Appendix 1 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Cyanide Species in Water

This analysis is carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable (SAD) cyanide and weak acid dissociable (WAD) cyanide are determined by sample distillation and analysis using the chloramine-T colourimetric method. Cyanate is determined by the cyanate hydrolysis method using an ammonia selective electrode. Thiocyanate is determined by the ferric nitrate colourimetric method.

Recommended Holding Time:

Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 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 procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ALS "Collection & Sampling Guide"

Metals in Seawater

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis of the seawater is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Trace Metals in Seawater by SPR-IDA Chelation

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS) and/or routine atomic absorption spectrophotometry techniques (EPA 7000 series).

Appendix 1 - METHODOLOGY - Continued

Recommended Holding Time:

Sample/Extract:	6 months
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

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End of Report

CHEMICAL ANALYSIS REPORT

Date:	August 11, 2004
ALS File No.	U6161
Report On:	Polaris Water Analysis
Report To:	**Azimuth Consulting Group Inc.** 218 - 2902 West Broadway Vancouver, BC V6K 2G8
Attention:	**Mr. Randy Baker**
Received:	July 24, 2004

ALS ENVIRONMENTAL
per:

Andre Langlais, M.Sc. - Project Chemist
Heather A. Ross-Easton, B.Sc. - Project Chemist

File No. U6161

RESULTS OF ANALYSIS - Water

Sample ID		G-Creek_ Gen_ 072004	Tracer Dye	Injectn. Dye	G-Creek_ Rhod_ 072004
Sample Date		04-07-20	04-07-20	04-07-20	04-07-20
ALS ID		*1*	*2*	*3*	*4*
Physical Tests					
pH		7.86	-	-	-
Salinity	o/oo	3.3	-	-	-
Total Suspended Solids		<3.0	-	-	-
Cyanides					
Total Cyanide	CN	<0.0050	-	-	-
Total Metals					
Aluminum	T-Al	<0.20	-	-	-
Arsenic	T-As	<0.0020	-	-	-
Cadmium	T-Cd	0.000109	-	-	-
Copper	T-Cu	0.000427	-	-	-
Iron	T-Fe	<0.010	-	-	-
Lead	T-Pb	0.000837	-	-	-
Molybdenum	T-Mo	<0.0050	-	-	-
Nickel	T-Ni	0.000876	-	-	-
Zinc	T-Zn	0.0435	-	-	-
Miscellaneous					
Rhodamine			see below[1]	76900	0.0380
Radiological Parameters					
Radium-226[2,3]		<0.0050	-	-	-

Results are expressed as milligrams per litre except where noted.
< = Less than the detection limit indicated.
[1] This sample was used to prepare calibration standards
[2] Result is expressed as Becquerels per litre (Bq/L). This analysis is
[3] subcontracted to SRC, Saskatoon.

File No. U6161

Appendix 1 - METHODOLOGY

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:
Sample: 2 hours
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:
Sample: 7 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Cyanide Species in Water

This analysis is carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable (SAD) cyanide and weak acid dissociable (WAD) cyanide are determined by sample distillation and analysis using the chloramine-T colourimetric method. Cyanate is determined by the cyanate hydrolysis method using an ammonia selective electrode. Thiocyanate is determined by the ferric nitrate colourimetric method.

Recommended Holding Time:

Appendix 1 - METHODOLOGY - Continued

Sample: 14 days
Reference: APHA
For more detail see ALS Environmental "Collection & Sampling Guide"

Metals in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 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 procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ALS "Collection & Sampling Guide"

Metals in Seawater

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis of the seawater is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Trace Metals in Seawater by SPR-IDA Chelation

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995, and with procedures adapted from Cetac Technologies Incorporated. A suspended particulate resin (SPR), consisting of immobilized iminodiacetate (IDA) on a divinylbenzene polymer, is used to chelate and preconcentrate metals in seawater. Instrumental analysis is by inductively coupled plasma mass spectrometry (ICPMS) and/or routine atomic absorption spectrophotometry techniques (EPA 7000 series).

