



# Shell Canada Energy

**Camp Farewell NT**

## *Closure and Reclamation Plan*



November 4, 2015

Shell Canada Energy  
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Calgary, Alberta  
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**Mr. Randall Warren**  
**Manager, DAR and Drilling Waste**

Dear Mr. Warren:

**Closure and Reclamation Plan**  
**Camp Farewell, NT**

IEG Consultants Ltd. (IEG) is pleased to provide consulting services to Shell Canada Energy (Shell) regarding the Closure and Reclamation Plan for the Camp Farewell (Site). The enclosed document is intended to meet the requirements for Shell to update the interim Closure and Reclamation Plan for the site bi-annually.

This plan update is submitted in confidence and its contents may not be divulged to third parties without express written consent of IEG.

We appreciate this opportunity to continue to offer our services and assistance to Shell Canada Energy. If you have any questions, please call the undersigned at (403) 730-6809.

Yours truly,  
**IEG CONSULTANTS LTD.**

Nicole Wills, P.Ag.  
Project Manager

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# Shell Canada Energy

**Camp Farewell NT**

## *Closure and Reclamation Plan*

## LIMITATIONS AND USE OF REPORT

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## EXECUTIVE SUMMARY

IEG Consultants Ltd. (IEG) was retained by Shell Canada Energy (Shell) to update the Closure and Reclamation Plan (CRP) for Shell's Camp Farewell (Site) located at 69°12' 30" N, 135°06' 04" W, approximately 125 km northwest of the town of Inuvik in the Northwest Territories (NT).

Camp Farewell is located within the Inuvialuit Settlement Region on the northeast bank of the Middle Channel near Harry Channel in the Kendall Island Bird Sanctuary (KIBS), NT. It has been used as a staging site for various activities such as seismic operations, preliminary development assessment work, and drilling operations. Currently the site is decommissioned and infrastructure has either been disassembled or demolished with the exception of a fuel storage trailer, the emergency shelter, and one shed building to store equipment.

This plan includes a summary of the existing conditions at the Site and the closure activities that have been conducted to date. The plan also includes details regarding the permanent closure and reclamation activities that are expected to occur at the site in subsequent years. Requirements of federal, territorial, and other regulations have been considered and applied throughout this plan.

Primary temporary closure activities were initiated in 2008 and 2009 and have continued with the removal and responsible management of materials and equipment that are no longer required at the Site. In 2012, activities related to the decommissioning, remediation, and reclamation of the former sewage lagoon were initiated.

Permanent closure activities were initiated in 2013 with the excavation and backfilling of the former sewage lagoon. Activities continued in 2014 and 2015 with the decommissioning and removal of site infrastructure, materials, and equipment.

Permanent closure activities are expected to continue in 2016 and 2017; a schedule for the completion of permanent closure activities at the Site is undefined at this time.

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## 1 INTRODUCTION

IEG Consultants Ltd. (IEG) was retained by Shell Canada Energy (Shell) to update the Closure and Reclamation Plan (CRP) for Shell’s Camp Farewell (Site) located at 69°12’ 30” N, 135°06’ 04” W, approximately 125 km northwest of the town of Inuvik in the Northwest Territories (NT) (Figures 1 and 2).

### 1.1 Purpose of Closure and Reclamation Plan (CRP)

The purpose of the CRP is to summarize the existing site operational and environmental conditions of Camp Farewell and summarize Shell’s plans for closure and reclamation at this Site. This CRP is intended to meet the requirements associated with closure and reclamation planning in accordance with both federal and territorial regulations.

### 1.2 Planning Team

This CRP has been prepared on behalf of Shell by IEG. The following individuals were involved in the preparation and submission of this Plan.

Company	Responsibility	Individual	Role
Shell Canada Energy	Owner	Randall Warren	Decommissioning, Abandonment & Reclamation Manager
IEG Consultants	Environmental Planning	Nicole Wills	Environmental Scientist

### 1.3 Approach of the Closure and Reclamation Plan

#### 1.3.1 Applicable Regulatory Bodies

Regulatory bodies maintain jurisdiction over the Site, as outlined below.

##### 1.3.1.1 Inuvialuit Water Board (IWB)

The IWB, formerly known as the Northwest Territories Water Board (NTWB), enforces the Northwest Territories Water Act.

