment of a lake or tainting of food flavor).  Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know  Is there evidence of olfactory impact (i.e., unpleasant smell)? Yes No Do Not Know  Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know  Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	Do Not Know — 1 No 0 — No 0 — Do Not Know — 1 0 3 3 21 18.0	Peace River has high flow. Do not know if the aesthetics will be impacted.	Documentation may consist of environmental investigation reports, press articles, petitions or other records.  Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.  A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients e.g., nitrogen or phosphorus releases to an aquatic body can act as a fertilizer.  Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	This item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
<b>5. Other Potential Contaminant Receptors</b>				
a) Exposure of permafrost (leading to erosion and structural concerns)  Are there improvements (roads, buildings) at the site dependent upon the permafrost for structural integrity? Yes No Do Not Know  Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	No 0 — Do Not Know — 1 0 1	Do not know.	Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.  Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Other Potential Receptors Total - Known Other Potential Receptors Total - Potential	0 1			
<b>Exposure Total</b>				
Raw Human Health + Ecological Total - Known Raw Human Health + Ecological Total - Potential Raw Total Exposure Total (max 34)	48 4 50 37.0	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.		

# **CCME National Classification System (2008)** **Score Summary**

Scores from individual worksheets are tallied in this worksheet.  
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	2	—
2. Chemical Hazard	8	—
3. Contaminant Exceedance Factor	4	—
4. Contaminant Quantity	6	—
5. Modifying Factors	2	—
<b>Raw Total Score</b>	<b>22</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>22</b>	
<b>Adjusted Total Score (Raw Total / 40 * 33)</b>	<b>18.2</b>	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	9	—
2. Surface Water Movement	8	—
3. Soil	12	—
4. Vapour	9	—
5. Sediment Movement	12	—
6. Modifying Factors	0	0
<b>Raw Total Score</b>	<b>50</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>50</b>	
<b>Adjusted Total Score (Raw Total / 64 * 33)</b>	<b>25.8</b>	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	22	
B. Potential		
a. Land Use		—
b. Accessibility		—
c. Exposure Route		
i. Direct Contact		—
ii. Inhalation		—
iii. Ingestion		—
2. Human Receptors Modifying Factors	6	—
<b>Raw Total Human Score</b>	<b>28</b>	<b>0</b>
<b>Raw Total Human Score (Known + Potential)</b>	<b>28</b>	
<b>Adjusted Total Human Score</b>	<b>22.0</b>	(maximum 22)
3. Ecological Receptors		
A. Known Impact	18	
B. Potential		
a. Terrestrial		—
b. Aquatic		—
4. Ecological Receptors Modifying Factors	0	3
<b>Raw Total Ecological Score</b>	<b>18</b>	<b>3</b>
<b>Raw Total Ecological Score (Known + Potential)</b>	<b>21</b>	
<b>Adjusted Total Ecological Score</b>	<b>18.0</b>	(maximum 18)
5. Other Receptors	0	1
<b>Total Other Receptors Score (Known + Potential)</b>	<b>1</b>	
<b>Total Exposure Score (Human + Ecological + Other)</b>	<b>41.0</b>	
<b>Adjusted Total Exposure Score (Total Exposure / 46 * 34)</b>	<b>30.3</b>	(max 34)

## **Site Score**

Test Site	
Site Letter Grade	A
Certainty Percentage	100%
% Responses that are "Do Not Know"	-59%
<b>Total NCSCS Score for site</b>	<b>74.2</b>
<b>Site Classification Category</b>	<b>1</b>

## **Site Classification Categories\*:**

- Class 1 - High Priority for Action (Total NCS Score >70)
- Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
- Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
- Class N - Not a Priority for Action (Total NCS Score <37)
- Class INS - Insufficient Information (>15% of responses are "Do Not Know")

\* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

<b>Subject Site:</b>	<b>Test Site</b>	
Civic Address: (or other description of location)	On the north shore of the Peace River, approximately 220 km east of High Level, Alberta, in Wood Buffalo National Park	
Site Common Name : (if applicable)	Community of Garden River	
Site Owner or Custodian: (Organization and Contact Person)	Parks Canada Agency	
Legal description or metes and bounds:	N 58°42.5', W113°52.0'	
Approximate Site area:		
PID(s) : (or Parcel Identification Numbers [PIN] if untitled Crown land)	Garden River Airstrip (FCSI #00022199)	
Centre of site: (provide latitude/longitude or UTM coordinates)	Latitude:	_____ degrees _____ min _____ secs
	Longitude:	_____ degrees _____ min _____ secs
	UTM Coordinate:	Northing Easting
Site Land Use:	Current:	Commercial/Industrial
	Proposed:	Commercial/Industrial
<b>Site Plan</b>	To delineate the bounds of the Site a site plan <b>MUST</b> be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.	
Provide a brief description of the Site:		
<p>The Garden River Airstrip is located north of the community of Garden River (see attached Site Plan).</p>		

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

Affected media and Contaminants of Potential Concern (COPC):	The concentration of petroleum hydrocarbon fractions F1 and F2 in one sample exceeded Alberta Environment 2008 Soil and Groundwater Remediation Guidelines. The concentrations of dissolved Cadmium, Selenium, and Zinc in three monitoring wells exceeded Canadian Council of Ministers of the Environment 2007 Canadian water quality guidelines for the protection of aquatic life. The concentrations of dissolved Manganese in three monitoring wells exceeded Health Canada 2008 Guidelines for Canadian drinking water quality.
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Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade

**A**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	Cathy Hamlen, Ph.D. A.Ag.
Date Scoring Completed:	6-Feb-09

CCME National Classification System (2008)  
(I) Contaminant Characteristics  
Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
<b>1. Residency Media (replaces physical state)</b>				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance		Twelve soil samples and three groundwater monitoring wells were assessed. Refer to <i>Contaminated Site Assessment, Initial and Detailed Testing Programs, Wood Buffalo National Park, Various Locations in the Community of Garden River, Alberta</i> (EBA Consulting Engineers Ltd., 2009).	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline).  Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at <a href="http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124">http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124</a> .  For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_res_recom/index_e.html">http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_res_recom/index_e.html</a> .	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	No			
Yes	0			
No				
Do Not Know				
B. Groundwater	Yes			
Yes	2			
No				
Do Not Know				
C. Surface water	No			
Yes	0			
No				
Do Not Know				
D. Sediment	No			
Yes	0			
No				
Do Not Know				
"Known" -score	2			
"Potential" - score	—			
<b>2. Chemical Hazard</b>				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?  High Medium Low Do Not Know	High	Petroleum hydrocarbon fraction F1 (soil) is High and fraction F2 (soil) is Medium; Cadmium (groundwater) is High, Selenium (groundwater) is Medium, and Manganese and Zinc (groundwater) are Low.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site.  The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file.  <i>See Attached Reference Material for Contaminant Hazard Rankings.</i>	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
"Known" -score	8			
"Potential" - score	—			
<b>3. Contaminant Exceedance Factor</b>				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?  Mobile NAPL High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	High (10x to 100x)	The petroleum hydrocarbon fraction F1 concentration in soil was 22.5 times higher than Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines and the F2 concentration in soil was 24.6 times higher than Alberta Environment 2008 Tier 1 guideline; The maximum groundwater Manganese concentration was 2.48 times higher than Health Canada 2008 Guideline for Canadian Drinking Water Quality; The maximum groundwater Cadmium concentration was 1.03 times higher than the CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life, the maximum groundwater Selenium concentration was 21.4 times higher than the 2007 CCME guideline, and the maximum groundwater Zinc concentration was 3.2 times higher than the 2007 CCME guideline.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME environmental quality guidelines</i> . Ranking should be based on contaminant with greatest exceedance of CCME guidelines. Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines  Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks.  Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria.  Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
"Known" -score	4			
"Potential" - score	—			

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
<b>4. Contaminant Quantity (known or strongly suspected)</b>				
What is the known or strongly suspected quantity of all contaminants?  <div> <div>&gt;10 hectare (ha) or 5000 m<sup>3</sup></div> <div>2 to 10 ha or 1000 to 5000 m<sup>3</sup></div> <div>&lt;2 ha or 1000 m<sup>3</sup></div> <div>Do Not Know</div> </div>	<div>&gt;10 hectare (ha) or 5000 m<sup>3</sup></div> <div></div> <div></div> <div></div>	The soil concentrations of petroleum hydrocarbon fractions F1 and F2 that exceeded Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines were detected in an area of approximately 1,600 m <sup>2</sup> . The groundwater monitoring wells with concentrations of COPC exceeding CCME 2007 Canadian Water Quality Guidelines for the protection of aquatic life covered an area of approximately 10,000 m <sup>2</sup> .	Measure or estimate the area or quantity of total contamination (i.e. all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
"Known" - score	9			
"Potential" - score	—			
<b>5. Modifying Factors</b>				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div> <div></div>	Chemicals do not persist.	Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics: (a) in air, (i) its half-life is equal to or greater than 2 days, or (ii) it is subject to atmospheric transport from its source to a remote area; (b) in water, its half-life is equal to or greater than 182 days; (c) in sediments, its half-life is equal to or greater than 365 days; or (d) in soil, its half-life is equal to or greater than 182 days.  This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.	Examples of Persistent Substances are provided in attached Reference Materials
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div> <div></div>			Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances?  <div> <div>one</div> <div>two to four</div> <div>five or more</div> <div>Do Not Know</div> </div>	<div>two to four</div> <div>2</div> <div></div>	Cadmium, Selenium, and Zinc in groundwater.	For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.
"Known" - Score	2			
"Potential" - Score	—			

Contaminant Characteristic Total

Raw Total Scores- "Known"	25
Raw Total Scores- "Potential"	0
Raw Combined Total Scores	25
Total Score (Raw Combined / 40 * 33)	20.6

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Groundwater Movement</b>				
<b>A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.</b>				
<p>i) For potable groundwater environments 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For non-potable environments (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non-potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.</p> <p>ii) Same as (i) except the information is not known but is <u>strongly suspected</u> based on indirect observations.</p> <p>iii) Meets GCDWQ for potable environments meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for non-potable environments or Absence of groundwater exposure pathway (i.e., there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).</p>	12	Selenium concentration in one monitoring well exceeded maximum acceptable concentration for drinking water (Health Canada 2008 Guidelines for Canadian Drinking Water Quality). Manganese in groundwater exceeded drinking water aesthetic objective (Health Canada 2008). Cadmium, Selenium, and Zinc concentrations exceeded guideline for protection of fresh water aquatic life (CCME, 2007). Hydraulic conductivity is in the order of 10 m/s at the site.	Review chemical data and evaluate groundwater quality.  The evaluation method concentrates on 1) a potable or non-potable groundwater environment; the groundwater flow system and its potential to be an exposure pathway to known or potential receptors  An aquifer is defined as a geologic unit that yields groundwater in usable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas). The evaluation of a non-potable environment will be based on a site specific basis.  Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils.  Seeps and springs are considered part of the groundwater pathway.  In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.	<p>The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries.</p> <p>Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links.</p> <p>Note that for potable groundwater that also daylights into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered.</p> <p><b>Selected References</b></p> <p><b>Potable Environments</b></p> <p>Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/ewh-semt/subst/water/gau/gcp_suo-soultium_guide-res_recom/index_e.html">www.hc-sc.gc.ca/ewh-semt/subst/water/gau/gcp_suo-soultium_guide-res_recom/index_e.html</a></p> <p><b>Non-Potable Environments</b></p> <p>Canadian Water Quality Guidelines for Protection of Aquatic Life, CCME, 1999 <a href="http://www.ccme.ca">www.ccme.ca</a></p> <p>Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations, Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.</p>
<p>NOTE: If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)</p>				
<b>B. Potential for groundwater pathway.</b>				
<p>a. Relative Mobility</p> <p>High</p> <p>Moderate</p> <p>Low</p> <p>Insignificant</p> <p>Do Not Know</p>			<p>Organics Koc (L/kg)</p> <p>Metals with higher mobility at acidic conditions</p> <p>Metals with higher mobility at alkaline conditions</p> <p>Koc &lt; 500 (i.e., log Koc &lt; 2.7) pH &lt; 5</p> <p>Koc = 500 to 5000 (i.e., log Koc = 2.7 to 3.7) pH = 5 to 6</p> <p>Koc = 5,000 to 100,000 (i.e., log Koc = 3.7 to 5) pH &gt; 6</p> <p>Koc &gt; 100,000 (i.e., log Koc &gt; 5)</p>	<p>Reference: US EPA Soil Screening Guidance (Part 5 - Table 3B)</p> <p>If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivity and precipitation infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.</p>
<p>b. Presence of engineered sub-surface containment?</p> <p>No containment</p> <p>Partial containment</p> <p>Full containment</p> <p>Do Not Know</p>			<p>Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved.</p> <p>Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for "Full Containment" scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.</p>	<p>Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links.</p> <p><b>Selected Resources:</b></p> <p>United States Environmental Protection Agency (USEPA) 1988, Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater, EPA/600/R-88/128.</p> <p>Environment Canada—Ontario Region—Natural Attenuation Technical Assistance Bulletin (TABS) Number 10-21.</p>
<p>c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway</p> <p>3 m or less including no confining layer or discontinuous confining layer</p> <p>3 to 10 m</p> <p>&gt; 10 m</p> <p>Do Not Know</p>			<p>The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow.</p> <p>Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway.</p> <p>The evaluation of this category is based on:</p> <p>1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or</p> <p>2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (e.g., water table aquifer, first hydrostratigraphic unit or other groundwater pathway).</p>	
<p>d. Hydraulic conductivity of confining layer</p> <p>&gt;10<sup>-6</sup> cm/s or no confining layer</p> <p>10<sup>-6</sup> to 10<sup>-8</sup> cm/s</p> <p>&lt;10<sup>-8</sup> cm/s</p> <p>Do Not Know</p>			<p>Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on:</p> <p>1) The presence and hydraulic conductivity (K) of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or</p> <p>2) The presence and permeability (K) of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.</p>	

(II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Page 2 of 5

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>c. Topography</b> Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	1		Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).	
<b>d. Run-off potential</b> High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score < 0.6) Low (0.2 < rainfall run-off score < 0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	0.4		<b>Rainfall</b> Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). The former definition of annual rainfall did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor.  <b>Permeability</b> For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1).  Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.	Selected Sources: Environment Canada web page link <a href="http://www.msc.ec.gc.ca">www.msc.ec.gc.ca</a> Snow to rainfall conversion apply ratio of 15 (snow):1(water)
<b>e. Flood potential</b> 1 in 2 years 1 in 10 years 1 in 50 years Do Not Know	0.5		Review published data such as flood plain mapping or flood potential (e.g., spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.	
Potential surface water pathway total	0.9			
Allowed Potential score	—			
Surface water pathway total	8	Note: If a "known" score is provided, the "potential" score is disallowed.		
<b>3. Surface Soils (potential for dust, dermal and ingestion exposure)</b>				
<b>A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)</b>				
COPCs measured in surface soils exceed the CCME soil quality guideline.  Strongly suspected that soils exceed guidelines  COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	12  9  0	The concentrations of petroleum hydrocarbon fractions F1 and F2 exceeded Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines in one surface soil sample (0 - 0.6 m depth). The risk is minimized since the area has full vegetative cover.	Collect all available information on quality of surface soils (i.e., top 1.5 metres) at the site. Evaluate available data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (i.e., agricultural, residential/peri-urban, commercial, or industrial), and soil texture if applicable (i.e., coarse or fine).	Selected References: CCME, 1999, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health <a href="http://www.ccme.ca">www.ccme.ca</a>
Score	12			
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)				
<b>B. Potential for a surface soils (top 1.5 m) migration pathway</b>				
<b>a. Are the soils in question covered?</b> Exposed Vegetated Landscaped Paved Do Not Know	4		Consult engineering or risk assessment reports for the site. Alternatively, review photographs and perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.
<b>b. For what proportion of the year does the site remain covered by snow?</b> 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	3		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
Potential surface soil pathway total	7			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Soil pathway total	12			

## (II) Migration Potential (Evaluation of contaminant migration pathways)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>4. Vapour</b>				
<b>A. Demonstrated COPCs in vapour.</b>				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	The concentration of petroleum hydrocarbons (fractions F1 and F2) exceeded Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines in one surface sample. The soil sample was collected approximately 150 m east of a Parks Canada Cabin.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0			
Score	9			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment).				
<b>B. Potential for COPCs in vapour</b>				
a. Relative Volatility based on Henry's Law Constant, $H'$ (dimensionless) High ( $H' > 1.0E-1$ ) Moderate ( $H' = 1.0E-1$ to $1.0E-3$ ) Low ( $H' < 1.0E-3$ ) Not Volatile Do Not Know		Reference: US EPA Soil Screening Guidance (Part 5 - Table 36)  Provided in Attached Reference Materials		If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5.
Score	2.5			
b. What is the soil grain size? Fine Coarse Do Not Know		Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours.  Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter ( $D_{50} < 75 \mu\text{m}$ ). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter ( $D_{50} > 75 \mu\text{m}$ ).		
Score	3			
c. Is the depth to the source less than 10m? Yes No Do Not Know		Review groundwater depths below grade for the site.		
Score	2			
d. Are there any preferential pathways? Yes No Do Not Know		Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.		Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Score	2			
Potential vapour pathway total	9.5	Note: If a "known" score is provided, the "potential" score is disallowed.		
Allowed Potential score	9			
Vapour pathway total	9			
<b>5. Sediment Movement</b>				
<b>A. Demonstrated migration of sediments containing COPCs</b>				
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	The site has full vegetative cover and sediment movement is considered to be unlikely.	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9			
Sediments have been contained and there is no indication that sediments will migrate in future, or Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0			
Score	9			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
B. Potential for sediment migration				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?		Note: If a "known" score is provided, the "potential" score is disallowed.	Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
Yes				
No				
Do Not Know	4			
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?				
Yes				
No				
Do Not Know	4			
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?				
Yes				
No				
Do Not Know	4			
Potential sediment pathway total	12			
Allowed Potential score	—			
Sediment pathway total	9			
6. Modifying Factors				
Are there subsurface utility conduits in the area affected by contamination?		No underground facilities were located in March 2008.	Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Yes	No			
No				
Do Not Know				
Known	0			
Potential	0			

## Migration Potential Total

Raw "known" total	47
Raw "potential" total	0.0
Raw combined total	47.0
Total (max 33)	24.2

Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Human</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site)	22			Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10			Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.
No quantified or suspected exposures/impacts in humans.	0			Selected References: Health Canada- Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Health Screening Level Risk Assessments <a href="http://www.hc-sc.gc.ca/wh-sam/03ubs/contaminated/index_e.html">www.hc-sc.gc.ca/wh-sam/03ubs/contaminated/index_e.html</a> United States Environmental Protection Agency, Integrated Risk Information System (IRIS) <a href="http://www.epa.gov/iris/">http://www.epa.gov/iris/</a>
Score	22	The soil concentration of petroleum hydrocarbon fraction F1 was 22.5 times higher than Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines and the soil concentration of F2 was 24.6 times higher than Alberta Environment 2008 Tier 1 guideline. The sample was collected from the eastern edge of the site. The groundwater concentration of Selenium in one monitoring well exceeded maximum acceptable concentration for drinking water (Health Canada 2008). The monitoring well is located near the Parks Canada shed.	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this is typically either >10 <sup>-6</sup> or >10 <sup>-5</sup> ). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 µg/dL) or other health based testing.	
Score	22	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10 <sup>-6</sup> or 10 <sup>-5</sup> ).		
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
<b>B. Potential for human exposure</b>				
a) Land use (provides an indication of potential human exposure scenarios)				Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).
Agricultural Residential / Parkland Commercial Industrial Do Not Know				This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
Score	1.5			
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination)				Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.
Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know				
Score	1			
<b>B. Potential for human exposure</b>				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).				If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.
i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know				Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
Score	3			
ii) inhalation (i.e., inhalation of dust, vapour)				Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion.
Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know				Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.
Score	3			General Notes: Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as Internet links.
Dust - If there is contaminated surface soil (e.g. top 1.5 m), indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent Do Not Know Texture				Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2008)) then these soils are more likely to generate dusts.
Score	0			Selected References: Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 133 <a href="http://www.ccme.ca">www.ccme.ca</a> Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
Inhalation total	3			

CCME National Classification System (2008)

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for human exposure</b>				
<p>iii) Ingestion (i.e., ingestion of food items, water and soils [for children]). Including traditional foods.</p> <p>Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future).</p> <p>0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know</p> <p>Score</p> <p>Is an alternative water supply readily available?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Is human ingestion of contaminated soils possible?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Ingestion total</p>	<p>2</p> <p>1</p> <p>3</p> <p>1</p> <p>7</p>	<p>Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.</p>	<p>Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure.</p> <p>The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of flow-contaminant transport.</p> <p>If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.</p> <p>Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.</p>	<p><b>Selected References:</b> Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/hccp/sesc/water/publications/drinking_water_quality_guidelines_toc.html">www.hc-sc.gc.ca/hccp/sesc/water/publications/drinking_water_quality_guidelines_toc.html</a></p> <p>Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable.</p> <p>Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.</p>
Human Health Total "Potential" Score	15.5			
Allowed "Potential" Score	—			
<b>2. Human Exposure Modifying Factors</b>				
<p>a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.)</p> <p>Yes No Do Not Know</p> <p>Known Potential</p> <p>Raw Human "known" total Raw Human "potential" total Raw Human Exposure Total Score Human Health Total (max 22)</p>	<p>Yes</p> <p>6</p> <p>28</p> <p>0</p> <p>28</p> <p>22.0</p>	<p>Potable water supply is local; Strong reliance of community on local foods which include fish from Peace River.</p>		
<b>3. Ecological</b>				
<b>A. Known exposure</b>				
<p>Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.</p> <p>Same as above, but "Strongly Suspected" based on observations or indirect evidence.</p> <p>No quantified or suspected exposures/impacts in terrestrial or aquatic organisms</p> <p>Score</p>	<p>18</p> <p>12</p> <p>0</p> <p>18</p> <p>18</p>	<p>The concentrations of petroleum hydrocarbon fractions F1 and F2 exceeded Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines in one surface soil sample (0 - 0.6 m depth). Groundwater concentrations of Cadmium, Selenium, and Zinc were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life and the site is approximately 1 km north of the Peace River.</p>	<p>Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients &gt;1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects such as site observations, tissue testing, toxicity testing and quantitative community assessments.</p>	<p>CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a> CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses <a href="http://www.ccme.ca">www.ccme.ca</a> Sensitive receptors- review: Canadian Council on Ecological Areas <a href="http://www.ccea.org">www.ccea.org</a></p> <p>Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in A Framework for Ecological Risk Assessment: General Guidance (CCME 1998).</p> <p>Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as Internet links.</p>
<p>NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)</p>				

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>a) Terrestrial</b>				
<b>i) Land use</b>				
Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know	Score	1.5	Review zoning and land use maps. If the proposed future land use is more sensitive than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration).  Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
<b>ii) Uptake potential</b>				
Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know	Score	1	If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
<b>ii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water)</b>				
Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know	Score	1	Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.	
Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know	Score	1	Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.	
Can the contamination identified bioaccumulate? Yes No Do Not Know	Score	1	Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines. It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: <a href="http://www.ccea.org">www.ccea.org</a>	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	Score	1.5		
Raw Terrestrial Total Potential	7	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Terrestrial Total Potential	—			
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>b) Aquatic</b>				
<b>i) Classification of aquatic environment</b>				
Sensitive Typical Not Applicable (no aquatic environment present) Do Not Know	Score	2	"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species.  "Typical aquatic environments" include those in areas other than those listed above.	
<b>ii) Uptake potential</b>				
Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know	Score	1	Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the areas of daylighting groundwater	
Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	Score	1.5	It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: <a href="http://www.ccea.org">www.ccea.org</a>  Bioaccumulation of food items is possible if:	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and rivers and other aquatic environments.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	1 5.5 ---	Note: If a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.	1) The Log(K <sub>ow</sub> ) of the contaminant is greater than 4 (as per the chemical characteristics work sheet and concentrations in sediments exceed the CCME ISQGs. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Raw Aquatic Total Potential Allowed Aquatic Total Potential	5.5 ---			
<b>4. Ecological Exposure Modifying Factors</b>				
a) Known occurrence of a species at risk.  Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	Do Not Know 1 ---	Not known if a species at risk is present at the site.	Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as Eco Explorer, Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act ( <a href="http://www.sar.gov.gc.ca/species/schedules_e.cfm?d=1">http://www.sar.gov.gc.ca/species/schedules_e.cfm?d=1</a> ). Many provincial governments may also provide regional applicable lists of species at risk. For example, in British Columbia, consult BCNWRAP, 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists, Ministry of Sustainable Resource Management and Water, Land and Air Protection ( <a href="http://www.gov.bc.ca/atrisk/red-blue.htm">http://www.gov.bc.ca/atrisk/red-blue.htm</a> )
Score	1			
b) Potential impact of aesthetics (e.g., enrichment of a lake or tarnishing of food flavor).  Is there evidence of aesthetic impact in receiving water bodies? Yes No Do Not Know	Do Not Know 1 ---	Peace River has high flow. Do not know if the aesthetics will be impacted.	Documentation may consist of environmental investigation reports, press articles, petitions or other records.  Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.  A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients e.g., nitrogen or phosphorous releases to an aquatic body can act as a fertilizer.	This item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Is there evidence of olfactory impact (i.e., unpleasant smell)? Yes No Do Not Know	No 0 ---			
Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know	No 0 ---			
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	Do Not Know 1 ---		Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	
Ecological Modifying Factors Total - Known Ecological Modifying Factors Total - Potential Raw Ecological Total - Known Raw Ecological Total - Potential Raw Ecological Total Ecological Total (Max 18)	0 3 18 3 21 18.0			
<b>5. Other Potential Contaminant Receptors</b>				
a) Exposure of permafrost (leading to erosion and structural concerns)  Are there improvements (roads, buildings) at the site dependent upon the permafrost for structural integrity? Yes No Do Not Know	No 0 ---		Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	Do Not Know 1 ---	Do not know.	Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	
Other Potential Receptors Total - Known Other Potential Receptors Total - Potential	0 1			
<b>Exposure Total</b>				
Raw Human Health + Ecological Total - Known Raw Human Health + Ecological Total - Potential Raw Total Exposure Total (max 34)	48 4 50 37.0	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.		

