WorleyParsons

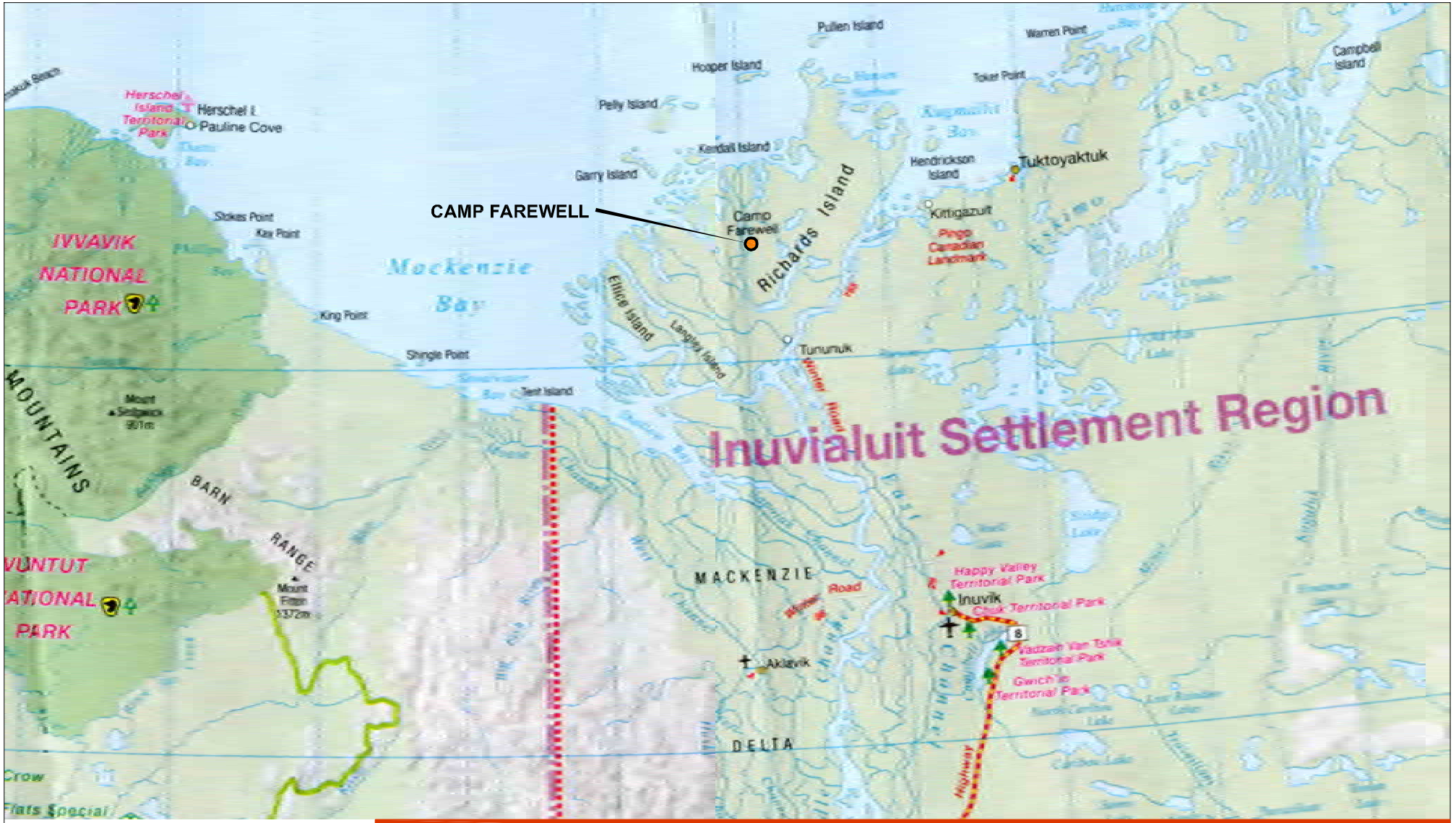
resources & energy

Table 1

FAREWELL INVENTORY 2009

Quantity	Description	Condition	Container Type	Size	Location
200	Pile Caps	Good	Basket	12 inch	Yard East End
500	Pile Caps	Good	Rig Box	in 2 large rig boxes	Yard East End

Figures



SCALE 1 : 1,500,000

Infrastructure & Environment

SHELL CANADA ENERGY
INTERIM ABANDONMENT AND RESTORATION PLAN
CAMP FAREWELL, NT

SITE LOCATION MAP

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18-JAN-11	date	K.M.S.	edited by	OTHERS	drawn by		app by

PREPARED SOLELY FOR THE USE OF OUR CLIENT AS SPECIFIED IN THE ACCOMPANYING REPORT. NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH WORLEYPARSONS HAS NOT ENTERED INTO A CONTRACT.

PROJECT NUMBER:	FIGURE:
C52360500	1

FILE: J:\52360500\siteloc.DWG Issued By: Calgary CAD

LEGEND

- 5.0m INDEX CONTOUR
- 1.0m INDEX CONTOUR
- SITE DIGITIZED FROM FAREWELL STOCK SITE & ACCESS ROAD DATA APRIL 09, 1973
- BUILDING
- ROAD
- GRAVEL PAD
- TANK

N

0 50 100 150 200 250m

SCALE 1 : 5,000

Projection: UTM ZONE 08

Datum: North American Datum 1983 (NAD83)

SOURCES:
1. SHELL CANADA LTD.; MAP SHOWING ORTHOPHOTO CAMP FAREWELL; MACKENZIE DELTA NT; JUNE 12, 2006; ACAD NO 35014
2. ORTHOPHOTOGRAPHY: PRODUCED BY CHALLENGER GEOMATICS LTD. FROM 1:30,000 PHOTO FLOWN AUGUST 04,2005 0.5M PIXEL
3. AERIAL PHOTOGRAPH; © 2005. GOVERNMENT OF CANADA WITH PERMISSION FROM INDIAN AND NORTHERN AFFAIRS CANADA

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SHELL CANADA ENERGY
INTERIM ABANDONMENT AND RESTORATION PLAN
CAMP FAREWELL, NT

AERIAL PHOTOGRAPH

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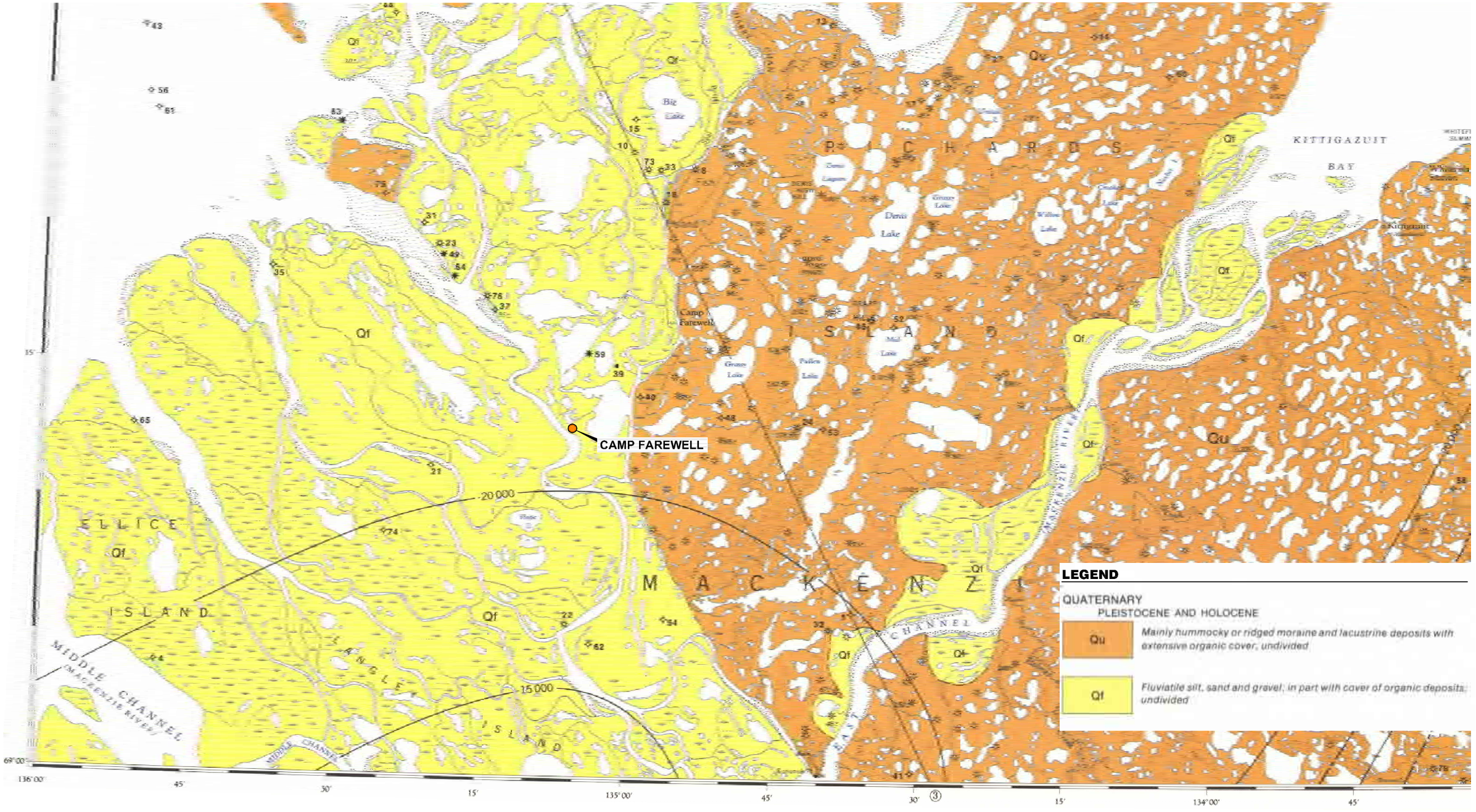
PROJECT NUMBER: C52360500

FIGURE: 2

FILE: J:\52360500\aerial.dwg Issued By: Calgary CAD



LEGEND

QUATERNARY

PLEISTOCENE AND HOLOCENE

Qu	*Mainly hummocky or ridged moraine and lacustrine deposits with extensive organic cover; undivided*
Qf	*Fluviatile silt, sand and gravel; in part with cover of organic deposits; undivided*

N

0 5 10 km

SCALE 1 : 250,000

Transverse Mercator Projection

SOURCE:
MAP 1515A GEOLOGY;MACKENZIE DELTA; DISTRICT OF MACKENZIE; GEOLOGY BY D.K. NORRIS; 1975

Infrastructure & Environment

SHELL CANADA ENERGY
INTERIM ABANDONMENT AND RESTORATION PLAN
CAMP FAREWELL, NT

GEOLOGY

WorleyParsons
resources & energy

18-JAN-11	date	K.M.S.	edited by	OTHERS	drawn by		app by	PROJECT NUMBER: C52360500	FIGURE: 3

FILE: J:\52360500\Geology.dwg Issued By: Calgary CAD

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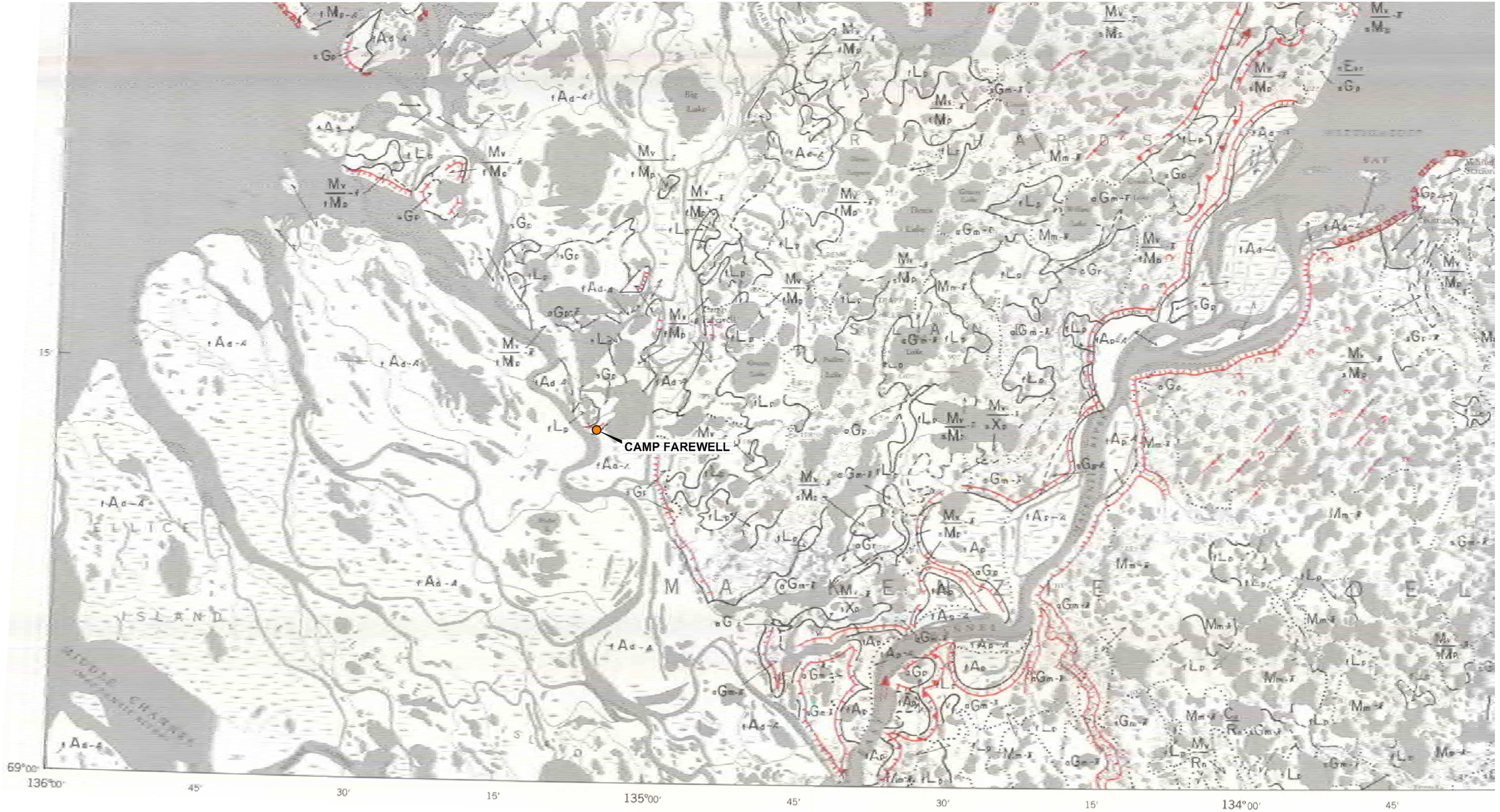