This Plan has been updated in partial fulfillment of the requirements outlined in licence # N7L1-1762 (Appendix I) as issued by the IWB. Item 1 of Part G of the Licence states:

*“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 plans for the abandonment and restoration of the Sewage lagoon and a complete Phase II Environmental Site Assessment of Camp Farewell. This assessment will include the full delineation of contamination (soil and water) associated with Camp Farewell operations, both on and off the gravel base pad.”*

### 1.3.1.2 Aboriginal Affairs and Northern Development Canada (AANDC)

The AANDC, formerly known as Indian and Northern Affairs Canada (INAC), is the ministry that enforces the *Mine Site Reclamation Guidelines for the Northwest Territories*. This guideline was developed in consultation with aboriginal community members, scientific experts, mine representatives, regulatory authorities, and other affected parties to support the environment and provide regulation of mining activities occurring in Canada's north.

This guideline is the most recent publication and therefore the most appropriate regulatory guideline for the Camp Farewell site. As such, it has been used in the development of this Closure and Reclamation Plan. Specific considerations of the guideline have been made as Camp Farewell has a unique history and distinct characteristics that may justify the potential continued use of the site as a staging and/or storage area following decommissioning of camp operations.

Camp Farewell is located on federal Crown land and is under lease to Shell. The lease, No. 107-C/4-2-15 (Appendix II), was re-issued in 2009 and is valid until 2028. The general requirements regarding reclamation of the Site and the airstrip are outlined in the lease. Part 12 (Termination) states:

*"Upon the termination or expiration of this lease, the lessee shall deliver up possession of the land in a condition satisfactory to the Minister."*

And; Part 14 (Restoration) of both Leases state:

*"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."*

Where appropriate, potential restoration and reclamation options have been presented to Shell to assist in closure planning, however; specific plans will require review and consent of the applicable regulatory bodies.

### 1.3.1.3 Environment Canada – Canadian Wildlife Service (CWS)

The Site lies within the Kendall Island Bird Sanctuary (KIBS), under jurisdiction of Environment Canada. Shell holds permit # NT-MBS-15-01 (Appendix III). Further detail regarding this permit is discussed in Section 2.2.4.

### 1.3.1.4 Applicable Regulatory Guidelines

Remediation guidelines utilized during the assessments of the Site have been based on the *Environmental Guideline for Contaminated Site Remediation, 2003*, as enforced by the NT government (the Minister of Environment and Natural Resources [ENR]) as identified by the *NT Environmental Protection Act (EPA)*. The applicable guidelines that have been applied to assessments at the Site are discussed in Section 4.5.2.3.

### 1.3.2 Project Understanding

The following activities have been conducted as part of this plan:

- review of the applicable regulatory requirements and issued licenses and approvals as they relate to Camp Farewell, including direct communications with appropriate regulators;
- review of the current site status and Shell's future intentions for the site, including past, present and potential future land use considerations;
- review of Site history;
- review of existing Environmental Site Assessments (ESAs) conducted at Camp Farewell, including existing analytical data resulting from recent soil and water quality monitoring programs and documentation related to dismantling/remediation programs; and,
- review and update of the 2013 Closure and Reclamation Plan, submitted by IEG to Shell in July, 2013.

### 1.4 Definition of Terms

The following list of terms are used throughout this document and are consistent with those identified in the Mine Site Reclamation Guidelines:

**Abandonment:** The permanent dismantlement of a facility so it is incapable of its intended use. This includes the removal of associated equipment and structures.

**Active layer:** The layer of ground above the permafrost which thaws and freezes annually.

**Backfill:** Material excavated from a site and reused for filling the surface or underground void created by mining or excavating.

**Background:** An area near the site under evaluation not influenced by chemicals released from the site, or other impacts created by onsite activity.

**Berm:** A mound or wall, usually of earth, used to retain substances or to prevent substances from entering an area.

**Biodiversity:** The variety of plants and animals that live in a specific area.

**Bioremediation:** The use of microorganisms or vegetation to reduce contaminant levels in soil or water.

**Closure:** When Camp Farewell ceases operations without the intent to resume activities in the future.

**Closure Criteria:** Detail to set precise measures of when a closure objective has been satisfied.

**Contaminant:** Any physical, chemical, biological or radiological substance in the air, soil, or water that has an adverse effect. Any chemical substance with a concentration that exceeds background levels or which is not naturally occurring in the environment.

**Contouring:** The process of shaping the land surface to fit the form of the surrounding land.

**Decommissioning:** The process of permanently closing a site; removing equipment, buildings and structures. Rehabilitation and plans for future maintenance of affected land and water are also included.

**Disposal:** The relocation and containment of unwanted materials in an approved facility.

**Drainage:** The removal of excess surface water or groundwater from land by natural runoff and permeation, or by surface or subsurface drains.

**Erosion:** The wearing away of rock, soil or other surface material by water, rain, waves, wind, or ice; the process may be accelerated by human activities.