# **CCME National Classification System (2008)** **Score Summary**

Scores from individual worksheets are tallied in this worksheet.  
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	2	---
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	4	---
4. Contaminant Quantity	9	---
5. Modifying Factors	2	---
<b>Raw Total Score</b>	<b>25</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>25</b>	
<b>Adjusted Total Score (Raw Total / 40 * 33)</b>	<b>20.6</b>	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	9	---
2. Surface Water Movement	8	---
3. Soil	12	---
4. Vapour	9	---
5. Sediment Movement	9	---
6. Modifying Factors	0	0
<b>Raw Total Score</b>	<b>47</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>47</b>	
<b>Adjusted Total Score (Raw Total / 64 * 33)</b>	<b>24.2</b>	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	22	
B. Potential		
a. Land Use		---
b. Accessibility		---
c. Exposure Route		
i. Direct Contact		---
ii. Inhalation		---
iii. Ingestion		---
2. Human Receptors Modifying Factors	6	---
<b>Raw Total Human Score</b>	<b>28</b>	<b>0</b>
<b>Raw Total Human Score (Known + Potential)</b>	<b>28</b>	
<b>Adjusted Total Human Score</b>	<b>22.0</b>	(maximum 22)
3. Ecological Receptors		
A. Known Impact	18	
B. Potential		
a. Terrestrial		---
b. Aquatic		---
4. Ecological Receptors Modifying Factors	0	3
<b>Raw Total Ecological Score</b>	<b>18</b>	<b>3</b>
<b>Raw Total Ecological Score (Known + Potential)</b>	<b>21</b>	
<b>Adjusted Total Ecological Score</b>	<b>18.0</b>	(maximum 18)
5. Other Receptors	0	1
<b>Total Other Receptors Score (Known + Potential)</b>	<b>1</b>	
<b>Total Exposure Score (Human + Ecological + Other)</b>	<b>41.0</b>	
<b>Adjusted Total Exposure Score (Total Exposure / 46 * 34)</b>	<b>30.3</b>	(max 34)

<b>Site Score</b>	
Test Site	
Site Letter Grade	A
Certainty Percentage	100%
% Responses that are "Do Not Know"	-59%
<b>Total NCSCS Score for site</b>	<b>75.2</b>
<b>Site Classification Category</b>	<b>1</b>

## **Site Classification Categories\*:**

- Class 1 - High Priority for Action (Total NCS Score >70)
- Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
- Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
- Class N - Not a Priority for Action (Total NCS Score <37)
- Class INS - Insufficient Information (>15% of responses are "Do Not Know")

\* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

<b>Subject Site:</b>	<b>Test Site</b>	
Civic Address: (or other description of location)	On the north shore of the Peace River, approximately 220 km east of High Level, Alberta, in Wood Buffalo National Park	
Site Common Name : (if applicable)	Community of Garden River	
Site Owner or Custodian: (Organization and Contact Person)	Parks Canada Agency	
Legal description or metes and bounds:	N 58°42.5', W113°52.0'	
Approximate Site area:		
PID(s): (or Parcel Identification Numbers [PIN] if untitled Crown land)	Garden River Landfill (FCSI #00022827)	
Centre of site: (provide latitude/longitude or UTM coordinates)	Latitude:	_____ degrees _____ min _____ secs
	Longitude:	_____ degrees _____ min _____ secs
	UTM Coordinate:	Northing Easting
Site Land Use:	Current:	Commercial/Industrial
	Proposed:	
<b>Site Plan</b>	To delineate the bounds of the Site a site plan <b>MUST</b> be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.	
Provide a brief description of the Site:		
<p>Landfill is located approximately 1 km northwest of the community of Garden River (see attached Site Plan).</p>		

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

Affected media and Contaminants of Potential Concern (COPC):	The concentration of petroleum hydrocarbon fraction F3 in one soil sample exceeded Alberta Environment 2008 Tier 1 Soil and Groundwater Remediation Guidelines. The concentration of Copper in one soil sample exceeded Canadian Council of Ministers of the Environment 2007 Canadian soil quality guidelines for the protection of environmental and human health. The concentrations of dissolved Pyrene, Benzo(a)anthracene, Cadmium, Selenium, and Zinc exceeded Canadian Council of Ministers of the Environment 2007 Canadian water quality guidelines for the protection of aquatic life. The dissolved concentrations of Manganese exceeded Health Canada 2008 Guidelines for Canadian drinking water quality.
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Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade

**A**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	Cathy Hamlen, Ph.D. A.Ag.
Date Scoring Completed:	5-Feb-09

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance		Eleven soil samples and three groundwater monitoring wells were assessed. Refer to <i>Contaminated Site Assessment, Initial and Detailed Testing Programs, Wood Buffalo National Park, Various Locations in the Community of Garden River, Alberta</i> (EBA Consulting Engineers Ltd., 2009).	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline).  Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at <a href="http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124">http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124</a> .  For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at <a href="http://www.hc-sc.gc.ca/ewh-scmt/pubs/water-eau/doc_sup-appui/sum_guides_res_recom/index_e.html">http://www.hc-sc.gc.ca/ewh-scmt/pubs/water-eau/doc_sup-appui/sum_guides_res_recom/index_e.html</a> .	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	Yes			
Yes	2			
No				
Do Not Know				
B. Groundwater	Yes			
Yes	2			
No				
Do Not Know				
C. Surface water	No			
Yes	0			
No				
Do Not Know				
D. Sediment	No			
Yes	0			
No				
Do Not Know				
"Known" -score	4			
"Potential" - score	—			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?  High Medium Low Do Not Know	High	F3 and copper in soil are Low; Manganese and Zinc in groundwater are Low, Pyrene and Selenium in groundwater are Medium, and Benzo(a)anthracene and Cadmium in groundwater are High.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site.  The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file.  See Attached Reference Material for Contaminant Hazard Rankings.	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
"Known" -score	8			
"Potential" - score	—			
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?  Mobile NAPL High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	High (10x to 100x)	The concentration of F3 (soil) was 2.7 times higher than AENV Tier 1 soil guideline, and the concentration of copper (soil) was 3.2 times higher than CCME 2007 Canadian soil quality guideline; The maximum dissolved Manganese concentration was 2.9 times higher than Health Canada 2008 Guideline for drinking water, the maximum dissolved Zinc concentration was 3.9 times higher than CCME 2007 Canadian water quality guidelines for the protection of fresh water aquatic life, the maximum dissolved Pyrene concentration was 2.0 times higher than the CCME 2007 guideline for protection of aquatic life, the maximum dissolved Selenium concentration was 4.7 times higher than the 2007 CCME guideline, the dissolved Benzo(a)anthracene concentration was 1.1 times higher than the 2007 CCME guideline, and the maximum dissolved Cadmium concentration was 15.5 times higher than the 2007 CCME guideline.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME environmental quality guidelines</i> . Ranking should be based on contaminant with greatest exceedance of CCME guidelines. Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks.  Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria.  Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
"Known" -score	4			
"Potential" - score	—			

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
<b>4. Contaminant Quantity (known or strongly suspected)</b>				
What is the known or strongly suspected quantity of all contaminants?  <div> <div>&gt;10 hectare (ha) or 5000 m<sup>3</sup></div> <div>2 to 10 ha or 1000 to 5000 m<sup>3</sup></div> <div>&lt;2 ha or 1000 m<sup>3</sup></div> <div>Do Not Know</div> </div>	<div>2 to 10 ha or 1000 to 5000 m<sup>3</sup></div> <div>—</div>	Area of site is approximately 3,000 m <sup>2</sup> .	Measure or estimate the area or quantity of total contamination (i.e., all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
"Known" - score	6			
"Potential" - score	—			
<b>5. Modifying Factors</b>				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div>	Chemicals do not persist.	<p>Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics:</p> <p>(a) in air,            (i) its half-life is equal to or greater than 2 days, or            (ii) it is subject to atmospheric transport from its source to a remote area;            (b) in water, its half-life is equal to or greater than 182 days;            (c) in sediments, its half-life is equal to or greater than 365 days; or            (d) in soil, its half-life is equal to or greater than 182 days.</p> <p>This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.</p>	Examples of Persistent Substances are provided in attached Reference Materials
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div>			Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances?  <div> <div>one</div> <div>two to four</div> <div>five or more</div> <div>Do Not Know</div> </div>	<div>five or more</div> <div>3</div>	Pyrene, Benzo(a)anthracene, Cadmium, Selenium, and Zinc in groundwater; Copper in Soil.	For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.
"Known" - Score	3			
"Potential" - Score	—			

Contaminant Characteristic Total

Raw Total Scores- "Known"	25
Raw Total Scores- "Potential"	0
Raw Combined Total Scores	25
Total Score (Raw Combined / 40 * 33)	20.6

## Test Site

CCME National Classification System for Contaminated Sites  
(2008)

**Test Site**

CCME National Classification System for Contaminated Sites  
(2008)

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>c. Topography</b> Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	1		Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).	
<b>d. Run-off potential</b> High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score < 0.6) Low (0.2 < rainfall run-off score < 0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	0.4		<b>Rainfall</b> Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). The former definition of annual rainfall did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor.  <b>Permeability</b> For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1).  Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.	Selected Sources: Environment Canada web page link <a href="http://www.msc.ec.gc.ca">www.msc.ec.gc.ca</a> Snow to rainfall conversion apply ratio of 15 (snow):1(water)
<b>e. Flood potential</b> 1 in 2 years 1 in 10 years 1 in 50 years Do Not Know	0.5		Review published data such as flood plain mapping or flood potential (e.g., spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.	
Potential surface water pathway total	6.9			
Allowed Potential score	—			
Surface water pathway total	8	Note: If a "known" score is provided, the "potential" score is disallowed.		
<b>3. Surface Soils (potential for dust, dermal and ingestion exposure)</b>				
<b>A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)</b>				
COPCs measured in surface soils exceed the CCME soil quality guideline.	12			
Strongly suspected that soils exceed guidelines	9			
COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	0			
	12			
Score	12			
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)				
<b>B. Potential for a surface soils (top 1.5 m) migration pathway</b>				
<b>a. Are the soils in question covered?</b> Exposed Vegetated Landscaped Paved Do Not Know	4		Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.
<b>b. For what proportion of the year does the site remain covered by snow?</b> 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	3		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
Potential surface soil pathway total	7			
Allowed Potential score	—			
Soil pathway total	12	Note: If a "known" score is provided, the "potential" score is disallowed.		

CCME National Classification System (2008)

(II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>4. Vapour</b>				
<b>A. Demonstrated COPCs in vapour.</b>				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	The groundwater concentrations of volatile hydrocarbons (Pyrene and Benzo(a)anthracene) were above CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life. Site is more than 1 km from community buildings.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0			
Score	9			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)				
<b>B. Potential for COPCs in vapour.</b>				
a. Relative Volatility based on Henry's Law Constant, H <sup>*</sup> (dimensionless) High (H <sup>*</sup> > 1.0E-1) Moderate (H <sup>*</sup> = 1.0E-1 to 1.0E-3) Low (H <sup>*</sup> < 1.0E-3) Not Volatile Do Not Know			Reference: US EPA Soil Screening Guidance (Part 5 - Table 36)  Provided in Attached Reference Materials	If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5.
Score	2.5			
b. What is the soil grain size? Fine Coarse Do Not Know			Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours.  Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter (D50 < 75 µm). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter (D50 > 75 µm).	
Score	3			
c. Is the depth to the source less than 10m? Yes No Do Not Know			Review groundwater depths below grade for the site.	
Score	2			
d. Are there any preferential pathways? Yes No Do Not Know			Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.	Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Score	2			
Potential vapour pathway total	9.5	Note: If a "known" score is provided, the "potential" score is disallowed.		
Allowed Potential score	9			
Vapour pathway total	9			
<b>5. Sediment Movement</b>				
<b>A. Demonstrated migration of sediments containing COPCs</b>				
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	The site is vegetated, but landfill management activities might disturb the surface and expose sediments.	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9			
Sediments have been contained and there is no indication that sediments will migrate in future. or Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0			
Score	9			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for sediment migration</b>				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?			Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
Yes				
No				
Do Not Know	4			
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?				
Yes				
No				
Do Not Know	4			
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?		Note: if a "known" score is provided, the "potential" score is disallowed.	Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional	
Yes				
No				
Do Not Know	4			
Potential sediment pathway total	12			
Allowed Potential score	—			
Sediment pathway total	9			
<b>6. Modifying Factors</b>				
Are there subsurface utility conduits in the area affected by contamination?		No underground utilities were located in March 2008.	Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Yes	No			
No				
Do Not Know				
Known	0			
Potential	0			

## Migration Potential Total

Raw "known" total	47
Raw "potential" total	0.0
Raw combined total	47.0
Total (max 33)	24.2

Note: if "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Human</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site*)	22		*Where adverse effects on humans are documented, the site should be automatically designated Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10	The site is located at least 1 km northwest of the community. A single surface soil sample (0 - 0.6 m depth) had Copper concentration greater than the Canadian Council of Ministers of the Environment 2007 Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health.	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this typically either >10 <sup>-6</sup> or >10 <sup>-5</sup> ). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 µg/dL) or other health based testing.	Selected References: Health Canada- Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Health Screening Level Risk Assessments <a href="http://www.hc-sc.gc.ca/ehv/ehm/subs/contam/risk/index_e.html">http://www.hc-sc.gc.ca/ehv/ehm/subs/contam/risk/index_e.html</a> United States Environmental Protection Agency, Integrated Risk Information System (IRIS) <a href="http://toxnet.nlm.nih.gov">http://toxnet.nlm.nih.gov</a>
No quantified or suspected exposures/impacts in humans.	0		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10 <sup>-6</sup> or 10 <sup>-5</sup> ).	
Score	10			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors).				
<b>B. Potential for human exposure</b>				
a) Land use (provides an indication of potential human exposure scenarios)  Agricultural Residential / Parkland Commercial Industrial Do Not Know	1.5		Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis in the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination)  Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know	1		Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
<b>B. Potential for human exposure</b>				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).  i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know	3		If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
ii) Inhalation (i.e., inhalation of dust, vapour)  Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know	3		If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances) relative to buildings. Refer to (II) Migration Potential worksheet, 4B (Potential for COPCs in Vapour) for a definition of volatility.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion.
Dust - If there is contaminated surface soil (e.g. top 1.5 m), indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent Do Not Know Texture	0		Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2006)) then these soils are more likely to generate dusts.	Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.
Score	3			General Notes: Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as Internet links.  Selected References: Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332 <a href="http://www.ccme.ca">www.ccme.ca</a> Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
Inhalation total	3			

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for human exposure</b>				
<p>ii) Ingestion (i.e., ingestion of food items, water and soils (for children)). Including traditional foods.</p> <p>Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future).</p> <p>0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know</p> <p>Score</p> <p>Is an alternative water supply readily available?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Is human ingestion of contaminated soils possible?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Ingestion total</p> <p>Human Health Total "Potential" Score</p> <p>Allowed "Potential" Score</p>	<p>2</p> <p>1</p> <p>3</p> <p>1</p> <p>7</p> <p>15.5</p> <p>—</p>	<p>Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.</p>	<p>Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure.</p> <p>The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of and contaminant transport.</p> <p>If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.</p> <p>Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.</p>	<p><b>Selected References:</b> Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/cehcc/assess/publications/drinking_water_quality_guidelines/00c.htm">www.hc-sc.gc.ca/cehcc/assess/publications/drinking_water_quality_guidelines/00c.htm</a></p> <p>Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable.</p> <p>Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.</p>
<b>2. Human Exposure Modifying Factors</b>				
<p>a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.)</p> <p>Yes No Do Not Know</p> <p>Known Potential</p> <p>Raw Human "known" total</p> <p>Raw Human "potential" total</p> <p>Raw Human Exposure Total Score</p> <p>Human Health Total (max 22)</p>	<p>Yes</p> <p>6</p> <p>16</p> <p>0</p> <p>16</p> <p>16.0</p>	<p>Potable water supply is local; Strong reliance of community on local foods which include fish from Peace River.</p>		
<b>3. Ecological</b>				
<b>A. Known exposure</b>				
<p>Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.</p> <p>Score</p> <p>Same as above, but "Strongly Suspected" based on observations or indirect evidence.</p> <p>Score</p> <p>No quantified or suspected exposures/impacts in terrestrial or aquatic organisms</p> <p>Score</p>	<p>18</p> <p>12</p> <p>0</p> <p>12</p> <p>12</p>	<p>Groundwater concentrations of Pyrene, Benzo(a)anthracene, Cadmium, Selenium, and Zinc were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life. The site is within 2 of the Peace River.</p>	<p>Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients &gt;1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects, such as site observations, tissue testing, toxicity testing and quantitative community assessments.</p>	<p>CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a> CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Use <a href="http://www.ccme.ca">www.ccme.ca</a> Sensitive receptors- review: Canadian Council on Ecological Areas <a href="http://www.ccea.org">www.ccea.org</a></p> <p>Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in <i>Framework for Ecological Risk Assessment: General Guidance</i> (CCME 1998).</p> <p><b>Notes:</b> Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as Internet links.</p>
<p>NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)</p>				

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>a) Terrestrial</b> <b>i) Land use</b> Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know  Score: 1.5			Review zoning and land use maps. If the proposed future land use is more intensive than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration).  Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
<b>ii) Uptake potential</b> Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know Score: 1			If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
<b>iii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water)</b> Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know Score: 1  Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know Score: 1  Can the contamination identified bioaccumulate? Yes No Do Not Know Score: 1  Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score: 1.5  Raw Terrestrial Total Potential: 7 Allowed Terrestrial Total Potential: ---		Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.	Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.  Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.  Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(K <sub>ow</sub> ) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines. It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link <a href="http://www.ccea.org">www.ccea.org</a>	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>b) Aquatic</b> <b>i) Classification of aquatic environment</b> Sensitive Typical Not Applicable (no aquatic environment present) Do Not Know Score: 2			"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species.  "Typical aquatic environments" include those in areas other than those listed above.	
<b>ii) Uptake potential</b> Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know Score: 1  Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score: 1.5			Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater  It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: <a href="http://www.ccea.org">www.ccea.org</a> .  Bioaccumulation of food items is possible if:	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and fens and other aquatic environments.

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	1		1) The Log(K <sub>ow</sub> ) of the contaminant is greater than 4 (as per the chemical characteristics work sheet and concentrations in sediments exceed the CCME ISQGs. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Raw Aquatic Total Potential Allowed Aquatic Total Potential	5.5 —	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
<b>4. Ecological Exposure Modifying Factors</b>				
a) Known occurrence of a species at risk.  Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	Do Not Know — 1	Not known if a species at risk is present at the site.	Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as Eco Explorer, Regional, Provincial (Environment Minister), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act ( <a href="http://www.sararegistry.gc.ca/species/schedules_a_sir/index.html">http://www.sararegistry.gc.ca/species/schedules_a_sir/index.html</a> ). Many provincial governments may also provide regional applicable lists of species at risk. For example, in British Columbia, consult: BCNWRAP, 2005, Endangered Species and Ecosystems in British Columbia, Provincial red and blue lists, Ministry of Sustainable Resource Management and Water, Land and Air Protection ( <a href="http://www.gov.bc.ca/erisk/red-blue.htm">http://www.gov.bc.ca/erisk/red-blue.htm</a> )
b) Potential impact of aesthetics (e.g., enrichment of a lake or tainting of food flavor).  Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know  Is there evidence of olfactory impact (i.e., unpleasant smell)? Yes No Do Not Know  Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know  Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	Do Not Know — 1 — 0 — 0 — Do Not Know — 1 0 3 12 3 15 Ecological Total (max 18)	Peace River has high flow. Do not know if the aesthetics will be impacted.	Documentation may consist of environmental investigation reports, press articles, petitions or other records.  Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.  A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients (e.g., nitrogen or phosphorous) releases to an aquatic body can act as a fertilizer.  Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	This item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Ecological Modifying Factors Total - Known Ecological Modifying Factors Total - Potential Raw Ecological Total - Known Raw Ecological Total - Potential Raw Ecological Total Ecological Total (max 18)	0 3 12 3 15 15.0			
<b>5. Other Potential Contaminant Receptors</b>				
a) Exposure of permafrost (leading to erosion and structural concerns)  Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity? Yes No Do Not Know  Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	No 0 — Do Not Know — 1 0 1	Do not know.	Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.  Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Other Potential Receptors Total - Known Other Potential Receptors Total - Potential	0 1			
<b>Exposure Total</b>				
Raw Human Health + Ecological Total - Known Raw Human Health + Ecological Total - Potential Raw Total Exposure Total (max 34)	28 4 32 23.7	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.		

# CCME National Classification System (2008) Score Summary

Scores from individual worksheets are tallied in this worksheet.  
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	4	---
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	4	---
4. Contaminant Quantity	6	---
5. Modifying Factors	3	---
<b>Raw Total Score</b>	<b>25</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>25</b>	
<b>Adjusted Total Score (Raw Total / 40 * 33)</b>	<b>20.6</b>	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	9	---
2. Surface Water Movement	8	---
3. Soil	12	---
4. Vapour	9	---
5. Sediment Movement	9	---
6. Modifying Factors	0	0
<b>Raw Total Score</b>	<b>47</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>47</b>	
<b>Adjusted Total Score (Raw Total / 64 * 33)</b>	<b>24.2</b>	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	10	
B. Potential		
a. Land Use		---
b. Accessibility		---
c. Exposure Route		
i. Direct Contact		---
ii. Inhalation		---
iii. Ingestion		---
2. Human Receptors Modifying Factors	6	---
<b>Raw Total Human Score</b>	<b>16</b>	<b>0</b>
<b>Raw Total Human Score (Known + Potential)</b>	<b>16</b>	
<b>Adjusted Total Human Score</b>	<b>16.0</b>	(maximum 22)
3. Ecological Receptors		
A. Known Impact	12	
B. Potential		
a. Terrestrial		---
b. Aquatic		---
4. Ecological Receptors Modifying Factors	0	3
<b>Raw Total Ecological Score</b>	<b>12</b>	<b>3</b>
<b>Raw Total Ecological Score (Known + Potential)</b>	<b>15</b>	
<b>Adjusted Total Ecological Score</b>	<b>15.0</b>	(maximum 18)
5. Other Receptors	0	1
<b>Total Other Receptors Score (Known + Potential)</b>	<b>1</b>	
<b>Total Exposure Score (Human + Ecological + Other)</b>	<b>32.0</b>	
<b>Adjusted Total Exposure Score (Total Exposure / 46 * 34)</b>	<b>23.7</b>	(max 34)

## Site Score

Test Site	
Site Letter Grade	A
Certainty Percentage	100%
% Responses that are "Do Not Know"	-59%
<b>Total NCSCS Score for site</b>	<b>68.5</b>
<b>Site Classification Category</b>	<b>2</b>

## Site Classification Categories\*:

- Class 1 - High Priority for Action (Total NCS Score >70)
- Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
- Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
- Class N - Not a Priority for Action (Total NCS Score <37)
- Class INS - Insufficient Information (>15% of responses are "Do Not Know")

\* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

<b>Subject Site:</b>	<b>Test Site</b>	
Civic Address: (or other description of location)	On the north shore of the Peace River, approximately 220 km east of High Level, Alberta, in Wood Buffalo National Park	
Site Common Name : (if applicable)	Community of Garden River	
Site Owner or Custodian: (Organization and Contact Person)	Parks Canada Agency	
Legal description or metes and bounds:	N 58°42.5', W113°52.0'	
Approximate Site area:		
PID(s): (or Parcel Identification Numbers [PIN] if untitled Crown land)	Garden River Old Dump (FCSI #15841002)	
Centre of site: (provide latitude/longitude or UTM coordinates)	Latitude:	_____ degrees _____ min _____ secs
	Longitude:	_____ degrees _____ min _____ secs
	UTM Coordinate:	Northing Easting
Site Land Use:	Current:	Commercial/Industrial
	Proposed:	
<b>Site Plan</b>	To delineate the bounds of the Site a site plan <b>MUST</b> be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.	
Provide a brief description of the Site:		
<p>The Garden River Old Dump is located on the east side of the community of Garden River, approximately 300 m north of the Peace River (see attached Site Plan).</p>		

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

Affected media and Contaminants of Potential Concern (COPC):	The concentration of Selenium in one sample exceeded Canadian Council of Ministers of the Environment 2007 Canadian soil quality guidelines for the protection of environmental and human health. The concentrations of dissolved Cadmium, Lead, Selenium, and Zinc in three monitoring wells exceeded Canadian Council of Ministers of the Environment 2007 Canadian water quality guidelines for the protection of aquatic life. The concentrations of dissolved Manganese in three monitoring wells exceeded Health Canada 2008 Guidelines for Canadian drinking water quality.
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Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade **A**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	Cathy Hamlen, Ph.D. A.Ag.
Date Scoring Completed:	5-Feb-09

CCME National Classification System (2008)  
(I) Contaminant Characteristics  
Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance		Eleven soil samples and three groundwater monitoring wells were assessed. Refer to <i>Contaminated Site Assessment, Initial and Detailed Testing Programs, Wood Buffalo National Park, Various Locations in the Community of Garden River, Alberta</i> (EBA Consulting Engineers Ltd., 2009).	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline).  Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at <a href="http://www.ccme.ca/publications/ceqg_rceq.html?category_id=124">http://www.ccme.ca/publications/ceqg_rceq.html?category_id=124</a> .  For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appu/sum_guides_recom/index_e.html">http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appu/sum_guides_recom/index_e.html</a> .	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	Yes			
Yes	2			
No				
Do Not Know				
B. Groundwater	Yes			
Yes	2			
No				
Do Not Know				
C. Surface water	No			
Yes	0			
No				
Do Not Know				
D. Sediment	No			
Yes	0			
No				
Do Not Know				
"Known" -score	4			
"Potential" - score	—			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?  High Medium Low Do Not Know	High	Cadmium (groundwater) is High, Selenium (groundwater, soil) is Medium, and Iron, Manganese, and Zinc (groundwater) are Low.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site.  The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file.  <i>See Attached Reference Material for Contaminant Hazard Rankings.</i>	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
"Known" -score	8			
"Potential" - score	—			
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?  Mobile NAPL High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	High (10x to 100x)	The maximum Selenium concentration in soil was 1.58 times higher than CCME 2007 Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health; The maximum groundwater Manganese concentration was 12.7 times higher than Health Canada 2008 Guideline for Canadian Drinking Water Quality, and the maximum groundwater Iron concentration was 6.7 times higher than the 2008 Health Canada guideline and the CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life; The maximum groundwater Zinc concentration was 3.1 times higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life, the maximum Selenium concentration was 10.8 times higher than the 2007 CCME guideline, and the maximum dissolved Cadmium concentration was 21.6 times higher than the 2007 CCME guideline.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME environmental quality guidelines</i> . Ranking should be based on contaminant with greatest exceedance of CCME guidelines. Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks.  Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria.  Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
"Known" -score	4			
"Potential" - score	—			