N

0 5 10 km

SCALE 1 : 250,000

Transverse Mercator Projection

SOURCE:
MAP 32-1979 SURFICIAL GEOLOGY; MACKENZIE DELTA; DISTRICT OF MACKENZIE; GEOLOGY BY V.N. RAMPTON; 1974

Infrastructure & Environment

SHELL CANADA ENERGY
INTERIM ABANDONMENT AND RESTORATION PLAN
CAMP FAREWELL, NT

SURFICIAL GEOLOGY

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18-JAN-11	date	K.M.S.	edited by	OTHERS	drawn by		app by	PROJECT NUMBER: C52360500	FIGURE: 4A

Issued By: Calgary CAD

FILE: J:\52360500\SurficialGeology.dwg

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DESCRIPTION OF TERRAIN UNITS

SYMBOL	NAME	MATERIALS AND THICKNESS	PERMAFROST DISTRIBUTION[1] AND ICE CONTENTS	GEOMORPHOLOGY[2] AND DRAINAGE	ORIGIN AND AGE
$\frac{C_l}{R_c}$	Sandy colluvium over bedrock	Sandy possibly containing few interbeds of silt clay and gravel 0.5-4 m thick. Scarps contain peat up to 3 m thick.	Continuous permafrost; variable ice contents.	Moderate to steep escarpments; imperfectly well to well drained. Undisturbed slopes are stable.	Scarps probably result from glacial and stream erosion along edge of Caribou Hills (underlain by poorly consolidated Tertiary rocks at their northern end).
$\frac{E_{ss}}{G_p}$	Sand dune on glaciofluvial plain	Fine to medium sand, in places silty, interbed peaty layers. Local veneer of silt and few patches of thin peat present on surface. Windblown sand up to 4 m thick, generally 1.5-3 m thick; glaciofluvial sand, 5-10 m thick.	Continuous permafrost. Sand generally has low ice contents. Silt and peat have medium to high ice contents due to abundance of ice lenses.	Broad linear sand dunes range from 1.5-3 m in height; variable drainage with small thaw pools common on extensive flat areas. Blowouts common along banks of streams and lakes.	Dunes formed subsequent to outwash deposition during early Wisconsin(?) glaciation. Dunes presently stable, except where blowouts form.
A_a	Alluvial plain	Silt, fine sand, and clayey silt, commonly organic; generally more than 6 m thick. Thin local accumulations of peat present.	Irregular distribution of permafrost; medium ice contents in frozen sediment due to presence of ice lenses.	Flat floodplains and low terraces near sea or stream level; meander pools, lakes, and marshy areas covering low surfaces occasionally inundated.	Alluvium deposited by streams in recent past.
A_{a-s}	Alluvial plain actively forming	Silt, fine sand, and clayey silt, commonly organic; coarse sand and gravel possibly underlie fine alluvium in some areas. Fine alluvium is 2 to more than 6 m thick.	Isolated islands of permafrost within unit; medium ice contents in frozen sediments due to presence of ice lenses.	Flat floodplain with many marshy areas on poorly drained surfaces inundated annually.	Floodplain alluvium presently being deposited.
A_{d-s}	Alluvial deltas actively forming	Silt, fine sand, and clayey silt, commonly organic; 10 to more than 30 m thick.	Permafrost present under part of unit; many irregularly shaped taliks; low to medium ice contents in frozen sediments; ice contents increase with depth.	Flat surface marked by numerous distributaries, islands, lakes, and marshes. Poorly drained and subject to flooding by sea or river water. Some lakes expanding due to thermokarst.	Alluvium deposited primarily by Mackenzie River with minor silt and clay being deposited following storm tides at outer edge of delta. Delta formed during Holocene and graded to present sea level.
M_{b-s}	Tidal flats	Interbedded silt, clayey silt, and sand; 1-3 m thick.	Irregular distribution of permafrost; ice wedges in frozen sediments.	Flat poorly drained and marshy surface; frequently inundated by sea water.	Deposition continuing at present. Most of underlying marine sediment deposited during last 5000 years.
$\frac{M_l}{L_p}$	Intertidal lagoons	Interbedded silt, clayey silt, and sands predominantly east of northeastern part of Richards Island. Maybe veneer generally 1-3 m thick.	Irregularly shaped taliks present within permafrost; ice contents probably low in sandy sediments, medium to high in fine sediments.	Flat basins poorly drained and marshy; frequently inundated by sea water.	Lagoons are lake basins where seaward edges have been breached during the postglacial rise in sea level; deposition has continued subsequently, mainly during last 5000 years.
$\frac{M_r}{M_{r-s}}$	Beaches, spits and bars	Sand (sM) to gravel and sand (GM), 0.5-3 m thick; mainly sand features along northern edge of Tuktoyaktuk Peninsula.	Irregular distribution of thin permafrost; low ice contents in frozen sediment.	Low broad ridges rising up to 3 m a.s.l.	Ridges formed and continuously modified by wave action.
L_p	Lacustrine plain and basin	Interbedded silt, clayey silt, and silty sand with peaty layers; predominantly silty sand and sand in areas of outwash and till-covered sandy deposits; sediment 1.5-8 m thick.	Rare isolated taliks present within continuous permafrost; ice contents generally low in medium to sandy sediments and medium to high in silty and clayey sediments due to presence of ice lenses; massive ice under pingos and domes.	Flat to gently sloping in places benches are separated by small scarps. Surface commonly marshy with many thaw pools. Pingos and small domes, both inactive and presently forming, within unit.	Lake basins formed by thermokarst development mainly during last 10 000 years and subsequently infilled and drained through normal stream development. Pingos and domes have formed during aggradation of permafrost in drained lake basins. Lacustrine plain lying below mapped strandline in Eskimo Lakes basin formed during blockage of outlet to Liverpool Bay by late Wisconsin glaciofluvial deposition along Kugaluk River estuary.
L_{m-s}	Rolling lacustrine plains modified by thermokarst	Interbedded clayey silt and clays generally 5-15 m thick. Surface patches of peat 1.5-3 m thick.	Isolated taliks present within continuous permafrost; ice contents medium to high due to presence of ice lenses; massive ice at base of unit and in underlying sediments at depths of 7-70 m.	Rolling surface with local relief to 30 m; summits of hills are generally accordant. Slopes moderately well drained; flat hill tops and depressions imperfectly drained.	Sediments deposited in glacially fed basin of probable early Wisconsin age.
G_o G_{o-s} G_{p-s}	Outwash plain	Silty sand over sand (SiG), sand (sG), and interbedded sand and gravel (sdG); local veneer of fine sand and silt and surface patches of thin peat. Outwash generally 5-10 m thick.	Continuous permafrost; ice contents of sand and gravel generally low, but silt has high ice content; massive ice may be present in underlying sediments at depths of 7-70 m.	Flat plain with some relief due to terracing, inset channels, and thermokarst lakes; drainage moderately good to good, but imperfect to poor in channel scarps and on extensive broad flat areas where ice-thaw pools are common.	Outwash plain making up major part of Tuktoyaktuk Peninsula formed when early Wisconsin(?) glacier stood at its maximum extent; remainder of outwash on Tuktoyaktuk Peninsula, Richards Island, and adjacent areas deposited during deglaciation. Outwash in Eskimo Lakes basin deposited during late Wisconsin time.
G_{o-s} G_{p-s}	Outwash plain modified by thermokarst	Sand with low relief; beds and channels of gravel (sG) and interbedded sand and gravel (sdG) generally 15-20 m thick. Local veneer of fine sand and silt and patches of thin peat on surface. Depressions contain 2-5 m of sandy and gravelly lacustrine sediment and peat.	Rare taliks in depressions within continuous permafrost; ice contents in near-surface outwash low, but massive ice may be present at depths of 7-70 m.	Rolling to hummocky surface with local relief to 30 m; summits of hills are generally flat and accordant; well drained.	Outwash plains formed during early Wisconsin(?) glaciation, except in Eskimo Lakes basin where outwash plains are late Wisconsin in age. Most ground ice formed concurrent with deglaciation; relief results from thermokarst during last 10 000 years.
G_{m-s} G_{m-s}	Hummocky thermokarst-modified outwash	Sand (sG) or interbedded sand and gravel (sdG); extensive unmapped areas of morainal deposits may be present in unit. Outwash generally 10-30 m thick; depressions contain 2-5 m of lacustrine sediment and peat.	Rare taliks in depressions within continuous permafrost; ice contents in near-surface low, but morainal deposits have higher ice contents, and massive ice may be present at depths of 7-70 m, especially under hills and ridges.	Hummocky with local relief to 30 m; well drained, but depressions imperfectly to moderately well drained.	Outwash deposited during early Wisconsin(?) glaciation. Most ground ice formed concurrent with deglaciation; thermokarst, modifying unit morphology, occurred mainly during last 10 000 years.
G_l G_l	Esker	Gravel with sandy interbeds (gG) or interbedded sand and gravel (sdG) generally 5-30 m thick.	Continuous permafrost; ice contents in near surface low, but massive ice may be present at depths of 7-70 m.	Linear features 60-600 m wide; locally multiple ridges and hummocky topography; well drained.	Eskers formed during retreat of early Wisconsin(?) glacier.
M_{m-s}	Rolling and hummocky morainic plains modified by thermokarst	Clayey diamicton containing pockets of sorted silty and clayey material; diamicton in 4-12 m thick; depressions contain 2-8 m of lacustrine sediment and peat; isolated areas of unmapped outwash within unit.	Rare taliks in depressions within continuous permafrost; ice contents of diamicton low to medium due to presence of ice lenses (generally having reticulate pattern); massive ice common at base of till and at depths of 7-70 m especially under hills and ridges.	Hummocks to rolling with local relief between 30 and 50 m. Many hills around Tuktoyaktuk show an "ermonized" pattern of ridges with 1-3 m relief. Slopes moderately well drained; till crests imperfectly to moderately well drained; depressions poorly drained. Inactive and active retrogressive thaw flow slides along hill slopes.	Till deposited during maximum extent of Laurentide glaciers during early Wisconsin(?) time. Most ground ice formed concurrent with deglaciation; thermokarst, modifying unit morphology, mainly during last 10 000 years.
$\frac{M_v}{M_p}$ $\frac{M_v}{A_p}$ $\frac{M_v}{X_p}$	Hummocky till-veneered sandy modified by thermokarst	Clayey diamicton in poorly sorted gravel over fine grained marine sand (sM), medium grained fluvial/glaciofluvial(?) sand (sA) or interbedded marine and fluvial sand (sX). Diamicton extremely variable in thickness, generally 1-3 m but thin or absent in areas between Kittigazuit and Peter's Creek, and between Cabin Creek and Pullen Island, where sand is commonly capped by thin poorly sorted gravelly sands generally 10-20 m thick. Depressions contain 2-8 m of lacustrine sediment and peat. Isolated unmapped outwash in unit.	Rare taliks in depressions within continuous permafrost; ice contents of diamicton low to medium due to presence of ice lenses; near-surface sands have low to medium ice contents, but massive ice may be present at depths of 7-70 m, especially at the base of till and in sediments under hills and ridges.	Hummocky to rolling with local relief between 30 and 70 m; hills and slopes moderately well drained, depressions imperfectly drained. Stabilized retrogressive thaw flow slides on slopes where till is thick, active slides on recently steepened slopes. Cliff-top dunes and blowouts common along eroding coast lines where till is thin.	Deposition of thick marine sands in deltaic foreset appears to have been preceded and followed by the deposition of fluvial sand, apparently in proglacial outwash plains. The upper outwash sands possibly correlate with units formed on Tuktoyaktuk Peninsula during early Wisconsin(?) time. Till deposited during maximum extent of Laurentide glaciers during early Wisconsin(?) time. Most ground ice formed concurrent with deglaciation; thermokarst, modifying unit morphology, mainly during last 10 000 years.
$\frac{M_v}{M_p}$	Hummocky till-veneered silt and clay; modified by thermokarst	Clayey diamicton over marine clay, silt, and fine sand. Diamicton generally varies from 0.5-2.5 m thick, rarely up to 6 m. Depressions contain 1.5-8 m of lacustrine deposits and peat.	Rare isolated taliks present under depressions within continuous permafrost. Ice contents variable in diamicton; massive ice present in places near base of diamicton. Marine sediments have low to high ice contents; ice lenses commonly form reticulate network; isolated layers of massive ice.	Rolling topography with 15-30 m local relief; hills and slopes moderately well drained; depressions imperfectly to poorly drained and marshy. Stabilized retrogressive thaw flow slides on slopes where till is thick, active slides on recently steepened slopes.	Till deposited during maximum extent of Laurentide glaciers during early Wisconsin(?). Most ground ice formed concurrent with deglaciation. Thermokarst, modifying unit morphology, mainly during last 10 000 years.
$\frac{M_v}{A_p}$ $\frac{M_v}{X_p}$	Hummocky till-veneered clay and sand; modified by thermokarst	Clayey diamicton or poorly sorted gravel over marine clay (c) and marine and fluvial sand (s). Diamicton generally less than 5 m thick. Depressions contain 2-8 m of lacustrine sediment and peat.	Rare taliks in depressions within continuous permafrost; ice content of diamicton low to medium due to presence of ice lenses; near-surface sands commonly have low to medium ice contents; clay has low to high ice content with ice lenses commonly forming a reticulate network; massive ice may be present at depths of 7-70 m.	Hummocky with local relief between 30 and 70 m. Hills and slopes moderately well drained; depressions imperfectly drained.	Deposition of marine clay and sand and fluvial (glaciofluvial?) sand preceded the early Wisconsin(?) glaciation that deposited the till. Most ground ice formed concurrent with deglaciation; thermokarst, modifying unit morphology, mainly during last 10 000 years.
$\frac{M_v}{R_c}$	Till veneer on bedrock	Clayey diamicton over poorly consolidated Tertiary rocks; diamicton up to 3 m thick. Low areas may contain 2-8 m of lacustrine sediment and peat.	Rare isolated taliks present under depressions within continuous permafrost; ice contents variable in diamicton; massive ice present in places near base of diamicton.	Rolling broad hills with 15-30 m local relief; hills and slopes moderately well drained; depressions imperfectly drained. Few stabilized retrogressive thaw flow slides on slopes where till is thick.	Till deposited during maximum extent of Laurentide glaciers during early Wisconsin(?). Most ground ice formed concurrent with deglaciation. Thermokarst, modifying unit morphology, occurred mainly during last 10 000 years.