**Groundwater:** All subsurface water that occurs beneath the water table in rocks and geologic formations that are fully saturated.

**In Situ Treatment:** A method of managing or treating contaminated soils, sludges and waters “in place” in a manner that does not require the contaminated material to be physically removed or excavated from where it originated.

**Landfill:** An engineered waste management facility at which waste is disposed by placing it on or in land in a manner that minimizes adverse human health and environmental effects.

**Monitoring:** Observing the change in geophysical, hydrogeological, or geochemical measurements over time.

**Objectives:** Objectives describe what the reclamation activities are aiming to achieve. The goal of Site closure is to achieve the long-term objectives that are selected for the Camp Farewell Site.

**Permafrost:** Ground that remains at or below zero degrees Celsius for a minimum of two consecutive years.

**Reclamation:** The process of returning a disturbed site to its natural state or one for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.

**Rehabilitation:** Activities to ensure that the land will be returned to a form and productivity in conformity with a prior land use, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values.

**Remediation:** The removal, reduction, or neutralization of substances, wastes or hazardous material from a site in order to prevent or minimize any adverse effects on the environment and public safety now or in the future.

**Restoration:** The renewing, repairing, cleaning-up, remediation or other management of soil, groundwater or sediment so that its functions and qualities are comparable to those of its original, unaltered state.

**Revegetation:** Replacing original ground cover following a disturbance to the land.

**Risk Assessment:** Reviewing risk analysis and options for a given site, component or condition. Risk assessments consider factors such as risk acceptability, public perception of risk, socio-economic impacts, benefits, and technical feasibility. It forms the basis for risk management.

**Temporary Closure:** When Camp Farewell ceases operations with the intent to resume activities in the future. Temporary closures can last for a period of weeks, or for several years, based on economical, environmental, political, or social factors.

**Traditional Knowledge:** A cumulative, collective body of knowledge, experience, and values built up by a group of people through generations of living in close contact with nature. It builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual and political change.

## 2 SITE DESCRIPTION

Camp Farewell is located within the Inuvialuit Settlement Region (ISR) on the northeast bank of the Middle Channel near Harry Channel in the KIBS.

### 2.1 Background and Construction

Camp Farewell was constructed in the winter of 1970 and summer of 1971 and was operated as a staging and storage site in support of the Shell Mackenzie Delta Drilling Program. The site consisted of a self-contained camp, providing electrical and heating services and facilities for accommodation, meals, fuel storage, equipment handling, water withdrawal and wastewater storage. The camp operated as a 60-70 person camp full time until 1978, after which it was in operation periodically until 1994. During full operation in the 1970's, infrastructure on-site included: a single story accommodations building, two 5,000 barrel (bbl) tanks, one 3,000 bbl tank, and three 2,000 bbl tanks. In the mid 1980's, the accommodations building was replaced with a smaller building, designed for approximately 32 people. Storage information included in previous WorleyParsons reports indicates the following has been stored on-site: up to 6.8 million litres of fuel (including gasoline, diesel and aviation fuel), building materials, drilling mats, piping, and drilling additives (including barite, Aqua Seal™, and caustic soda).

The Site was constructed on permafrost, and based on site history the preservation of this layer was considered. A layer of polyurethane (either 50 mm foam or pads) was installed, including 450 mm of compacted gravel to act as a thermal barrier and prevent contamination of underlying soils and groundwater. In 2006, WorleyParsons conducted test pitting on-site and encountered remnants of liner between approximately 0.38 and 0.62 metres below ground surface (m bgs) in some, but not all of the test pits. This suggests that while liner was used, the gravel pad extended beyond the liner. Sand and gravel comprised the pad fill material and extended to between approximately 0.5 and 1 m bgs. Clay mineral additive (bentonite) appears to have been mixed with gravel as well to aid in compaction and adhesion of gravel throughout the site (WorleyParsons 2011).

### 2.1.1 Spill History

Approximately 800,000 litres of water contaminated diesel fuel was unintentionally released from the tank farm in 1981 according to a search of the Government of Northwest Territories (GNT) Hazardous Spills Database. Canadian Marine Drilling (CanMar, a subsidiary of Dome Petroleum), was occupying Camp Farewell and responsible for the two 5,000 bbl tanks located in the tank farm. Investigation suggests the spill was a result of vandalism/theft that occurred in the winter of 1980-81, resulting in the spring release, which was reported to authorities on May 24, 1981 (WorleyParsons 2011).