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
<b>4. Contaminant Quantity (known or strongly suspected)</b>				
What is the known or strongly suspected quantity of all contaminants?  <div> <div>&gt;10 hectare (ha) or 5000 m<sup>3</sup></div> <div>2 to 10 ha or 1000 to 5000 m<sup>3</sup></div> <div>&lt;2 ha or 1000 m<sup>3</sup></div> <div>Do Not Know</div> </div>	<div>&gt;10 hectare (ha) or 5000 m<sup>3</sup></div> <div></div> <div></div> <div></div>	Area of site is approximately 8,000 m <sup>2</sup> .	Measure or estimate the area or quantity of total contamination (i.e., all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
"Known" - score	9			
"Potential" - score	---			
<b>5. Modifying Factors</b>				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div> <div></div>	Chemicals do not persist.	Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics: (a) in air, (i) its half-life is equal to or greater than 2 days, or (ii) it is subject to atmospheric transport from its source to a remote area; (b) in water, its half-life is equal to or greater than 182 days; (c) in sediments, its half-life is equal to or greater than 365 days; or (d) in soil, its half-life is equal to or greater than 182 days.  This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.	Examples of Persistent Substances are provided in attached Reference Materials
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div> <div></div>			Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances?  <div> <div>one</div> <div>two to four</div> <div>five or more</div> <div>Do Not Know</div> </div>	<div>five or more</div> <div>3</div> <div></div>	Cadmium, Iron, Selenium, and Zinc in groundwater; Selenium in soil.	For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.
"Known" - Score	3			
"Potential" - Score	---			

Contaminant Characteristic Total

Raw Total Scores- "Known"	28
Raw Total Scores- "Potential"	0
Raw Combined Total Scores	28
Total Score (Raw Combined / 40 * 33)	23.1

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Groundwater Movement</b>				
<b>A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.</b>				
<p>i) For potable groundwater environments 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For non-potable environments (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non-potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.</p> <p>ii) Same as (i) except the information is not known but is only suspected based on indirect observations.</p> <p>iii) Meets GCDWQ for potable environments; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for non-potable environments or Absence of groundwater exposure pathway (i.e., there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).</p>	<p>12</p> <p>9</p> <p>0</p> <p>0</p> <p>Score 0</p>	<p>Selenium concentration in one monitoring well exceeded maximum acceptable concentration for drinking water (Health Canada 2008). Manganese in groundwater exceeded drinking water aesthetic objective (Health Canada 2008 Guidelines for Canadian Drinking Water Quality). Cadmium, Iron, Manganese, and Zinc concentrations exceeded guideline for protection of fresh water aquatic life (CCME, 2007). The hydraulic conductivity of the site is in the range of 10m/s and groundwater flow is interpreted to be towards the Peace River (based on March 2008 groundwater elevation contours).</p>	<p>Review chemical data and evaluate groundwater quality.</p> <p>The evaluation method concentrates on 1) a potable or non-potable groundwater environment; the groundwater flow system and its potential to be an exposure pathway to known or potential receptors.</p> <p>An aquifer is defined as a geologic unit that yields groundwater in usable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas). The evaluation of a non-potable environment will be based on a site specific basis.</p> <p>Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils.</p> <p>Seeps and springs are considered part of the groundwater pathway.</p> <p>In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.</p>	<p>The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries.</p> <p>Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links.</p> <p>Note that for potable groundwater that also daylights into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered.</p> <p><b>Selected References</b></p> <p><u>Potable Environments</u></p> <p>Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/nwh/som/vous/eau/eau/cdr_sup-approprum_guide-rs_recommande_e.html">www.hc-sc.gc.ca/nwh/som/vous/eau/eau/cdr_sup-approprum_guide-rs_recommande_e.html</a></p> <p><u>Non-Potable Environments</u></p> <p>Canadian Water Quality Guidelines for Protection of Aquatic Life. CCME. 1999 <a href="http://www.ccme.ca">www.ccme.ca</a></p> <p>Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada). report to Environment Canada, January 4, 2002.</p>
NOTE: If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)				
<b>B. Potential for groundwater pathway.</b>				
<p>a. Relative Mobility</p> <p>High</p> <p>Moderate</p> <p>Low</p> <p>Insignificant</p> <p>Do Not Know</p>	<p>2</p> <p>Score 2</p>	<p>Organics</p> <p>Koc &lt; 500 (i.e., log Koc &lt; 2.7)</p> <p>Koc = 500 to 5000 (i.e., log Koc = 2.7 to 3.7)</p> <p>Koc = 5,000 to 100,000 (i.e., log Koc = 3.7 to 5)</p> <p>Koc &gt; 100,000 (i.e., log Koc &gt; 5)</p> <p>Metals with higher mobility at acidic conditions</p> <p>pH &lt; 5</p> <p>pH = 5 to 6</p> <p>pH &gt; 6</p> <p>Metals with higher mobility at alkaline conditions</p> <p>pH &gt; 8.5</p> <p>pH = 7.5 to 8.5</p> <p>pH &lt; 7.5</p>	<p>Reference: USEPA Soil Screening Guidance (Part 5 - Table 39)</p> <p>If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and precipitation infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.</p>	
<p>b. Presence of engineered sub-surface containment?</p> <p>No containment</p> <p>Partial containment</p> <p>Full containment</p> <p>Do Not Know</p>	<p>1.5</p> <p>Score 1.5</p>	<p>Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved.</p> <p>Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for 'Full Containment' scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.</p>	<p>Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links.</p> <p><b>Selected Resources:</b></p> <p>United States Environmental Protection Agency (USEPA) 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128.</p> <p>Environment Canada - Ontario Region - Natural Attenuation Technical Assistance Bulletin (TABs) Number 19-21.</p>	
<p>c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway</p> <p>3 m or less including no confining layer or discontinuous confining layer</p> <p>3 to 10 m</p> <p>&gt; 10 m</p> <p>Do Not Know</p>	<p>0.5</p> <p>Score 0.5</p>	<p>The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow.</p> <p>Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway.</p> <p>The evaluation of this category is based on:</p> <p>1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or</p> <p>2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (e.g., water table aquifer, first hydrostratigraphic unit or other groundwater pathway).</p>		
<p>d. Hydraulic conductivity of confining layer</p> <p>&gt;10<sup>-4</sup> cm/s or no confining layer</p> <p>10<sup>-4</sup> to 10<sup>-6</sup> cm/s</p> <p>&lt;10<sup>-6</sup> cm/s</p> <p>Do Not Know</p>	<p>0.5</p> <p>Score 0.5</p>	<p>Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use 'Range of Values of Hydraulic Conductivity and Permeability' figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on:</p> <p>1) The presence and hydraulic conductivity (K') of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or</p> <p>2) The presence and permeability (K') of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.</p>		

(II) Migration Potential (Evaluation of contaminant migration pathways)

**Test Site**

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## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>c. Topography</b> Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	1		Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).	
<b>d. Run-off potential</b> High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score < 0.6) Low (0.2 < rainfall run-off score < 0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	0.4		<b>Rainfall</b> Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). The former definition of annual rainfall did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor. <b>Permeability</b> For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.	Selected Sources: Environment Canada web page link <a href="http://www.msc.ec.gc.ca">www.msc.ec.gc.ca</a> Snow to rainfall conversion apply ratio of 15 (snow):1 (water)
<b>e. Flood potential</b> 1 in 2 years 1 in 10 years 1 in 50 years Do Not Know	0.5		Review published data such as flood plain mapping or flood potential (e.g., spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.	
Potential surface water pathway total	0.9			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Surface water pathway total	8			
<b>3. Surface Soils (potential for dust, dermal and ingestion exposure)</b>				
<b>A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)</b>				
COPCs measured in surface soils exceed the CCME soil quality guideline.	12		Collect all available information on quality of surface soils (i.e., top 1.5 metres) at the site. Evaluate available data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (i.e., agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (i.e., coarse or fine).	Selected References: CCME, 1999, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health <a href="http://www.ccme.ca">www.ccme.ca</a>
Strongly suspected that soils exceed guidelines	9			
COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	0	The concentration of Selenium in one surface soil sample (0 - 0.6 m depth) exceeded the CCME 2007 Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. Risk is minimized since the site is not an active landfill and has full vegetative cover.		
Score	12			
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)				
<b>B. Potential for a surface soils (top 1.5 m) migration pathway</b>				
<b>a. Are the soils in question covered?</b> Exposed Vegetated Landscaped Paved Do Not Know	4		Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.
<b>b. For what proportion of the year does the site remain covered by snow?</b> 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	3		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
Potential surface soil pathway total	7			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Soil pathway total	12			

CCME National Classification System (2008)

(II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>4. Vapour</b>				
<b>A. Demonstrated COPCs in vapour.</b>				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	No Volatile COPCs were detected in soil or groundwater.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)				
<b>B. Potential for COPCs in vapour</b>				
a. Relative Volatility based on Henry's Law Constant, $H^*$ (dimensionless) High ( $H^* > 1.0E-1$ ) Moderate ( $H^* = 1.0E-1$ to $1.0E-3$ ) Low ( $H^* < 1.0E-3$ ) Not Volatile Do Not Know		Reference: US EPA Soil Screening Guidance (Part 5 - Table 36)  Provided in Attached Reference Materials		If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section of Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5.
Score	2.5			
b. What is the soil grain size? Fine Coarse Do Not Know		Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours.  Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter ( $D_{50} < 75 \mu m$ ). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter ( $D_{50} > 75 \mu m$ ).		
Score	3			
c. Is the depth to the source less than 10m? Yes No Do Not Know		Review groundwater depths below grade for the site.		
Score	2			
d. Are there any preferential pathways? Yes No Do Not Know		Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.		Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Score	2			
Potential vapour pathway total	9.5	Note: If a "known" score is provided, the "potential" score is disallowed.		
Allowed Potential score	0			
Vapour pathway total	0			
<b>5. Sediment Movement</b>				
<b>A. Demonstrated migration of sediments containing COPCs</b>				
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	The site has full vegetative cover and is no longer an active landfill.	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9			
Sediments have been contained and there is no indication that sediments will migrate in future. or Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for sediment migration</b>				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")? Yes No Do Not Know	4		Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash? Yes No Do Not Know	4		Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.	
c. For rivers, are the contaminated sediments in an area prone to sediment scouring? Yes No Do Not Know	4		Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional	
Potential sediment pathway total	12			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Sediment pathway total	0			
<b>6. Modifying Factors</b>				
Are there subsurface utility conduits in the area affected by contamination? Yes No Do Not Know	No	No underground utilities were located in March 2008.	Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Known	0			
Potential	0			

## Migration Potential Total

Raw "known" total	29
Raw "potential" total	0.0
Raw combined total	29.0
Total (max 33)	15.9

Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

## CCME National Classification System (2008)

## (II) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Human</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site*)	22	The site is located approximately 300 m east of the community. The soil sample with the Selenium concentration greater than the CCME 2007 Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health was collected 7.6 m below ground, and groundwater concentration of Selenium at this location exceeded maximum acceptable concentration for drinking water (Health Canada 2008). Groundwater flow is interpreted to be towards the Peace River and away from the community (based on March 2008 groundwater elevation contours).	*Where adverse effects on humans are documented, the site should be automatically designated Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).  This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this typically either >10 <sup>-6</sup> or >10 <sup>-5</sup> ). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 ug/dL) or other health based testing.  This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10 <sup>-6</sup> or 10 <sup>-5</sup> ).	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.  Selected References: Health Canada- Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Health Screening Level Risk Assessment ( <a href="http://www.hc-sc.gc.ca/enh-sam/evaluation/contaminated/index_e.html">www.hc-sc.gc.ca/enh-sam/evaluation/contaminated/index_e.html</a> ) United States Environmental Protection Agency, Integrated Risk Information System (IRIS) ( <a href="http://toxnet.nlm.nih.gov">toxnet.nlm.nih.gov</a> )
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10			
No quantified or suspected exposures/impacts in humans.	0			
	10			
Score	10			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors).				
<b>B. Potential for human exposure</b>				
a) Land use (provides an indication of potential human exposure scenarios)  Agricultural Residential / Parkland Commercial Industrial Do Not Know	1.5		Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination)  Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know	1		Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
<b>B. Potential for human exposure</b>				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).  i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know	3		If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated water, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
ii) Inhalation (i.e., inhalation of dust, vapour)  Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know  Dust - If there is contaminated surface soil (e.g. top 1.5 m), indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent Do Not Know Texture	3		If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances relative to buildings. Refer to (II) Migration Potential worksheet, 4B Potential for COPCs in Vapour for a definition of volatility.  Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2006)) then these soils are more likely to generate dusts.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion.  Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.  General Notes: Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as Internet links.  Selected References: Canadian Council of Ministers of the Environment (CCME), 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 133/00/6208.62 Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
Score	0			
Inhalation total	3			

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>8. Potential for human exposure</b>				
<p>iii) Ingestion (i.e., ingestion of food items, water and soils [for children]), including traditional foods.</p> <p>Drinking Water: Choose a score based on the proximity to a drinking water supply. Indicate the potential for contamination (present or future).</p> <p>0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know</p> <p>Score</p> <p>Is an alternative water supply readily available?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Is human ingestion of contaminated soils possible?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Ingestion total</p>	<p>2</p> <p>1</p> <p>3</p> <p>1</p> <p>7</p>	<p>Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.</p>	<p>Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure.</p> <p>The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of flow and contaminant transport.</p> <p>If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.</p> <p>Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the CCPC in question.</p>	<p><b>Selected References:</b> Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/hccp/scp/water/publications/drinking_water_quality_guidelines/toc.html">www.hc-sc.gc.ca/hccp/scp/water/publications/drinking_water_quality_guidelines/toc.html</a></p> <p>Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable.</p> <p>Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.</p>
Human Health Total "Potential" Score	15.5			
Allowed "Potential" Score	—			
<b>2. Human Exposure Modifying Factors</b>				
<p>a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.)</p> <p>Yes No Do Not Know</p> <p>Known Potential</p> <p>Raw Human "Known" total</p> <p>Raw Human "Potential" total</p> <p>Raw Human Exposure Total Score</p> <p>Human Health Total (max 22)</p>	<p>Yes</p> <p>0</p> <p>—</p> <p>10</p> <p>0</p> <p>10</p> <p>18.0</p>	<p>Potable water supply is local; Strong reliance of community on local foods which include fish from Peace River.</p>		
<b>3. Ecological</b>				
<b>A. Known exposure</b>				
<p>Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.</p> <p>Same as above, but "Strongly Suspected" based on observations or indirect evidence.</p> <p>No quantified or suspected exposures/impacts in terrestrial or aquatic organisms</p> <p>Score</p>	<p>18</p> <p>12</p> <p>0</p> <p>18</p> <p>18</p>	<p>Dissolved concentrations of Cadmium, Iron, Selenium, and Zinc were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life. The site is within 0.5 km of the Peace River.</p>	<p>Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients &gt;1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects such as site observations, tissue testing, toxicity testing and quantitative community assessments.</p>	<p>CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a></p> <p>CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses <a href="http://www.ccme.ca">www.ccme.ca</a></p> <p>Sensitive receptors- review: Canadian Council on Ecological Areas <a href="http://www.ccea.org">www.ccea.org</a></p> <p>Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in A Framework for Ecological Risk Assessment: General Guidance (CCME 1998).</p> <p><b>Notes:</b> Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as Internet links.</p>
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)				

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>a) Terrestrial</b>				
<b>i) Land use</b>				
Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know	Score	1.5	Review zoning and land use maps. If the proposed future land use is more sensitive than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration).  Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
<b>ii) Uptake potential</b>				
Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know	Score	1	If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
<b>iii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water)</b>				
Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know	Score	1	Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.	
Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know	Score	1	Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.	
Can the contamination identified bioaccumulate? Yes No Do Not Know	Score	1	Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(K <sub>ow</sub> ) of the contaminant is greater than 4 (as per the chemical characteristics worksheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines. It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link <a href="http://www.ccea.org">www.ccea.org</a>	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	Score	1.5		
Raw Terrestrial Total Potential	7	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
Allowed Terrestrial Total Potential	—			
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>b) Aquatic</b>				
<b>i) Classification of aquatic environment</b>				
Sensitive Typical Not Applicable (no aquatic environment present) Do Not Know	Score	2	"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species.  "Typical aquatic environments" include those in areas other than those listed above.	
<b>ii) Uptake potential</b>				
Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know	Score	1	Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.	
Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know	Score	1.5	It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: <a href="http://www.ccea.org">www.ccea.org</a>  Bioaccumulation of food items is possible if:	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and rivers and other aquatic environments.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	1		1) The Log(K <sub>ow</sub> ) of the contaminant is greater than 4 (as per the chemical characteristics work sheet and concentrations in sediments exceed the CCME ISOGs. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Raw Aquatic Total Potential Allowed Aquatic Total Potential	5.5 —	Note If a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
<b>4. Ecological Exposure Modifying Factors</b>				
a) Known occurrence of a species at risk.  Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	Do Not Know 1	Not known if a species at risk is present at the site.	Consult any ecological risk assessment reports. If information is not present, utilize on-line database Risk, consult Schedule 1 of the federal Species at Risk Act (http://www.sar.govt.ca/species/schedule_1.htm?id=1). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCNWLAP, 2005, Endangered Species and Ecosystems in British Columbia, Provincial red and blue lists, Ministry of Sustainable Resource Management and Water, Land and Air Protection (http://www.sar.govt.ca/species/schedule_1.htm?id=1).	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act (http://www.sar.govt.ca/species/schedule_1.htm?id=1). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCNWLAP, 2005, Endangered Species and Ecosystems in British Columbia, Provincial red and blue lists, Ministry of Sustainable Resource Management and Water, Land and Air Protection (http://www.sar.govt.ca/species/schedule_1.htm?id=1).
b) Potential impact of aesthetics (e.g., enrichment of a lake or tainting of food flavor).  Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know	Do Not Know 1	Peace River has high flow. Do not know if the aesthetics will be impacted.	Documentation may consist of environmental investigation reports, press articles, petitions or other records.  Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.  A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients e.g., nitrogen or phosphorus releases to an aquatic body can act as a fertilizer.  Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	This item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Is there evidence of olfactory impact (i.e., unpleasant smell)? Yes No Do Not Know	No 0			
Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know	No 0			
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	Do Not Know 1			
Ecological Modifying Factors Total - Known Ecological Modifying Factors Total - Potential Raw Ecological Total - Known Raw Ecological Total - Potential Raw Ecological Total Ecological Total (Max 18)	0 3 18 3 21 18.0			
<b>5. Other Potential Contaminant Receptors</b>				
a) Exposure of permafrost (leading to erosion and structural concerns)  Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity? Yes No Do Not Know	No 0		Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	Do Not Know 1	Do not know.	Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	
Other Potential Receptors Total - Known Other Potential Receptors Total - Potential	0 1			
<b>Exposure Total</b>				
Raw Human Health + Ecological Total - Known Raw Human Health + Ecological Total - Potential Raw Total Exposure Total (max 34)	34 4 38 28.1	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.		

# CCME National Classification System (2008) Score Summary

Scores from individual worksheets are tallied in this worksheet.  
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	4	---
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	4	---
4. Contaminant Quantity	9	---
5. Modifying Factors	3	---
<b>Raw Total Score</b>	<b>28</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>28</b>	
<b>Adjusted Total Score (Raw Total / 40 * 33)</b>	<b>23.1</b>	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	9	---
2. Surface Water Movement	8	---
3. Soil	12	---
4. Vapour	0	---
5. Sediment Movement	0	---
6. Modifying Factors	0	0
<b>Raw Total Score</b>	<b>29</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>29</b>	
<b>Adjusted Total Score (Raw Total / 64 * 33)</b>	<b>15.0</b>	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	10	
B. Potential		
a. Land Use		---
b. Accessibility		---
c. Exposure Route		
i. Direct Contact		---
ii. Inhalation		---
iii. Ingestion		---
2. Human Receptors Modifying Factors	6	---
<b>Raw Total Human Score</b>	<b>16</b>	<b>0</b>
<b>Raw Total Human Score (Known + Potential)</b>	<b>16</b>	
<b>Adjusted Total Human Score</b>	<b>16.0</b>	(maximum 22)
3. Ecological Receptors		
A. Known Impact	18	
B. Potential		
a. Terrestrial		---
b. Aquatic		---
4. Ecological Receptors Modifying Factors	0	3
<b>Raw Total Ecological Score</b>	<b>18</b>	<b>3</b>
<b>Raw Total Ecological Score (Known + Potential)</b>	<b>21</b>	
<b>Adjusted Total Ecological Score</b>	<b>18.0</b>	(maximum 18)
5. Other Receptors	0	1
<b>Total Other Receptors Score (Known + Potential)</b>	<b>1</b>	
<b>Total Exposure Score (Human + Ecological + Other)</b>	<b>35.0</b>	
<b>Adjusted Total Exposure Score (Total Exposure / 46 * 34)</b>	<b>25.9</b>	(max 34)

<b>Site Score</b>	
Test Site	
Site Letter Grade	A
Certainty Percentage	100%
% Responses that are "Do Not Know"	-59%
<b>Total NCSCS Score for site</b>	<b>63.9</b>
<b>Site Classification Category</b>	<b>2</b>

## Site Classification Categories\*:

- Class 1 - High Priority for Action (Total NCS Score >70)
- Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
- Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
- Class N - Not a Priority for Action (Total NCS Score <37)
- Class INS - Insufficient Information (>15% of responses are "Do Not Know")

\* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

## CCME National Classification System for Contaminated Sites (2008)

### Summary of Site Conditions

<b>Subject Site:</b>	<b>Test Site</b>		
<b>Civic Address:</b> (or other description of location)	On the north shore of the Peace River, approximately 220 km east of High Level, Alberta, in Wood Buffalo National Park		
<b>Site Common Name :</b> (if applicable)	Community of Garden River		
<b>Site Owner or Custodian:</b> (Organization and Contact Person)	Parks Canada Agency		
<b>Legal description or metes and bounds:</b>	N 58°42.5', W113°52.0'		
<b>Approximate Site area:</b>			
<b>PID(s) :</b> (or Parcel Identification Numbers [PIN] if untitled Crown land)	Northlands School Historic AST (FCSI #00022828)		
<b>Centre of site:</b> (provide latitude/longitude or UTM coordinates)	<b>Latitude:</b>	_____ degrees	_____ min _____ secs
	<b>Longitude:</b>	_____ degrees	_____ min _____ secs
	<b>UTM</b>	Northing 6511191.299	
	<b>Coordinate:</b>	Easting 680525.8838	
<b>Site Land Use:</b>	<b>Current:</b>	Residential	
	<b>Proposed:</b>		
<b>Site Plan</b>	To delineate the bounds of the Site a site plan <b>MUST</b> be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.		
<b>Provide a brief description of the Site:</b>	<p>The Northlands School Historic AST is located within the community of Garden River (see attached Site Plan).</p>		

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

Affected media and Contaminants of Potential Concern (COPC):	The groundwater concentrations of Cadmium and Selenium in one monitoring well exceeded Canadian Council of Ministers of the Environment 2007 Canadian Water Quality Guidelines for the protection of aquatic life and the groundwater concentration of Manganese exceeded Health Canada 2008 Guidelines for Canadian Drinking Water Quality.
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Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade

**A**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	Cathy Hamlen, Ph.D. A.Ag.
Date Scoring Completed:	6-Feb-09

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance		Five soil samples and one groundwater monitoring well were assessed. Refer to <i>Contaminated Site Assessment, Initial and Detailed Testing Programs, Wood Buffalo National Park, Various Locations in the Community of Garden River, Alberta</i> (EBA Consulting Engineers Ltd., 2009).	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline).  Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at <a href="http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124">http://www.ccme.ca/publications/ceqg_rcqe.html?category_id=124</a> .  For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup/appui/sum_guides_recom/index_e.html">http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup/appui/sum_guides_recom/index_e.html</a> .	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	No			
Yes No Do Not Know	0			
B. Groundwater	Yes			
Yes No Do Not Know	2			
C. Surface water	No			
Yes No Do Not Know	0			
D. Sediment	No			
Yes No Do Not Know	0			
"Known" -score "Potential" - score	2 ---			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?  High Medium Low Do Not Know	High	Cadmium (groundwater) is High, and Selenium (groundwater) is Medium, and Manganese (groundwater) is Low.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site.  The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file.  <i>See Attached Reference Material for Contaminant Hazard Rankings.</i>	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
"Known" -score "Potential" - score	8 ---			
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?  Mobile NAPL High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	High (10x to 100x)	The groundwater Cadmium concentration was 1.03 times higher than the CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life. The groundwater Selenium concentration was 1.79 times higher and the groundwater Manganese concentration was 31.6 times higher than the Health Canada 2008 Guideline for Canadian Drinking Water Quality.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME environmental quality guidelines</i> . Ranking should be based on contaminant with greatest exceedance of CCME guidelines. Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks.  Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria.  Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF=>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
"Known" -score "Potential" - score	4 ---			