SOURCE:
MAP 32–1979 SURFICIAL GEOLOGY; MACKENZIE DELTA; DISTRICT OF MACKENZIE; GEOLOGY BY V.N. RAMPTON; 1974

Infrastructure & Environment

SHELL CANADA ENERGY
INTERIM ABANDONMENT AND RESTORATION PLAN
CAMP FAREWELL, NT

SURFICIAL GEOLOGY LEGEND

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PROJECT NUMBER: C52360500

FIGURE: 4B

FILE: J:\52360500\SurficialGeology.dwg Issued By: Calgary CAD

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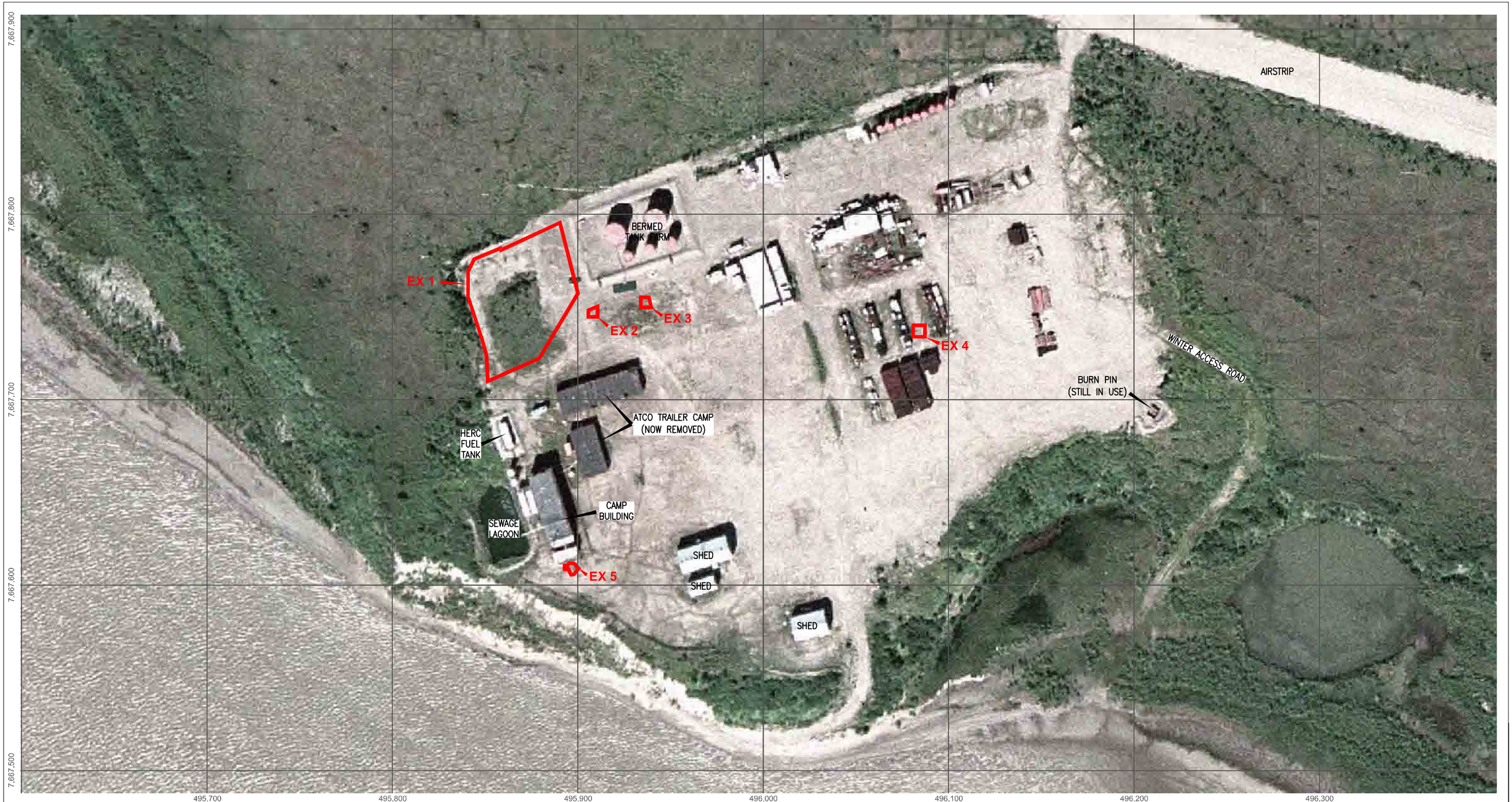

SOURCES:
1. SHELL CANADA LTD.; MAP SHOWING ORTHOPHOTO CAMP FAREWELL; MACKENZIE DELTA NT; JUNE 12, 2006; ACAD NO 35014
2. ORTHOPHOTOGRAPHY: PRODUCED BY CHALLENGER GEOMATICS LTD. FROM 1:30,000 PHOTO FLOWN AUGUST 04,2005 0.5M PIXEL
3. AERIAL PHOTOGRAPH; © 2005. GOVERNMENT OF CANADA WITH PERMISSION FROM INDIAN AND NORTHERN AFFAIRS CANADA

N

0 20 40 60 80 100m

SCALE 1 : 2,000

Projection: UTM ZONE 08
Datum: North American Datum 1983 (NAD83)

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SHELL CANADA ENERGY
INTERIM ABANDONMENT AND RESTORATION PLAN
CAMP FAREWELL, NT

AREAS OF REMEDIAL EXCAVATION AND TREATMENT

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18-JAN-11	date	K.M.S.	edited by	OTHERS	drawn by		app by	PROJECT NUMBER: C52360500	FIGURE: 5

FILE: J:\52360500\aerial.dwg Issued By: Calgary CAD

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Appendices

Appendix 1 Water Licence – N7L1-1762 Renewal

NORTHWEST TERRITORIES WATER BOARD

NUNAPPA SIVUNIUKPAIT IMMAKUN

WATER LICENCE: N7L1-1762

January 25th, 2011

Randall Warren
DAR/ Construction Manager
Shell Canada Limited
400- 4th Avenue S.W.
P.O. Box 100, Station M
Calgary, Alberta, Canada
T2P 2H5

Dear Mr. Warren:

Re: Amendment of Water Licence N7L1-1762

This letter is to inform you that at a January 25th, 2011 teleconference meeting of the Northwest Territories Water Board (NWTWB), the NWTWB evaluated Shell Canada Ltd's water licence N7L1-1762 which is due to expire on January 31st, 2011. Below you will find a summary of the decision made by the NWTWB concerning this licence.

- The expiry date of licence N7L1-1762 was amended to June 30th, 2011 to make sure the licensing process is completed before the NWT Water Board can decide on the renewal of licence N7L1-1762.

If you have any questions or comments please contact Mike Harlow via e-mail at harlowm@nwtwb.com or by telephone at 867-678-8609.

Sincerely,

Eddie Dillon
Chairperson
NWT Water Board

Attached : Licence renewal cover page

Copy to: Water Resources Division, INAC, Yellowknife, NT
District Manager, North Mackenzie District, INAC, Inuvik, NT

NORTHWEST TERRITORIES WATER BOARD

Pursuant to the *Northwest Territories Waters Act* and Regulations the Northwest Territories Water Board, hereinafter referred to as the Board, hereby grants to

SHELL CANADA LIMITED
(Licensee)

of 400- 4 Avenue S.W.
P.O. Box 100, Station M
CALGARY, ALBERTA T2P 0J4
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the *Northwest Territories Waters Act* and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence.

Licence Number	N7L1-1762 (AMENDMENT)
Licence Type	"B"
Water Management Area	NORTHWEST TERRITORIES 07
Location	Within a two kilometre radius of Latitude 69°12'30" N. Longitude135°06'04" W. MACKENZIE RIVER DELTA, N.W.T
Purpose	TO USE WATER AND DISPOSE OF WASTE FOR MUNICIPAL UNDERTAKINGS AND ASSOCIATED USES
Description	OIL AND GAS EXPLORATION
Quantity of Water Not To Be Exceeded	150 CUBIC METRES DAILY
Effective Date of Licence	NOVEMBER 1ST, 2005
Expiry Date of Licence	JUNE 30th, 2011

This Licence issued and recorded at Inuvik includes and is subject to the annexed conditions.

NORTHWEST TERRITORIES WATER BOARD

Witness

Chairperson (Eddie Dillon)

NORTHWEST TERRITORIES WATER BOARD

Pursuant to the *Northwest Territories Waters Act* and Regulations the Northwest Territories Water Board, hereinafter referred to as the Board, hereby grants to

SHELL CANADA LIMITED
(Licensee)

of 400 - 4 Avenue S.W.
P.O. Box 100, Station M
CALGARY, ALBERTA T2P 0J4
(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water subject to the restrictions and conditions contained in the *Northwest Territories Waters Act* and Regulations made thereunder and subject to and in accordance with the conditions specified in this Licence.

Licence Number	N7L1-1762 RENEWAL
Licence Type	"B"
Water Management Area	NORTHWEST TERRITORIES 07
Location	"Camp Farewell" Latitude 69°12'30" North Longitude 135°06'04" West MACKENZIE RIVER DELTA, N.W.T.
Purpose	TO USE WATER AND DISPOSE OF WASTE FOR MUNICPAL UNDERTAKINGS AND ASSOCIATED USES
Description	OIL AND GAS EXPLORATION
Quantity of Water Not to be Exceeded	150 CUBIC METRES DAILY
Effective Date of Licence	NOVEMBER 1, 2005
Expiry Date of Licence	OCTOBER 31, 2010

This Licence issued and recorded at Yellowknife includes and is subject to the annexed conditions.