Released fluids overtopped the berm and flowed with site topography to the south-west, over the steep banks of the site and onto the frozen Mackenzie River. Free fuel within the berm and camp area was collected and pumped into holding tanks, while residual fuel was collected using sorbent pads. Fuel that spilled onto the frozen river was also collected using the sorbent pads. These pads were incinerated in a Sacke Portable Burner over the 4 to 6 week clean-up period (WorleyParsons 2011).

Additional detail regarding the actual spill and clean-up efforts is documented in Komex, 2001.

### 2.1.2 Site Operations

The Site has been utilized by many different corporations for different activities; however, it is under the stewardship of Shell. The Site is currently inactive. Previously the Site has been utilized as a staging area for seismic and drilling operations. It has been used for camp facilities, and storage of equipment and fuel. Currently one fuel storage facility (93,000 L white tank) exists on site adjacent to the former location of the camp building.

Recent site activities have been limited to those involved in the Closure and include dismantling and removal of infrastructure, removal of stockpiled materials and consumables, decommissioning and remediation of the lagoon, assessment activities, and required environmental monitoring work.

### 2.1.3 On-Site Facilities

In 2013, 2014, and 2015 many facilities on-site were either disassembled or demolished, and then removed and transported via barge to appropriate facilities.

In 2013, the sewage lagoon was remediated and water supply and sewage treatment facilities were demolished and removed. There are no longer water-related facilities at the Site.

In 2014, infrastructure including Shed #2, Shed #3, and the camp building were disassembled and/or demolished. Materials that could be recycled such as metals were separated from debris and waste material, for shipment to appropriate facilities.

Materials stored on-site including scrap metal, cable wire, assorted hoses, assorted pieces of pipe, five gallon pails of nuts, bolts and screws, pieces of conduit, steel caps, pup joints, tarps, rolls of polyliner, absorbants, steel skis for sleighs, large drums of jet fuel and engine oil, and assorted chemicals in small quantities were packaged and removed from Site via barge.

In 2015, the tank farm consisting of five tanks was demolished and removed from Site via barge. In addition, a soil assessment program of the lease area and air strip was conducted. Results of the 2015 Soil Assessment Program will be included in the Camp Farewell 2015 annual report as well as the updated Closure and Reclamation Plan in 2017.

The following facilities currently exist at the Site (Figure 2):

- fuel trailer;
- one storage shed (shed #1);
- emergency shelter; and,
- the airstrip (occasionally aviation fuel has been stored in tanks on the airstrip for regional helicopter operations).

AANDC and the CWS have been known to occasionally store fuel within a secondary containment on the west side of the site.

In 2009, WorleyParsons conducted dismantling and material removal activities and conducted a detailed audit of the materials and structures on site. A list of materials and equipment prepared by WorleyParsons is included in Appendix IV. No additional materials or equipment were stored at the site after 2009.

From 2013 to 2015, IEG conducted site visits to confirm the infrastructure was secure and in good condition. A summary of the 2013, 2014, and 2015 site inspections are available in Appendix V.

## 2.2 Setting

Camp Farewell is located within the Mackenzie Delta, the area where the Mackenzie River meets the Beaufort Sea. The nearest municipal centers are the town of Inuvik, located approximately 125 km southeast of Site, and the hamlet of Tuktoyaktuk, located approximately 135 km northeast of the Site (Figure 1).

### 2.2.1 Climate

Environment Canada (2006) reported that historical climatic data from Inuvik identified that the mean daily temperature between 1971 and 2000 was -8.8 degrees Celsius (°C), with a temperature exceeding 0°C occurring an average of 156 days per year. During the same period, the average annual precipitation is reported as 248.2 mm, including approximately 117 mm of rainfall and 167.9 cm of snowfall (WorleyParsons 2011).

Environment Canada reported that historical climatic data from Tuktoyaktuk reported an average temperature between 1971 and 2000 to be  $-10.6^{\circ}\text{C}$  with the temperature exceeding  $0^{\circ}\text{C}$  an average of 137 days a year. Average annual precipitation for this period was 167.8 mm, consisting of 75.3 mm of rainfall and 95.3 cm of snowfall (WorleyParsons 2011).

### 2.2.2 Local and Regional Geology

The Mackenzie Delta outwash plain that Camp Farewell is located on is bordered by the Mackenzie River to the west and southwest with the nearest camp boundary located approximately 20 m northwest. Shallow lakes and intermittent ponds surround the east, north (nearest camp boundary approximately 360 m), and south (nearest camp boundary approximately 660 m) sides of the site. Surface drainage is predominantly to the south and southwest (WorleyParsons 2011).