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
<b>4. Contaminant Quantity (known or strongly suspected)</b>				
What is the known or strongly suspected quantity of all contaminants?  <div> <div>&gt;10 hectare (ha) or 5000 m<sup>3</sup></div> <div>2 to 10 ha or 1000 to 5000 m<sup>3</sup></div> <div>&lt;2 ha or 1000 m<sup>3</sup></div> <div>Do Not Know</div> </div>	<div>2 to 10 ha or 1000 to 5000 m<sup>3</sup></div>	The groundwater monitoring wells with COPCs exceeding Health Canada 2008 Guidelines for Canadian Drinking Water Quality and CCME 2007 Canadian Water Quality Guidelines for the protection of aquatic life represented an area of approximately 1,250 m <sup>2</sup> .	Measure or estimate the area or quantity of total contamination (i.e., all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
"Known" - score	6			
"Potential" - score	---			
<b>5. Modifying Factors</b>				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div>	Chemicals do not persist.	<p>Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics:</p> <p>(a) In air,                      (i) its half-life is equal to or greater than 2 days, or                      (ii) it is subject to atmospheric transport from its source to a remote area;                      (b) In water, its half-life is equal to or greater than 182 days;                      (c) In sediments, its half-life is equal to or greater than 365 days; or                      (d) In soil, its half-life is equal to or greater than 182 days.</p> <p>This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.</p>	Examples of Persistent Substances are provided in attached Reference Materials
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div>			Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances?  <div> <div>one</div> <div>two to four</div> <div>five or more</div> <div>Do Not Know</div> </div>	<div>two to four</div> <div>2</div>	Cadmium, Manganese, and Selenium in groundwater.	For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.
"Known" - Score	2			
"Potential" - Score	---			

Contaminant Characteristic Total

Raw Total Scores- "Known"	22
Raw Total Scores- "Potential"	0
Raw Combined Total Scores	22
Total Score (Raw Combined / 40 * 33)	18.2

## (II) Migration Potential (Evaluation of contaminant migration pathways)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Groundwater Movement</b>				
<b>A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.</b>				
i) For potable groundwater environments 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For non-potable environments (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non-potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.	12	Selenium concentration in groundwater was 2.87 times higher than maximum acceptable concentration for drinking water (Health Canada 2008 Guidelines for Canadian Drinking Water Quality) and the Manganese concentration was 31.8 times higher than the drinking water aesthetic objective (Health Canada 2008). The monitoring well is located within the community.	Review chemical data and evaluate groundwater quality.  The evaluation method concentrates on 1) a potable or non-potable groundwater environment; the groundwater flow system and its potential to be an exposure pathway to known or potential receptors.  An aquifer is defined as a geologic unit that yields groundwater in usable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas). The evaluation of a non-potable environment will be based on a site specific basis.  Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils.  Seeps and springs are considered part of the groundwater pathway.  In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.	The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries.  Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links.  Note that for potable groundwater that also daylights into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered.  <b>Selected References</b>  <b>Potable Environments</b>  Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/owh/stom/food/safety/qa/qd/cdr/gcdwq/gcdwq-eng.php">www.hc-sc.gc.ca/owh/stom/food/safety/qa/qd/cdr/gcdwq/gcdwq-eng.php</a>  <b>Non-Potable Environments</b>  Canadian Water Quality Guidelines for Protection of Aquatic Life. CCME, 1999 <a href="http://www.ccme.ca">www.ccme.ca</a>  Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.
ii) Same as (i) except the information is not known but is only suspected based on indirect observations.	9			
iii) Meets GCDWQ for potable environments meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for non-potable environments or Absence of groundwater exposure pathway (i.e., there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0			
	12			
Score	12			
<b>NOTE: If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)</b>				
<b>B. Potential for groundwater pathway.</b>				
a. Relative Mobility High Moderate Low Insignificant Do Not Know			Organics Koc (L/kg) Koc < 500 (i.e., log Koc < 2.7) Koc = 500 to 5000 (i.e., log Koc = 2.7 to 3.7) Koc = 5,000 to 100,000 (i.e., log Koc = 3.7 to 5) Koc > 100,000 (i.e., log Koc > 5)  Metals with higher mobility at acidic conditions pH < 5 pH = 5 to 6 pH > 6  Metals with higher mobility at alkaline conditions pH > 8.5 pH = 7.5 to 8.5 pH < 7.5	Reference: US EPA Soil Screening Guidance (Part 5 - Table 39)  If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and precipitation infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.
Score	2			
b. Presence of engineered sub-surface containment? No containment Partial containment Full containment Do Not Know			Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved. Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for 'Full Containment' scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.	Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links.  <b>Selected Resources:</b> United States Environmental Protection Agency (USEPA) 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128. Environment Canada - Ontario Region - Natural Attenuation Technical Assistance Bulletin (TAB) Number 19-21.
Score	1.5			
c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway 3 m or less including no confining layer or discontinuous confining layer 3 to 10 m > 10 m Do Not Know			The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow.  Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway. The evaluation of this category is based on: 1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or 2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (e.g., water table aquifer, first hydrostratigraphic unit or other groundwater pathway).	
Score	0.5			
d. Hydraulic conductivity of confining layer > 10 <sup>-6</sup> cm/s or no confining layer 10 <sup>-6</sup> to 10 <sup>-8</sup> cm/s < 10 <sup>-6</sup> cm/s Do Not Know			Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on: 1) The presence and hydraulic conductivity (K) of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or 2) The presence and permeability (K) of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.	
Score	0.5			

(II) Migration Potential (Evaluation of contaminant migration pathways)

**Test Site**

CCME National Classification System for Contaminated Sites  
(2008)

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>c. Topography</b> Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	1		Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).	
<b>d. Run-off potential</b> High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score < 0.6) Low (0.2 < rainfall run-off score < 0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	0.4		<b>Rainfall</b> Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 687 mm = 0.7 score). The former definition of annual rainfall did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor. <b>Permeability</b> For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.	Selected Sources: Environment Canada web page link <a href="http://www.msc.ec.gc.ca">www.msc.ec.gc.ca</a> Snow to rainfall conversion apply ratio of 15 (snow):1(water)
<b>e. Flood potential</b> 1 in 2 years 1 in 10 years 1 in 50 years Do Not Know	0.5		Review published data such as flood plain mapping or flood potential (e.g., spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.	
Potential surface water pathway total	6.9			
Allowed Potential score	—			
Surface water pathway total	8	Note: If a "known" score is provided, the "potential" score is disallowed.		
<b>3. Surface Soils (potential for dust, dermal and ingestion exposure)</b>				
<b>A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)</b>				
COPCs measured in surface soils exceed the CCME soil quality guideline. Strongly suspected that soils exceed guidelines COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	12 9 0	Soil concentrations met federal and provincial guidelines.	Collect all available information on quality of surface soils (i.e., top 1.5 metres) at the site. Evaluate available data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (i.e., agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (i.e., coarse or fine).	Selected References: Environment Canada web page link <a href="http://www.msc.ec.gc.ca">www.msc.ec.gc.ca</a> CCME, 1999, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health <a href="http://www.ccme.ca">www.ccme.ca</a>
Score	0			
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)				
<b>B. Potential for a surface soils (top 1.5 m) migration pathway</b>				
<b>a. Are the soils in question covered?</b> Exposed Vegetated Landscaped Paved Do Not Know	4		Consult engineering or risk assessment reports for the site. Alternatively, review photographs of the site. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.
<b>b. For what proportion of the year does the site remain covered by snow?</b> 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	3		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
Potential surface soil pathway total	7			
Allowed Potential score	—			
Soil pathway total	0	Note: If a "known" score is provided, the "potential" score is disallowed.		

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>4. Vapour</b>				
<b>A. Demonstrated COPCs in vapour.</b>				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	Concentrations of volatile COPCs in the soil and groundwater were below provincial and federal guidelines.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated COPCs In Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)				
<b>B. Potential for COPCs in vapour</b>				
a. Relative Volatility based on Henry's Law Constant, $H^*$ (dimensionless) High ( $H^* > 1.0E-1$ ) Moderate ( $H^* = 1.0E-1$ to $1.0E-3$ ) Low ( $H^* < 1.0E-3$ ) Not Volatile Do Not Know		Reference: US EPA Soil Screening Guidance (Part 5 - Table 38)  Provided in Attached Reference Materials		If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 6.
Score	2.5			
b. What is the soil grain size? Fine Coarse Do Not Know		Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours.  Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter ( $D_{50} < 75 \mu\text{m}$ ). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter ( $D_{50} > 75 \mu\text{m}$ ).		
Score	3			
c. Is the depth to the source less than 10m? Yes No Do Not Know		Review groundwater depths below grade for the site.		
Score	2			
d. Are there any preferential pathways? Yes No Do Not Know		Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.		Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Score	2			
Potential vapour pathway total	9.5	Note: If a "known" score is provided, the "potential" score is disallowed.		
Allowed Potential score	—			
Vapour pathway total	0			
<b>5. Sediment Movement</b>				
<b>A. Demonstrated migration of sediments containing COPCs</b>				
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	No COPC in soil exceeded provincial or federal guidelines.	Review sediment assessment reports. Evidence of migration of contaminants in sediments may be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9			
Sediments have been contained and there is no indication that sediments will migrate in future.	0			
or Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for sediment migration</b>				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?			Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
Yes				
No	4			
Do Not Know				
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?			Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.	
Yes				
No	4			
Do Not Know				
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?			Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional	
Yes				
No	4			
Do Not Know				
Potential sediment pathway total	12			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Sediment pathway total	0			
<b>6. Modifying Factors</b>				
Are there subsurface utility conduits in the area affected by contamination?			Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Yes	No			
No		No COPC in soil exceeded provincial or federal guidelines.		
Do Not Know				
Known	0			
Potential	0			

## Migration Potential Total

Raw "known" total	20
Raw "potential" total	0.0
Raw combined total	20.0
Total (max 33)	10.3

Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Human</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site*)	22	Selenium concentration in groundwater was 2.87 times higher than maximum acceptable concentration for drinking water (Health Canada 2008 Guidelines for Canadian Drinking Water Quality). The potable water source for the community is not known.	<p>*Where adverse effects on humans are documented, the site should be automatically designated Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients &gt;1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this typically either &gt;10<sup>-6</sup> or &gt;10<sup>-5</sup>). Known impacts can also be evaluated based on blood testing (e.g. blood lead &gt;10 ug/dL) or other health based testing.</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10<sup>-6</sup> or 10<sup>-5</sup>).</p>	<p>Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet.</p> <p>Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.</p> <p><b>Selected References:</b> Health Canada- Federal Contaminated Site Risk Assessment In Canada Parts 1 and 2 Guidance on Human Health Screening Level Risk Assessment <a href="http://www.hc-sc.gc.ca/ehv/ehv/contam/risk/index_e.html">http://www.hc-sc.gc.ca/ehv/ehv/contam/risk/index_e.html</a> United States Environmental Protection Agency, Integrated Risk Information System (IRIS) <a href="http://www.epa.gov/iris/">http://www.epa.gov/iris/</a></p>
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10			
No quantified or suspected exposures/impacts in humans.	0			
Score	10			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
<b>B. Potential for human exposure</b>				
<p>a) Land use (provides an indication of potential human exposure scenarios)</p> <p>Agricultural Residential / Parkland Commercial Industrial Do Not Know</p> <p>Score</p>	1.5		<p>Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place.</p> <p>Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).</p>	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
<p>b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination)</p> <p>Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know</p> <p>Score</p>	1		<p>Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.</p>	
<b>B. Potential for human exposure</b>				
<p>c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).</p> <p>i) direct contact</p> <p>Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated?</p> <p>Yes No Do Not Know</p> <p>Score</p>	3		<p>If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.</p>	<p>Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.</p>
<p>ii) inhalation (i.e., inhalation of dust, vapour)</p> <p>Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Dust - If there is contaminated surface soil (e.g. top 1.5 m), indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero.</p> <p>Fine Coarse Surface soil is not contaminated or absent Do Not Know Texture</p> <p>Score</p> <p>Inhalation total</p>	3		<p>If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances) relative to buildings. Refer to (ii) Migration Potential worksheet, 4B, Potential for COPCs in Vapour for a definition of volatility.</p> <p>Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2008)) then these soils are more likely to generate dusts.</p>	<p>Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion.</p> <p>Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.</p> <p><b>General Notes:</b> Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.</p> <p><b>Selected References:</b> Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 133/2006/CCME/63 Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC</p>

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for human exposure</b>				
<p>iii) Ingestion (i.e., ingestion of food items, water and soils [for children]). Including traditional foods.</p> <p>Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future).</p> <p>0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know</p> <p>Score</p> <p>Is an alternative water supply readily available?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Is human ingestion of contaminated soils possible?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Ingestion total</p>	<p>2</p> <p>1</p> <p>3</p> <p>1</p> <p>7</p>	<p>Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.</p>	<p>Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure.</p> <p>The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modeling of flow and contaminant transport.</p> <p>If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.</p> <p>Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.</p>	<p><b>Selected References:</b> Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/hccs/scss/water/publications/drinking_water_quality_guidelines2006.html">www.hc-sc.gc.ca/hccs/scss/water/publications/drinking_water_quality_guidelines2006.html</a></p> <p>Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable.</p> <p>Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.</p>
Human Health Total "Potential" Score	15.5			
Allowed "Potential" Score	---			
<b>2. Human Exposure Modifying Factors</b>				
<p>a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.)</p> <p>Yes No Do Not Know</p> <p>Known Potential</p> <p>Raw Human "known" total Raw Human "potential" total</p> <p>Raw Human Exposure Total Score</p> <p>Human Health Total (max 22)</p>	<p>Yes</p> <p>0 ---</p> <p>16 0</p> <p>16 16.0</p>	<p>Potable water supply is local: Strong reliance of community on local foods which include fish from Peace River.</p>		
<b>3. Ecological</b>				
<b>A. Known exposure</b>				
<p>Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.</p> <p>Score</p> <p>Same as above, but "Strongly Suspected" based on observations or indirect evidence.</p> <p>Score</p> <p>No quantified or suspected exposures/impacts in terrestrial or aquatic organisms</p> <p>Score</p>	<p>18</p> <p>12</p> <p>0</p> <p>12</p> <p>12</p>	<p>Monitoring well concentrations of Cadmium and Selenium were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life and the site is located on a bluff adjacent to the Peace River</p>	<p>Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (16) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients &gt;1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects such as site observations, tissue testing, toxicity testing and quantitative community assessments.</p>	<p>CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a> CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses <a href="http://www.ccme.ca">www.ccme.ca</a> Sensitive receptors- review: Canadian Council on Ecological Areas <a href="http://www.ccea.org">www.ccea.org</a></p> <p>Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in <i>A Framework for Ecological Risk Assessment: General Guidance</i> (CCME 1996).</p> <p><b>Notes:</b> Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as Internet links.</p>
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)				

CCME National Classification System for Contaminated Sites  
(2008)

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	1		1) The Log(K <sub>ow</sub> ) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in sediments exceed the CCME ISQGs. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Raw Aquatic Total Potential Allowed Aquatic Total Potential	5.5 —	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
<b>4. Ecological Exposure Modifying Factors</b>				
a) Known occurrence of a species at risk.  Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	  Do Not Know	Not known if a species at risk is present at the site.	Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as Eco Explorer, Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act ( <a href="http://www.sarregistry.gc.ca/species/schedule.asp?lang=eng">http://www.sarregistry.gc.ca/species/schedule.asp?lang=eng</a> ). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCNWLAP, 2005, Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection ( <a href="http://srmmwww.gov.bc.ca/enrisk/red-blue.htm">http://srmmwww.gov.bc.ca/enrisk/red-blue.htm</a> )
Score	1			
b) Potential impact of aesthetics (e.g., enrichment of a lake or limiting of food flavor).  Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know	  Do Not Know	Peace River has high flow. Do not know if the aesthetics will be impacted.	Documentation may consist of environmental investigation reports, press articles, petitions or other records.  Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.  A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients (e.g., nitrogen or phosphorus) releases to an aquatic body can act as a fertilizer.  Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	This item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Is there evidence of olfactory impact (i.e., unpleasant smell)? Yes No Do Not Know	  No			
Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know	  No			
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	  Do Not Know			
Ecological Modifying Factors Total - Known Ecological Modifying Factors Total - Potential Raw Ecological Total - Known Raw Ecological Total - Potential Raw Ecological Total Ecological Total (Max 18)	 3 12 3 15 15.0			
<b>5. Other Potential Contaminant Receptors</b>				
a) Exposure of permafrost (leading to erosion and structural concerns)  Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity? Yes No Do Not Know	  No		Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	  Do Not Know	Do not know.	Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	
Other Potential Receptors Total - Known Other Potential Receptors Total - Potential	 1			
<b>Exposure Total</b>				
Raw Human Health + Ecological Total - Known Raw Human Health + Ecological Total - Potential Raw Total Exposure Total (max 34)	 28 4 32 23.7	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.		

# CCME National Classification System (2008) Score Summary

Scores from individual worksheets are tallied in this worksheet.  
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	2	—
2. Chemical Hazard	8	—
3. Contaminant Exceedance Factor	4	—
4. Contaminant Quantity	6	—
5. Modifying Factors	2	—
<b>Raw Total Score</b>	<b>22</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>22</b>	
<b>Adjusted Total Score (Raw Total / 40 * 33)</b>	<b>18.2</b>	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	12	—
2. Surface Water Movement	8	—
3. Soil	0	—
4. Vapour	0	—
5. Sediment Movement	0	—
6. Modifying Factors	0	0
<b>Raw Total Score</b>	<b>20</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>20</b>	
<b>Adjusted Total Score (Raw Total / 64 * 33)</b>	<b>10.3</b>	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	10	—
B. Potential		—
a. Land Use		—
b. Accessibility		—
c. Exposure Route		—
i. Direct Contact		—
ii. Inhalation		—
iii. Ingestion		—
2. Human Receptors Modifying Factors	6	—
<b>Raw Total Human Score</b>	<b>16</b>	<b>0</b>
<b>Raw Total Human Score (Known + Potential)</b>	<b>16</b>	
<b>Adjusted Total Human Score</b>	<b>16.0</b>	(maximum 22)
3. Ecological Receptors		
A. Known Impact	12	—
B. Potential		—
a. Terrestrial		—
b. Aquatic		—
4. Ecological Receptors Modifying Factors	0	3
<b>Raw Total Ecological Score</b>	<b>12</b>	<b>3</b>
<b>Raw Total Ecological Score (Known + Potential)</b>	<b>15</b>	
<b>Adjusted Total Ecological Score</b>	<b>15.0</b>	(maximum 18)
5. Other Receptors	0	1
<b>Total Other Receptors Score (Known + Potential)</b>	<b>1</b>	
<b>Total Exposure Score (Human + Ecological + Other)</b>	<b>32.0</b>	
<b>Adjusted Total Exposure Score (Total Exposure / 46 * 34)</b>	<b>23.7</b>	(max 34)

<b>Site Score</b>	
Test Site	
Site Letter Grade	A
Certainty Percentage	100%
% Responses that are "Do Not Know"	-59%
<b>Total NCSCS Score for site</b>	<b>52.1</b>
<b>Site Classification Category</b>	<b>2</b>

## Site Classification Categories\*:

- Class 1 - High Priority for Action (Total NCS Score >70)
- Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
- Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
- Class N - Not a Priority for Action (Total NCS Score <37)
- Class INS - Insufficient Information (>15% of responses are "Do Not Know")

\* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

<b>Subject Site:</b>	<b>Test Site</b>	
Civic Address: (or other description of location)	On the north shore of the Peace River, approximately 220 km east of High Level, Alberta, in Wood Buffalo National Park	
Site Common Name : (if applicable)	Community of Garden River	
Site Owner or Custodian: (Organization and Contact Person)	Parks Canada Agency	
Legal description or metes and bounds:	N 58°42.5', W113°52.0'	
Approximate Site area:		
PID(s) : (or Parcel Identification Numbers [PIN] if untitled Crown land)	Former Septic Tile Field (FCSI #00022830)	
Centre of site: (provide latitude/longitude or UTM coordinates)	Latitude:	_____ degrees _____ min _____ secs
	Longitude:	_____ degrees _____ min _____ secs
	UTM Coordinate:	Northing Easting
Site Land Use:	Current:	Residential
	Proposed:	
<b>Site Plan</b>	To delineate the bounds of the Site a site plan <b>MUST</b> be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.	
Provide a brief description of the Site:		
<p>The Former Septic Tile Field is located at the east side of the community of Garden River (see attached Site Plan).</p>		

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

Affected media and Contaminants of Potential Concern (COPC):	The concentrations of dissolved Cadmium, Selenium, and Zinc in three monitoring wells exceeded Canadian Council of Ministers of the Environment 2007 Canadian water quality guidelines for the protection of aquatic life. The concentrations of dissolved Manganese in three monitoring wells exceeded Health Canada 2008 Guidelines for Canadian drinking water quality.
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Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade

**A**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	Cathy Hamlen, Ph.D. A.Ag.
Date Scoring Completed:	6-Feb-09

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance		Twelve soil samples and three groundwater monitoring wells were assessed. Refer to <i>Contaminated Site Assessment, Initial and Detailed Testing Programs, Wood Buffalo National Park, Various Locations in the Community of Garden River, Alberta</i> (EBA Consulting Engineers Ltd., 2009).	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline).  Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at <a href="http://www.ccme.ca/publications/ccqg_ccqe.html?category_id=124">http://www.ccme.ca/publications/ccqg_ccqe.html?category_id=124</a> .  For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_recom/index_e.html">http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_recom/index_e.html</a> .	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	No			
Yes No Do Not Know	0			
B. Groundwater	Yes			
Yes No Do Not Know	2			
C. Surface water	No			
Yes No Do Not Know	0			
D. Sediment	No			
Yes No Do Not Know	0			
"Known" -score "Potential" - score	2 ---			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?  High Medium Low Do Not Know	High	Cadmium (groundwater) is High, Selenium (groundwater) is Medium, and Manganese and Zinc (groundwater) are Low.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site.  The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file.  <i>See Attached Reference Material for Contaminant Hazard Rankings.</i>	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
"Known" -score "Potential" - score	8 ---			
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?  Mobile NAPL High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	Low (1x to 10x)	The maximum groundwater Manganese concentration was 3.4 times higher than Health Canada 2008 Guidelines for Canadian Drinking Water Quality. The maximum groundwater Cadmium concentration was 1.03 times higher than the CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life, the maximum groundwater Selenium concentration was 5 times higher than the 2007 CCME guideline, and the maximum groundwater Zinc concentration was 1.8 times higher than the 2007 CCME guideline.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME environmental quality guidelines</i> . Ranking should be based on contaminant with greatest exceedance of CCME guidelines. Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks.  Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria.  Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF>=1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
"Known" -score "Potential" - score	2 ---			

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
<b>4. Contaminant Quantity (known or strongly suspected)</b>				
What is the known or strongly suspected quantity of all contaminants?  <div> <div>&gt;10 hectare (ha) or 5000 m<sup>3</sup></div> <div>2 to 10 ha or 1000 to 5000 m<sup>3</sup></div> <div>&lt;2 ha or 1000 m<sup>3</sup></div> <div>Do Not Know</div> </div>	<div>2 to 10 ha or 1000 to 5000 m<sup>3</sup></div> <div></div>	The assessment area is approximately 4,000 m <sup>2</sup> .	Measure or estimate the area or quantity of total contamination (i.e., all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.
"Known" - score	6			
"Potential" - score	—			
<b>5. Modifying Factors</b>				
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div>	Chemicals do not persist.	<p>Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics:</p> <p>(a) in air,                      (i) its half-life is equal to or greater than 2 days, or                      (ii) it is subject to atmospheric transport from its source to a remote area;                      (b) in water, its half-life is equal to or greater than 182 days;                      (c) in sediments, its half-life is equal to or greater than 365 days; or                      (d) in soil, its half-life is equal to or greater than 182 days.</p> <p>This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.</p>	Examples of Persistent Substances are provided in attached Reference Materials
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location?  <div> <div>Yes</div> <div>No</div> <div>Do Not Know</div> </div>	<div>No</div> <div>0</div>			Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.
How many different contaminant classes have representative CCME guideline exceedances?  <div> <div>one</div> <div>two to four</div> <div>five or more</div> <div>Do Not Know</div> </div>	<div>two to four</div> <div>2</div>	Cadmium, Selenium, and Zinc in groundwater.	For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.
"Known" - Score	2			
"Potential" - Score	—			

Contaminant Characteristic Total

Raw Total Scores- "Known"	20
Raw Total Scores- "Potential"	0
Raw Combined Total Scores	20
Total Score (Raw Combined / 40 * 33)	16.5

(II) Migration Potential (Evaluation of contaminant migration pathways)

**NOTE:** If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway).

CCME National Classification System (2008)

(II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for groundwater pathway.</b>				
<b>e. Precipitation infiltration rate</b> (Annual precipitation factor x surface soil relative permeability factor) High Moderate Low Very Low None Do Not Know	<div>Score</div> <div>0.4</div>		<b>Precipitation</b> Refer to Environment Canada precipitation records for relevant areas. Divide annual precipitation by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score).  <b>Permeability</b> For surface soil relative permeability (i.e., infiltration) assume: gravel (1), sand (0.6), loam (0.3) and pavement or clay (0).  Multiply the surface soil relative permeability factor with precipitation factor to obtain the score or precipitation infiltration rate.	
<b>f. Hydraulic conductivity of aquifer</b> $>10^{-2}$ cm/s $10^{-2}$ to $10^{-4}$ cm/s $<10^{-4}$ cm/s Do Not Know	<div>Score</div> <div>1</div>		Determine the nature of geologic materials and estimate hydraulic conductivity of all aquifers of concern from published material (refer to "Range of Values of Hydraulic Conductivity and Permeability" in the Reference Material sheet).	
Potential groundwater pathway total	5.0			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Groundwater pathway total	12			
<b>2. Surface Water Movement</b>				
<b>A. Demonstrated migration of COPC in surface water above background conditions</b>				
Known concentrations of surface water:  i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by $>1 \times$ , or There is known contact of contaminants with surface water based on site observations. or (In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (e.g. toxicity testing; or other indicator testing of exposure).  ii) Same as (i) except the information is not known but is <u>suspected</u> based on indirect observations.  iii) Meets CWQG or absence of surface water exposure pathway (i.e., Distance to nearest surface water is $> 5$ km.)	<div>12</div> <div>8</div> <div>0</div> <div>8</div> <div>8</div>	Groundwater concentrations of Cadmium, Selenium, and Zinc were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life. The site is within 0.5 km of the Peace River and a tributary, Garden Creek.	Collect all available information on quality of surface water near to site. Evaluate available data against Canadian Water Quality Guidelines (select appropriate guidelines based on local water use, e.g., recreation, irrigation, aquatic life, livestock watering, etc.). The evaluation method concentrates on the surface water flow system and its potential to be an exposure pathway. Contamination is present on the surface (above ground) and has the potential to impact surface water bodies. Surface water is defined as a water body that supports one of the following uses: recreation, irrigation, livestock watering, aquatic life.	<b>General Notes:</b> Someone experienced must provide a thorough description of the sources researched to classify the surface water body in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.  <b>Selected References:</b> CCME. 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a>  CCME. 1999. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water) <a href="http://www.ccme.ca">www.ccme.ca</a>  Health and Welfare Canada. 1992. Guidelines for Canadian Recreational Water Quality.
<b>NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you can skip Part B (Potential for migration of COPCs in surface water) and go to Section 3 (Surface Soils)</b>				
<b>B. Potential for migration of COPCs in surface water</b>				
<b>a. Presence of containment</b> No containment Partial containment Full containment Do Not Know	<div>Score</div> <div>3</div>		Review the existing engineered systems and relate these structures to site conditions and proximity to surface water and determine if full containment is achieved: score low if there is full containment such as capping, berms, dikes; score medium if there is partial containment such as natural barriers, trees, ditches, sedimentation ponds; score high if there are no intervening barriers between the site and nearby surface water. Full containment must include containment of all chemicals.	
<b>b. Distance to Surface Water</b> 0 to $<100$ m 100 - 300 m $>300$ m Do Not Know	<div>Score</div> <div>2</div>		Review available mapping and survey data to determine distance to nearest surface water bodies.	