Appendix 1 - METHODOLOGY - Continued

Recommended Holding Time:

Sample/Extract:	6 months
Reference:	Puget

For more detail see ALS Environmental "Collection & Sampling Guide"

Rhodamine WT in Water

This analysis is carried out using a Waters Model 470 Scanning Fluorescence Detector. Prior to analysis, samples are warmed to room temperature and then an aliquot of the sample is filtered through a 0.45 um cellulose acetate filter to remove some of the potential interferences. After filtration, a portion of the sample, typically 500 uL, is injected into the fluorescence detector. An excitation wavelength of 556 nm is used and fluorescence is measured at an emission wavelength of 580 nm.

Please note the following: This method is non-selective and subject to many interferences. Typical interferences may include; pH, salinity, temperature, suspended matter, photochemical degradation of Rhodamine WT, and some types of algae pigments. Detection for this analysis is not chromatographic; therefore, anything present in the sample that fluoresces at the same wavelength as Rhodamine WT will be detected and reported as Rhodamine WT. Results reported using this method should be considered semi-quantitative in nature.

Recommended Holding Time:
Sample: None Available
Reference: None Available
For more detail see ALS Environmental "Collection & Sampling Guide"

Results contained within this report relate only to the samples as submitted.

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End of Report

EVS environment consultants

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Canada V7P 2R4
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Tel: 604-986-4331
Info@evsenvironment.com
www.evsenvironment.com

FAX TRANSMITTAL SHEET

TO:	Cheryl Mackintosh	**DATE:**	August 9, 2004
	Azimuth Consulting Group	**PROJECT No.:**	09-0302-54
	218 – 2902 West Broadway	**W.O. No.:**	0400342,348
	Vancouver, BC	**FAX No.:**	604-739-9070
	V6K 2G8	**TEL No.:**	604-730-1220
SENT BY:	Rachel DeWynter	**# PAGES (incl. cover):**	One (1)

Re: Interim data for the 96-h rainbow trout and 48-h *Daphnia magna* LC50 toxicity tests performed on the sample identified as G-Creek acute 270704 (collected July 27, 2004).

Sample ID	Sample Collection Date	LC50 (95% Confidence Limits) [%vol/vol]	
		96-h Rainbow Trout	48-h *Daphnia magna*
G-Creek acute 270704	July 27, 2004 (09:30h)	> 100	> 100

Please note that these are draft results and are subject to a QA/QC review. A complete report will follow by mail. Should you have any questions, please contact Edmund Canaria or myself at 604-986-4331.

Thank you,

Jennifer Young, B.Sc
Bioassay Test Supervisor – Cladoceran Team
jyoung@evsenvironment.com

RSD

Environment Canada Environnement Canada

Environment Canada
Environmental Protection Branch
Prairie and Northern Region
Northern Division
P.O. Box 1870 Iqaluit, Nunavut
X0A 0H0

PROTECTED
WITHOUT PREJUDICE

11 January 200~~4~~5

Occurrence Files: 4408-2004-09-13-001
4408-2004-12-01-001

Mr. David Thompson
Deputy Chairman and CEO
Teck Cominco Metals Ltd.
Suite 600 – 200 Burrard Street
Vancouver, British Columbia
V6C 3L9

and

Mr. Bruce Donald
Manager of Operations
Teck Cominco Metals Ltd.
Polaris Mine Operation
Polaris, Little Cornwallis Island, Nunavut
X0A 0Y0

Dear Sirs;

FISHERIES ACT - Metal Mining Effluent Regulations (MMER)

I wish to acknowledge your letter of 12 August 2004 advising Environment Canada of the details surrounding the exceedance of the MMER Total Suspend Solid limits at the Polaris Mine site on July 07th 2004. I also acknowledge you timely submission of the 3rd quarter MMER report dated 17 November 2004 as required by the regulations.

Upon review of the above mentioned supporting documentation supplied by your company no further action will be pursued of this alleged violation. For more information or to comment, on the alleged facts, contained in this letter, please contact the undersigned. Your comments will be considered and, where appropriate, a response provided. Any comments you make, as well as Environment Canada's response, will be retained and filed with this letter in Environment Canada's records.