Documentation suggests that surficial geology near the site consists of silty sand overlying sand and interbedded sand and gravel deposits (Figures 3, 4A, and 4B). These deposits are typically associated with the Toker Member, Melloch Till, or Buckland Glaciation deposits. These sediments are overlain by organic deposits. Outwash plains and valley trains identified in the Mackenzie Delta and Tuktoyaktuk Coastal lands are reported to be between 3 m and 30 m thick and include North Star Outwash, Garry Island Member, Cape Dalhousie Sands, and Turnabout Member. Geology observed at Camp Farewell indicates the outwash plain is approximately 15 m thick (WorleyParsons 2011).

An extensive discontinuous permafrost layer with a low to moderate ice content extending to approximately 95 m bgs has been documented in the region surrounding the Site. This region is reportedly characterized by sparse ice wedges and pingo ice and no massive ground ice. The active layer (layer of soil subject to seasonal thaw cycles) depth is typically less than 1.0 m bgs and may be as little as 0.28 m bgs (WorleyParsons 2011).

Groundwater flow is typically highest in the active layer and above the permafrost, and has been reported at depths ranging from 0.26 to 0.83 m bgs with depths increasing toward the south. The depth to groundwater is dependent on the amount of gravel overburden and is a light brown color as a result of the organic rich soils (WorleyParsons 2011).

### 2.2.3 Vegetation

Ice wedges result in the formation of polygon-shaped depressions which have been identified in the area to the north and west of the site. These depressions result in conditions favorable for the growth of willow (*Salix* species) and alder (*Alnus* species) woody vegetation. Dwarf shrubs, moss and lichen ground cover characterizes the remaining areas surrounding the site (WorleyParsons 2011).

### 2.2.4 Sensitive Area

The KIBS was established in 1961 to protect the staging and breeding grounds of over 100 species of songbirds, shorebirds, and waterfowl, including the protected Lesser Snow Goose. The sanctuary includes  $620\text{ km}^2$  of the Mackenzie River Delta. The habitat within the delta inlet consists of coastal marshes, wet meadows, and seasonal flats, and provides seasonal refuge for several thousand migratory birds including Greater White-Fronted Geese, Brants, and Tundra Swans (WorleyParsons 2011).



The sanctuary is adjacent to the migration and summering area of marine mammals, including beluga whales. The outer islands of the sanctuary are known to be indigenous to the Barren-ground grizzly bear (WorleyParsons 2011).

### 2.2.5 Land Use

Two indigenous populations are native to the Mackenzie Delta, the Gwich'in and the Inuvialuit. These populations, both currently and historically, utilize the Mackenzie Delta for traditional hunting and trapping activities.

Since the establishment of the KIBS in 1961 and the involvement of the CWS, the land surrounding Camp Farewell is protected. There are no industrial settlements within 95 km of the site. Seismic exploration and exploratory drilling activities have occurred intermittently since the 1960's yet there are few oil and gas related activities currently occurring (WorleyParsons 2011).

### 2.2.6 Community

Consultation with local stakeholders is an important initiative pursued by Shell. Periodic sessions have been held with local community groups, residents, community leadership and special interest groups planned appropriately based on the level of Shell's activities in the region, Shell's plans and the communities desire to discuss issues. Historically, consultation programs have had participation from the Aklavik, Inuvik and Tuktoyaktuk communities, including the Aklavik Hunters and Trappers Committee.

In 2005 and 2006, a formal consultation process was initiated regarding the renewal of the Water Licence for Camp Farewell. Shell's plans for continual development in the region were also addressed. It is understood that the community stakeholders were supportive of the Temporary Closure and Permanent Closure plans for Camp Farewell and of the following efforts:

- improving the visual aesthetics of the Site;
- initiating treatment of hydrocarbon impacts on-site;
- minimizing disturbance of the tundra (provided the historical spill would not cause risk of adverse environmental effects); and,
- protect traditional land use in the area.

## 2.3 Previous Environmental Programs

Various ESA programs have been conducted at Camp Farewell. IEG has reviewed the available reports concerning ESA programs and provided summaries in Appendix VI.

- Golder (Golder and Associates), 2000. Baseline Environmental Site Assessment, Camp Farewell, Mackenzie Delta, Northwest Territories. Unpublished report prepared for Geco-Prakla, March, 2000.