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>c. Topography</b> Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	1		Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).	
Score	1			
<b>d. Run-off potential</b> High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score < 0.6) Low (0.2 < rainfall run-off score < 0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	0.4		<b>Rainfall</b> Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 567 mm = 0.7 score). The former definition of annual rainfall did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor. <b>Permeability</b> For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.	Selected Sources: Environment Canada web page link <a href="http://www.msc.ec.gc.ca">www.msc.ec.gc.ca</a> Snow to rainfall conversion apply ratio of 16 (snow):1 (water)
Score	0.4			
<b>e. Flood potential</b> 1 in 2 years 1 in 10 years 1 in 50 years Do Not Know	0.5		Review published data such as flood plain mapping or flood potential (e.g., spring or mountain run off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.	
Score	0.5			
Potential surface water pathway total	6.9			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Surface water pathway total	8			
<b>3. Surface Soils (potential for dust, dermal and ingestion exposure)</b>				
<b>A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)</b>				
COPCs measured in surface soils exceed the CCME soil quality guideline. Strongly suspected that soils exceed guidelines COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock)	12	No soil concentrations of COPC exceeded provincial or federal guidelines.	Collect all available information on quality of surface soils (i.e., top 1.5 metres) at the site. Evaluate available data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (i.e., agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (i.e., coarse or fine).	Selected References: CCME, 1999, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health <a href="http://www.ccme.ca">www.ccme.ca</a>
Score	9			
	0			
	0			
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)	0			
<b>B. Potential for a surface soils (top 1.5 m) migration pathway</b>				
<b>a. Are the soils in question covered?</b> Exposed Vegetated Landscaped Paved Do Not Know	4		Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.
Score	4			
<b>b. For what proportion of the year does the site remain covered by snow?</b> 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	3		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).	
Score	3			
Potential surface soil pathway total	7			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Soil pathway total	9			

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>4. Vapour</b>				
<b>A. Demonstrated COPCs in vapour.</b>				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	Measured volatile hydrocarbons in the soil were below laboratory detection limits.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)				
<b>B. Potential for COPCs in vapour</b>				
a. Relative Volatility based on Henry's Law Constant, $H^*$ (dimensionless) High ( $H^* > 1.0E-1$ ) Moderate ( $H^* = 1.0E-1$ to $1.0E-3$ ) Low ( $H^* < 1.0E-3$ ) Not Volatile Do Not Know			Reference: US EPA Soil Screening Guidance (Part 5 - Table 36)  Provided in Attached Reference Materials	If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5.
Score	2.5			
b. What is the soil grain size? Fine Coarse Do Not Know			Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours.  Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter ( $D_{50} < 75 \mu m$ ). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter ( $D_{50} > 75 \mu m$ ).	
Score	3			
c. Is the depth to the source less than 10m? Yes No Do Not Know			Review groundwater depths below grade for the site.	
Score	2			
d. Are there any preferential pathways? Yes No Do Not Know			Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.	Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Score	2			
Potential vapour pathway total	9.5	Note: If a "known" score is provided, the "potential" score is disallowed.		
Allowed Potential score	—			
Vapour pathway total	0			
<b>5. Sediment Movement</b>				
<b>A. Demonstrated migration of sediments containing COPCs</b>				
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	No soil concentrations of COPC exceeded provincial or federal guidelines.	Review sediment assessment reports. Evidence of migration of contaminants in sediments may be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9			
Sediments have been contained and there is no indication that sediments will migrate in future, or Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for sediment migration</b>				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?			Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
Yes				
No	4			
Do Not Know				
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?			Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.	
Yes				
No	4			
Do Not Know				
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?			Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional	
Yes				
No	4			
Do Not Know				
Potential sediment pathway total	12			
Allowed Potential score	—	Note: If a "Known" score is provided, the "potential" score is disallowed.		
Sediment pathway total	0			
<b>6. Modifying Factors</b>				
Are there subsurface utility conduits in the area affected by contamination?			Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Yes	No			
No		No underground facilities were located in March 2008.		
Do Not Know				
Known	0			
Potential	0			

## Migration Potential Total

Raw "known" total	20
Raw "potential" total	0.0
Raw combined total	20.0
Total (max 33)	10.3

Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Human</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site)	22		Where adverse effects on humans are documented, the site should be automatically designated Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this typically either >10 <sup>-6</sup> or >10 <sup>-5</sup> ). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 ug/dL) or other health based testing.	Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.
No quantified or suspected exposures/impacts in humans.	0			Selected References: Health Canada-Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Health Screening Level Risk Assessment <a href="http://www.hc-sc.gc.ca/rwh/sem/ylv/s/contam/la/index_e.html">http://www.hc-sc.gc.ca/rwh/sem/ylv/s/contam/la/index_e.html</a> United States Environmental Protection Agency, Integrated Risk Information System (IRIS) <a href="http://www.epa.gov/iris/">http://www.epa.gov/iris/</a>
Score	0		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10 <sup>-6</sup> or 10 <sup>-5</sup> ).	
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
<b>B. Potential for human exposure</b>				
a) Land use (provides an indication of potential human exposure scenarios)  Agricultural Residential / Parkland Commercial Industrial Do Not Know	1.5		Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination)  Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know	1		Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
<b>B. Potential for human exposure</b>				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).  i) direct contact  Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know	3		If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
ii) Inhalation (i.e., inhalation of dust, vapour)  Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)?  Yes No Do Not Know	3		If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances relative to buildings. Refer to (II) Migration Potential worksheet, 4B) Potential for COPCs in Vapour for a definition of volatility.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion.
Dust - If there is contaminated surface soil (e.g. top 1.5 m), indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero.  Fine Coarse Surface soil is not contaminated or absent Do Not Know Texture	0		Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2008)) then these soils are more likely to generate dusts.	Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.
Score	0			General Notes: Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Inhalation total	3			Selected References: Canadian Council of Ministers of the Environment (CCME), 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332 <a href="http://www.ccme.ca">www.ccme.ca</a> Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for human exposure</b>				
<p>ii) Ingestion (i.e., ingestion of food items, water and soils [for children]). Including traditional foods.</p> <p>Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future).</p> <p>0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know</p> <p>Score</p> <p>2</p> <p>Is an alternative water supply readily available?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>1</p> <p>Is human ingestion of contaminated soils possible?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>3</p> <p>Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>1</p> <p>Ingestion total</p> <p>7</p> <p>Human Health Total "Potential" Score</p> <p>15.5</p> <p>Allowed "Potential" Score</p> <p>—</p>				<p><b>Selected References:</b> Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/hpsc/pubs/water/publications/drinking_water_quality_guidelines/index.html">www.hc-sc.gc.ca/hpsc/pubs/water/publications/drinking_water_quality_guidelines/index.html</a></p> <p>Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable.</p> <p>Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.</p> <p>The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modeling of and contaminant transport.</p> <p>If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.</p> <p>Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.</p>
<b>2. Human Exposure Modifying Factors</b>				
<p>a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.)</p> <p>Yes No Do Not Know</p> <p>Known</p> <p>Potential</p> <p>Raw Human "known" total</p> <p>Raw Human "potential" total</p> <p>Raw Human Exposure Total Score</p> <p>Human Health Total (max 22)</p>	<p>Yes</p> <p>8</p> <p>0</p> <p>0</p> <p>8</p> <p>6.0</p>	Potable water supply is local; Strong reliance of community on local foods which include fish from Peace River.		
<b>3. Ecological</b>				
<b>A. Known exposure</b>				
<p>Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.</p> <p>Score</p> <p>18</p> <p>Same as above, but "Strongly Suspected" based on observations or indirect evidence.</p> <p>Score</p> <p>12</p> <p>No quantified or suspected exposures/impacts in terrestrial or aquatic organisms</p> <p>Score</p> <p>0</p> <p>12</p> <p>Score</p> <p>12</p>		<p>Groundwater concentrations of Cadmium, Selenium, and Zinc were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life and the site is approximately 0.5 km from the Peace River and Garden Creek.</p>	<p>Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients &gt;1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects, such as site observations, tissue testing, toxicity testing and quantitative community assessments.</p>	<p>CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a></p> <p>CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Use <a href="http://www.ccme.ca">www.ccme.ca</a></p> <p>Sensitive receptors- review: Canadian Council on Ecological Areas <a href="http://www.ccea.org">www.ccea.org</a></p> <p>Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in <i>Framework for Ecological Risk Assessment: General Guidance</i> (CCME 1999).</p> <p>Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as Internet links.</p>
<p>NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)</p>				

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>a) Terrestrial</b> i) Land use Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know  Score	1.5		Review zoning and land use maps. If the proposed future land use is more intensive than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration).  Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
<b>ii) Uptake potential</b>  Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know  Score	1		If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
<b>iii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water)</b> Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know  Score  Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know  Score  Can the contamination identified bioaccumulate? Yes No Do Not Know  Score  Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know  Score	1.5		Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.  Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.  Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics worksheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines. It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link <a href="http://www.ccea.org">www.ccea.org</a>	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
Raw Terrestrial Total Potential Allowed Terrestrial Total Potential	7 --	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>b) Aquatic</b> i) Classification of aquatic environment Sensitive Typical Not Applicable (no aquatic environment present) Do Not Know  Score	2		"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species.  "Typical aquatic environments" include those in areas other than those listed above.	
<b>ii) Uptake potential</b>  Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know  Score  Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know  Score	1.5		Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.  It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: <a href="http://www.ccea.org">www.ccea.org</a> .  Bioaccumulation of food items is possible if:	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and ferns and other aquatic environments.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	1 5.5 —	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.	1) The Log(K <sub>ow</sub> ) of the contaminant is greater than 4 (as per the chemical characteristics work sheet and concentrations in sediments exceed the CCME ISQG. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Score	1			
Raw Aquatic Total Potential Allowed Aquatic Total Potential	5.5 —			
<b>4. Ecological Exposure Modifying Factors</b>				
a) Known occurrence of a species at risk.  Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	  Do Not Know —	Not known if a species at risk is present at the site.	Consult any ecological risk assessment reports. If information is not present, utilize on-line database risk, consult Schedule 1 of the federal Species at Risk Act ( <a href="http://www.sararegistry.gc.ca/species/schedules_a_sdm?nd=1">http://www.sararegistry.gc.ca/species/schedules_a_sdm?nd=1</a> ). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCMPALAP, 2005. Endangered Species and Ecosystems in British Columbia, Provincial red and blue lists, Ministry of Sustainable Resource Management and Water, Land and Air Protection ( <a href="http://trmwww.gov.bc.ca/strick/red-blue.htm">http://trmwww.gov.bc.ca/strick/red-blue.htm</a> )	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act ( <a href="http://www.sararegistry.gc.ca/species/schedules_a_sdm?nd=1">http://www.sararegistry.gc.ca/species/schedules_a_sdm?nd=1</a> ). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCMPALAP, 2005. Endangered Species and Ecosystems in British Columbia, Provincial red and blue lists, Ministry of Sustainable Resource Management and Water, Land and Air Protection ( <a href="http://trmwww.gov.bc.ca/strick/red-blue.htm">http://trmwww.gov.bc.ca/strick/red-blue.htm</a> )
Score	1			
b) Potential impact of aesthetics (e.g., enrichment of a lake or tinting of food flavor).  Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know  Is there evidence of olfactory impact (i.e., unpleasant smells)? Yes No Do Not Know  Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know  Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	  Do Not Know — 1 No 0 — 0 — Do Not Know — 1 0 3 12 3 15 Ecological Total (Max 18)	Peace River has high flow. Do not know if the aesthetics will be impacted.	Documentation may consist of environmental investigation reports, press articles, petitions or other records.  Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.  A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients (e.g., nitrogen or phosphorus releases to an aquatic body can act as a fertilizer.  Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	This item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Ecological Modifying Factors Total - Known Ecological Modifying Factors Total - Potential Raw Ecological Total - Known Raw Ecological Total - Potential Ecological Total (Max 18)	0 3 12 3 15			
Ecological Total (Max 18)	15.0			
<b>5. Other Potential Contaminant Receptors</b>				
a) Exposure of permafrost (leading to erosion and structural concerns)  Are there improvements (roads, buildings) at the site dependent upon the permafrost for structural integrity? Yes No Do Not Know  Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	  No 0 —  Do Not Know — 1 0 1	Do not know.	Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.  Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Other Potential Receptors Total - Known Other Potential Receptors Total - Potential	0 1			
Exposure Total	18.3			
Raw Human Health + Ecological Total - Known Raw Human Health + Ecological Total - Potential Raw Total Exposure Total (max 34)	18 4 22 18.3	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.		

# **CCME National Classification System (2008)** **Score Summary**

Scores from individual worksheets are tallied in this worksheet.  
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	2	---
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	2	---
4. Contaminant Quantity	6	---
5. Modifying Factors	2	---
<b>Raw Total Score</b>	<b>20</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>20</b>	
<b>Adjusted Total Score (Raw Total / 40 * 33)</b>	<b>16.5</b>	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	12	---
2. Surface Water Movement	8	---
3. Soil	0	---
4. Vapour	0	---
5. Sediment Movement	0	---
6. Modifying Factors	0	0
<b>Raw Total Score</b>	<b>20</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>20</b>	
<b>Adjusted Total Score (Raw Total / 64 * 33)</b>	<b>10.3</b>	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	0	
B. Potential		
a. Land Use		---
b. Accessibility		---
c. Exposure Route		
i. Direct Contact		---
ii. Inhalation		---
iii. Ingestion		---
2. Human Receptors Modifying Factors	6	---
<b>Raw Total Human Score</b>	<b>6</b>	<b>0</b>
<b>Raw Total Human Score (Known + Potential)</b>	<b>6</b>	
<b>Adjusted Total Human Score</b>	<b>6.0</b>	(maximum 22)
3. Ecological Receptors		
A. Known Impact	12	
B. Potential		
a. Terrestrial		---
b. Aquatic		---
4. Ecological Receptors Modifying Factors	0	3
<b>Raw Total Ecological Score</b>	<b>12</b>	<b>3</b>
<b>Raw Total Ecological Score (Known + Potential)</b>	<b>15</b>	
<b>Adjusted Total Ecological Score</b>	<b>15.0</b>	(maximum 18)
5. Other Receptors	0	1
<b>Total Other Receptors Score (Known + Potential)</b>	<b>1</b>	
<b>Total Exposure Score (Human + Ecological + Other)</b>	<b>22.0</b>	
<b>Adjusted Total Exposure Score (Total Exposure / 46 * 34)</b>	<b>16.3</b>	(max 34)

<b>Site Score</b>	
Test Site	
Site Letter Grade	A
Certainty Percentage	100%
% Responses that are "Do Not Know"	-59%
<b>Total NCSCS Score for site</b>	<b>43.1</b>
<b>Site Classification Category</b>	<b>3</b>

## **Site Classification Categories\*:**

- Class 1 - High Priority for Action (Total NCS Score >70)
- Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
- Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
- Class N - Not a Priority for Action (Total NCS Score <37)
- Class INS - Insufficient Information (>15% of responses are "Do Not Know")

\* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

<b>Subject Site:</b>	<b>Test Site</b>	
Civic Address: (or other description of location)	On the north shore of the Peace River, approximately 220 km east of High Level, Alberta, in Wood Buffalo National Park	
Site Common Name : (if applicable)	Community of Garden River	
Site Owner or Custodian: (Organization and Contact Person)	Parks Canada Agency	
Legal description or metes and bounds:	N 58°42.5', W113°52.0'	
Approximate Site area:		
PID(s) : (or Parcel Identification Numbers [PIN] if untitled Crown land)	Garden River Trading (Charlie Rose) AST (FCSI #00022202)	
Centre of site: (provide latitude/longitude or UTM coordinates)	Latitude:	_____ degrees _____ min _____ secs
	Longitude:	_____ degrees _____ min _____ secs
	UTM Coordinate:	Northing 6511083.579 Easting 680620.3577
Site Land Use:	Current:	Residential
	Proposed:	
<b>Site Plan</b>	To delineate the bounds of the Site a site plan <b>MUST</b> be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.	
Provide a brief description of the Site:		
<p>The Garden River Trading (Charlie Rose) AST is located north of the community of Garden River (see attached Site Plan).</p>		

## CCME National Classification System for Contaminated Sites (2008)

### Summary of Site Conditions

Affected media and Contaminants of Potential Concern (COPC):	The groundwater concentrations of Cadmium, Selenium, and Zinc in one monitoring well exceeded Canadian Council of Ministers of the Environment 2007 Canadian Water Quality Guidelines for the protection of aquatic life.
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Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade **A**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	Cathy Hamlen, Ph.D. A.Ag.
Date Scoring Completed:	6-Feb-09

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance		Five soil samples and one groundwater monitoring well were assessed. Refer to <i>Contaminated Site Assessment, Initial and Detailed Testing Programs, Wood Buffalo National Park, Various Locations in the Community of Garden River, Alberta</i> (EBA Consulting Engineers Ltd., 2009).	The overall score is calculated by adding the individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline).  Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at <a href="http://www.ccme.ca/publications/cegg_rcqe.html?category_id=124">http://www.ccme.ca/publications/cegg_rcqe.html?category_id=124</a> .  For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_recom/index_e.html">http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_recom/index_e.html</a> .	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	No			
Yes	0			
No				
Do Not Know				
B. Groundwater	Yes			
Yes	2			
No				
Do Not Know				
C. Surface water	No			
Yes	0			
No				
Do Not Know				
D. Sediment	No			
Yes	0			
No				
Do Not Know				
"Known" -score	2			
"Potential" - score	---			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?  High Medium Low Do Not Know	High	Cadmium (groundwater) is High, Selenium (groundwater) is Medium, and Zinc (groundwater) is Low.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site.  The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file.  <i>See Attached Reference Material for Contaminant Hazard Rankings.</i>	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
"Known" -score	8			
"Potential" - score	---			
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?  Mobile NAPL High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	Low (1x to 10x)	The groundwater Cadmium concentration was 1.03 times higher than the CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life, and the groundwater Zinc concentration was 1.1 times higher than the 2007 CCME guideline. The groundwater Selenium concentration was 1.6 times higher than the Health Canada 2008 Guidelines for Canadian Drinking Water Quality.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME environmental quality guidelines</i> . Ranking should be based on contaminant with greatest exceedance of CCME guidelines. Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks.  Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethally observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria.  Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF>1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
"Known" -score	2			
"Potential" - score	---			

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Test Site	Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
4. Contaminant Quantity (known or strongly suspected)					
What is the known or strongly suspected quantity of all contaminants?  >10 hectare (ha) or 5000 m <sup>3</sup> 2 to 10 ha or 1000 to 5000 m <sup>3</sup> <2 ha or 1000 m <sup>3</sup> Do Not Know	<2 ha or 1000 m <sup>3</sup>	The groundwater monitoring well with concentrations of COPC exceeding Canadian Council of Ministers of the Environment 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life and Health Canada 2008 Guidelines for Canadian Drinking Water Quality covered an area of approximately 50 m <sup>2</sup> .	Measure or estimate the area or quantity of total contamination (i.e., all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.	
"Known" - score	2				
"Potential" - score	—				
5. Modifying Factors					
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?  Yes No Do Not Know	No	Chemicals do not persist.	Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics:  (a) in air, (i) its half-life is equal to or greater than 2 days, or (ii) it is subject to atmospheric transport from its source to a remote area; (b) in water, its half-life is equal to or greater than 182 days; (c) in sediments, its half-life is equal to or greater than 365 days; or (d) in soil, its half-life is equal to or greater than 182 days.  This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.	Examples of Persistent Substances are provided in attached Reference Materials	
	0				
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location?  Yes No Do Not Know	No			Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.	
	0				
How many different contaminant classes have representative CCME guideline exceedances?  one two to four five or more Do Not Know	two to four	Cadmium, Selenium, and Zinc in groundwater.	For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.	
	2				
"Known" - Score	2				
"Potential" - Score	—				

Contaminant Characteristic Total

Raw Total Scores- "Known"	16
Raw Total Scores- "Potential"	0
Raw Combined Total Scores	16
Total Score (Raw Combined / 40 * 33)	13.2

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
<b>1. Groundwater Movement</b>				
<b>A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary.</b>				
<p>i) For potable groundwater environments 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For non-potable environments (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non-potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.</p> <p>ii) Same as (i) except the information is not known but is <u>strongly suspected</u> based on indirect observations.</p> <p>iii) Meets GCDWQ for potable environments meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for non-potable environments or</p> <p>Absence of groundwater exposure pathway (i.e., there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).</p>	<p>12</p> <p>9</p> <p>0</p> <p>12</p> <p>Score 12</p>	<p>Selenium in groundwater was 1.6 times higher than Health Canada 2008 Guidelines for Canadian Drinking Water Quality, but source for potable water is unknown. Cadmium and Zinc concentrations exceeded guideline for protection of fresh water aquatic life (CCME, 2007). Hydraulic conductivity is in the order of <math>10^{-6}</math> m/s at the site.</p>	<p>Review chemical data and evaluate groundwater quality.</p> <p>The evaluation method concentrates on 1) a potable or non-potable groundwater environment; 2) the groundwater flow system and its potential to be an exposure pathway to known or potential receptors</p> <p>An aquifer is defined as a geologic unit that yields groundwater in useable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas). The evaluation of a non-potable environment will be based on a site specific basis.</p> <p>Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils.</p> <p>Seeps and springs are considered part of the groundwater pathway.</p> <p>In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.</p>	<p>The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries.</p> <p>Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links.</p> <p>Note that for potable groundwater that also daylights into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered.</p> <p><b>Selected References</b></p> <p><b>Potable Environments</b></p> <p>Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/ewh-scmt/you/ab/water-eau/dgc_snp-sppu/snm_guide-res_recom/index_e.html">www.hc-sc.gc.ca/ewh-scmt/you/ab/water-eau/dgc_snp-sppu/snm_guide-res_recom/index_e.html</a></p> <p><b>Non-Potable Environments</b></p> <p>Canadian Water Quality Guidelines for Protection of Aquatic Life. CCME, 1999 <a href="http://www.ccme.ca">www.ccme.ca</a></p> <p>Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.</p>
<p>NOTE: If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)</p>				
<b>B. Potential for groundwater pathway.</b>				
<p>a. Relative Mobility</p> <p>High</p> <p>Moderate</p> <p>Low</p> <p>Insignificant</p> <p>Do Not Know</p>	<p>2</p> <p>Score 2</p>	<p>Organics Koc (L/kg) Koc &lt; 500 (i.e., log Koc &lt; 2.7) Koc = 500 to 5000 (i.e., log Koc = 2.7 to 3.7) Koc = 5,000 to 100,000 (i.e., log Koc = 3.7 to 5) Koc &gt; 100,000 (i.e., log Koc &gt; 5)</p> <p>Metals with higher mobility at acidic conditions pH &lt; 5 pH = 5 to 6 pH &gt; 6</p> <p>Metals with higher mobility at alkaline conditions pH &gt; 8.5 pH = 7.5 to 8.5 pH &lt; 7.5</p>	<p>Reference: US EPA Soil Screening Guidance (Part 5 - Table 39)</p> <p>If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and precipitation infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.</p>	<p>Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links.</p> <p><b>Selected Resources:</b></p> <p>United States Environmental Protection Agency (USEPA) 1998, Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128.</p> <p>Environment Canada—Ontario Region—Natural Attenuation Technical Assistance Bulletin (TABS) Number 19–21.</p>
<p>b. Presence of engineered sub-surface containment?</p> <p>No containment</p> <p>Partial containment</p> <p>Full containment</p> <p>Do Not Know</p>	<p>1.5</p> <p>Score 1.5</p>	<p>Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved.</p> <p>Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for "Full Containment" scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.</p>	<p>Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links.</p> <p><b>Selected Resources:</b></p> <p>United States Environmental Protection Agency (USEPA) 1998, Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128.</p> <p>Environment Canada—Ontario Region—Natural Attenuation Technical Assistance Bulletin (TABS) Number 19–21.</p>	
<p>c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway</p> <p>3 m or less including no confining layer or discontinuous confining layer</p> <p>3 to 10 m</p> <p>&gt; 10 m</p> <p>Do Not Know</p>	<p>0.5</p> <p>Score 0.5</p>	<p>The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow.</p> <p>Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway.</p> <p>The evaluation of this category is based on:</p> <p>1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or</p> <p>2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (e.g., water table aquifer, first hydrostratigraphic unit or other groundwater pathway).</p>		
<p>d. Hydraulic conductivity of confining layer</p> <p>&gt; <math>10^{-6}</math> cm/s or no confining layer</p> <p><math>10^{-6}</math> to <math>10^{-8}</math> cm/s</p> <p>&lt; <math>10^{-8}</math> cm/s</p> <p>Do Not Know</p>	<p>0.5</p> <p>Score 0.5</p>	<p>Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on:</p> <p>1) The presence and hydraulic conductivity (K) of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or</p> <p>2) The presence and permeability (K) of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.</p>		

## (II) Migration Potential (Evaluation of contaminant migration pathways)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes	
<b>B. Potential for groundwater pathway:</b>					
<b>e. Precipitation infiltration rate</b> (Annual precipitation factor x surface soil relative permeability factor) High Moderate Low Vary Low None Do Not Know	0.4		<b>Precipitation</b> Refer to Environment Canada precipitation records for relevant areas. Divide annual precipitation by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score).  <b>Permeability</b> For surface soil relative permeability (i.e., infiltration) assume: gravel (1), sand (0.6), loam (0.3) and pavement or clay (0).  Multiply the surface soil relative permeability factor with precipitation factor to obtain the score for precipitation infiltration rate.		
<b>f. Hydraulic conductivity of aquifer</b> >10 <sup>-2</sup> cm/s 10 <sup>-2</sup> to 10 <sup>-4</sup> cm/s <10 <sup>-4</sup> cm/s Do Not Know	1		Determine the nature of geologic materials and estimate hydraulic conductivity of all aquifers of concern from published material (refer to "Range of Values of Hydraulic Conductivity and Permeability" in the Reference Material sheet).		
Potential groundwater pathway total	5.9	Note: If a "known" score is provided, the "potential" score is disallowed.			
Allowed Potential score	—				
Groundwater pathway total	12				
<b>2. Surface Water Movement</b>					
<b>A. Demonstrated migration of COPC in surface water above background conditions</b>					
Known concentrations of surface water:  i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (e.g. toxicity testing; or other indicator testing of exposure).	12	Groundwater concentrations of Cadmium, Selenium, and Zinc were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life. The site is on a bluff above the Peace River.	Collect all available information on quality of surface water near to site. Evaluate available data against Canadian Water Quality Guidelines (select appropriate guidelines based on local water use, e.g., recreation, irrigation, aquatic life, livestock watering, etc.). The evaluation method concentrates on the surface water flow system and its potential to be an exposure pathway. Contamination is present on the surface (above ground) and has the potential to impact surface water bodies. Surface water is defined as a water body that supports one of the following uses: recreation, irrigation, livestock watering, aquatic life.	<b>General Notes:</b> Someone experienced must provide a thorough description of the sources researched to classify the surface water body in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.  <b>Selected References:</b> CCME. 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a>  CCME. 1999. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water) <a href="http://www.ccme.ca">www.ccme.ca</a>  Health and Welfare Canada. 1992. Guidelines for Canadian Recreational Water Quality.	
ii) Same as (i) except the information is not known but is <u>suspected</u> based on indirect observations.	8				
iii) Meets CWQG or absence of surface water exposure pathway (i.e., Distance to nearest surface water is > 5 km.)	0				
Score	8				
NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you can skip Part B (Potential for migration of COPCs in surface water) and go to Section 3 (Surface Soils)					
<b>B. Potential for migration of COPCs in surface water</b>					
<b>a. Presence of containment</b> No containment Partial containment Full containment Do Not Know	3		Review the existing engineered systems and relate these structures to site conditions and proximity to surface water and determine if full containment is achieved: score low if there is full containment such as capping, berms, dikes; score medium if there is partial containment such as natural barriers, trees, ditches, sedimentation ponds; score high if there are no intervening barriers between the site and nearby surface water. Full containment must include containment of all chemicals.		
<b>b. Distance to Surface Water</b> 0 to <100 m 100 - 300 m >300 m Do Not Know	2		Review available mapping and survey data to determine distance to nearest surface water bodies.		