Respectfully,

Sidney F. Bruinsma
Enforcement / Emergencies Officer, Nunavut
Northern Division, Environmental Protection Branch
ENVIRONMENT CANADA
Box 1870, Iqaluit, Nunavut X0A 0H0
Ph. 867-975-4644
Fax 867-975-4645
sid.bruinsma@ec.gc.ca

cc: Craig Broome
Head of Enforcement, Northern Division
Environmental Protection Branch
Prairie and Northern Region
Yellowknife, NWT

FILE NOTE

Bruce Donald,
Reclamation Manager
Environment and Corporate Affairs
Teck Cominco Limited

teckcominco

Date: **June 23, 2004**

Subject: **Polaris Mine - Discovery of Liquid Petroleum Hydrocarbons During Remediation of Maintenance Facilities**

The following is a summary of information related to the discovery of liquid petroleum hydrocarbon within an area of known soil hydrocarbon contamination during the demolition and reclamation program at the Polaris Mine site at the Polaris Mine on Little Cornwallis Island, Nunavut.

Background:

The Polaris Mine has been in operation since 1982. The mine has three metal Foldaway buildings located immediately adjacent to each other where mobile equipment has been stored and maintained over the years when the mine was in operation. The mine is now closed and environmental assessments conducted as part of closure planning identified hydrocarbon contamination of the soils in the area surrounding these three buildings. The buildings are currently being demolished and 2 of the 3 buildings have been removed. Remediation of hydrocarbon contaminated soils by excavation has been completed at the first of the buildings being demolished. Remediation of the contaminated soils at the second building was approximately 20% complete when water with liquid petroleum hydrocarbons were discovered under the foot print of the building. This discovery was made on June 19, 2004.

Source of Hydrocarbons:

A specific time and source of the hydrocarbon leaks and/or spills can not be identified due to the long term use of this area. There are no apparent current or on-going sources of leaks in the area.

Volume Estimation:

The area of contaminated soils in total in the area of the three buildings is approximately 3,000 square metres. Drilling of the area indicated that the contaminated soils extend approximately 3 metres deep. The liquid hydrocarbon products were floating on water in a puddle in the excavation under Foldaway #1. The area of ponding was approximately 9 square metres. The water/oil mixture was recovered by pumping it into barrels and a larger tank. As the water was pumped, additional volumes seeped from surrounding soils. All of the water and free product have now been recovered. Approximately 2,100 liters of water and 400 liters of hydrocarbons were recovered from this area. Observations indicated that heat from the buildings depressed the active layer in this area creating a basin that contained the hydrocarbon limiting both the vertical and horizontal extent of contamination.

Remedial Action:

The contaminated soils in the area were being actively being remediated when the liquid petroleum products were discovered. Upon completion of recovery of the hydrocarbon/water mixture, the surrounding contaminated soils are being excavated. Excavation of the contaminated soils surrounding this building has continued on a continuous (24 hours per day) basis and is nearing completion. No further liquid petroleum products have been in evidence since. Excavation of contaminated soils related to this building is estimated to be 75% complete at this time. The last remaining Foldaway building will be demolished during the next two to three weeks and reclamation of this area will be complete within a maximum of three weeks. Recovery of the hydrocarbon contaminated soils are being conducted under the guidance of a team of independent environmental consultants who are located on-site. Upon completion of remediation of this area, confirmatory sampling will be undertaken to verify remedial efforts meet the remedial targets at the site as approved in the mine's Decommissioning and Reclamation Plan. A formal report presenting the confirmatory sampling data will be prepared and presented as part of the regular project reporting.

Gartner Lee Limited

memorandum

to: Bruce Donald, P.Eng, Reclamation Manager, Teck Cominco Limited
from: Brenda Bolton
date: March 2, 2005
ref: 40-137
re: **2004 Concentrate Shed Sampling Results**

The former concentrate storage shed area was located south of the process barge and shiploading dock. The metal-clad, steel frame shed was used to store lead and zinc concentrates produced in the mill through the winter for shipment to market in the short summer shipping season. The concentrate storage shed was subdivided to provide storage capacity for 40,000 tonnes lead concentrate at the north end and 175,000 tonnes zinc concentrate at the south end. The concentrate load-out conveyors were located along the west wall of the concentrate storage shed and fed the shiploader at the loading dock. The building was demolished in August 2003.