- Komex (Komex International Ltd.), 2001. Phase I and Phase II Environmental Site Assessment of the Shell Farewell Stockpile and Campsite. Unpublished report prepared for: Shell Canada Limited, July, 2001. C52360000.
- WorleyParsons Komex, 2006. 2006 Environmental Site Assessment, Camp Farewell, NT. December, 2006.
- WorleyParsons, 2008. Interim Abandonment and Restoration Program, Camp Farewell, NT. Unpublished report prepared for Shell Canada Energy Limited, November, 2008. C52360500.
- WorleyParsons, 2010. 2009 Interim Abandonment and Restoration Program, Camp Farewell, NT. Unpublished report prepared for Shell Canada Energy Limited, April, 2010. C52360500.
- WorleyParsons, 2011. 2010 Interim Abandonment and Restoration Program, Camp Farewell, NT. Unpublished report prepared for Shell Canada Energy Limited, March, 2011. C52360500
- IEG (IEG Consultants Ltd.), 2010. 2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report. Prepared for: Shell Canada Energy. February 24th, 2010.
- IEG (IEG Consultants Ltd.), 2012b. Summary of 2012 Camp Farewell Activities. Letter report prepared for: Shell Canada Energy and Canadian Wildlife Services in compliance with Kendall Island Bird Sanctuary Permit. December 13, 2012.
- IEG (IEG Consultants Ltd.), 2013. 2012 Annual Report, Type "B" Water License #N7L1-1834. Prepared for: Shell Canada Energy and the Northwest Territories Water Board. March 28, 2013.
- IEG (IEG Consultants Ltd.), 2014a. Shell Canada Energy Canadian Wildlife Service Kendall Island Bird Sanctuary Permit Summary of 2013 Camp Farewell Activities. January 2014.
- IEG (IEG Consultants Ltd.), 2014b. Camp Farewell Lagoon Remediation. April, 2014.
- IEG (IEG Consultants Ltd.), 2015a. Shell Canada Energy Canadian Wildlife Service Kendall Island Bird Sanctuary Permit Summary of 2014 Camp Farewell Activities. January 2015.
- IEG (IEG Consultants Ltd.), 2015b. Camp Farewell Environmental Supervision during 2014 Decommissioning Program. September 2015.
- IEG (IEG Consultants Ltd.), 2015c. Shell Canada Energy Canadian Wildlife Service Kendall Island Bird Sanctuary Permit Summary of 2015 Camp Farewell Activities. November 2015.

## 2.4 Current Conditions

### 2.4.1 Former Sewage Lagoon

Remedial excavation activities were conducted from July 15, 2013 to August 18, 2013. The dimensions of the excavation were approximately 52 m by 34 m, with the long axis oriented in a north-south direction. The maximum depth of the excavation was approximately 7.5 m bgs. Prior to remedial activities, the lagoon had a depth of approximately 2.5 m bgs. Domestic waste debris was observed in the excavated material, including metal cans, fragments, and plastic debris.

The laboratory analytical results from confirmatory soil samples collected from the lagoon excavation were less than the applicable guidelines for petroleum hydrocarbon (PHC) and polyaromatic hydrocarbon (PAH) parameters. Confirmatory samples collected and analyzed for trace metals parameters were below applicable guidelines with the exception of one sample from the north wall where the arsenic concentration measured 13 mg/kg and one sample from the east wall where the selenium concentration measured 1.4 mg/kg. The reported concentrations are marginally greater than the applicable guidelines (12 mg/kg and 1 mg/kg). The background value for selenium was reported as 1.6 mg/kg (WorleyParsons Komex 2006).

Nine of the 61 samples analyzed for salinity parameters had EC values greater than the applicable guideline. Six samples had calculated SAR values greater than the applicable guideline. Salinity parameters with no comparative guidelines had variable soil concentration results, with notable elevated chloride and sodium concentrations when compared to background results; however, background locations were not analyzed at depths greater than 0.4 m bgs in 2006. Concentrations of salinity and EC exceeding guidelines are expected due to brackish water infiltration, overland flooding, and the lagoon's close proximity to the source area (middle channel of the Mackenzie River and the Beaufort Sea).

PHC affected soil resulting from previous operations was effectively removed from the lagoon area during the 2013 Remediation Program based on laboratory analytical data. Approximately 1,900 m<sup>3</sup> of excavated impacted soil was barged to Hay River and hauled by truck to the Tervita Rainbow Lake Landfill in Rainbow Lake, AB where it was disposed.

The lagoon excavation was backfilled with approved material from the on-site stockpiles from August 19 to 23, 2013. On August 23, 2013, stockpiles for backfilling were depleted. Approximately 20 cm of surficial soil from test pit areas on-site, where previously collected samples had come back below guidelines, were scraped to provide additional backfill material. Backfilling activities were completed on August 27, 2013.