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes			
<b>c. Topography</b> Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is intermediate Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100		Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).				
<b>d. Run-off potential</b> High (rainfall run-off score > 0.6) Moderate (0.4 < rainfall run-off score < 0.6) Low (0.2 < rainfall run-off score < 0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100		<b>Rainfall</b> Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). The former definition of annual rainfall did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor. <b>Permeability</b> For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.	Selected Sources: Environment Canada web page link <a href="http://www.msc.ec.gc.ca">www.msc.ec.gc.ca</a> Snow to rainfall conversion apply ratio of 15 (snow):1(water)			
<b>e. Flood potential</b> 1 in 2 years 1 in 10 years 1 in 50 years Do Not Know	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100		Review published data such as flood plain mapping or flood potential (e.g., spring or mountain run off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.				
Potential surface water pathway total	6.9	Note: If a "known" score is provided, the "potential" score is disallowed.					
Allowed Potential score	—						
Surface water pathway total	8						
<b>3. Surface Soils (potential for dust, dermal and ingestion exposure)</b>							
<b>A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)</b>							
COPCs measured in surface soils exceed the CCME soil quality guideline.	12	Soil concentrations met federal and provincial guidelines.	Collect all available information on quality of surface soils (i.e., top 1.5 metres) at the site. Evaluate data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (i.e., agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (i.e., coarse or fine).	Selected References: CCME, 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health <a href="http://www.ccme.ca">www.ccme.ca</a>			
Strongly suspected that soils exceed guidelines	9						
COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bed/rock).	0						
Score	0						
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)							
<b>B. Potential for a surface soils (top 1.5 m) migration pathway</b>							
<b>a. Are the soils in question covered?</b> Exposed Vegetated Landscaped Paved Do Not Know	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100		Consult engineering or risk assessment reports for the site. Alternatively, review photographs or perform a site visit. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.			
<b>b. For what proportion of the year does the site remain covered by snow?</b> 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).				
Potential surface soil pathway total	7	Note: If a "known" score is provided, the "potential" score is disallowed.					
Allowed Potential score	—						
Soil pathway total	0						

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>4. Vapour</b>				
<b>A. Demonstrated COPCs in vapour.</b>				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	Concentrations of volatile COPCs in the soil and groundwater were below provincial and federal guidelines.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)				
<b>B. Potential for COPCs in vapour</b>				
a. Relative Volatility based on Henry's Law Constant, $H'$ (dimensionless) High ( $H' > 1.0E-1$ ) Moderate ( $H' = 1.0E-1$ to $1.0E-3$ ) Low ( $H' < 1.0E-3$ ) Not Volatile Do Not Know			Reference: US EPA Soil Screening Guidance (Part 5 - Table 36)  Provided in Attached Reference Materials	If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5.
Score	2.5			
b. What is the soil grain size? Fine Coarse Do Not Know			Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours.  Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 $\mu\text{m}$ mean diameter ( $D_{50} < 75 \mu\text{m}$ ). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 $\mu\text{m}$ mean diameter ( $D_{50} > 75 \mu\text{m}$ ).	
Score	3			
c. Is the depth to the source less than 10m? Yes No Do Not Know			Review groundwater depths below grade for the site.	
Score	2			
d. Are there any preferential pathways? Yes No Do Not Know			Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.	Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Score	2			
Potential vapour pathway total	9.5			
Allowed Potential score	—			
Vapour pathway total	0	Note: If a "known" score is provided, the "potential" score is disallowed.		
<b>5. Sediment Movement</b>				
<b>A. Demonstrated migration of sediments containing COPCs</b>				
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	No COPC in soil exceeded provincial or federal guidelines.	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9			
Sediments have been contained and there is no indication that sediments will migrate in future. or Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes			
B. Potential for sediment migration							
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")? Yes No Do Not Know	<div></div> <div>4</div>	Note: If a "known" score is provided, the "potential" score is disallowed.	Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.  Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.  Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional				
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash? Yes No Do Not Know	<div></div> <div>4</div>						
c. For rivers, are the contaminated sediments in an area prone to sediment scouring? Yes No Do Not Know	<div></div> <div>4</div>						
Potential sediment pathway total	12						
Allowed Potential score	—						
Sediment pathway total	0						
6. Modifying Factors							
Are there subsurface utility conduits in the area affected by contamination? Yes No Do Not Know	<div>No</div>				No COPC in soil exceeded provincial or federal guidelines.	Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Known	0						
Potential	0						

## Migration Potential Total

Raw "known" total	20
Raw "potential" total	0.0
Raw combined total	20.0
Total (max 33)	10.3

Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Human</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site)	22	The groundwater concentration of Selenium was 1.0 times higher than the Health Canada 2008 Guidelines for Canadian Drinking Water Quality, and the monitoring well is located within the community. However, source of potable water not known.	Where adverse effects on humans are documented, the site should be automatically designated Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).  This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this typically either >10 <sup>-6</sup> or >10 <sup>-5</sup> ). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 ug/dL) or other health based testing.  This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10 <sup>-6</sup> or 10 <sup>-5</sup> ).	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.  Selected References: Health Canada-Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Health Screening Level Risk Assessment <a href="http://www.hc-sc.gc.ca/ehp/contaminated/index_e.php">http://www.hc-sc.gc.ca/ehp/contaminated/index_e.php</a> United States Environmental Protection Agency, Integrated Risk Information System (IRIS) <a href="http://www.epa.gov/iris/">http://www.epa.gov/iris/</a>
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10			
No quantified or suspected exposures/impacts in humans.	0			
Score	10			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
<b>B. Potential for human exposure</b>				
a) Land use (provides an indication of potential human exposure scenarios)  Agricultural Residential / Parkland Commercial Industrial Do Not Know	1.5	Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).	
Score	1.5			
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination)  Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants not covered. Controlled access or remote location and contaminants are covered Do Not Know	1	Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.		
Score	1			
<b>B. Potential for human exposure</b>				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).  i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know	3	If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.	
Score	3			
ii) Inhalation (i.e., inhalation of dust, vapour)  Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know  Dust - If there is contaminated surface soil (e.g. top 1.5 m), indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent Do Not Know Texture	3	If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances relative to buildings. Refer to (II) Migration Potential worksheet, 4B) Potential for VOCs in Vapour for a definition of volatility.  Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2006)) then these soils are more likely to generate dusts.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion.  Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.	General Notes: Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.  Selected References: Canadian Council of Ministers of the Environment (CCME). 2006. Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 133 <a href="http://www.ccme.ca">www.ccme.ca</a> Golder, 2004. Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
Score	3			
Inhalation total	3			

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for human exposure</b>				
ii) Ingestion (i.e., ingestion of food items, water and soils [for children]). Including traditional foods. Drinking Water: Choose a score based on the proximity to a drinking water supply, to indicate the potential for contamination (present or future). 0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know Score	2		Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure.  The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of flow and contaminant transport.	Selected References: Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/hccp-scschwater/publications/drinking_water_quality_guidelines/toc.html">www.hc-sc.gc.ca/hccp-scschwater/publications/drinking_water_quality_guidelines/toc.html</a>  Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable.  Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.
Is an alternative water supply readily available? Yes No Do Not Know Score	1			
Is human ingestion of contaminated soils possible? Yes No Do Not Know Score	3		If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.	
Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings? Yes No Do Not Know Score	1		Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.	
Ingestion total Human Health Total "Potential" Score Allowed "Potential" Score	7 15.5 ---	Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.		
<b>2. Human Exposure Modifying Factors</b>				
a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.) Yes No Do Not Know Known Potential Raw Human "Known" total Raw Human "potential" total Raw Human Exposure Total Score Human Health Total (max 22)	Yes --- 18 0 18 18.0	Potable water supply is local; Strong reliance of community on local foods which include fish from Peace River.		
<b>3. Ecological</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.	18	Groundwater concentrations of Cadmium, Selenium, and Zinc were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life and the site is on a bluff above the Peace River.	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of the numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).  This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.	CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a> CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses <a href="http://www.ccme.ca">www.ccme.ca</a> Sensitive receptors- review: Canadian Council on Ecological Areas <a href="http://www.ccea.ca">www.ccea.ca</a>  Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in A Framework for Ecological Risk Assessment: General Guidance (CCME 1996).  Notes: Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	12			
No quantified or suspected exposures/impacts in terrestrial or aquatic organisms	0		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects such as site observations, tissue testing, toxicity testing and quantitative community assessments.	
Score	12			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)				

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>a) Terrestrial</b> <b>i) Land use</b> Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know Score	1.5		Review zoning and land use maps. If the proposed future land use is more intensive than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration).  Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	
<b>ii) Uptake potential</b>  Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know Score	1		If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
<b>iii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water)</b> Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know Score  Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know Score  Can the contamination identified bioaccumulate? Yes No Do Not Know Score  Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score	1.5	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.	Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.  Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.  Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics worksheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines. It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: <a href="http://www.ccea.org">www.ccea.org</a>	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
Raw Terrestrial Total Potential Allowed Terrestrial Total Potential	7 —			
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>b) Aquatic</b> <b>i) Classification of aquatic environment</b> Sensitive Typical Not Applicable (no aquatic environment present) Do Not Know Score	2		"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species.  "Typical aquatic environments" include those in areas other than those listed above.	
<b>ii) Uptake potential</b>  Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know Score  Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score	1.5		Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.  It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: <a href="http://www.ccea.org">www.ccea.org</a> .  Bioaccumulation of food items is possible if:	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and rivers and other aquatic environments.

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	1	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.	1) The Log(K <sub>ow</sub> ) of the contaminant is greater than 4 (as per the chemical characteristics work sheet and concentrations in sediments exceed the CCME ISQGs. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Raw Aquatic Total Potential	5.5			
Allowed Aquatic Total Potential	—			
<b>4. Ecological Exposure Modifying Factors</b>				
a) Known occurrence of a species at risk.  Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	Do Not Know — 1	Not known if a species at risk is present at the site.	Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as Eco Explorer, Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act ( <a href="http://www.sarregistry.gc.ca/species/schedule1_e.shtml">http://www.sarregistry.gc.ca/species/schedule1_e.shtml</a> ). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCWVAP, 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection ( <a href="http://srmwww.gov.bc.ca/bcfr/red-blue.htm">http://srmwww.gov.bc.ca/bcfr/red-blue.htm</a> )
Score	1			
b) Potential impact of aesthetics (e.g., enrichment of a lake or tainting of food flavor).  Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know	Do Not Know — 1	Peace River has high flow. Do not know if the aesthetics will be impacted.	Documentation may consist of environmental investigation reports, press articles, petitions or other records.  Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.  A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients (e.g., nitrogen or phosphorus) releases to an aquatic body can act as a fertilizer.  Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	This item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Is there evidence of olfactory impact (i.e., unpleasant smell)? Yes No Do Not Know	No — 0			
Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know	No — 0			
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	Do Not Know — 1			
Ecological Modifying Factors Total - Known	0			
Ecological Modifying Factors Total - Potential	3			
Raw Ecological Total - Known	12			
Raw Ecological Total - Potential	3			
Raw Ecological Total	15			
Ecological Total (Max 18)	15.0			
<b>5. Other Potential Contaminant Receptors</b>				
a) Exposure of permafrost (leading to erosion and structural concerns)  Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity? Yes No Do Not Know	No — 0	Do not know.	Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.  Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	Do Not Know — 1			
Other Potential Receptors Total - Known	0			
Other Potential Receptors Total - Potential	1			
Exposure Total	23.7			
Raw Human Health + Ecological Total - Known	28	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.		
Raw Human Health + Ecological Total - Potential	4			
Raw Total	32			
Exposure Total (max 34)	23.7			

# CCME National Classification System (2008) Score Summary

Scores from individual worksheets are tallied in this worksheet.  
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	2	---
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	2	---
4. Contaminant Quantity	2	---
5. Modifying Factors	2	---
<b>Raw Total Score</b>	<b>16</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>16</b>	
<b>Adjusted Total Score (Raw Total / 40 * 33)</b>	<b>13.2</b>	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	12	---
2. Surface Water Movement	8	---
3. Soil	0	---
4. Vapour	0	---
5. Sediment Movement	0	---
6. Modifying Factors	0	0
<b>Raw Total Score</b>	<b>20</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>20</b>	
<b>Adjusted Total Score (Raw Total / 64 * 33)</b>	<b>10.3</b>	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	10	
B. Potential		
a. Land Use		---
b. Accessibility		---
c. Exposure Route		
i. Direct Contact		---
ii. Inhalation		---
iii. Ingestion		---
2. Human Receptors Modifying Factors	6	---
<b>Raw Total Human Score</b>	<b>16</b>	<b>0</b>
<b>Raw Total Human Score (Known + Potential)</b>	<b>16</b>	
<b>Adjusted Total Human Score</b>	<b>16.0</b>	(maximum 22)
3. Ecological Receptors		
A. Known Impact	12	
B. Potential		
a. Terrestrial		---
b. Aquatic		---
4. Ecological Receptors Modifying Factors	0	3
<b>Raw Total Ecological Score</b>	<b>12</b>	<b>3</b>
<b>Raw Total Ecological Score (Known + Potential)</b>	<b>15</b>	
<b>Adjusted Total Ecological Score</b>	<b>15.0</b>	(maximum 18)
5. Other Receptors	0	1
<b>Total Other Receptors Score (Known + Potential)</b>	<b>1</b>	
<b>Total Exposure Score (Human + Ecological + Other)</b>	<b>32.0</b>	
<b>Adjusted Total Exposure Score (Total Exposure / 46 * 34)</b>	<b>23.7</b>	(max 34)

<b>Site Score</b>	
Test Site	
Site Letter Grade	A
Certainty Percentage	100%
% Responses that are "Do Not Know"	-59%
<b>Total NCSCS Score for site</b>	<b>47.2</b>
<b>Site Classification Category</b>	<b>3</b>

## Site Classification Categories\*:

- Class 1 - High Priority for Action (Total NCS Score >70)
- Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
- Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
- Class N - Not a Priority for Action (Total NCS Score <37)
- Class INS - Insufficient Information (>15% of responses are "Do Not Know")

\* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

<b>Subject Site:</b>	<b>Test Site</b>	
Civic Address: (or other description of location)	On the north shore of the Peace River, approximately 220 km east of High Level, Alberta, in Wood Buffalo National Park	
Site Common Name : (if applicable)	Community of Garden River	
Site Owner or Custodian: (Organization and Contact Person)	Parks Canada Agency	
Legal description or metes and bounds:	N 58°42.5', W113°52.0'	
Approximate Site area:		
PID(s) : (or Parcel Identification Numbers [PIN] if untitled Crown land)	Fifth Meridian Market AST (FCSI #00022201)	
Centre of site: (provide latitude/longitude or UTM coordinates)	Latitude:	_____ degrees _____ min _____ secs
	Longitude:	_____ degrees _____ min _____ secs
	UTM Coordinate:	Northing 6511163.683 Easting 680598.0815
Site Land Use:	Current:	Residential
	Proposed:	
<b>Site Plan</b>	To delineate the bounds of the Site a site plan MUST be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.	
Provide a brief description of the Site:		
<p>The Fifth Meridian Market AST is located within the community of Garden River (see attached Site Plan).</p>		

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

Affected media and Contaminants of Potential Concern (COPC):	The groundwater concentrations of Cadmium, Selenium, and Zinc in one monitoring well exceeded Canadian Council of Ministers of the Environment 2007 Canadian Water Quality Guidelines for the protection of aquatic life.
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Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade

**A**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

Scoring Completed By:	Cathy Hamlen, Ph.D. A.Ag.
Date Scoring Completed:	6-Feb-09

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Residency Media (replaces physical state)				
Which of the following residency media are known (or strongly suspected) to have one or more exceedances of the applicable CCME guidelines? yes = has an exceedance or strongly suspected to have an exceedance no = does not have an exceedance or strongly suspected not to have an exceedance		Six soil samples and one groundwater monitoring well were assessed. Refer to <i>Contaminated Site Assessment, Initial and Detailed Testing Programs, Wood Buffalo National Park, Various Locations in the Community of Garden River, Alberta</i> (EBA Consulting Engineers Ltd., 2009).	The overall score is calculated by adding the Individual scores from each residency media (having one or more exceedance of the most conservative media specific and land-use appropriate CCME guideline).  Summary tables of the Canadian Environmental Quality Guidelines for soil, water (aquatic life, non-potable groundwater environments, and agricultural water uses) and sediment are available on the CCME website at <a href="http://www.ccme.ca/publications/ccsq_rcqe.html?category_id=124">http://www.ccme.ca/publications/ccsq_rcqe.html?category_id=124</a> .  For potable groundwater environments, guidelines for Canadian Drinking Water Quality (for comparison with groundwater monitoring data) are available on the Health Canada website at <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_recom/index_e.html">http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guides_recom/index_e.html</a> .	An increasing number of residency media containing chemical exceedances often equates to a greater potential risk due to an increase in the number of potential exposure pathways.
A. Soil	No			
Yes	0			
No				
Do Not Know				
B. Groundwater	Yes			
Yes	2			
No				
Do Not Know				
C. Surface water	No			
Yes	0			
No				
Do Not Know				
D. Sediment	No			
Yes	0			
No				
Do Not Know				
"Known" -score	2			
"Potential" - score	---			
2. Chemical Hazard				
What is the relative degree of chemical hazard of the contaminant in the list of hazard rankings proposed by the Federal Contaminated Sites Action Plan (FCSAP)?  High Medium Low Do Not Know	High	Cadmium (groundwater) is High, and Selenium (groundwater) is Medium.	The relative degree of chemical hazard should be selected based on the most hazardous contaminant known or suspected to be present at the site.  The degree of hazard has been defined by the Federal Contaminated Sites Action Plan (FCSAP) and a list of substances with their associated hazard (Low, Medium and High) has been provided as a separate sheet in this file.  <i>See Attached Reference Material for Contaminant Hazard Rankings.</i>	Hazard as defined in the revised NCS pertains to the physical properties of a chemical which can cause harm. Properties can include toxic potency, propensity to biomagnify, persistence in the environment, etc. Although there is some overlap between hazard and contaminant exceedance factor below, it will not be possible to derive contaminant exceedance factors for many substances which have a designated chemical hazard designation, but don't have a CCME guideline. The purpose of this category is to avoid missing a measure of toxic potential.
"Known" -score	8			
"Potential" - score	---			
3. Contaminant Exceedance Factor				
What is the ratio between the measured contaminant concentration and the applicable CCME guidelines (or other "standards")?  Mobile NAPL High (>100x) Medium (10x to 100x) Low (1x to 10x) Do Not Know	Low (1x to 10x)	The groundwater Cadmium concentration was 1.03 times higher than the CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life. The groundwater Selenium concentration was 2.87 times higher than the Health Canada 2008 Guideline for Canadian Drinking Water Quality.	Ranking of contaminant "exceedance" is determined by comparing contaminant concentrations with the <i>most conservative media-specific and land-use appropriate CCME environmental quality guidelines</i> . Ranking should be based on contaminant with greatest exceedance of CCME guidelines. Ranking of contaminant hazard as high, medium and low is as follows: High = One or more measured contaminant concentration is greater than 100 X appropriate CCME guidelines Medium = One or more measured contaminant concentration is 10 - 99.99 X appropriate CCME guidelines Low = One or more measured contaminant concentration is 1 - 9.99 X appropriate CCME guidelines Mobile NAPL = Contaminant is a non-aqueous phase liquid (i.e., due to its low solubility, it does not dissolve in water, but remains as a separate liquid) and is present at a sufficiently high saturation (i.e., greater than residual NAPL saturation) such that there is significant potential for mobility either downwards or laterally. Other standards may include local background concentration or published toxicity benchmarks.  Results of toxicity testing with site samples can be used as an alternative. This approach is only relevant for contaminants that do not biomagnify in the food web, since toxicity tests would not indicate potential effects at higher trophic levels. High = lethality observed. Medium = no lethality, but sub lethal effects observed. Low = neither lethal nor sub lethal effects observed.	In the event that elevated levels of a material with no associated CCME guidelines are present, check provincial and USEPA environmental criteria.  Hazard Quotients (sometimes referred to as a screening quotient in risk assessments) refer to the ratio of measured concentration to the concentration believed to be the threshold for toxicity. A similar calculation is used here to determine the contaminant exceedance factor (CEF). Concentrations greater than one times the applicable CCME guideline (i.e., CEF>=1) indicate that risks are possible. Mobile NAPL has the highest associated score (8) because of its highly concentrated nature and potential for increase in the size of the impacted zone.
"Known" -score	2			
"Potential" - score	---			

CCME National Classification System (2008)

(I) Contaminant Characteristics

Test Site

Test Site	Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
4. Contaminant Quantity (known or strongly suspected)					
What is the known or strongly suspected quantity of all contaminants?  >10 hectare (ha) or 5000 m <sup>3</sup> 2 to 10 ha or 1000 to 5000 m <sup>3</sup> <2 ha or 1000 m <sup>3</sup> Do Not Know	<2 ha or 1000 m <sup>3</sup>	The groundwater monitoring wells with COPCs exceeding Health Canada 2008 Guidelines for Canadian Drinking Water Quality and CCME 2007 Canadian Water Quality Guidelines for the protection of aquatic life represented an area of approximately 500 m <sup>2</sup> .	Measure or estimate the area or quantity of total contamination (i.e. all contaminants known or strongly suspected to be present on the site). The "Area of Contamination" is defined as the area or volume of contaminated media (soil, sediment, groundwater, surface water) exceeding appropriate environmental criteria.	A larger quantity of a potentially toxic substance can result in a larger frequency of exposure as well as a greater probability of migration, therefore, larger quantities of these substances earn a higher score.	
"Known" - score	2				
"Potential" - score	—				
5. Modifying Factors					
Does the chemical fall in the class of persistent chemicals based on its behavior in the environment?  Yes No Do Not Know	No	Chemicals do not persist.	Persistent chemicals, e.g., PCBs, chlorinated pesticides etc. either do not degrade or take longer to degrade, and therefore may be available to cause effects for a longer period of time. Canadian Environmental Protection Act (CEPA) classifies a chemical as persistent when it has at least one of the following characteristics: (a) in air, (i) its half-life is equal to or greater than 2 days, or (ii) it is subject to atmospheric transport from its source to a remote area; (b) in water, its half-life is equal to or greater than 182 days; (c) in sediments, its half-life is equal to or greater than 365 days; or (d) in soil, its half-life is equal to or greater than 182 days.  This list does not include metals or metalloids, which in their elemental form do not degrade. However metals and metalloids form chemical species in the environment, many of which are not readily bioavailable.	Examples of Persistent Substances are provided in attached Reference Materials	
	0				
Are there contaminants present that could cause damage to utilities and infrastructure, either now or in the future, given their location?  Yes No Do Not Know	No			Some contaminants may react or absorb into underground utilities and infrastructure. For example, organic solvents may degrade some plastics, and salts could cause corrosion of metal.	
	0				
How many different contaminant classes have representative CCME guideline exceedances?  one two to four five or more Do Not Know	two to four	Cadmium, and Selenium in groundwater.	For the purposes of the revised NCS ranking system, the following chemicals represent distinct chemical "classes": inorganic substances (including metals), volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons, heavy extractable petroleum hydrocarbons, PAHs, phenolic substances, chlorinated hydrocarbons, halogenated methanes, phthalate esters, pesticides.	Refer to the Reference Material sheet for a list of example substances that fall under the various chemical classes.	
	2				
"Known" - Score	2				
"Potential" - Score	—				