Removal of small quantities of residual soil impacted with lead and zinc concentrate from within the fractured limestone bedrock by the remedial methods originally proposed proved impractical. Therefore, GLL investigated alternative methods to limit the contact of this material to human or ecological receptors and found that the best alternative was to isolate the residual concentrate dust under a durable cover of sand and gravel, a soil cover. The placement of the soil cover meets the principal objective of the original remediation plan, which is to eliminate the exposure pathways of the lead and zinc concentrate to human and ecological receptors at the Polaris Mine site.

Following the demolition and attempted remediation of the Concentrate Shed footprint, the area was used for storage of machinery and pallets of assorted fluids. On June 10, 2004 at 3:15 pm, an employee of Teck Cominco noted that an area surrounding a pallet of oil was saturated. An approximate volume of twenty two cubic meters was removed the same day by 9:00 pm. The dimensions of the excavation were approximately 6 meters by 4 meters, and 0.5 meters deep.

A representative of Gartner Lee Ltd. examined the excavated area on June 11, 2004. There was no sheen observed on a puddle located in the excavated depression, nor was there any detectable odour. Two samples were collected in accordance with standard GLL and TCL sampling procedures and protocols – one composite from the wall of the excavation, and one composite sample from the floor of the excavation. Both samples were sent to Analytical Laboratory Services (ALS) of Vancouver BC, in clean Teflon lined jars to confirm the presence and nature of hydrocarbon compounds.

Analytical laboratory confirmatory results for hydrocarbons are summarized in Table 1, along with the approved Polaris Mine SQROs for hydrocarbons. All samples sent to the analytical laboratory confirmed Extrable Petroleum Hydrocarbons (EPH) below the soil quality remediation objective (SQRO) of 1,000 mg/kg. Based on the laboratory results, no further remedial excavation was required.

Yours very truly,
GARTNER LEE LIMITED

Brenda Bolton
Environmental Geologist

Arlene Laudrum, P.Geol.
Remediation Supervisor, Polaris Mine Project

Rob Dickin.
Principal

Table 1. Utilidor Hydrocarbon Sample Results

Gartner Lee	FEDERAL CCME GUIDELINES[a]		Polaris Mine Soil Quality Remediation Objective	Location	Concentrate Shed	
	Residential / Parkland Land Use Guideline			Sample ID	04-369-11362-W-C	04-369-11363-F-C
				Date Sampled	11/06/2004	12/06/2004
				ALS File No.	U4483	U4483
				Field Screen (ppm)[b]	-	-
Parameter	**CEQG**	**PHC CWS[b,c,d]**	**Site-Specific**	**Units**	**Analytical Results**	
Non-Halogenated Volatiles						
Benzene	*0.5*	-	-	mg/kg	<0.040	<0.040
Ethylbenzene	*1.2*	-	-	mg/kg	<0.050	<0.050
Styrene	-	-	-	mg/kg	<0.050	<0.050
Toluene	*0.8*	-	-	mg/kg	<0.050	<0.050
meta- & para-Xylene	-	-	-	mg/kg	<0.050	<0.050
ortho-Xylene	-	-	-	mg/kg	<0.050	<0.050
Total Xylenes	*1.0*	-	-	mg/kg	<0.10	<0.10
Extractable Hydrocarbons						
F1 (C6-C10)	-	-	-	mg/kg	<10	<10
F1-BTEX	-	*130* (coarse)	-	mg/kg	<10	<10
F2 (C10-C16)	-	*450* (coarse)[f]	-	mg/kg	51	35
F3 (C16-C34)	-	*400* (coarse)[f]	-	mg/kg	261	277
F4 (C34-C50)	-	*2800* (coarse)	-	mg/kg	124	72
F4G-sg[d]	-	-	-	mg/kg	690	<500
F4G-SG Required (yes/no)	-	-	-	mg/kg	yes	yes
Extractable Hydrocarbons						
EPH10-19	-	-	1000	mg/kg	<200	<200
EPH19-32	-	-	1000	mg/kg	290	<200

Bold	Concentration greater than or equal to CCME RL Guideline for soil and/or the site-specific SQRO

Notes:

"<" = Less than analytical method detection limit.