#### 2.4.2 Gravel Pad

WorleyParsons conducted assessment and remediation activities of the on-site gravel pad in 2008 and 2009. Approximately 1,300 m<sup>3</sup> of soil was excavated for on-site ex-situ soil treatment from the gravel pad area: EX 1 – in the western corner of the pad, EX 2 and 3 – independent locations south of the tank farm, EX 4 – in the centre of the pad between the rows of storage, and EX 5 – south of the main camp building. Excavation locations are identified in Appendix VII on the site diagram created by IEG.

Hydrocarbon concentrations from soil samples from EX 1, EX 4 and EX 5 were reported to be less than the applicable guidelines, though additional confirmatory sampling was recommended by WorleyParsons in 2011. The south and southeast excavation walls from EX 2 and EX 3 were reported to meet guidelines, however the north walls and the historical fuel spill area were determined to require additional remediation.

It was estimated that approximately 600 m<sup>3</sup> of the 1,300 m<sup>3</sup> of soil being treated on-site still contained F2 and F3 hydrocarbon fractions exceeding the NT industrial and residential/parkland guidelines at the end of 2009. Soils within the treatment area were reported to have pH, sodium adsorption ratio (SAR) and EC values exceeding the NT industrial guidelines.

Further details are discussed in Section 3.4.2.

### 2.4.3 Burn Pit

Since 2000 the burn pit has been investigated including: eight soil sampling locations, one piezometer installation, and two surface water sampling locations.

Based on previous investigations, it has been confirmed that the pit was used for the disposal of hydrocarbon contaminated material, scrap metal and empty bags of drilling mud additives (barite). This is apparent in the reported elevated pH and elevated concentrations of barium, copper, lead, and zinc, as well as detectable concentrations of PAH's within and down-gradient of the burn pit.

Shallow groundwater samples have been reported to have detectable concentrations of benzene, toluene, ethylbenzene and xylenes (BTEX) and PHCs down-gradient of the burn pit.

While metals concentrations that exceeded guidelines were reported from surface water samples collected from water bodies down-gradient of the burn pit, they are likely a result of natural conditions. Hydrocarbon and PAH concentrations were not detected in these samples.

Shell personnel supervised the excavation of hydrocarbon stained gravel adjacent to the burn pit. Confirmatory soil samples were reported to have hydrocarbon parameters within the applicable guidelines and/or detection limits and has been adequately remediated (WorleyParsons 2011).

During the 2014 decommissioning program, wood materials not impacted with chemicals were burned in the burn pit. Ash samples collected from the burn pit met the applicable guidelines for landfill disposal (IEG 2015).

### 2.4.4 Tank Farm Area

Since 2000, soil samples have been collected from ten locations within the above ground storage tank (AST) areas.

Adjacent to the Day Tank, a F2 hydrocarbon fraction concentration from a surface sample was reported to exceed the residential/parkland guideline. Investigation of deeper soils and surrounding soils (test pitting) resulted in PHC concentrations that were reported to be less than the applicable guidelines, suggesting the elevated F2 concentration is limited to the gravel pad and isolated to the one location.

Visual indications of surface fuel spills were noted and four soil samples collected from these locations. Two of the four samples were reported to have BTEX or PHC concentrations exceeding the applicable guidelines. The remaining two soil samples were reported to have PHC concentrations exceeding the detection limit, but less than the guidelines. The depth of impact was not confirmed, but WorleyParsons suspected it extended to the base of the gravel pad (WorleyParsons 2011).

Soils sampled from the sampling location adjacent to the Heating Oil AST were reported to have PHC concentrations exceeding the applicable guidelines. An F3 concentration was reported from the gravel pad and an F2 concentration in the underlying organic layer was reported to be greater than background and/or the guideline value (WorleyParsons 2011).

#### 2.4.5 Surrounding Tundra

As part of the implementation of the 2009 Interim Abandonment and Restoration Program outlined by WorleyParsons, an assessment of the soil quality, soil invertebrates and vegetation health of the tundra surrounding and including the historical spill area was conducted. Differences were not identified between the surrounding tundra and the fuel spill site related to vegetation, invertebrate population or relative abundance or hydrocarbon concentrations measurable in soil (WorleyParsons 2011).