NORTHWEST TERRITORIES WATER BOARD

Witness

Chairman

PART A: SCOPE AND DEFINITIONS

1. Scope

a) This Licence entitles Shell Canada Limited to use Water and dispose of Waste for municipal undertakings associated with oil and gas exploration and development in the Mackenzie Delta at Farewell Camp and Stockpile Site (Camp Farewell) located at Latitude 69°12'30" North, and Longitude 135°06'04" West, Northwest Territories;

b) This Licence is issued subject to the conditions contained herein with respect to the taking of Water and the depositing of Waste of any type in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the *Northwest Territories Waters Act*, or other statutes imposing more stringent conditions relating to the quantity or type of Waste that may be so deposited or under which any such Waste may be so deposited this Licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations; and

c) Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation

2. Definitions

In this Licence, **N7L1-1762**

"**Act**" means the *Northwest Territories Waters Act;*

"**Analyst**" means an Analyst designated by the Minister under Section 35(1) of the *Northwest Territories Waters Act*;

"**Average Concentration For Faecal Coliform**" means the geometric mean of any four consecutive analytical results submitted to the Board in accordance with the sampling and analysis requirements specified in the "Surveillance Network Program",

"**Board**" means the Northwest Territories Water Board established under Section 10 of the *Northwest Territories Waters Act*;

"**Freeboard**" means the vertical distance between water line and crest on a dam or dyke's upstream slope;

"**Geotechnical Engineer**" means a professional engineer registered with the Association of Professional Engineers, Geologists, and Geophysicists of the Northwest Territories and whose experience is the design and construction of earthworks in a permafrost environment;

"**Greywater**" means all liquid Wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet Wastes;

"**Inspector**" means an Inspector designated by the Minister under Section 35(1) of the *Northwest Territories Waters Act*;

"**Licensee**" means the holder of this Licence;

"**Maximum Average Concentration**" means the running average of any four (4) consecutive analytical results, or if less than four analytical results collected, and submitted to the Inspector in accordance with the sampling and analysis requirements specified in the "Surveillance Network Program";

"**Minister**" means the Minister of Indian Affairs and Northern Development;

"**Modification**" means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does include an expansion;

"**Permeability**" means the capacity to transmit water through a medium;

"**Sewage**" means all toilet Waste and greywater;

"**Toilet Wastes**" mean all human excreta and associated products, but does not include greywater;

"**Regulations**" mean Regulations proclaimed pursuant to Section 33 of the *Northwest Territories Waters Act*;

"**Sewage Treatment Facilities**" comprises the area and engineered structures designed to contain sewage as identified in the Project Description and also includes a Sump constructed of impervious material and/or with an impervious liner;

"**Sump**" means an excavation for the purpose of catching or storing Water and/or Waste;

"Waste" means Waste as defined by Section 2 of the *Northwest Territories Waters Act*; and

"Waters" mean Waters as defined by Section 2 of the *Northwest Territories Waters Act*.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report with the Board not later than March 31st of the year following the calendar year reported which shall contain the following information:

   a) the total quantity in cubic metres of fresh Water obtained from all sources;

   b) the total quantities in cubic metres of each and all Waste discharged;

   c) the location and direction of flow of all Waste discharged to the Water;

   d) the results of sampling carried out under the Surveillance Network Program;

   e) a summary of any modifications carried out on the Water supply and Sewage Treatment Facilities, including all associated structures;

   f) a list of spills and unauthorized discharges;

   g) details on the restoration of any sumps;

   h) any revisions to the approved Contingency Plan; and,

   i) any other details on Water use or Waste disposal requested by the Board within forty-five (45) days before the annual report is due.

2. The Licensee shall comply with the "Surveillance Network Program" annexed to this Licence, and any amendment to the said "Surveillance Network Program" as may be made from time to time, pursuant to the conditions of this Licence.

3. The "Surveillance Network Program" and compliance dates specified in the Licence may be modified at the discretion of the Board.

4. The Licensee shall, within thirty (30) days of the issuance of the Licence, post the necessary signs to identify the stations of the "Surveillance Network Program". All postings shall be located and maintained to the satisfaction of an Inspector.

5. Meters, devices or other such methods used for measuring the volumes of Water used and Waste discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.

6. All monitoring data shall be submitted in printed form and electronically in spreadsheet format on a diskette or other electronic forms acceptable to the Board.

7. All reports shall be submitted to the Board in printed format accompanied by an electronic copy in a common word processing format on diskette or other electronic forms acceptable to the Board.

8. Within thirty (30) days of issuance of this Licence, pursuant to Section 17(1) of the *Act* and Section 12 of the Regulations, the Licensee shall have posted and shall maintain a security deposit of Two Million ($2,000,000.00) Dollars in a form suitable to the Minister.

9. The Licensee shall ensure a copy of this Licence is maintained at the site of operation at all times.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee shall obtain Water from the Middle Channel of the Mackenzie River in winter or the unnamed lake north of the camp in summer as described in the project description, or as otherwise approved by an Inspector.

2. For lakes used as a Water source, a representative dissolved oxygen/temperature profile must be obtained prior to the initial Water withdrawal and prior to demobilization of the project for the year.

3. The Licensee is not permitted to remove more than five (5%) percent of the available under ice Water volume per lake as calculated using a maximum expected ice thickness of two (2) meters during a single winter season.

4. The daily quantity of Water used for all purposes shall not exceed 150 cubic metres.

5. The Water intake hose used on the Water pumps shall be equipped with a screen with a mesh size sufficient to ensure no entrainment of fish (2.54 mm).

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Licensee shall within thirty (30) days of the issuance of this Licence, submit to the Board for approval an updated Operation and Maintenance Plan for the Sewage and Solid Waste Treatment Facilities. This Plan shall include but not necessarily be limited to details on the design, operational capacity, management and maintenance, and disposal of sludges.

2. All Sewage shall be directed to the onsite Sewage Treatment Facilities as approved by an Inspector.

3. The Sewage Treatment Facilities shall be maintained and operated in such a manner as to prevent structural failure to the satisfaction of the Inspector.

4. All Waste discharged from the onsite Sewage Treatment Facilities shall be directed to the channel of the Mackenzie River at a location approved by an Inspector.

5. There shall be no discharge of floating solids, garbage, grease, free oil or foam.

6. All Sewage effluent discharged by the Licensee from the Sewage Treatment Facilities at "Surveillance Network Program" Station Number 1762-1 shall meet the following effluent quality requirements:

Sample Parameter	Maximum Average Concentration
Biological Oxygen Demand (BOD_5)	70.0 mg/L
Total Suspended Solids (TSS)	70.0 mg/L
Faecal Coliforms	10E4 CFU/dL
Oil and Grease	5.0 mg/L
Total Residual Chlorine (TRC)	0.1 mg/L

The Waste discharged shall have a pH between 6 and 9.

7. Introduction of Water to Waste for the purpose of achieving effluent quality requirements in Part D, Item 5 is prohibited.

8. The Licensee shall dispose of all solid Wastes in a manner acceptable to the Inspector.

9. A freeboard limit of 1.0 metre shall be maintained at all times in the Sump, part of the Sewage Treatment Facilities, or as recommended by a Geotechnical Engineer and or as approved by the Board.

10. The Licensee may commence decanting upon receipt of an Inspector's approval.

11. All analyses shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater" or by such other methods as may be approved by an Analyst.

PART E: CONDITIONS APPLYING TO MODIFICATIONS

1. The Licensee may, without written approval from the Board, carry out Modifications to the planned undertakings provided that such Modifications are consistent with the terms of this Licence and the following requirements are met:

   a) the Licensee has notified an Inspector in writing of such proposed Modifications at least five (5) days prior to beginning the Modifications;

   b) such Modifications do not place the Licensee in contravention of either this Licence or the *Act*;

   c) an Inspector has not, during the five (5) days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than five (5) days, and

   d) an Inspector has not rejected the proposed Modifications.

2. Modifications for which all of the conditions referred to in Part E, Item 1 have not been met may be carried out only with written approval from an Inspector.

3. The Licensee shall provide to the Board as-built plans and drawings of the Modifications referred to in this Licence within ninety (90) days of completion of the Modifications.

PART F: CONDITIONS APPLYING TO CONTINGENCY PLANNING

1. The Licensee shall submit to the Board for approval within thirty (30) days of the issuance of this Licence an updated Emergency Response & Spill Contingency Plan.

2. The Licensee will maintain a copy of the approved Emergency Response & Spill Contingency Plan onsite in a readily available location, to the satisfaction of an Inspector.

3. The Licensee shall ensure that petroleum products, hazardous material and other Wastes associated with the project do not enter any Waters.

4. The Licensee shall ensure that all containment berms are constructed of an impermeable material, to the satisfaction of an Inspector.

5. The Licensee shall ensure that fuel stored in each tank within the tank farm be no greater than 85% of the tank's capacity to allow for expansion and avoid overflows.

6. If, during the period of this Licence, an unauthorized discharge of Waste occurs, or if such a discharge is foreseeable, the Licensee shall:

   a) report the incident immediately via the 24 Hour Spill Reporting Line (867) 920-8130; and

   b) submit to an Inspector a detailed report on each occurrence not later than thirty (30) days after initially reporting the event.

PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION

1. The Licensee shall submit to the Board for approval within one (1) year of issuance of this Licence, an updated Interim Abandonment and Restoration Plan including a complete Phase II Environmental Assessment of Camp Farewell. This assessment will include the full delineation of contamination (soil and Water) associated with Camp Farewell operations, located both on and off the gravel base pad. The Licensee shall implement this Plan as and when approved by the Board.

2. The Licensee shall review the Interim Abandonment and Restoration Plan every two (2) years and shall modify the Plan as necessary to reflect changes in operations and technology. All proposed modifications to the Plan shall be submitted to the Board for approval.

NORTHWEST TERRITORIES WATER BOARD

Witness

Chairman

NORTHWEST TERRITORIES WATER BOARD

LICENSEE:	Shell Canada Limited
LICENCE NUMBER:	N7L1-1762
EFFECTIVE DATE OF LICENCE:	November 1, 2005
EFFECTIVE DATE OF SURVEILLANCE NETWORK PROGRAM:	November 1, 2005

SURVEILLANCE NETWORK PROGRAM

A. **Location of Sampling Stations**

Station Number	Description
1762-1	Treated Sewage at the Point of Discharge

B. **Sampling and Analysis Requirements**

1. Water at Station Number 1762-1, shall be sampled every two weeks, and analyzed for the following parameters:

BOD_5	Total Suspended Solids
Oil and Grease	Faecal Coliforms
Ammonia	pH - Method 4500
Phosphorous Method 4500	Total Residual Chlorine Method 4500 - Cl

2. More frequent sample collection maybe required at the request of an Inspector.

3. All sampling, sample preservation, and analyses shall be conducted in accordance with methods prescribed in the current edition of "Standard Methods for the Examination of Water and Wastewater", or by such other methods approved by an Analyst.

4. All analyses shall be performed in a laboratory approved by an Analyst.

5. The Licensee shall, by December 31st, 2005, submit to an Analyst for approval a Quality Assurance/Quality Control Plan.

6. The Plan referred to in Part B, Item 5 shall be implemented as approved by an Analyst.

C. **Reports**

1. The Licensee shall, within thirty (30) days following the month being reported, submit to the Board all data and information required by the "Surveillance Network Program" including the results of the approved Quality Assurance Plan.

NORTHWEST TERRITORIES WATER BOARD

Witness

Chairman

Appendix 2 Lease 107 C/4-2-10 and 107 C/4-1-7

N.W.T. Lease No.: **107 C/4-2-15**

File No.: **107 C/4-2**

THIS LEASE made this 7 day of April 2009.

BETWEEN: Her Majesty the Queen in right of Canada,

Hereinafter called "Her Majesty"

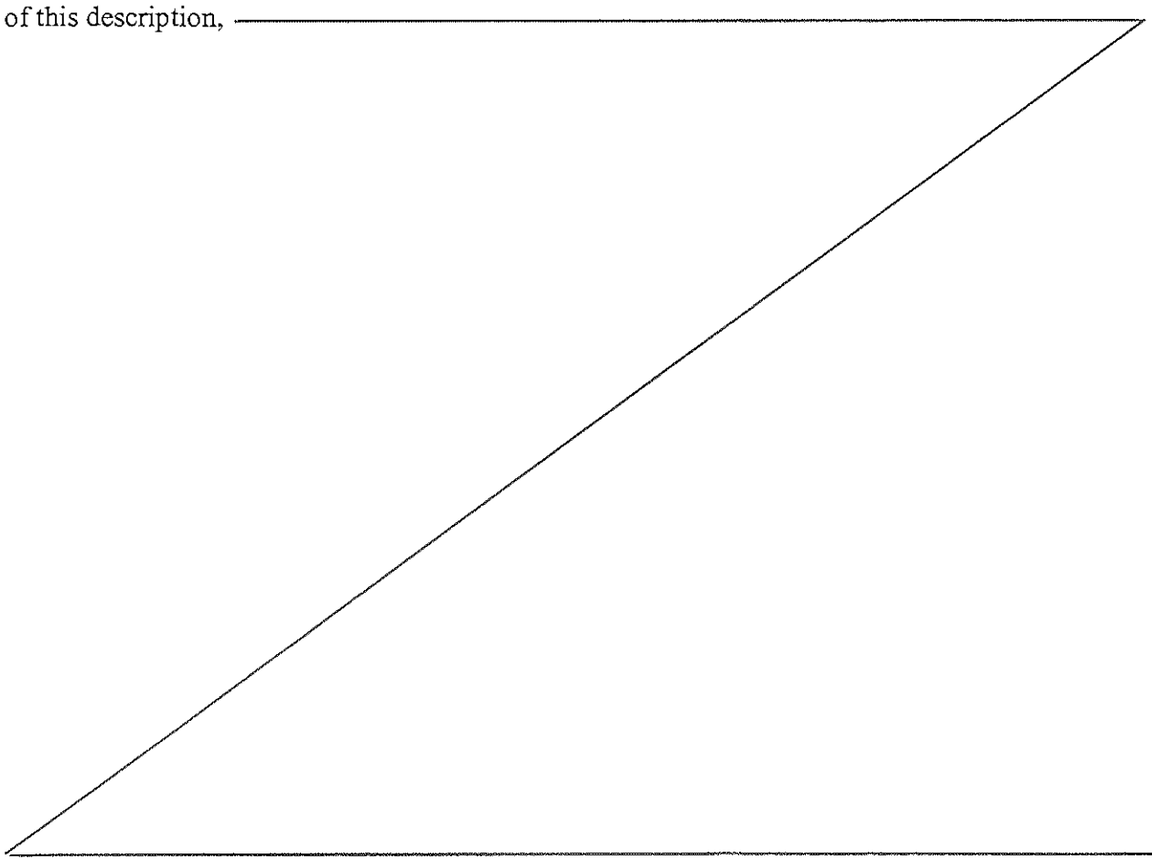
OF THE FIRST PART

AND: **SHELL CANADA LIMITED** a body corporate, incorporated under the Laws of Canada, having a registered office in the City of Calgary in the Province of Alberta,