"-" = Analysis not conducted, or no guideline.

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

[a] Canadian Environmental Quality Guidelines (CEQG) and Petroleum Hydrocarbon Canada-Wide Standards (PHC CWS) presented apply to soil.

[b] Guideline is dependant upon depth of sample (surface, subsoil >1.5 m depth). Surface soil analyzed.

[c] Guideline is dependent on median grain size of soil analyzed (Fine≤75 µm, Coarse >75 µm). Median grain size of soil analyzed is >75 µm.

[d] Guideline is based on the site-specific exposure pathway of Ecological Soil Contact

[e] Total Xylene calculated as the sum of meta, para and ortho Xylenes

[f] Use of the guideline requires that PAHs be subtracted from the fraction. Based on the results for soil sample A1 it is assumed that PAHs form a small percentage of the fractions 2 and 3 for the samples not analyzed for PAHs.

d) Fraction 4G measures carbon chain length in excess of C16.

Gartner Lee Limited

memorandum

to: Bruce Donald, P.Eng, Reclamation Manager, Teck Cominco Limited
from: Dennis Lu
date: April 14, 2005
ref: 40-137
re: **2004 Utilidor Sampling Results**

This memo is in response to the fuel leak on March 20, 2003 at the Utilidor. It addresses the nature of the spill, investigation and results of the sampling events.

The Utilidor is a utility corridor that runs from the accommodations complex to the barge. It houses various utilities including sewage, electrical and fuel. On March 20, 2003, a small fuel leak was discovered along the Utilidor near the junction of the haul road above the barge and the road leading to the accommodations. Upon identification of the leak, the fuel was shut off and the leak was patched immediately. There was no documentation of the amount of fuel spilled during this leak. The leak occurred on the east side of the road and followed the Utilidor path beneath the road and ponded in the barge area. The barge area was an area targeted for hydrocarbon remediation and the fuel that leaked from the Utilidor would be handled accordingly during the area remediation.

Inspection of the site occurred after snowmelt by GLL in July 2004. Upon inspection of the site, no visible staining was apparent. Screening samples were collected to identify the surface and sub-surface quality of the soil and any potential hydrocarbon contamination in the soil.

Delineation of the potentially hydrocarbon impacted area was accomplished through screening level sampling of the surface and subsurface material in the targeted area for remediation. Two boreholes were advanced in the area immediately below the fuel spill to confirm the spill had traveled along the Utilidor and not through the roadbed. The subsurface samples were collected using a drill-mounted excavator to allow for observations at depth.

Samples from the boreholes were collected over a 0.75 m interval to bedrock at a depth of 2.25 m. The samples were field screened with a Photo-ionization detector (PID). A subset of the on site field screening samples were sent to Analytical Laboratory Services (ALS) of Vancouver BC, in clean Teflon lined jars to confirm the presence and nature of hydrocarbon compounds.

The olfactory condition and field screening measurements of the concentrations of organic vapours in the soil samples from the southern borehole indicated possible subsurface hydrocarbon contamination. To confirm a clean vertical profile, the sample with the highest organic reading (Barge-10614-BH-C), and the sample below (Barge-10615-BH-C) were submitted to the lab for analysis. The borehole north of the Utilidor did not show signs of potential contamination; the sample with the highest organic reading from the borehole (Barge-10610-BH-C) was submitted for laboratory analysis to determine horizontal extent.

The Utilidor, and soils directly surrounding it were excavated and disposed. Upon removal of the Utilidor, two surface soil samples were collected from the footprint and surrounding area. The two composite samples were collected in accordance with standard GLL and TCL sampling procedures and protocols.