Contaminant Characteristic Total

Raw Total Scores- "Known"	16
Raw Total Scores- "Potential"	0
Raw Combined Total Scores	16
Total Score (Raw Combined / 40 * 33)	13.2

## CCME National Classification System (2008)

## (II) Migration Potential (Evaluation of contaminant migration pathways)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method of Evaluation	Notes
1. Groundwater Movement				
A. Known COPC exceedances and an operable groundwater pathway within and/or beyond the property boundary				
i) For potable groundwater environments 1) groundwater concentrations exceed background concentrations and 1X the Guideline for Canadian Drinking Water Quality (GCDWQ) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater contamination. For non-potable environments (typically urban environments with municipal services), 1) groundwater concentrations exceed 1X the applicable non-potable guidelines or modified generic guidelines (which exclude ingestion of drinking water pathway) or 2) there is known contact of contaminants with groundwater, based on physical evidence of groundwater impacts.	12	Selenium concentrations were up to 2.67 times higher than maximum acceptable concentration for drinking water (Health Canada 2008 Guidelines for Canadian Drinking Water Quality). Manganese concentration in one groundwater well exceeded drinking water aesthetic objective (Health Canada 2008). Cadmium concentrations exceeded the guideline for protection of freshwater aquatic life (CCME, 2007). Hydraulic conductivity is in the order of 10-6 m/s at the site.	Review chemical data and evaluate groundwater quality.  The evaluation method concentrates on 1) a potable or non-potable groundwater environment; the groundwater flow system and its potential to be an exposure pathway to known or potential receptors  An aquifer is defined as a geologic unit that yields groundwater in usable quantities and drinking water quality. The aquifer can currently be used as a potable water supply or could have the potential for use in the future. Non-potable groundwater environments are defined as areas that are serviced with a reliable alternative water supply (most commonly provided in urban areas); evaluation of a non-potable environment will be based on a site specific basis.  Physical evidence includes significant sheens, liquid phase contamination, or contaminant saturated soils.  Seeps and springs are considered part of the groundwater pathway.  In Arctic environments, the potability and evaluation of the seasonal active layer (above the permafrost) as a groundwater exposure pathway will be considered on a site-specific basis.	The 1992 NCS rationale evaluated the off-site migration as a regulatory issue. The exposure assessment and classification of hazards should be evaluated regardless of the property boundaries.  Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a groundwater supply source in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resources such as internet links.  Note that for potable groundwater that also daylights into a nearby surface water body, the more stringent guidelines for both drinking water and protection of aquatic life should be considered.  Selected References  <u>Potable Environments</u>  Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/ewh-scmt/vv/bp2/water-eng/doc/sup-appro/sup-appro-eng-recom/index_e.html">www.hc-sc.gc.ca/ewh-scmt/vv/bp2/water-eng/doc/sup-appro/sup-appro-eng-recom/index_e.html</a>  <u>Non-Potable Environments</u>  Canadian Water Quality Guidelines for Protection of Aquatic Life. CCME. 1999 <a href="http://www.ccme.ca">www.ccme.ca</a>  Compilation and Review of Canadian Remediation Guidelines, Standards and Regulations. Science Applications International Corporation (SAIC Canada), report to Environment Canada, January 4, 2002.
ii) Same as (i) except the information is not known but <u>strongly suspected</u> based on indirect observations.	9			
iii) Meets GCDWQ for potable environments; meets non-potable criteria or modified generic criteria (excludes ingestion of drinking water pathway) for non-potable environments or  Absence of groundwater exposure pathway (i.e., there is no aquifer (see definition at right) at the site or there is an adequate isolating layer between the aquifer and the contamination, and within 5 km of the site there are no aquatic receiving environments and the groundwater does not daylight).	0			
Score	12			
NOTE: If a score is assigned here for Known COPC Exceedances, then you can skip Part B (Potential for groundwater pathway) and go to Section 2 (Surface Water Pathway)				
B. Potential for groundwater pathway.				
a. Relative Mobility  High Moderate Low Insignificant Do Not Know			Organics Koc (L/kg)  Koc < 500 (i.e., log Koc < 2.7) Koc = 500 to 5000 (i.e., log Koc = 2.7 to 3.7) Koc = 5,000 to 100,000 (i.e., log Koc = 3.7 to 5) Koc > 100,000 (i.e., log Koc > 5)  Metals with higher mobility at acidic conditions pH < 5 pH = 5 to 6 pH > 6  Metals with higher mobility at alkaline conditions pH > 8.5 pH = 7.5 to 8.5 pH < 7.5	Reference: US EPA Soil Screening Guidance (Part 5 - Table 38)  If a score of zero is assigned for relative mobility, it is still recommended that the following sections on potential for groundwater pathway be evaluated and scored. Although the Koc of an individual contaminant may suggest that it will be relatively immobile, it is possible that, with complex mixtures, there could be enhanced mobility due to co-solvent effects. Therefore, the Koc cannot be relied on solely as a measure of mobility. An evaluation of other factors such as containment, thickness of confining layer, hydraulic conductivities and precipitation infiltration rate are still useful in predicting potential for groundwater migration, even if a contaminant is expected to have insignificant mobility based on its chemistry alone.
Score	2			
b. Presence of engineered sub-surface containment?  No containment Partial containment Full containment Do Not Know			Review the existing engineered systems or natural attenuation processes for the site and determine if full or partial containment is achieved.  Full containment is defined as an engineered system or natural attenuation processes, monitored as being effective, which provide for full capture and/or treatment of contaminants. All chemicals of concern must be contained for full containment scoring. Natural attenuation must have sufficient data, and reports cited with monitoring data to support steady state conditions and the attenuation processes. If there is no containment or insufficient natural attenuation process, this category is evaluated as high. If there is less than full containment or if uncertain, then evaluate as medium. In Arctic environments, permafrost will be evaluated, as appropriate, based on detailed evaluations, effectiveness and reliability to contain/control contaminant migration.	Someone experienced must provide a thorough description of the sources researched to determine the containment of the source at the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps, geotechnical reports or natural attenuation studies and other resources such as internet links.  Selected Resources:  United States Environmental Protection Agency (USEPA) 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater. EPA/600/R-98/128.  Environment Canada - Ontario Region - Natural Attenuation Technical Assistance Bulletin (TAB) Number 16-21.
Score	1.5			
c. Thickness of confining layer over aquifer of concern or groundwater exposure pathway  3 m or less including no confining layer or discontinuous confining layer 3 to 10 m > 10 m Do Not Know			The term "confining layer" refers to geologic material with little or no permeability or hydraulic conductivity (such as unfractured clay); water does not pass through this layer or the rate of movement is extremely slow.  Measure the thickness and extent of materials that will impede the migration of contaminants to the groundwater exposure pathway.  The evaluation of this category is based on: 1) The presence and thickness of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as drinking water sources or 2) The presence and thickness of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated zone (e.g., water table aquifer, first hydrostratigraphic unit or other groundwater pathway).	
Score	0.5			
d. Hydraulic conductivity of confining layer  >10 <sup>-6</sup> cm/s or no confining layer 10 <sup>-6</sup> to 10 <sup>-8</sup> cm/s <10 <sup>-8</sup> cm/s Do Not Know			Determine the nature of geologic materials and estimate hydraulic conductivity from published material (or use "Range of Values of Hydraulic Conductivity and Permeability" figure in the Reference Material sheet). Unfractured clays should be scored low. Silts should be scored medium. Sand, gravel should be scored high. The evaluation of this category is based on: 1) The presence and hydraulic conductivity (K) of saturated subsurface materials that impede the vertical migration of contaminants to lower aquifer units which can or are used as a drinking water source, groundwater exposure pathway or 2) The presence and permeability (K) of unsaturated subsurface materials that impede the vertical migration of contaminants from the source location to the saturated water table aquifer, first hydrostratigraphic unit or other groundwater pathway.	
Score	0.5			

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for groundwater pathway.</b>				
<b>e. Precipitation infiltration rate</b> (Annual precipitation factor x surface soil relative permeability factor) High Moderate Low Very Low None Do Not Know	0.4		<b>Precipitation</b> Refer to Environment Canada precipitation records for relevant areas. Divide annual precipitation by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score).  <b>Permeability</b> For surface soil relative permeability (i.e., infiltration) assume: gravel (1), sand (0.6), loam (0.3) and pavement or clay (0).  Multiply the surface soil relative permeability factor with precipitation factor to obtain the score or precipitation infiltration rate.	
<b>f. Hydraulic conductivity of aquifer</b> >10 <sup>-2</sup> cm/s 10 <sup>-2</sup> to 10 <sup>-4</sup> cm/s <10 <sup>-4</sup> cm/s Do Not Know	1		Determine the nature of geologic materials and estimate hydraulic conductivity of all aquifers of concern from published material (refer to "Range of Values of Hydraulic Conductivity and Permeability" in the Reference Material sheet).	
Potential groundwater pathway total	5.9			
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.		
Groundwater pathway total	12			
<b>2. Surface Water Movement</b>				
<b>A. Demonstrated migration of COPCs in surface water above background conditions</b>				
Known concentrations of surface water:  i) Concentrations exceed background concentrations and exceed CCME CWQG for protection of aquatic life, irrigation, livestock water, and/or recreation (whichever uses are applicable at the site) by >1 X; or There is known contact of contaminants with surface water based on site observations. or In the absence of CWQG, chemicals have been proven to be toxic based on site specific testing (e.g. toxicity testing; or other indicator testing of exposure).	12	Groundwater concentrations of Cadmium and Selenium were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of fresh water aquatic life. The site is approximately 200 m from the edge of a bluff beside the Peace River.	Collect all available information on quality of surface water near to site. Evaluate available data against Canadian Water Quality Guidelines (select appropriate guidelines based on local water use, e.g., recreation, irrigation, aquatic life, livestock watering, etc.). The evaluation method concentrates on the surface water flow system and its potential to be an exposure pathway. Contamination is present on the surface (above ground) and has the potential to impact surface water bodies. Surface water is defined as a water body that supports one of the following uses: recreation, irrigation, livestock watering, aquatic life.	<b>General Notes:</b> Someone experienced must provide a thorough description of the sources researched to classify the surface water body in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.  <b>Selected References:</b> CCME. 1999. Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">www.ccme.ca</a>  CCME. 1999. Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses (Irrigation and Livestock Water) <a href="http://www.ccme.ca">www.ccme.ca</a>  Health and Welfare Canada. 1992. Guidelines for Canadian Recreational Water Quality.
ii) Same as (i) except the information is not known but strongly suspected based on indirect observations.	8			
iii) Meets CWQG or absence of surface water exposure pathway (i.e., Distance to nearest surface water is > 5 km.)	0			
Score	8			
<b>NOTE: If a score is assigned here for Demonstrated Migration in Surface Water, then you can skip Part B (Potential for migration of COPCs in surface water) and go to Section 3 (Surface Soils).</b>				
<b>B. Potential for migration of COPCs in surface water</b>				
<b>a. Presence of containment</b> No containment Partial containment Full containment Do Not Know	3		Review the existing engineered systems and relate these structures to site conditions and proximity to surface water and determine if full containment is achieved: score low if there is full containment such as capping, berms, dikes; score medium if there is partial containment such as natural barriers, trees, ditches, sedimentation ponds; score high if there are no intervening barriers between the site and nearby surface water. Full containment must include containment of all chemicals.	
<b>b. Distance to Surface Water</b> 0 to <100 m 100 - 300 m >300 m Do Not Know	2		Review available mapping and survey data to determine distance to nearest surface water bodies.	

CCME National Classification System (2008)

(II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes			
<b>c. Topography</b> Contaminants above ground level and slope is steep Contaminants at or below ground level and slope is steep Contaminants above ground level and slope is intermediate Contaminants at or below ground level and slope is flat Contaminants above ground level and slope is flat Contaminants at or below ground level and slope is flat Do Not Know	1		Review engineering documents on the topography of the site and the slope of surrounding terrain. Steep slope = >50% Intermediate slope = between 5 and 50% Flat slope = < 5% Note: Type of fill placement (e.g., trench, above ground, etc.).				
<b>d. Run-off potential</b> High (rainfall run-off score > 0.8) Moderate (0.4 < rainfall run-off score < 0.8) Low (0.2 < rainfall run-off score < 0.4) Very Low (0 < rainfall run-off score < 0.2) None (rainfall run-off score = 0) Do Not Know	0.4		<b>Rainfall</b> Refer to Environment Canada precipitation records for relevant areas. Divide rainfall by 1000 and round to nearest tenth (e.g., 667 mm = 0.7 score). The former definition of annual rainfall did not include the precipitation as snow. This minor adjustment has been made. The second modification was the inclusion of permeability of surface materials as an evaluation factor. <b>Permeability</b> For infiltration assume: gravel (0), sand (0.3), loam (0.6) and pavement or clay (1). Multiply the infiltration factor with precipitation factor to obtain rainfall run off score.	Selected Sources: Environment Canada web page link <a href="http://www.msc.ec.gc.ca">www.msc.ec.gc.ca</a> Snow to rainfall conversion apply ratio of 15 (snow):1(water)			
<b>e. Flood potential</b> 1 in 2 years 1 in 10 years 1 in 50 years Do Not Know	0.5		Review published data such as flood plain mapping or flood potential (e.g., spring or mountain run-off) and Conservation Authority records to evaluate flood potential of nearby water courses both up and down gradient. Rate zero if site not in flood plain.				
Potential surface water pathway total	0.9						
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.					
Surface water pathway total	8						
<b>3. Surface Soils (potential for dust, dermal and ingestion exposure)</b>							
<b>A. Demonstrated concentrations of COPC in surface soils (top 1.5 m)</b>							
COPCs measured in surface soils exceed the CCME soil quality guideline.	12	Soil concentrations met federal and provincial guidelines.	Collect all available information on quality of surface soils (i.e., top 1.5 metres) at the site. Evaluate data against Canadian Soil Quality Guidelines. Select appropriate guidelines based on current (or proposed future) land use (i.e. agricultural, residential/parkland, commercial, or industrial), and soil texture if applicable (i.e., coarse or fine).	Selected References: CCME, 1999, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health <a href="http://www.ccme.ca">www.ccme.ca</a>			
Strongly suspected that soils exceed guidelines	9						
COPCs in surface soils does not exceed the CCME soil quality guideline or is not present (i.e., bedrock).	0						
Score	0						
NOTE: If a score is assigned here for Demonstrated Concentrations in Surface Soils, then you can skip Part B (Potential for a surface soils migration pathway) and go to Section 4 (Vapour)							
<b>B. Potential for a surface soils (top 1.5 m) migration pathway</b>							
<b>a. Are the soils in question covered?</b> Exposed Vegetated Landscaped Paved Do Not Know	4		Consult engineering or risk assessment reports for the site. Alternatively, review photographs of the site. Landscaped surface soils must include a minimum of 0.5 m of topsoil.	The possibility of contaminants in blowing snow have not been included in the revised NCS as it is difficult to assess what constitutes an unacceptable concentration and secondly, spills to snow or ice are most efficiently mitigated while freezing conditions remain.			
<b>b. For what proportion of the year does the site remain covered by snow?</b> 0 to 10% of the year 10 to 30% of the year More than 30% of the year Do Not Know	3		Consult climatic information for the site. The increments represent the full span from soils which are always wet or covered with snow (and therefore less likely to generate dust) to those soils which are predominantly dry and not covered by snow (and therefore are more likely to generate dust).				
Potential surface soil pathway total	7						
Allowed Potential score	—	Note: If a "known" score is provided, the "potential" score is disallowed.					
Soil pathway total	0						

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>4. Vapour</b>				
<b>A. Demonstrated COPCs in vapour.</b>				
Vapour has been measured (indoor or outdoor) in concentrations exceeding risk based concentrations.	12	Concentrations of volatile COPCs in the soil and groundwater were below provincial and federal guidelines.	Consult previous investigations, including human health risk assessments, for reports of vapours detected.	
Strongly suspected (based on observations and/or modelling)	9			
Vapour has not been measured and volatile hydrocarbons have not been found in site soils or groundwater.	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated COPCs in Vapour, then you can skip Part B (Potential for COPCs in vapour) and go to Section 5 (Sediment)				
<b>B. Potential for COPCs in vapour</b>				
a. Relative Volatility based on Henry's Law Constant, $H'$ (dimensionless) High ( $H' > 1.0E-1$ ) Moderate ( $H' = 1.0E-1$ to $1.0E-3$ ) Low ( $H' < 1.0E-3$ ) Not Volatile Do Not Know		Reference: US EPA Soil Screening Guidance (Part 5 - Table 38)  Provided in Attached Reference Materials		If the Henry's Law Constant for a substance indicates that it is not volatile, and a score of zero is assigned here for relative volatility, then the other three questions in this section on Potential for COPCs will be automatically assigned scores of zero and you can skip to section 5.
Score	2.5			
b. What is the soil grain size? Fine Coarse Do Not Know		Review soil permeability data in engineering reports. The greater the permeability of soils, the greater the possible movement of vapours.  Fine-grained soils are defined as those which contain greater than 50% by mass particles less than 75 µm mean diameter ( $D_{50} < 75 \mu\text{m}$ ). Coarse-grained soils are defined as those which contain greater than 50% by mass particles greater than 75 µm mean diameter ( $D_{50} > 75 \mu\text{m}$ )		
Score	3			
c. Is the depth to the source less than 10m? Yes No Do Not Know		Review groundwater depths below grade for the site.		
Score	2			
d. Are there any preferential pathways? Yes No Do Not Know		Visit the site during dry summer conditions and/or review available photographs. Where bedrock is present, fractures would likely act as preferential pathways.		Preferential pathways refer to areas where vapour migration is more likely to occur because there is lower resistance to flow than in the surrounding materials. For example, underground conduits such as sewer and utility lines, drains, or septic systems may serve as preferential pathways. Features of the building itself that may also be preferential pathways include earthen floors, expansion joints, wall cracks, or foundation perforations for subsurface features such as utility pipes, sumps, and drains.
Score	2			
Potential vapour pathway total	9.5	Note: If a "known" score is provided, the "potential" score is disallowed.		
Allowed Potential score	—			
Vapour pathway total	0			
<b>5. Sediment Movement</b>				
<b>A. Demonstrated migration of sediments containing COPCs</b>				
There is evidence to suggest that sediments originally deposited to the site (exceeding the CCME sediment quality guidelines) have migrated.	12	No COPC in soil exceeded provincial or federal guidelines.	Review sediment assessment reports. Evidence of migration of contaminants in sediments must be reported by someone experienced in this area.	Usually not considered a significant concern in lakes/marine environments, but could be very important in rivers where transport downstream could be significant.
Strongly suspected (based on observations and/or modelling)	9			
Sediments have been contained and there is no indication that sediments will migrate in future. or Absence of sediment exposure pathway (i.e., within 5 km of the site there are no aquatic receiving environments, and therefore no sediments).	0			
Score	0			
NOTE: If a score is assigned here for Demonstrated Migration of Sediments, then you can skip Part B (Potential for Sediment Migration) and go to Section 6 (Modifying Factors)				

## (II) Migration Potential (Evaluation of contaminant migration pathways)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for sediment migration</b>				
a. Are the sediments having COPC exceedances capped with sediments having no exceedances ("clean sediments")?			Review existing sediment assessments. If sediment coring has been completed, it may indicate that historically contaminated sediments have been covered over by newer "clean" sediments. This assessment will require that cores collected demonstrate a low concentration near the top and higher concentration with sediment depth.	
Yes				
No	4			
Do Not Know				
b. For lakes and marine habitats, are the contaminated sediments in shallow water and therefore likely to be affected by tidal action, wave action or propeller wash?			Review existing sediment assessments. If the sediments present at the site are in a river, select "no" for this question.	
Yes				
No	4			
Do Not Know				
c. For rivers, are the contaminated sediments in an area prone to sediment scouring?			Review existing sediment assessments. It is important that the assessment is made under worst case flows (high yearly flows). Under high yearly flows, areas which are commonly depositional	
Yes				
No	4			
Do Not Know				
Potential sediment pathway total	12			
Allowed Potential score	—			
Sediment pathway total	0	Note: If a "Known" score is provided, the "potential" score is disallowed.		
<b>6. Modifying Factors</b>				
Are there subsurface utility conduits in the area affected by contamination?			Consult existing engineering reports. Subsurface utilities can act as conduits for contaminant migration.	
Yes	No			
No		No COPC in soil exceeded provincial or federal guidelines.		
Do Not Know				
Known	0			
Potential	0			

## Migration Potential Total

Raw "known" total	20
Raw "potential" total	0.0
Raw combined total	20.0
Total (max 33)	10.3

Note: If "Known" and "Potential" scores are provided, the checklist defaults to known. Therefore, the total "Potential" Score may not reflect the sum of the individual "Potential" scores.

## CCME National Classification System (2008)

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>1. Human</b>				
<b>A. Known exposure</b>				
Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to humans as a result of the contaminated site. (Class 1 Site)	22		Where adverse effects on humans are documented, the site should be automatically designated Class 1 site (i.e., action required). There is no need to proceed through the NCS in this case. However, a scoring guideline (22) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).	Known adverse impact includes domestic and traditional food sources. Adverse effects based on food chain transfer to humans and/or animals can be scored in this category. However, the weight of evidence must show a direct link of a contaminated food source/supply and subsequent ingestion/transfer to humans. Any associated adverse effects to the environment are scored separately later in this worksheet. Someone experienced must provide a thorough description of the sources researched to evaluate and determine the quantified exposure/impact (adverse effect) in the vicinity of the contaminated site.
Same as above, but "Strongly Suspected" based on observations or indirect evidence.	10	The groundwater concentration of Selenium exceeded maximum acceptable concentration for drinking water (Health Canada 2008). The monitoring wells are located within the community, but potable water supply may come from Peace River.	This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients >1 for noncarcinogenic chemicals and incremental cancer risks that exceed acceptable levels defined by the jurisdiction for carcinogenic chemicals (for most jurisdictions this typically either >10 <sup>-6</sup> or >10 <sup>-5</sup> ). Known impacts can also be evaluated based on blood testing (e.g. blood lead >10 µg/dL) or other health based testing.	Selected References: Health Canada- Federal Contaminated Site Risk Assessment in Canada Parts 1 and 2 Guidance on Human Health Screening Level Risk Assessments <a href="http://www.hc-sc.gc.ca/ewh-emt/pubs/contam/risk/index_e.html">www.hc-sc.gc.ca/ewh-emt/pubs/contam/risk/index_e.html</a> United States Environmental Protection Agency, Integrated Risk Information System (IRIS) <a href="http://www.epa.gov/iris/">http://www.epa.gov/iris/</a>
No quantified or suspected exposures/impacts in humans.	0		This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 0.2 for non-carcinogenic chemicals and incremental lifetime cancer risks for carcinogenic chemicals that are within acceptable levels as defined by the jurisdiction (for most jurisdictions this is less than either 10 <sup>-6</sup> or 10 <sup>-5</sup> ).	
Score	10			
NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Human Exposure) and go to Section 2 (Human Exposure Modifying Factors)				
<b>B. Potential for human exposure</b>				
a) Land use (provides an indication of potential human exposure scenarios)			Review zoning and land use maps over the distances indicated. If the proposed future land use is more "sensitive" than the current land use, evaluate this factor assuming the proposed future use is in place. Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (industrial).	This is the main "receptor" factor used in site scoring. A higher score implies a greater exposure and/or exposure of more sensitive human receptors (e.g., children).
Agricultural Residential / Parkland Commercial Industrial Do Not Know				
Score	1.5			
b. Indicate the level of accessibility to the contaminated portion of the site (e.g., the potential for coming in contact with contamination)			Review location and structures and contaminants at the site and determine if there are intervening barriers between the site and humans. A low rating should be assigned to a (covered) site surrounded by a fence or in a remote location, whereas a high score should be assigned to a site that has no cover, fence, natural barriers or buffer.	
Limited barriers to prevent site access; contamination not covered Moderate access or no intervening barriers, contaminants are covered. Remote locations in which contaminants are covered. Controlled access or remote location and contaminants are covered Do Not Know				
Score	1			
<b>B. Potential for human exposure</b>				
c) Potential for intake of contaminated soil, water, sediment or foods for operable or potentially operable pathways, as identified in Worksheet II (Migration Potential).			If soils or potable groundwater are present exceeding their respective CCME guidelines, dermal contact is assumed. Exposure to surface water, non-potable groundwater or sediments exceeding their respective CCME guidelines will depend on the site. Select "Yes" if dermal exposure to surface water, non-potable groundwater or sediments is expected. For instance, dermal contact with sediments would not be expected in an active port. Only soils in the top 1.5 m are defined by CCME (2003) as surface soils. If contaminated soils are only located deeper than 1.5 m, direct contact with soils is not anticipated to be an operable contaminant exposure pathway.	Exposure via the skin is generally believed to be a minor exposure route. However for some organic contaminants, skin exposure can play a very important component of overall exposure. Dermal exposure can occur while swimming in contaminated waters, bathing with contaminated surface water/groundwater and digging in contaminated dirt, etc.
i) direct contact Is dermal contact with contaminated surface water, groundwater, sediments or soils anticipated? Yes No Do Not Know				
Score	3			
ii) inhalation (i.e., inhalation of dust, vapour)			If inhabitable buildings are on the site within 30 m of soils or groundwater exceeding their respective guidelines for volatile chemicals, there is a potential of risk to human health (Health Canada, 2004). Review site investigations for location of soil samples (having exceedances of volatile substances relative to buildings. Refer to (II) Migration Potential worksheet, 4B) Potential for VOCs in Vapour for a definition of volatility.	Exposure via the lungs (inhalation) can be a very important exposure pathway. Inhalation can be via both particulates (dust) and gas (vapours). Vapours can be a problem where buildings have been built on former industrial sites or where volatile contaminants have migrated below buildings resulting in the potential for vapour intrusion.
Vapour - Are there inhabitable buildings on the site within 30 m of soils or groundwater with volatile contamination as determined in Worksheet II (Migration Potential)? Yes No Do Not Know				Assesses the potential for humans to be exposed to vapours originating from site soils. The closer the receptor is to a source of volatile chemicals in soil, the greater the potential of exposure. Also, coarser-grained soil will convey vapour much more efficiently in the soil than finer grained material such as clays and silts.
Score	3			General Notes: Someone experienced must provide a thorough description of the sources researched to determine the presence/absence of a vapour migration and/or dust generation in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.
Dust - If there is contaminated surface soil (e.g. top 1.5 m), indicate whether the soil is fine or coarse textured. If it is known that surface soil is not contaminated, enter a score of zero. Fine Coarse Surface soil is not contaminated or absent Do Not Know Texture			Consult grain size data for the site. If soils (containing exceedances of the CCME soil quality guidelines) predominantly consist of fine material (having a median grain size of 75 microns; as defined by CCME (2008)) then these soils are more likely to generate dusts.	Selected References: Canadian Council of Ministers of the Environment (CCME), 2006, Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. PN 1332 <a href="http://www.ccme.ca">www.ccme.ca</a> Golder, 2004, Soil Vapour Intrusion Guidance for Health Canada Screening Level Risk Assessment (SLRA) Submitted to Health Canada, Burnaby, BC
Score	0			
Inhalation total	3			