Hereinafter called "the lessee"

OF THE SECOND PART

WITNESSETH that in consideration of the rents, covenants and agreements herein reserved and contained on the part of the lessee to be paid, observed and performed, and subject to the Territorial Lands Act and the Territorial Lands Regulations, Her Majesty demises and leases unto the lessee all that certain parcel or tract of land situate, lying and being composed of all those parcels of land at Farewell designated as Parcels A, B and C, in QUAD 107 C/4, in the Northwest Territories, as said parcels are shown outlined in red on the sketch annexed hereto and forming part of this description,



hereinafter called "the land", SUBJECT to the following reservations:

(a) all mines and of all minerals whether solid, liquid or gaseous which may be found to exist within, upon, or under such lands together with the full powers to work the same and for that purpose to enter upon, use and occupy the lands or so much thereof and to such an extent as may be necessary for the effectual working and extracting of the said minerals;

(b) the rights of the recorded holders of mineral claims and any other claims or permits affecting the land;

(c) all timber that may be on the land;

(d) the right to enter upon, work and remove any rock outcrop required for public purposes;

(e) such right or rights-of-way and of entry as may be required under regulations in force in connection with the construction, maintenance and use of works for the conveyance of water for use in mining operations; and

(f) the right to enter upon the land for the purpose of installing and maintaining any public utility;

THE PARTIES COVENANT AND AGREE AS FOLLOWS:

DEFINITIONS:

1. In this lease:

(a) "Minister" means the Minister of Indian Affairs and Northern Development and any person authorized by him in writing to act on his behalf;

(b) "facilities" means all physical structures or appurtenances placed in or upon the land;

(c) "construction" means all manner of disturbance of the natural state of the surface of the land, including the sub-surface and sub-strata;

(d) "Surveyor General" means the Surveyor General as defined in the Canada Lands Surveys Act;

(e) "body of water" means any lake, river, stream, swamp, marsh, channel, gully, coulee or draw that continuously or intermittently contains water;

TERM:

2. The term of this lease shall be for a period of **twenty (20)** years commencing on the **1st day of January A.D. 2009 AD.** and terminating on the **31st day of December A.D. 2028 AD.**

RENT AND TAXES:

3. Subject to Clause 4 the lessee shall pay to the lessor yearly and every year in advance the rental of **six hundred and twenty ($620.00)** dollars.

Initial(s)_____

4. The Minister may, not less than three (3) months before the expiration of the first five (5) year period of the said term, or of any succeeding five (5) year period during the term, notify the lessee in writing of an amended rental payable for the following five (5) year period and, failing further notification, for the remainder of the term, the said amended rental to be based upon the fair appraised value of the land at the time of such notification but without taking into account the value of any improvements placed thereon by and at the expense of the lessee.

5. The lessee shall during the term of this lease, pay all taxes, rates and assessments charged upon the land or upon the lessee in respect thereof.

USE:

6. The lessee shall use the land for **STAGING AREA, FUEL STORAGE, EQUIPMENT AND MATERIAL STORAGE AND BASE CAMP** purposes only.

SUBLETTING OR ASSIGNMENTS:

7. The lessee shall not sublet the land or assign or transfer this lease without the consent of the Minister in writing , which consent shall not be unreasonably withheld. Such consent shall not be required in the event of the lessee mortgaging or pledging the rights and privileges granted herein to secure the payment of any bonds or other indebtedness of the lessee, or to any assignment made to or by any securing holder as a result of default by the lessee under any mortgage or pledge; however, copies of such instruments must be forwarded to the Minister.

8. No Sublease, assignment or transfer of this lease to any party will receive the consent of the Minister unless Lease number 107 C/4-1-8 is sublet, assigned or transferred to the same party.

BREACH:

9. Where any portion of the rental herein reserved is unpaid for more than thirty (30) days after it becomes due, whether formally demanded or not, the Minister may by notice in writing terminate this lease and on the day following the mailing of such notice, this lease is cancelled.

10. Where the lessee breaches or fails to perform or observe any of the covenants, terms, conditions or agreements herein contained, other than the covenant to pay rent, the Minister may so advise the lessee by written notice and if the lessee fails to remedy the breach or non-performance within a reasonable time thereafter or within the time granted in the said notice, the Minister may, by notice in writing, terminate this lease and on the day following the mailing of such notice, this lease is cancelled.

11. Unless a waiver is given in writing by the Minister, Her Majesty will not be deemed to have waived any breach or non-performance by the lessee of any of the covenants, terms, conditions or agreements herein contained and a waiver affects only the specific breach to which it refers.

TERMINATION:

12. Upon the termination or expiration of this lease, the lessee shall deliver up possession of the land in a restored condition and, where there are no arrears of rent or taxes, the lessee may, within three (3) months after the termination or expiration, remove any buildings or other structures owned by him that may be on the land.

13. Termination or expiration of this lease will not prejudice Her Majesty's right to unpaid rental or any other right with respect to a breach or non-performance of any covenant, term, condition or agreement herein contained nor will the lessee be relieved of any obligation contained herein.

RESTORATION:

14. Where the lessee fails to restore the land as required and within the time allowed by the Regulations or by the Minister, the Minister may order the restoration of all or any part of such land and any expenses thus incurred by the Minister shall be recoverable from the lessee as a debt due to Her Majesty.

WASTE DISPOSAL:

15. The lessee shall dispose of all combustible garbage and debris by burning in an incinerator approved by the Land Agent and remove all noncombustible garbage and debris to an authorized dumping site.

16. The lessee shall dispose of human waste in a manner satisfactory to the Minister.

17. The lessee shall not discharge or deposit any refuse substances or other waste materials in any body of water, or the banks thereof, which will, in the opinion of the Minister, impair the quality of the waters or the natural environment and any areas designated for waste disposal shall not be located within thirty-one (31) metres of the ordinary high water mark of any body of water, unless otherwise authorized by the Minister.

ENVIRONMENTAL:

18. The lessee shall at all times keep the land in a condition satisfactory to the Minister.

19. The lessee shall not do anything which will cause erosion of the banks of any body of water on or adjacent to the land, and shall provide necessary controls to prevent such erosion.

20. The lessee shall not unduly interfere with the natural drainage pattern of the land, except with the permission of the Minister.

FUEL AND HAZARDOUS CHEMICALS:

21. The lessee shall take all reasonable precautions to prevent the possibility of migration of spilled petroleum fuel over the ground surface or through seepage in the ground by:

    (i) constructing a dyke around any stationary petroleum fuel container where the container has a capacity exceeding four thousand (4,000) litres; and

    (ii) ensuring that the dyke(s) and the area enclosed by the dyke(s) is impermeable to petroleum products at all times; and

    (iii) ensuring that the volumetric capacity of the dyked area shall, at all times, be equal to the capacity of the largest petroleum fuel container plus ten (10) percent of the total displacement of all other petroleum fuel containers placed therein; or

    Such other alternative specifications submitted by the lessee that may be approved, in writing, by the Minister.

22. The lessee shall ensure that fuel storage containers are not located within thirty-one (31) metres of the ordinary high water mark of any body of water unless otherwise authorized by the Minister.

23. The lessee shall mark with flags, posts or similar devices all petroleum fuel storage facilities, including fill and distribution lines, such that they are clearly visible at all times.

24. The lessee shall immediately report all spills of petroleum and hazardous chemicals in accordance with the Government of the Northwest Territories Spill Contingency Planning and Reporting Regulations and any amendments thereto, or in a manner satisfactory to the Minister.

25. The lessee shall prevent the possibility of migration of spilled fuel over the ground surface or through seepage in the ground.

26. The lessee shall take all reasonable precautions to prevent the migration of petroleum products into bodies of water.

27. The lessee shall, within six (6) months of the execution of this lease deliver to the Minister, for his approval, an Oil Spill Contingency Plan and shall maintain the provisions of the said Plan, and any modifications approved by the Minister, throughout the term of this lease.

28. The lessee shall handle, store, dispose and keep records of all hazardous and toxic chemicals in a manner satisfactory to the Minister.

29. The fuel storage facilities of the lessee, including all tanks, bladders, hoses, pumps, fuel transfer lines and associated mechanical connections and valves shall be installed and maintained to the satisfaction of the Minister and the lessee agrees to make such reasonable modifications and improvements as are deemed necessary by the Minister.

BOUNDARIES AND SURVEYS:

30. Her Majesty is not responsible for the establishment on the ground of the boundaries of the land.

31. The boundaries of the land are subject to such adjustment and alteration as may be shown to be necessary by survey.

32. The Minister may, during the term herein granted, by notice in writing, order the lessee to survey the boundaries of the land and the lessee shall, at its own expense, within one (1) year from the date of said notice, make or cause to be made a survey of the land, such survey to be made in accordance with the instructions of the Surveyor General, and upon completion of the survey and the production of survey plans suitable for recording in the Canada Lands Surveys Records and filing in the Land Titles Office for the Northwest Territories Land Registration District, Her Majesty will execute an Indenture in amendment of this lease for the purpose of incorporating herein descriptions of the land based on the said plans.

IMPROVEMENTS:

33. The lessee is responsible for ensuring that all improvements to the land are made within the boundaries of the land.

34. The lessee shall not erect any building or structure nearer than a distance of three (3) metres from any boundary of the land.

35. The lessee shall not construct any facilities within thirty-one (31) metres of the ordinary high water mark of any body of water without the written approval of the Minister.

Initial(s)_____

36. The lessee shall maintain the existing improvements now situated on the land on the effective date of this lease, or any similar improvements which may be constructed, in a manner and condition satisfactory to the Minister.

ACCESS:

37. Her Majesty assumes no responsibility, express or implied, to provide access to the land.

38. It shall be lawful for Her Majesty or any person duly authorized at all reasonable times to enter upon the land for the purpose of examining the condition thereof.

39. The Minister may grant to such persons as he may consider fit, rights-of-way or access across, through, under or over all or any portion of the land for any purpose whatsoever, but such rights-of-way or access will not unreasonably interfere with the rights granted to the lessee hereunder, or with any improvements made by the lessee on the land.

INDEMNIFICATION:

40. The Lessee shall at all times hereafter indemnify and keep Her Majesty indemnified against all claims, demands, actions or other legal proceedings by whomsoever made or brought against Her Majesty by reason of anything done or omitted to be done by the lessee, his officers, servants, agents or employees arising out of or connected with the granting of this lease.

41. The lessee will not be entitled to compensation from Her Majesty by reason of the land or any portion thereof being submerged, damaged by erosion, or otherwise affected by flooding.

42. Her Majesty will not be liable for damages caused by vandalism or interference by others with the lessee's facilities and equipment.

REVIEW:

43. At the request of the lessee, any decision of the Minister will be reviewable by the Trial Division of the Federal Court of Canada; costs of such review are the responsibility of the lessee unless otherwise ordered by the Court.

NOTICES:

44. All written notices respecting the land or the covenants, terms, conditions or agreements contained in this lease shall, unless otherwise stipulated herein, be deemed to have been received by the lessee ten (10) days after the mailing thereof or, if hand delivered, on the day of delivery.

45. Any notice affecting this lease which Her Majesty may desire to serve upon the lessee, or any notice which the lessee may desire to serve upon Her Majesty shall, unless otherwise stipulated herein, be sufficiently served if posted by registered mail to the last known address of the opposite party as follows:

To Her Majesty: Director of Operations,
Northwest Territories Region,
Department of Indian Affairs and Northern Development
P. O. Box 1500
Yellowknife, N.T.
X1A 2R3

To the Lessee: **SHELL CANADA LIMITED**
P.O. Box 100 Station Main
Calgary, AB T2P 2H5

Either party may change its address for service during the term of this lease by notifying the other party in writing.

46. No notice of breach or default given herein by Her Majesty shall be valid or of any effect unless it is also given to any mortgagee of the lessee, in respect of the leased lands, of which Her Majesty shall have received written notice.

GENERAL:

47. The Lessee shall abide by and comply with all applicable lawful rules, acts, regulations and by-laws of the Federal Government, Territorial Government, Municipal Government or any other governing body whatsoever that have been or may be enacted or amended from time to time and in any manner affect the said land.

48. This lease enures to the benefit of and is binding upon Her Majesty, Her Heirs and Successors and the lessee, its successors and assigns.