Analytical laboratory confirmatory results for hydrocarbons are summarized in Table 1, along with the approved Polaris Mine SQROs for hydrocarbons. The soil quality results and the lateral limits of samples are shown in the Barge area close out report Figure Barge-01-2. A total of 5 screening samples were submitted for petroleum hydrocarbons (3 borehole samples and 2 composite area samples). All samples sent to the analytical laboratory confirmed Extractable Petroleum Hydrocarbons (EPH) below the soil quality remediation objective (SQRO) of 1,000 mg/kg. Samples collected from the footprint of the Utilidor were also analysed to Canada Wide Standards (CWS) for Petroleum Hydrocarbons (PHC). All samples submitted returned results below the PHC CWS for Parkland Land Use.

Table 1. Utilidor Hydrocarbon Sample Results

Gartner Lee	FEDERAL CCME GUIDELINES[a]		Polaris Mine Soil Quality Remediation Objective	Location	Utilidor				
	Residential / Parkland Land Use Guideline			Sample ID	Barge-10610-BH-C	Barge-10614-BH-C	Barge-10615-BH-C	Barge-12179-F-C	Barge-12180-F-C
				Date Sampled	13/05/2004	13/05/2004	13/05/2004	27/08/2004	27/08/2004
				ALS File No.	U3564rr	U3564rr	U3564rr	U7584	U7584
				Field Screen (ppm)[b]	75	225	85	10	10
Parameter	**CEQG**	**PHC CWS[b,c,d]**	**Site-Specific**	**Units**	**Analytical Results**				
Non-Halogenated Volatiles									
Benzene	*0.5*			mg/kg	-	-	-	<0.040	<0.040
F1 (C6-C10)				mg/kg	-	-	-	<10	<10
F1-BTEX		*130* (coarse)		mg/kg	-	-		<10	<10
Ethylbenzene	*1.2*			mg/kg				<0.050	<0.050
Styrene				mg/kg				<0.050	<0.050
Toluene	*0.8*			mg/kg	-	-	-	<0.050	<0.050
meta- & para-Xylene				mg/kg	-	-	-	<0.050	<0.050
ortho-Xylene				mg/kg	-	-	-	<0.050	<0.050
Total Xylenes	*1.0*			mg/kg	-	-	-	<0.10	<0.10
Extractable Hydrocarbons									
F2 (C10-C16)		*450* (coarse)[f]		mg/kg	-			41	43
F3 (C16-C34)		*400* (coarse)[f]		mg/kg	-			253	271
F4 (C34-C50)		*2800* (coarse)		mg/kg	-			176	188
F4G-sg[d]				mg/kg	-	-	-	820	930
F4G-SG Required (yes/no)				mg/kg	-	-	-	YES	YES
Extractable Hydrocabrons									
EPH10-19			1000	mg/kg	<200	<200	<200	<200	<200
EPH19-32			1000	mg/kg	230	330	250	230	220

Bold	Concentration greater than or equal to CCME RL Guideline for soil and/or the site-specific SQRO.

Notes:

"< " = *Less than analytical method detection limit.*

"-" = *Analysis not conducted, or no guideline.*

b) Field screening results are measured based on a 'dry headspace' method using a combustible gas meter calibrated to a hexane standard.

[a] Canadian Environmental Quality Guidelines (CEQG) and Petroleum Hydrocarbon Canada-Wide Standards (PHC CWS) presented apply to soil.

[b] Guideline is dependant upon depth of sample (surface, subsoil >1.5 m depth). Surface soil analyzed

[c] Guideline is dependent on median grain size of soil analyzed (Fine≤75 µm, Coarse >75 µm). Median grain size of soil analyzed is >75 µm.

[d] Guideline is based on the site-specific exposure pathway of Ecological Soil Contact

[e] Total Xylene calculated as the sum of meta, para and ortho Xylenes

[f] Use of the guideline requires that PAHs be subtracted from the fraction. Based on the results for soil sample A1 it is assumed that PAHs form a small percentage of the fractions 2 and 3 for the samples not analyzed for PAHs.

d) Fraction 4G measures carbon chain length in excess of C16.