CCME National Classification System (2008)

(III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for human exposure</b>				
<p>iii) Ingestion (i.e., ingestion of food items, water and soils (for children)), including traditional foods.</p> <p>Drinking Water: Choose a score based on the proximity to drinking water supply, to indicate the potential for contamination (present or future).</p> <p>0 to 100 m 100 to 300 m 300 m to 1 km 1 to 5 km No drinking water present Do Not Know</p> <p>Score</p> <p>Is an alternative water supply readily available?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Is human ingestion of contaminated soils possible?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Are food items consumed by people, such as plants, domestic animals or wildlife harvested from the contaminated land and its surroundings?</p> <p>Yes No Do Not Know</p> <p>Score</p> <p>Ingestion total</p>	<p>2</p> <p>1</p> <p>3</p> <p>1</p> <p>7</p>	<p>Note if a "Known" Human Health score is provided, the "Potential" score is disallowed.</p>	<p>Review available site data to determine if drinking water (groundwater, surface water, private, commercial or municipal supply) is known or suspected to be contaminated above Guidelines for Canadian Drinking Water Quality. If drinking water supply is known to be contaminated, some immediate action (e.g., provision of alternate drinking water supply) should be initiated to reduce or eliminate exposure.</p> <p>The evaluation of significant potential for exceedances of the water supply in the future may be based on the capture zones of the drinking water wells; contaminant travel times; computer modelling of and contaminant transport.</p> <p>If contaminated soils are located within the top 1.5 m, it is assumed that ingestion of soils is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely, and the duration is shorter. Refer to human health risk assessment reports for the site in question.</p> <p>Use human health risk assessment reports (or others) to determine if there is significant reliance on traditional food sources associated with the site. Is the food item in question going to spend a large proportion of its time at the site (e.g., large mammals may spend a very small amount of time at a small contaminated site)? Human health risk assessment reports for the site in question will also provide information on potential bioaccumulation of the COPC in question.</p>	<p><b>Selected References:</b> Guidelines for Canadian Drinking Water Quality <a href="http://www.hc-sc.gc.ca/hccp/spec/water/publications/drinking_water_quality_guidelines/index.html">www.hc-sc.gc.ca/hccp/spec/water/publications/drinking_water_quality_guidelines/index.html</a></p> <p>Drinking water can be an extremely important exposure pathway to humans. If site groundwater or surface water is not used for drinking, then this pathway is considered to be inoperable.</p> <p>Consider both wild foods such as salmon, venison, caribou, as well as agricultural sources of food items if the contaminated site is on or adjacent to agricultural land uses.</p>
Human Health Total "Potential" Score	15.5			
Allowed "Potential" Score	---			
<b>2. Human Exposure Modifying Factors</b>				
<p>a) Strong reliance of local people on natural resources for survival (i.e., food, water, shelter, etc.)</p> <p>Yes No Do Not Know</p> <p>Known Potential</p> <p>Raw Human "Known" total Raw Human "Potential" total Raw Human Exposure Total Score Human Health Total (max 22)</p>	<p>Yes</p> <p>6 ---</p> <p>18 0 10 18.0</p>	<p>Potable water supply is local, but either from river or wells; Strong reliance of community on local foods which include fish from Peace River.</p>		
<b>3. Ecological</b>				
<b>A. Known exposure</b>				
<p>Documented adverse impact or high quantified exposure which has or will result in an adverse effect, injury or harm or impairment of the safety to terrestrial or aquatic organisms as a result of the contaminated site.</p> <p>Score</p> <p>Same as above, but "Strongly Suspected" based on observations or indirect evidence.</p> <p>Score</p> <p>No quantified or suspected exposures/impacts in terrestrial or aquatic organisms</p> <p>Score</p>	<p>18</p> <p>12</p> <p>0</p> <p>12</p> <p>12</p>	<p>Monitoring well concentrations of Cadmium and Selenium were higher than CCME 2007 Canadian Water Quality Guidelines for the protection of freshwater aquatic life and the site is located on a bluff adjacent to the Peace River.</p>	<p>Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are deemed to be severe, the site may be categorized as class one (i.e., a priority for remediation or risk management), regardless of its numerical total NCS score. For the purpose of application of the NCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction. If ecological effects are determined to be severe and an automatic Class 1 is assigned, there is no need to proceed through the NCS. However, a scoring guideline (18) is provided in case a numerical score for the site is still desired (e.g., for comparison with other Class 1 sites).</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients &gt;1. Alternatively, known impacts can also be evaluated based on a weight of evidence assessment involving a combination of site observations, tissue testing, toxicity testing and quantitative community assessments. Scoring of adverse effects on individual rare or endangered species will be completed on a case-by-case basis with full scientific justification.</p> <p>This category can be based on the outcomes of risk assessments and applies to studies which have reported Hazard Quotients of less than 1 and no other observable or measurable sign of impacts. Alternatively, it can be based on a combination of other lines of evidence showing no adverse effects, such as site observations, tissue testing, toxicity testing and quantitative community assessments.</p>	<p>CCME, 1999: Canadian Water Quality Guidelines for the Protection of Aquatic Life <a href="http://www.ccme.ca">http://www.ccme.ca</a> CCME, 1999: Canadian Water Quality Guidelines for the Protection of Agricultural Water Use <a href="http://www.ccme.ca">http://www.ccme.ca</a> Genative receptors- review: Canadian Council on Ecological Areas <a href="http://www.ccea.org">http://www.ccea.org</a></p> <p>Ecological effects should be evaluated at a population or community level, as opposed to at the level of individuals. For example, population-level effects could include reduced reproduction, growth or survival in a species. Community-level effects could include reduced species diversity or relative abundances. Further discussion of ecological assessment endpoints is provided in <i>Framework for Ecological Risk Assessment: General Guidance</i> (CCME 1996).</p> <p><b>Notes:</b> Someone experienced must provide a thorough description of the sources researched to classify the environmental receptors in the vicinity of the contaminated site. This information must be documented in the NCS Site Classification Worksheet including contact names, phone numbers, e-mail correspondence and/or reference maps/reports and other resource such as internet links.</p>
<p>NOTE: If a score is assigned here for Known Exposure, then you can skip Part B (Potential for Ecological Exposure) and go to Section 4 (Ecological Exposure Modifying Factors)</p>				

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>a) Terrestrial</b> <b>i) Land use</b> Agricultural (or Wild lands) Residential/Parkland Commercial Industrial Do Not Know Score	1.5		Review zoning and land use maps. If the proposed future land use is more intensive than the current land use, evaluate this factor assuming the proposed future use is in place (indicate in the worksheet that future land use is the consideration).  Agricultural land use is defined as uses of land where the activities are related to the productive capability of the land or facility (e.g., greenhouse) and are agricultural in nature, or activities related to the feeding and housing of animals as livestock. Wild lands are grouped with agricultural land due to the similarities in receptors that would be expected to occur there (e.g., herbivorous mammals and birds) and the similar need for a high level of protection to ensure ecological functioning. Residential/Parkland land uses are defined as uses of land on which dwelling on a permanent, temporary, or seasonal basis is the activity (residential), as well as uses on which the activities are recreational in nature and require the natural or human designed capability of the land to sustain that activity (parkland). Commercial/Industrial land uses are defined as land on which the activities are related to the buying, selling, or trading of merchandise or services (commercial), as well as land uses which are related to the production, manufacture, or storage of materials (Industrial).	
<b>ii) Uptake potential</b> Direct Contact - Are plants and/or soil invertebrates likely exposed to contaminated soils at the site? Yes No Do Not Know Score	1		If contaminated soils are located within the top 1.5 m, it is assumed that direct contact of soils with plants and soil invertebrates is an operable exposure pathway. Exposure to soils deeper than 1.5 m is possible, but less likely.	
<b>iii) Ingestion (i.e., wildlife or domestic animals ingesting contaminated food items, soils or water)</b> Are terrestrial animals likely to be ingesting contaminated water at the site? Yes No Do Not Know Score  Are terrestrial animals likely to be ingesting contaminated soils at the site? Yes No Do Not Know Score  Can the contamination identified bioaccumulate? Yes No Do Not Know Score  Distance to sensitive terrestrial ecological area 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score	1.5	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.	Refer to an Ecological Risk Assessment for the site. If there is contaminated surface water at the site, assume that terrestrial organisms will ingest it.  Refer to an Ecological Risk Assessment report. Most animals will co-ingest some soil while eating plant matter or soil invertebrates.  Bioaccumulation of contaminants within food items is considered possible if: 1) The Log(Kow) of the contaminant is greater than 4 (as per the chemical characteristics worksheet) and concentrations in soils exceed the most conservative CCME soil quality guideline for the intended land use, or 2) The contaminant in collected tissue samples exceeds the Canadian Tissue Residue Guidelines. It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor located within this area of the site will be subject to further evaluations. It is also considered that any environmental receptor located greater than 5 km will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link <a href="http://www.ccea.org">www.ccea.org</a>	Environmental receptors include: local, regional or provincial species of interest or significance; arctic environments (on a site specific basis); nature preserves, habitats for species at risk, sensitive forests, natural parks or forests.
Raw Terrestrial Total Potential Allowed Terrestrial Total Potential	7 —			
<b>B. Potential for ecological exposure (for the contaminated portion of the site)</b>				
<b>b) Aquatic</b> <b>i) Classification of aquatic environment</b> Sensitive Typical Not Applicable (no aquatic environment present) Do Not Know Score	2		"Sensitive aquatic environments" include those in or adjacent to shellfish or fish harvesting areas, marine parks, ecological reserves and fish migration paths. Also includes those areas deemed to have ecological significance such as for fish food resources, spawning areas or having rare or endangered species.  "Typical aquatic environments" include those in areas other than those listed above.	
<b>ii) Uptake potential</b> Does groundwater daylighting to an aquatic environment exceed the CCME water quality guidelines for the protection of aquatic life at the point of contact? Yes No (or Not Applicable) Do Not Know Score  Distance from the contaminated site to an important surface water resource 0 to 300 m 300 m to 1 km 1 to 5 km > 5 km Do Not Know Score	1.5		Groundwater concentrations of contaminants at the point of contact with an aquatic receiving environment can be estimated in three ways: 1) by comparing collected nearshore groundwater concentrations to the CCME water quality guidelines (this will be a conservative comparison, as contaminant concentrations in groundwater often decrease between nearshore wells and the point of discharge). 2) by conducting groundwater modeling to estimate the concentration of groundwater immediately before discharge. 3) by installing water samplers, "peepers", in the sediments in the area of daylighting groundwater.  It is considered that within 300 m of a site, there is a concern for contamination. Therefore an environmental receptor or important water resource located within this area of the site will be subject to further evaluation. It is also considered that any environmental receptor located greater than 5 km away will not be a concern for evaluation. Review Conservation Authority mapping and literature including Canadian Council on Ecological Areas link: <a href="http://www.ccea.org">www.ccea.org</a> .  Bioaccumulation of food items is possible if:	Environmental receptors include: local, regional or provincial species of interest or significance, sensitive wetlands and rivers and other aquatic environments.

## (III) Exposure (Demonstrates the presence of an exposure pathway and receptors)

## Test Site

Definition	Score	Rationale for Score (document any assumptions, reports, or site-specific information; provide references)	Method Of Evaluation	Notes
Are aquatic species (i.e., forage fish, invertebrates or plants) that are consumed by predatory fish or wildlife consumers, such as mammals and birds, likely to accumulate contaminants in their tissues? Yes No Do Not Know	1		1) The Log(K <sub>ow</sub> ) of the contaminant is greater than 4 (as per the chemical characteristics work sheet) and concentrations in sediments exceed the CCME ISQGs. 2) The contaminant in collected tissue samples exceeds the CCME tissue quality guidelines.	
Raw Aquatic Total Potential Allowed Aquatic Total Potential	5.5 ---	Note if a "Known" Ecological Effects score is provided, the "Potential" score is disallowed.		
<b>4. Ecological Exposure Modifying Factors</b>				
a) Known occurrence of a species at risk.  Is there a potential for a species at risk to be present at the site? Yes No Do Not Know	Do Not Know 1	Not known if a species at risk is present at the site.	Consult any ecological risk assessment reports. If information is not present, utilize on-line databases such as Eco Explorer, Regional, Provincial (Environment Ministries), or Federal staff (Fisheries and Oceans or Environment Canada) should be able to provide some guidance.	Species at risk include those that are extirpated, endangered, threatened, or of special concern. For a list of species at risk, consult Schedule 1 of the federal Species at Risk Act ( <a href="http://www.sarregistry.gc.ca/species/schedule_e.cfm?lang=fr">http://www.sarregistry.gc.ca/species/schedule_e.cfm?lang=fr</a> ). Many provincial governments may also provide regionally applicable lists of species at risk. For example, in British Columbia, consult: BCOWAP, 2005. Endangered Species and Ecosystems in British Columbia. Provincial red and blue lists. Ministry of Sustainable Resource Management and Water, Land and Air Protection ( <a href="http://rsmwww.gov.bc.ca/risk/red-blue.htm">http://rsmwww.gov.bc.ca/risk/red-blue.htm</a> )
b) Potential impact of aesthetics (e.g., enrichment of a lake or tainting of food flavor).  Is there evidence of aesthetic impact to receiving water bodies? Yes No Do Not Know	Do Not Know 1	Peace River has high flow. Do not know if the aesthetics will be impacted.	Documentation may consist of environmental investigation reports, press articles, petitions or other records.  Examples of olfactory change can include the smell of a COPC or an increase in the rate of decay in an aquatic habitat.  A distinct increase of plant growth in an aquatic environment may suggest enrichment. Nutrients e.g., nitrogen or phosphorus releases to an aquatic body can act as a fertilizer.  Some contaminants can result in a distinctive change in the way food gathered from the site tastes or smells.	This item will require some level of documentation by user, including contact names, addresses, phone numbers, e-mail addresses. Evidence of changes must be documented, please attach copy of report containing relevant information.
Is there evidence of olfactory impact (i.e., unpleasant smell)? Yes No Do Not Know	No 0 ---			
Is there evidence of increase in plant growth in the lake or water body? Yes No Do Not Know	No 0 ---			
Is there evidence that fish or meat taken from or adjacent to the site smells or tastes different? Yes No Do Not Know	Do Not Know 1			
Ecological Modifying Factors Total - Known Ecological Modifying Factors Total - Potential Raw Ecological Total - Known Raw Ecological Total - Potential Raw Ecological Total Ecological Total (Max 18)	0 3 12 3 15 15.0			
<b>5. Other Potential Contaminant Receptors</b>				
a) Exposure of permafrost (leading to erosion and structural concerns).  Are there improvements (roads, buildings) at the site dependant upon the permafrost for structural integrity? Yes No Do Not Know	No 0 ---		Consult engineering reports, site plans or air photos of the site. When permafrost melts, the stability of the soil decreases, leading to erosion. Human structures, such as roads and/or buildings are often dependent on the stability that the permafrost provides.	Plants and lichens provide a natural insulating layer which will help prevent thawing of the permafrost during the summer. Plants and lichens may also absorb less solar radiation. Solar radiation is turned into heat which can also cause underlying permafrost to melt.
Is there a physical pathway which can transport soils released by damaged permafrost to a nearby aquatic environment? Yes No Do Not Know	Do Not Know 1	Do not know.	Melting permafrost leads to a decreased stability of underlying soils. Wind or surface run-off erosion can carry soils into nearby aquatic habitats. The increased soil loadings into a river can cause an increase in total dissolved solids and a resulting decrease in aquatic habitat quality. In addition, the erosion can bring contaminants from soils to aquatic environments.	
Other Potential Receptors Total - Known Other Potential Receptors Total - Potential	0 1			
<b>Exposure Total</b>				
Raw Human Health + Ecological Total - Known Raw Human Health + Ecological Total - Potential Raw Total Exposure Total (max 34)	28 4 32 23.7	Only includes "Allowed potential" - if a "Known" score was supplied under a given category then the "Potential" score was not included.		

# **CCME National Classification System (2008)** **Score Summary**

Scores from individual worksheets are tallied in this worksheet.  
Refer to this sheet after filling out the revised NCS completely.

I. Contaminant Characteristics	Known	Potential
1. Residency Media	2	---
2. Chemical Hazard	8	---
3. Contaminant Exceedance Factor	2	---
4. Contaminant Quantity	2	---
5. Modifying Factors	2	---
<b>Raw Total Score</b>	<b>16</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>16</b>	
<b>Adjusted Total Score (Raw Total / 40 * 33)</b>	<b>13.2</b>	(max 33)

II. Migration Potential	Known	Potential
1. Groundwater Movement	12	---
2. Surface Water Movement	8	---
3. Soil	0	---
4. Vapour	0	---
5. Sediment Movement	0	---
6. Modifying Factors	0	0
<b>Raw Total Score</b>	<b>20</b>	<b>0</b>
<b>Raw Total Score (Known + Potential)</b>	<b>20</b>	
<b>Adjusted Total Score (Raw Total / 64 * 33)</b>	<b>10.3</b>	(max 33)

III. Exposure	Known	Potential
1. Human Receptors		
A. Known Impact	10	
B. Potential		
a. Land Use		---
b. Accessibility		---
c. Exposure Route		
i. Direct Contact		---
ii. Inhalation		---
iii. Ingestion		---
2. Human Receptors Modifying Factors	6	---
<b>Raw Total Human Score</b>	<b>16</b>	<b>0</b>
<b>Raw Total Human Score (Known + Potential)</b>	<b>16</b>	
<b>Adjusted Total Human Score</b>	<b>16.0</b>	(maximum 22)
3. Ecological Receptors		
A. Known Impact	12	
B. Potential		
a. Terrestrial		---
b. Aquatic		---
4. Ecological Receptors Modifying Factors	0	3
<b>Raw Total Ecological Score</b>	<b>12</b>	<b>3</b>
<b>Raw Total Ecological Score (Known + Potential)</b>	<b>15</b>	
<b>Adjusted Total Ecological Score</b>	<b>15.0</b>	(maximum 18)
5. Other Receptors	0	1
<b>Total Other Receptors Score (Known + Potential)</b>	<b>1</b>	
<b>Total Exposure Score (Human + Ecological + Other)</b>	<b>32.0</b>	
<b>Adjusted Total Exposure Score (Total Exposure / 46 * 34)</b>	<b>23.7</b>	(max 34)

<b>Site Score</b>	
Test Site	
Site Letter Grade	A
Certainty Percentage	100%
% Responses that are "Do Not Know"	-59%
<b>Total NCSCS Score for site</b>	<b>47.2</b>
<b>Site Classification Category</b>	<b>3</b>

## **Site Classification Categories\*:**

- Class 1 - High Priority for Action (Total NCS Score >70)
- Class 2 - Medium Priority for Action (Total NCS Score 50 - 69.9)
- Class 3 - Low Priority for Action (Total NCS Score 37 - 49.9)
- Class N - Not a Priority for Action (Total NCS Score <37)
- Class INS - Insufficient Information (>15% of responses are "Do Not Know")

\* NOTE: The term "action" in the above categories does not necessarily refer to remediation, but could also include risk assessment, risk management or further site characterization and data collection.

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

<b>Subject Site:</b>	<b>Test Site</b>	
Civic Address: (or other description of location)	On the north shore of the Peace River, approximately 220 km east of High Level, Alberta, in Wood Buffalo National Park	
Site Common Name : (if applicable)	Community of Garden River	
Site Owner or Custodian: (Organization and Contact Person)	Parks Canada Agency	
Legal description or metes and bounds:	N 58°42.5', W113°52.0'	
Approximate Site area:		
PID(s) : (or Parcel Identification Numbers [PIN] if untitled Crown land)	Church Historic AST	
Centre of site: (provide latitude/longitude or UTM coordinates)	Latitude:	_____ degrees _____ min _____ secs
	Longitude:	_____ degrees _____ min _____ secs
	UTM Coordinate:	Northing Easting
Site Land Use:	Current:	Residential
	Proposed:	
<b>Site Plan</b>	To delineate the bounds of the Site a site plan <b>MUST</b> be attached. The plan must be drawn to scale indicating the boundaries in relation to well-defined reference points and/or legal descriptions. Delineation of the contamination should also be indicated on the site plan.	
Provide a brief description of the Site:		
<p>The Church Historic AST are is located north of the community of Garden River (see attached Site Plan).</p>		

**CCME National Classification System for Contaminated Sites (2008)**  
**Summary of Site Conditions**

Affected media and  
Contaminants of Potential  
Concern (COPC):

All measured soil concentrations of COPC met federal and provincial guidelines.

Please fill in the "letter" that best describes the level of information available for the site being assessed:

Site Letter Grade

**A**

If letter grade is F, do not continue, you must have a minimum of a Phase I Environmental Site Assessment or equivalent.

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**CCME National Classification System for Contaminated Sites (2008)**  
**Pre-Screening Checklist**

Question	Response (yes / no)	Comment
1. Are <b>Radioactive material, Bacterial contamination or Biological hazards</b> likely to be present at the site?	<input type="checkbox"/> No	If yes, do not proceed through the NCSCS. Contact applicable regulatory agency immediately.
2. Are there <b>no contamination exceedances</b> (known or suspected)? Determination of exceedances may be based on: 1) CCME environmental quality guidelines; 2) equivalent provincial guidelines/standards if no CCME guideline exists for a specific chemical in a relevant medium; or 3) toxicity benchmarks derived from the literature for chemicals not covered by CCME or provincial guidelines/standards.	<input type="checkbox"/> Yes	If yes (i.e., there are no exceedances), do not proceed through the NCSCS.
3. Have <b>partial/incompleted or no environmental site investigations</b> been conducted for the Site?	<input type="checkbox"/> No	If yes, do not proceed through the NCSCS.
4. Is there direct and significant evidence of <b>impacts to humans</b> at the site, or off-site due to migration of contaminants from the site?	<input type="checkbox"/> No	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated (e.g., for comparison with other Class 1 sites).
5. Is there direct and significant evidence of <b>impacts to ecological receptors</b> at the site, or off-site due to migration of contaminants from the site?	<input type="checkbox"/> Yes	Some low levels of impact to ecological receptors are considered acceptable, particularly on commercial and industrial land uses. However, if ecological effects are considered to be severe, the site may be categorized as Class 1, regardless of the numerical total NCSCS score. For the purpose of application of the NCSCS, effects that would be considered severe include observed effects on survival, growth or reproduction which could threaten the viability of a population of ecological receptors at the site. Other evidence that qualifies as severe adverse effects may be determined based on professional judgement and in consultation with the relevant jurisdiction.
6. Are there indicators of significant <b>adverse effects in the exposure zone</b> (i.e., the zone in which receptors may come into contact with contaminants)? Some examples are as follows: -Hydrocarbon sheen or NAPL in the exposure zone -Severely stressed biota or devoid of biota; -Presence of material at ground surface or sediment with suspected high concentration of contaminants such as ore tailings, sandblasting grit, slag, and coal tar.	<input type="checkbox"/> No	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, regardless of the total score obtained should one be calculated (e.g., for comparison with other Class 1 sites).
7. Do measured concentrations of volatiles or unexploded ordnances represent an <b>explosion hazard</b> ?	<input type="checkbox"/> No	If yes, automatically rate the site as Class 1, a priority for remediation or risk management, and do not continue until the safety risks have been addressed. Consult your jurisdiction's occupational health and safety guidance or legislation on explosive hazards and measurement of lower explosive limits.

If none of the above applies, proceed with the NCSCS scoring.

# APPENDIX H

## APPENDIX H GEO-ENVIRONMENTAL REPORT – GENERAL CONDITIONS

## GEO-ENVIRONMENTAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these “General Conditions”.

### 1.0 USE OF REPORT

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

### 2.0 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed on site at the time of EBA's investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

### 2.1 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of this report, EBA may have relied on information provided by persons other than the client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

### 3.0 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

1. With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort;
2. With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

#### 4.0 JOB SITE SAFETY

EBA is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of EBA personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

#### 5.0 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

#### 6.0 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

#### 7.0 EMERGENCY PROCEDURES

The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect EBA employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay EBA for any expenses incurred as a result of such discoveries and to compensate EBA through payment of additional fees and expenses for time spent by EBA to deal with the consequences of such discoveries.

#### 8.0 NOTIFICATION OF AUTHORITIES

The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

#### 9.0 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

#### 10.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.