49. No implied covenant or implied liability on the part of Her Majesty is created by the use of the words "demises and leases" herein.

50. If an archaeological site is discovered within the land, the lessee shall immediately advise the Minister in writing of such a discovery and shall take all reasonable precautions necessary to prevent any further disturbance or destruction of such site.

DUPLICATE

IN WITNESS WHEREOF the Director of Operations, Northwest Territories Region, Department of Indian Affairs and Northern Development, has hereunto set his hand and seal on behalf of Her Majesty the Queen in right of Canada; and **SHELL CANADA LIMITED** has hereunto affixed its corporate seal attested to by its duly authorized officers.

SIGNED, SEALED AND DELIVERED)
on behalf of Her Majesty by the)
Director of Operations, Northwest)
Territories Region, Department of)
Indian Affairs and Northern)
Development in the presence of)

Director's Witness)

(SEAL)
Director's Signature

SIGNED SEALED AND DELIVERED)
on behalf of **SHELL CANADA LIMITED**)

(C/S)
Signature **Richard W. Riegert**
Assistant Secretary

Name and title of Director or Officer

(C/S)
Signature

Name and title of Director or Officer

APPROVALS
LAND RGM
J.V.
LEGAL JD
FORWARD FOR EXECUTION
RGM

Appendix 3 2010 Monitoring Program Results

WorleyParsons

resources & energy

APPENDIX 3: RESULTS OF 2010 SAMPLING AND MONITORING PROGRAM

1. INTRODUCTION

1.1 Background

In 2009, Shell Canada Energy (Shell) implemented a portion of an Interim Abandonment and Restoration Plan (WorleyParsons 2006) at Camp Farewell (Site). The program included dismantling and removal of a large proportion of the facilities and consumable materials stockpiled at the Site, as well as a remediation program that addressed the gravel fill on the Site that was contaminated by a fuel spill that occurred in 1980. The soil remediation program comprised construction of a soil treatment cell, excavation of gravel fill that was affected by the historical fuel spill, aerobic treatment of these soils using the oxidizing agent, RegenOx, and sampling and replacement of the treated soils. The verification sampling program completed in 2009 indicated that hydrocarbon concentrations in the treated soils were substantially reduced through the treatment program (WorleyParsons 2010).

In June of 2010 representatives of INAC visited the Camp Farewell Site and were concerned about an area of black staining associated with the treated soil area. At the time, INAC representatives were concerned that this black staining was associated with the historical fuel spill and represented residual hydrocarbon contamination of the soils. Accordingly, Mr. Randall Warren of Shell and Mr. Kevin Erikson of HAZCO Environmental Services Ltd. (HAZCO) visited the Site to inspect the area of staining and to collect samples of the materials in question. An additional sampling event was completed in September by IEG-Klohn who have been retained by Shell to complete follow-up monitoring of the Camp Farewell site. This letter provides an evaluation of the results of the laboratory analyses completed on the soil and water samples collected at Camp Farewell site in light of the concerns raised by INAC.

1.2 Purpose and Scope

This letter summarizes the results of sampling programs that were completed in 2010, and provides assessment of the analytical results associated with those sampling events. Specifically, this letter report provides the following:

- background information;
- an overview of the sampling and analytical programs;
- overview of the results of the water and soil analyses;
- analysis and discussion of the laboratory results; and
- recommendations for follow up sampling and testing.

1.3 Description of Stained Area

The area of staining that was noted by INAC representatives is located in the south portion of the Site and immediately north of the camp building. The zone of staining coincides with a depression in the gravel pad, is located in the area of soil treatment and is susceptible to water ponding during rainfall and thaw events. This depression has resulted from either uneven replacement of treated soils or subsidence of treated soils after they were replaced. Photo 1 illustrates the area of staining from an aerial view. Photo 2 shows this same area from ground level and Photo 3 provides a close up view of the soils and water in question. The discolouration in question can be described as, odourless, dark grey to black, and soot-like in composition.

Photo 1: Aerial View of Stained and Pond Area (August, 2009)

Photo 2: Stained Area – Ground View

Photo 3: Stained Soil and Water

2. SAMPLING AND ANALYTICAL PROGRAM

2.1 June Sampling Event

Grab samples were collected by Mr. Randall Warren of Shell and Mr. Kevin Erickson of HAZCO on June 22, 2010. Two grab samples of soil and two grab samples of ponded water were collected in sample containers provided by the laboratory and were delivered to the Maxxam Analytics of Edmonton, Alberta under standard chain of custody documentation. One of the water samples was turbid, to evaluate the nature of the dark residue, and the other was clear, to evaluate the nature of any potential dissolved impacts. Samples were analyzed for the following parameters:

Soil Sample

- hydrocarbon fractions F1 to F4;
- BTEX;
- hot water soluble boron; and
- ICP metals and hexavalent chromium.

Water Sample

- hydrocarbon fractions F1 and F2;
- BTEX; and
- Total ICP metals and cadmium.

Analytical results are provided in Attachment 1.

2.2 September Sampling Event

Grab samples were collected by Mr. R. Lennie of IEG Klohn on September 9, 2010. Five grab samples of soil and four grab samples of ponded water were collected at the locations illustrated in App 1A, and were analyzed for the following.

- Hydrocarbon fractions F1 to F4 plus BTEX
- Salinity parameters in soil samples and main ions in water samples
- ICP metals plus iron, manganese and aluminum (total and dissolved in water samples)

One water sample (SW002) was agitated to include a high proportion of suspended sediments. Another water sample (SW004) is representative of ponded water on the Site that is unaffected by the Regenox treated soils. Soil sample locations were selected to represent the highest area of staining (SS10-01), areas adjacent to the highest area of staining (SS10-02 and SS10-04), and background (SS10-03). Samples were placed in containers provided by the laboratory and were delivered to the Maxxam Analytics of Edmonton, Alberta under standard chain of custody documentation. Analytical results are provided in Attachment 2.

3. RESULTS

3.1 Soil Samples

Hydrocarbon compounds

The underlying table summarizes the results of the hydrocarbon analyses completed on the soil samples. Review of these results indicates the following:

- the concentrations of all aromatic (volatile) hydrocarbon compounds were non-detect, as were F1 hydrocarbon fractions in all samples;
- F2 and F3 hydrocarbons were detected in 5 of 7 samples tested, at concentrations varying from approximately 100 mg/kg to approximately 1,000 mg/kg;
- the concentrations of F4 hydrocarbon fractions were either low (40 mg/kg) or non-detect in all soil samples; and
- F2 and F3 hydrocarbon concentrations appear to be higher in the area of treated soils. F2 and F3 hydrocarbon concentrations measured in 2010 are consistently lower than those measured at the end of the 2009 remediation program (WorleyParsons 2010).

Based on these observations and measurements it can be concluded that the dark residue within the surface soils is not attributable to hydrocarbon contamination. The measured hydrocarbon concentrations are not sufficiently high to stain the soils.

HYDROCARBONS

June Sampling Program	Units	Sample 1	Sample 2			
Bulk Hydrocarbons						
F1 (C6-C10) - BTEX	mg/kg	<12	<12			
F2 (C10-C16 Hydrocarbons)	mg/kg	82	80			
F3 (C16-C34 Hydrocarbons)	mg/kg	150	110			
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10			
Volatiles						
Benzene	mg/kg	<0.0050	<0.0050			
Toluene	mg/kg	<0.020	<0.020			
Ethylbenzene	mg/kg	<0.010	<0.010			
Xylenes (Total)	mg/kg	<0.040	<0.040			
September Sampling Program	**Units**	**SS10-01**	**SS10-02**	**SS10-03**	**SS10-04**	**SS10-05**
Bulk Hydrocarbons						
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	<12
F2 (C10-C16 Hydrocarbons)	mg/kg	810	380	<10	<10	<10
F3 (C16-C34 Hydrocarbons)	mg/kg	960	680	110	56	320
F4 (C34-C50 Hydrocarbons)	mg/kg	20	14	<10	<10	37
Volatiles						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	mg/kg	<0.020	<0.020	<0.020	0.046	<0.020
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040

Salinity Parameters

Only the soil samples collected in September, 2010 were analyzed for salinity parameters. The underlying table summarizes the results of these analyses. Review of these analytical results indicates the following.

a) A high concentration of soluble sodium and high sodium adsorption ratio was measured for sample SS10-01 which was collected from the area of most significant staining. This soil would need to be amended with calcium carbonate to achieve calcium/sodium ratios conducive to plant growth.

b) The soil treatment appears to have increased (slightly) the pH of the soils.

c) Soluble calcium and magnesium concentrations are diminished by the soil treatment process as sodium has replaced a portion of the soluble calcium and magnesium present in the soil.

d) Soluble sulphate concentrations are relatively high in all samples and do not appear to be affected by the treatment process.

e) Soluble chloride concentrations are variable and do not appear to have been affected by the soil treatment.

f) Soil conductivity increases in the areas of soil treatment.

The soil salinity test results indicate that soluble sodium concentrations have increased significantly as part of the treatment. This impact appears to be limited to the immediate zone of soil treatment. While other salinity parameters such as soil conductivity and pH are increased by the treatment, these increases are no particularly significant.

SOIL SALINITY PARAMETERS

Soluble Parameters	Units	SS10-01	SS10-02	SS10-03	SS10-04
Soluble Chloride	mg/L	25	120	7	16
Soluble Conductivity	dS/m	5.2	2.9	1.2	2.9
Soluble pH	N/A	8.29	7.79	7.28	7.32
Sodium Adsorption Ratio	N/A	41	0.9	0.4	3.5
Soluble Calcium	mg/L	91	700	210	370
Soluble Magnesium	mg/L	28	40	37	97
Soluble Sodium	mg/L	1700	89	27	300
Soluble Potassium	mg/L	5.5	6.0	3.5	7.3
Soluble Sulphate (SO4)	mg/L	630	1700	550	1700
Theoretical Gypsum Requirement	tons/ac	25	<0.1	<0.1	<0.1

Selected Metals

Selected heavy and common metals were selected for presentation and analysis with the goal of potentially identifying a trend between the dark residue and the results of the metals analyses. The underlying table summarizes the results of the metals analyses completed on the soil samples. Review of these results indicates the following:

a) Sodium was elevated above anticipated background levels in sample SS10-01 and sulphur was elevated above anticipated background levels in sample SS10-02. Otherwise, no common metals were elevated in any of the samples that were tested. Common metals were not analyzed in the June sampling program.

b) Elevated total sodium and/or total sulphur is not expected to result in the dark discolouration.

c) No heavy metals concentrations were elevated in any of the June or September samples.

The results of these analyses indicate that metal concentrations in soil are not responsible for the dark staining that is evident in the areas of ponded water in the soil treatment area.

SELECTED METALS

June Sampling Program	Units	Sample 1	Sample 2			
Selected Metals						
Total Arsenic (As)	mg/kg	4	5			
Total Barium	mg/kg	350	450			
Total Cadmium (Cd)	mg/kg	<0.1	<0.1			
Total Chromium (Cr)	mg/kg	19	28			
Total Molybdenum	mg/kg	0.8	1.1			
Sept. Sampling Program	**Units**	**SS10-01**	**SS10-02**	**SS10-03**	**SS10-04**	**SS10-05**
Selected Metals						
Total Aluminum	mg/kg	2600	2900	2000	2700	2800
Total Iron	mg/kg	8000	8000	6700	6800	11000
Total Manganese	mg/kg	500	180	170	210	370
Total Sodium	mg/kg	2100	220	<50	190	<50
Total Sulphur	mg/kg	630	19000	220	310	530
Total Arsenic (As)	mg/kg	4	6	5	5	7
Total Barium	mg/kg	1600 (1)	180	250	260	1200
Total Cadmium (Cd)	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Total Chromium (Cr)	mg/kg	52	14	160	35	24
Total Molybdenum	mg/kg	1.5	0.8	4.1	1.2	1.4

3.2 Water Samples

Hydrocarbon Compounds

The underlying table summarizes the results of the hydrocarbon analyses completed on the water samples. Review of these results indicates the following:

- the concentrations of all measured hydrocarbon compounds were either non-detect or were very low in all samples;
- F2 and F3 hydrocarbons were consistently detected at concentrations varying from 0.1 mg/L to 0.4 mg/L; and
- there is no correlation between the F2 and F3 hydrocarbon concentrations that were measured and the turbidity or location of the samples.

Based on these observations and measurements it can be concluded that the discolouration of the ponded water is not attributable to hydrocarbon contamination of this water, or to hydrocarbon accumulation in the dark residue that is present in the depressions.

HYDROCARBON ANALYSIS OF WATER SAMPLES

June Sampling Program	Units	Turbid Sample	Clear Sample		
Extractable Hydrocarbons					
F1 (C6-C10) - BTEX	ug/L	<100	<100	--	--
F2 (C10-C16 Hydrocarbons)	mg/L	0.3	0.4	--	--
F3 (C16-C34 Hydrocarbons)	mg/L	--	--	--	--
F4 (C34-C50 Hydrocarbons)	mg/L	--	--	--	--
Volatiles					
Benzene	ug/L	<0.4	<0.4	--	--
Toluene	ug/L	<0.4	<0.4	--	--
Ethylbenzene	ug/L	<0.4	<0.4	--	--
Xylenes (Total)	ug/L	<0.8	<0.8	--	--
September Sampling Program	**Units**	**SW001**	**SW002**	**SW003**	**SW004**
Extractable Hydrocarbons					
F1 (C6-C10) - BTEX	mg/L	<100	<100	<100	<100
F2 (C10-C16 Hydrocarbons)	mg/L	0.1	0.1	0.2	0.1
F3 (C16-C34 Hydrocarbons)	mg/L	0.4	0.4	0.3	0.3
F4 (C34-C50 Hydrocarbons)	mg/L	<0.1	<0.1	<0.1	<0.1
Volatiles					
Benzene	ug/L	<0.4	<0.4	2.0	<0.4
Toluene	ug/L	<0.4	<0.4	34	<0.4
Ethylbenzene	ug/L	<0.4	<0.4	<0.4	<0.4
Xylenes (Total)	ug/L	<0.8	<0.8	1.4	<0.8

Main Ions and Indicators

The underlying table summarizes the results of the main ion and indicator analyses completed on the water samples. Review of these results indicates the following:

- relatively high mineralization, sodium and chloride concentrations are associated with sample SW004, which was unaffected by the soil treatment, which is indicative of sea water intrusions;
- significantly higher concentrations of dissolved sodium and sulphate, and to a lesser degree potassium are associated with the water samples affected by the soil treatment program;
- lower concentrations of calcium and magnesium are associated with the water samples affected by the soil treatment indicating that sodium is partially replacing calcium in the dissolved phase;
- bicarbonate and dissolved carbonate are driven into solution as a result of the soil treatment program; and
- water samples associated with the soil treatment possess higher pH.

Based on these observations and measurements it is evident that treatment using Regenox increases pH and introduces sodium, potassium, bicarbonate and carbonate into the dissolved phase. Minor replacement of calcium and magnesium also occurs as a result of amendment with Regenox. The higher concentrations of dissolved sodium could potentially affect plant health if this water were to be discharged to the adjacent tundra in significant quantities. None of these impacts is likely the source of dark residue that is present in the ponded water associated with the soil treatment area.

MAIN IONS AND INDICATOR PARAMETERS

	Units	SW001	SW002	SW003	SW004
Cations					
Calcium	mg/L	50	52	71	81
Magnesium	mg/L	23	24	28	39
Sodium	mg/L	1200	1300	950	99
Potassium	mg/L	4.5	4.6	4.3	0.3
Anions					
Bicarbonate (HCO3)	mg/L	2500	2500	2400	580
Carbonate (CO3)	mg/L	200	230	10	<0.5
Sulphate (SO4)	mg/L	120	130	64	<0.5
Chloride	mg/L	62	63	55	39
Hydroxide (OH)	mg/L	<5	<5	<5	<0.5
Indicator Parameters					
Conductivity	uS/cm	4300	4300	3500	970
pH	N/A	9.00	9.00	8.18	7.85
Total Dissolved Solids	mg/L	2950	2990	2390	545

Selected Metals

Aluminum, arsenic, barium, iron, manganese, molybdenum and sulphur were selected for analysis because these metals are deemed most diagnostic of the dark residue present in the area of the treated soils. The underlying table summarizes the results of the metals analyses completed on the water samples. Review of these results indicates the following:

a) Aluminum concentrations are elevated well above background in all samples affected by the treatment and are most elevated in the turbid water sample collected in June. It is noteworthy that dissolved aluminum concentrations in the samples collected in September typically exceed the total aluminum concentrations measured in the same samples.

b) Iron and manganese concentrations, and to a lesser extent barium concentrations, mirror those of aluminum.

c) Water samples collected from the areas affected by the treatment interfered significantly with the detection limits for heavy metals measured in these samples.

d) Molybdenum concentrations are elevated in the samples that are affected by the soil treatment program.

The results of these analyses indicate that iron, manganese and aluminum concentrations are elevated well above anticipated background concentrations. The higher concentrations of iron, aluminum and manganese measured in the turbid sample suggest that these elements are associated with the black residue observed in the ponded water in the soil treatment area.

SELECTED METALS

Metal	Units	Turbid Sample	Clear Sample		
Total Aluminum	mg/L	31	11		
Total Arsenic	mg/L	0.09	0.06		
Total Barium	mg/L	4	2		
Total Iron	mg/L	83	41		
Total Manganese	mg/L	4.9	3.2		
Total Molybdenum	mg/L	0.09	0.08		
Total Sulphur	mg/L	92	84		
Metal	**Units**	**SW001**	**SW002**	**SW003**	**SW004**
Dissolved Aluminum	mg/L	7.1	6.8	4.7	0.042
Total Aluminum	mg/L	4.1	4.1	2.4	0.09
Dissolved Arsenic	mg/L	0.1	<0.1	<0.1	<0.0002
Total Arsenic	mg/L	<0.1	<0.1	<0.1	<0.004
Dissolved Barium	mg/L	0.85	0.92	0.75	0.20
Total Barium	mg/L	1.5	1.9	1.1	0.20
Dissolved Iron	mg/L	7.9	8.4	15	1.1
Total Iron	mg/L	30	31	27	1.4
Dissolved Manganese	mg/L	1.7	1.7	3.7	0.11
Total Manganese	mg/L	2.5	2.7	4.3	0.21
Dissolved Molybdenum	mg/L	0.5	0.2	<0.1	<0.0002
Total Molybdenum	mg/L	0.2	<0.1	<0.1	0.027
Total Sulphur	mg/L	51	52	27	1.7

4. REGENOX

RegenOx® is manufactured by Regenesis and is designed specifically for the rapid, in situ and/or ex situ chemical oxidation of a broad range of contaminants including petroleum hydrocarbons. RegenOx has been effectively used to treat petroleum hydrocarbons (TPH, BTEX, MTBE, etc.), polyaromatic hydrocarbons (naphthalene, phenanthrene, etc.) and chlorinated hydrocarbons (PCE, TCE, TCA, etc.). RegenOx delivers rapid oxidization using a solid alkaline oxidant that is activated through the action of a catalytic complex. Once mixed with impacted soils, the combined product produces an oxidation reaction comparable to that of Fenton's Reagent but without an extreme exothermic reaction.

RegenOx™ is a two part product composed of an oxidizer/catalyst complex (Part A) and an activator complex (Part B). The activation of RegenOx is carried out by simply mixing Part A and Part B together in an on site tank prior to mixing with the soil. Part A consists of sodium percarbonate $(Na_2CO_3)_2(H_2O_2)_3$ and sodium carbonate monohydrate $(CH_2Na_2O_4)_2$ with minor amounts of sodium silicate and silica gel. Part B consists of sodium silicate, silica gel, ferrous sulphate and water. Activation of the oxidizing compounds results in the following:

- high levels of available oxygen and dissolved hydroxide ions;
- dissolution of sulphate, iron, and sodium; and
- heat.

The resultant soils and free water would be characterized by higher pH, higher soluble and total sodium, higher iron and abundant available oxygen. Attachment 3 provides MSDS data sheets for Parts A and B of Regenox.

5. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions have been derived based on the results of the sampling completed in 2010, our knowledge of the composition of Regenox and its anticipated affects on soil and water quality, and observations made during Site visits.

a) The dark staining associated with the surface depressions is not related to hydrocarbon contamination. Analyses of soil and water samples collected from the area of staining indicate non-detect to very low hydrocarbon concentrations that would not result in visual staining. The absence of any hydrocarbon odour also suggests that hydrocarbon compounds are not responsible for the dark residue that is present in the ponded water in the treated soil areas.

b) Iron and aluminum precipitates are the most likely source of the compounds that are causing the dark staining. These compounds were measured at concentrations substantially higher than expected background levels in water and suspended sediment samples collected from the stained areas. It is suspected that aluminum, which is naturally present in common soil minerals, is driven into solution through the high pH. Dissolved aluminum is then oxidized in the presence of Regenox to form the black, sooty precipitate (Al_2O_3). Iron sulphate, which is also present in

Regenox, can also precipitate out as a dark-grey, fine-grained precipitate and is expected to contribute to the dark residue.

c) Regenox is the likely source of elevated sodium (and sodium adsorption ratio) in the soil and water samples. The sodium, which is present in Regenox in the form of sodium percarbonate $(Na_2CO_3)_2(H_2O_2)_3$ and sodium carbonate monohydrate $(CH_2Na_2O_4)_2$ with minor amounts of sodium silicate, dissociates into sodium ions when dissolved in water. Sea water intrusions in the area may account for some naturally elevated concentrations of sodium in the area, but likely not to the degree observed at Camp Farewell. Elevated sodium concentrations in surface soils have the potential to stress vegetation if released to the tundra soils in large amounts.

d) The elevated pH observed in some soil and water samples is also associated with the amendment of contaminated gravel fill using Regenox. Dissolution of hydroxide is expected to occur as a result of dissolving percarbonate $(Na_2CO_3)_2(H_2O_2)_3$ and sodium carbonate monohydrate $(CH_2Na_2O_4)_2$ into water. The high pH impact is expected to attenuate over time as the free hydroxide ions are gradually neutralized by organic acids and dissolved CO_2.

e) Potential environmental issues associated with the Regenox are the elevated pH and the high ratio of sodium ions. Given that the elevated sodium and pH is confined to the treated gravels of the Site proper, there is very low risk to the ecology of the surrounding tundra.

The following recommendations are made respecting the stained areas of the Site:

a) Fill the local depressions to preclude future ponding of water and the associated accumulation of iron and aluminum precipitates.

b) Incorporate sampling and monitoring of the soils and ponded water associated with these areas into the regular Site monitoring program included in the main body of the Abandonment and Restoration Plan. Measure and confirm the anticipated attenuation of SAR and pH impacts over time.

c) Inspect the native tundra adjacent to the area of treated soils to identify potential areas of vegetation stress that could occur over time. Monitoring of tundra vegetation is already incorporated into the overall Site monitoring program associated with the Abandonment and Restoration Plan.

6. REFERENCES

WorleyParsons Komex, 2006. 2006 Environmental Site Assessment, Camp Farewell, NT. Unpublished report prepared for Shell Canada Limited, December 2006. C52360300.

WorleyParsons, 2010. 2009 Interim Abandonment and Restoration Program, Camp Farewell, NT. Unpublished report prepared for Shell Canada Energy Limited, April, 2010. C52360500.

Attachment 1 Soil Analytical Data

Your Project #: A04012A03 CAMP FAREWELL 2010
Site: MACKENZIE DELTA NWT
Your C.O.C. #: 81095

Attention: SAM BIRD
INUVIALUIT ENVIRONMENTAL & GEOTECHNICAL INC.
500, 2618 HOPEWELL PLACE NE
CALGARY, AB
CANADA T1V 7J7

Report Date: 2010/07/06

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B050197
Received: 2010/06/24, 8:00

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Boron (Hot Water Soluble)	2	2010/06/30	2010/06/30	AB SOP-00042	EPA 200.7
BTEX/F1 by HS GC/MS (MeOH extract)	1	2010/06/26	2010/07/02	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
BTEX/F1 by HS GC/MS (MeOH extract)	1	2010/06/26	2010/07/03	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
Hexavalent Chromium	2	2010/06/26	2010/06/26	EENVSOP-00131	SM 3500-Cr B
CCME Hydrocarbons (F2-F4 in soil)	2	2010/06/26	2010/06/29	EENVSOP-00007 AB WI-00016	CCME PHC-CWS
Elements by ICPMS - Soils	2	2010/06/30	2010/07/01	AB SOP-00043	EPA 200.8
Moisture	2	N/A	2010/06/28	EENVSOP-00139	Carter SSMA 51.2

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS	2	N/A	2010/07/02	EENVSOP-00004 EENVSOP-00002	EPA 8260C/CCME
Cadmium - low level CCME (Total)	2	2010/06/30	2010/07/04	CAL SOP-00191	EPA SW-846 6020A
CCME Hydrocarbons in Water (F2; C10-C16)	2	2010/06/30	2010/06/30	EENVSOP-00007 AB WI-00017	EPA3510/CCME PHCCWS
Elements by ICP - Total	2	2010/06/30	2010/07/03	AB SOP-00042	EPA 200.7
Elements by ICPMS - Total	2	2010/06/30	2010/07/03	AB SOP-00043	EPA 200.8

../2

Your Project #: A04012A03 CAMP FAREWELL 2010
Site: MACKENZIE DELTA NWT
Your C.O.C. #: 81095

Attention: SAM BIRD
INUVIALUIT ENVIRONMENTAL & GEOTECHNICAL INC.
500, 2618 HOPEWELL PLACE NE
CALGARY, AB
CANADA T1V 7J7

Report Date: 2010/07/06

CERTIFICATE OF ANALYSIS

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

ABDULKADIR DAKANE, Project Manager
Email: abdulkadir.dakane@maxxamanalytics.com
Phone# (780) 577-7100

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 2

Maxxam Job #: B050197
Report Date: 2010/07/06

INUVIALUIT ENVIRONMENTAL & GEOTECHNICAL INC.
Client Project #: A04012A03 CAMP FAREWELL 2010
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: KE

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		V04595	V04596		
Sampling Date		2010/06/22	2010/06/22		
COC Number		81095	81095		
	Units	**102**	**103**	**RDL**	**QC Batch**
Hydrocarbons					
F2 (C10-C16 Hydrocarbons)	mg/L	0.3	0.4	0.1	4068358
Volatiles					
Benzene	ug/L	<0.4	<0.4	0.4	4068942
Toluene	ug/L	<0.4	<0.4	0.4	4068942
Ethylbenzene	ug/L	<0.4	<0.4	0.4	4068942
o-Xylene	ug/L	<0.4	<0.4	0.4	4068942
m & p-Xylene	ug/L	<0.8	<0.8	0.8	4068942
Xylenes (Total)	ug/L	<0.8	<0.8	0.8	4068942
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	4068942
(C6-C10)	ug/L	<100	<100	100	4068942
Surrogate Recovery (%)					
4-BROMOFLUOROBENZENE (sur.)	%	106	104	N/A	4068942
D4-1,2-DICHLOROETHANE (sur.)	%	113	110	N/A	4068942
D8-TOLUENE (sur.)	%	99	98	N/A	4068942
O-TERPHENYL (sur.)	%	175 (1)	124	N/A	4068358

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) Surrogate recovery exceeds acceptance criteria due to matrix interference.

Maxxam Job #: B050197
Report Date: 2010/07/06

INUVIALUIT ENVIRONMENTAL & GEOTECHNICAL INC.
Client Project #: A04012A03 CAMP FAREWELL 2010
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: KE

AT1 BTEX AND F1-F4 IN SOIL (SOIL)

Maxxam ID		V04582	V04597		
Sampling Date		2010/06/22	2010/06/22		
COC Number		81095	81095		
	Units	**101**	**104**	**RDL**	**QC Batch**
Physical Properties					
Moisture	%	12	11	0.3	4063642
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/kg	82	80	10	4061878
F3 (C16-C34 Hydrocarbons)	mg/kg	150	110	10	4061878
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	10	4061878
Reached Baseline at C50	mg/kg	Yes	Yes	N/A	4061878
Volatiles					
Benzene	mg/kg	<0.0050	<0.0050	0.0050	4062440
Toluene	mg/kg	<0.020	<0.020	0.020	4062440
Ethylbenzene	mg/kg	<0.010	<0.010	0.010	4062440
Xylenes (Total)	mg/kg	<0.040	<0.040	0.040	4062440
m & p-Xylene	mg/kg	<0.040	<0.040	0.040	4062440
o-Xylene	mg/kg	<0.020	<0.020	0.020	4062440
F1 (C6-C10) - BTEX	mg/kg	<12	<12	12	4062440
(C6-C10)	mg/kg	<12	<12	12	4062440
Surrogate Recovery (%)					
4-BROMOFLUOROBENZENE (sur.)	%	100	95	N/A	4062440
D10-ETHYLBENZENE (sur.)	%	105	109	N/A	4062440
D4-1,2-DICHLOROETHANE (sur.)	%	100	100	N/A	4062440
D8-TOLUENE (sur.)	%	101	94	N/A	4062440
O-TERPHENYL (sur.)	%	118	121	N/A	4061878

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B050197
Report Date: 2010/07/06

INUVIALUIT ENVIRONMENTAL & GEOTECHNICAL INC.
Client Project #: A04012A03 CAMP FAREWELL 2010
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: KE

REGULATED METALS (CCME/AT1)

Maxxam ID		V04582	V04597		
Sampling Date		2010/06/22	2010/06/22		
COC Number		81095	81095		
	Units	**101**	**104**	**RDL**	**QC Batch**
Elements					
Soluble (Hot water) Boron (B)	mg/kg	0.8	0.7	0.1	4070945
Hex. Chromium (Cr 6+)	mg/kg	<0.15	<0.15	0.15	4061045
Total Antimony (Sb)	mg/kg	<1	<1	1	4071245
Total Arsenic (As)	mg/kg	4	5	1	4071245
Total Barium (Ba)	mg/kg	350	450	10	4071245
Total Beryllium (Be)	mg/kg	<0.4	<0.4	0.4	4071245
Total Cadmium (Cd)	mg/kg	<0.1	<0.1	0.1	4071245
Total Chromium (Cr)	mg/kg	19	28	1	4071245
Total Cobalt (Co)	mg/kg	2	3	1	4071245
Total Copper (Cu)	mg/kg	5	6	5	4071245
Total Lead (Pb)	mg/kg	10	11	1	4071245
Total Mercury (Hg)	mg/kg	<0.05	<0.05	0.05	4071245
Total Molybdenum (Mo)	mg/kg	0.8	1.1	0.4	4071245
Total Nickel (Ni)	mg/kg	11	16	1	4071245
Total Selenium (Se)	mg/kg	<0.5	<0.5	0.5	4071245
Total Silver (Ag)	mg/kg	<1	<1	1	4071245
Total Thallium (Tl)	mg/kg	<0.3	<0.3	0.3	4071245
Total Tin (Sn)	mg/kg	1	<1	1	4071245
Total Uranium (U)	mg/kg	<1	<1	1	4071245
Total Vanadium (V)	mg/kg	11	13	1	4071245
Total Zinc (Zn)	mg/kg	16	17	10	4071245

RDL = Reportable Detection Limit

Maxxam Job #: B050197
Report Date: 2010/07/06

INUVIALUIT ENVIRONMENTAL & GEOTECHNICAL INC.
Client Project #: A04012A03 CAMP FAREWELL 2010
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: KE

REGULATED METALS (CCME/AT1) - TOTAL

Maxxam ID		V04595	V04596		
Sampling Date		2010/06/22	2010/06/22		
COC Number		81095	81095		
	Units	**102**	**103**	**RDL**	**QC Batch**
Low Level Elements					
Total Cadmium (Cd)	ug/L	4.2	3.0	0.5	4069992
Elements					
Total Aluminum (Al)	mg/L	31	11	0.1	4075065
Total Antimony (Sb)	mg/L	<0.02	<0.02	0.02	4075065
Total Arsenic (As)	mg/L	0.09	0.06	0.02	4075065
Total Barium (Ba)	mg/L	4.0	2.0	0.1	4075518
Total Beryllium (Be)	mg/L	<0.1	<0.1	0.1	4075065
Total Boron (B)	mg/L	<0.2	<0.2	0.2	4075518
Total Calcium (Ca)	mg/L	72	59	3	4075518
Total Chromium (Cr)	mg/L	0.2	<0.1	0.1	4075065
Total Cobalt (Co)	mg/L	0.07	0.04	0.03	4075065
Total Copper (Cu)	mg/L	0.41	0.33	0.02	4075065
Total Iron (Fe)	mg/L	83	41	0.6	4075518
Total Lead (Pb)	mg/L	0.52	0.30	0.02	4075065
Total Lithium (Li)	mg/L	<0.2	<0.2	0.2	4075518
Total Magnesium (Mg)	mg/L	23	23	2	4075518
Total Manganese (Mn)	mg/L	4.9	3.2	0.04	4075518
Total Molybdenum (Mo)	mg/L	0.09	0.08	0.02	4075065
Total Nickel (Ni)	mg/L	0.33	0.24	0.05	4075065
Total Phosphorus (P)	mg/L	8	9	1	4075518
Total Potassium (K)	mg/L	11	7	3	4075518
Total Selenium (Se)	mg/L	<0.02	<0.02	0.02	4075065
Total Silicon (Si)	mg/L	56	21	1	4075518
Total Silver (Ag)	mg/L	<0.01	<0.01	0.01	4075065
Total Sodium (Na)	mg/L	1300	1300	5	4075518
Total Strontium (Sr)	mg/L	0.3	0.2	0.2	4075518
Total Sulphur (S)	mg/L	92	84	2	4075518
Total Thallium (Tl)	mg/L	<0.02	<0.02	0.02	4075065
Total Tin (Sn)	mg/L	<0.1	<0.1	0.1	4075065
Total Titanium (Ti)	mg/L	0.7	0.3	0.1	4075065
Total Uranium (U)	mg/L	0.04	0.06	0.01	4075065
Total Vanadium (V)	mg/L	0.3	0.2	0.1	4075065
Total Zinc (Zn)	mg/L	0.4	<0.3	0.3	4075065

RDL = Reportable Detection Limit

Maxxam Job #: B050197
Report Date: 2010/07/06

INUVIALUIT ENVIRONMENTAL & GEOTECHNICAL INC.
Client Project #: A04012A03 CAMP FAREWELL 2010
Site Reference: MACKENZIE DELTA NWT
Sampler Initials: KE

General Comments

Sample V04595-01: Detection limits raised due to sample matrix. Parameters affected are Al, Cr, Co, Cu, Pb, Sb, Mo, Ni, Se, Ag, As, Tl, Sn, Ti, U, V, Zn, Be, Cd.

Detection limits raised due to sample matrix.

Sample V04596-01: Detection limits raised due to sample matrix. Parameters affected are Al, Cr, Co, Cu, Pb, Sb, Mo, Ni, Se, Ag, As, Tl, Sn, Ti, U, V, Zn, Be, Cd.

Detection limits raised due to sample matrix.

Results relate only to the items tested.

INUVIALUIT ENVIRONMENTAL & GEOTECHNICAL INC.
Attention: SAM BIRD
Client Project #: A04012A03 CAMP FAREWELL 2010
P.O. #:
Site Reference: MACKENZIE DELTA NWT

Quality Assurance Report

Maxxam Job Number: EB050197

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
4061045 EC4	Matrix Spike	Hex. Chromium (Cr 6+)	2010/06/26		100	%	75 - 125
	Spiked Blank	Hex. Chromium (Cr 6+)	2010/06/26		103	%	80 - 120
	Method Blank	Hex. Chromium (Cr 6+)	2010/06/26	<0.15		mg/kg	
	RPD	Hex. Chromium (Cr 6+)	2010/06/26	NC		%	35
4061878 RC6	Matrix Spike	O-TERPHENYL (sur.)	2010/06/29		116	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2010/06/29		100	%	50 - 130
		F3 (C16-C34 Hydrocarbons)	2010/06/29		97	%	50 - 130
		F4 (C34-C50 Hydrocarbons)	2010/06/29		95	%	50 - 130
	Spiked Blank	O-TERPHENYL (sur.)	2010/06/29		93	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2010/06/29		95	%	80 - 120
		F3 (C16-C34 Hydrocarbons)	2010/06/29		88	%	80 - 120
		F4 (C34-C50 Hydrocarbons)	2010/06/29		84	%	80 - 120
	Method Blank	O-TERPHENYL (sur.)	2010/06/29		114	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2010/06/29	<10		mg/kg	
		F3 (C16-C34 Hydrocarbons)	2010/06/29	<10		mg/kg	
		F4 (C34-C50 Hydrocarbons)	2010/06/29	<10		mg/kg	
	RPD	F2 (C10-C16 Hydrocarbons)	2010/06/29	NC		%	50
		F3 (C16-C34 Hydrocarbons)	2010/06/29	NC		%	50
		F4 (C34-C50 Hydrocarbons)	2010/06/29	NC		%	50
4062440 AN1	Matrix Spike	4-BROMOFLUOROBENZENE (sur.)	2010/07/02		102	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2010/07/02		110	%	30 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2010/07/02		96	%	60 - 140
		D8-TOLUENE (sur.)	2010/07/02		96	%	60 - 140
		Benzene	2010/07/02		95	%	60 - 140
		Toluene	2010/07/02		94	%	60 - 140
		Ethylbenzene	2010/07/02		101	%	60 - 140
		m & p-Xylene	2010/07/02		101	%	60 - 140
		o-Xylene	2010/07/02		96	%	60 - 140
		(C6-C10)	2010/07/02		125	%	60 - 140
	Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2010/07/02		97	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2010/07/02		110	%	30 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2010/07/02		96	%	60 - 140
		D8-TOLUENE (sur.)	2010/07/02		103	%	60 - 140
		Benzene	2010/07/02		90	%	60 - 140
		Toluene	2010/07/02		93	%	60 - 140
		Ethylbenzene	2010/07/02		92	%	60 - 140
		m & p-Xylene	2010/07/02		95	%	60 - 140
		o-Xylene	2010/07/02		91	%	60 - 140
		(C6-C10)	2010/07/02		107	%	60 - 140
	Method Blank	4-BROMOFLUOROBENZENE (sur.)	2010/07/02		94	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2010/07/02		115	%	30 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2010/07/02		97	%	60 - 140
		D8-TOLUENE (sur.)	2010/07/02		100	%	60 - 140
		Benzene	2010/07/02	<0.0050		mg/kg	
		Toluene	2010/07/02	<0.020		mg/kg	
		Ethylbenzene	2010/07/02	<0.010		mg/kg	
		Xylenes (Total)	2010/07/02	<0.040		mg/kg	
		m & p-Xylene	2010/07/02	<0.040		mg/kg	
		o-Xylene	2010/07/02	<0.020		mg/kg	
		F1 (C6-C10) - BTEX	2010/07/02	<12		mg/kg	
		(C6-C10)	2010/07/02	<12		mg/kg	
	RPD	Benzene	2010/07/02	NC		%	50
		Toluene	2010/07/02	NC		%	50
		Ethylbenzene	2010/07/02	NC		%	50
		Xylenes (Total)	2010/07/02	NC		%	50