### 3 TEMPORARY CLOSURE

#### 3.1 Legislation

As defined by the Mine Site Reclamation Guidelines for the NT (AANDC 2007) a Temporary Closure is defined as *the scenario where a mine ceases operations with the intent to resume mining activities in the future.*

The main principle of the temporary closure legislation is to ensure activities occur that maintain all operating facilities in a manner that protects humans, wildlife and the environment. Section 1.4 of the guideline lists measures that should be implemented or completed upon temporary mine closure:

- *“access to the site, buildings, and all other structures are secured and restricted to authorized personnel only;*
- *appropriate signs are posted;*
- *soil treatment, and soil and groundwater monitoring programs are continued according to the requirements of this Plan;*
- *all waste management systems are secured;*
- *an inventory of chemicals and reagents, petroleum products, and other hazardous materials is conducted and these materials are secured appropriately or removed;*
- *fluid levels in all fuel tanks (currently empty) are recorded and monitored regularly for leaks or fuel is removed from the site;*
- *wastewater impoundment structures are stable and maintained in an appropriate manner;*
- *the Site is inspected and maintained regularly during the Temporary Closure period; and,*
- *the reclamation security deposit is kept up to date.”*

Sufficient equipment and supplies/reagents should be left on site (will be made available) for maintenance or reclamation activities that may need to take place.

## 3.2 Temporary Closure Management and Accountability

Randall Warren is the Manager of Shell's Decommissioning, Abandonment and Reclamation (DAR) programs. WorleyParsons was responsible for the assessment of the Site, the preparation of the Plan, the assessment of the off-site tundra areas and the preparation of reports, prior to 2012, under the direction of Gordon Johnson in conjunction with IEG under the direction of David Wells. IEG was also involved in ongoing site monitoring work under the direction of Sam Bird. Site activities since 2013 have been conducted under the direction of Nicole Wills (IEG). Kevin Erickson with Tervita Corporation (Tervita) has provided contractor services related to the dismantling, remediation and waste/materials transfer and disposal. A number of local Inuvik companies have been retained by Tervita to assist in site work.

## 3.3 General Closure Activities

Temporary closure activities have been occurring on-site since 2006.

The objectives of the program in 2009 included decommissioning, removal and responsible management of facilities and materials that were either no longer required or were no longer usable at Camp Farewell. These objectives were to reduce cost and scope of future reclamation work, remove substances and materials that had the potential to cause adverse effects on the environment, and maintain a tidy site. Efforts have been made to re-use and recycle materials where practical throughout this process.

Prior to 2012, the following materials were dismantled (as necessary), removed, and responsibly managed:

- unused facilities;
- drilling equipment and materials;
- construction materials;
- fuel and fuel tanks; and,
- drilling consumables.

In 2013, the sewage lagoon was remediated and in 2014 the decommissioning and dismantling of site facilities continued with the removal of the camp building, shed #2, and shed #3 building as well as various materials stored on-site. In 2015, the tank farm was demolished and removed and a soil assessment program was conducted.

## 3.4 Temporary Closure Program Summary

### 3.4.1 General

Initial activities were conducted in two phases: the winter of 2008/2009, and the summer of 2009. Additional activities were conducted during the summers of 2013, 2014, and 2015. Below is a summary of the activities that occurred from 2013 to 2015:

- The camp support facilities were dismantled and removed from Site as they were no longer operational or required. These facilities were inspected for potentially hazardous materials including mercury, switches, asbestos and lead-based paints. While hazardous materials were not identified, the facilities were determined to have little salvage value due to their age and condition. The dismantled facilities were transferred to Inuvik to be either recycled or disposed of at the municipal landfill.
- Drilling materials, such as pipes, that were still in operable condition were stored on-site. These were transferred to Inuvik and sold for re-use. Other drilling materials that were not salvageable were transferred to Inuvik for recycling or disposal.
- Drilling consumables such as drilling mud additives including mud, barite, and cement were removed from site.
- Fuel storage was minimized to only what was required for future remedial operations. Usable fuel was transferred to Inuvik for reuse and excess storage tanks were transported for recycling or disposal.
- Construction materials that could be reused were either transferred to Inuvik for re-sale or shipped south. Non-reusable construction materials were transferred for recycling or disposal. Additional miscellaneous metal and pipe materials were also transported for recycling or disposal. Materials in sufficient condition were transferred for re-use (WorleyParsons 2011; IEG 2015).
- The tank Farm was demolished and removed from Site via barge for recycling at an appropriate facility.
- A soil assessment was conducted on the lease and air strip.

### 3.4.2 Soil Remediation

#### 3.4.2.1 Excavation

During previous environmental assessments, various locations which were reported to contain hydrocarbon concentrations in soil exceeding the applicable guidelines were identified. During the 2009 assessment activities, remediation of some of these areas was initiated in an attempt to support progressive restoration and to remove potential sources of additional soil and groundwater contamination. The following activities were conducted in 2009:

- construction of a soil treatment area;
- excavation of the easily accessible hydrocarbon impacted gravel;
- transfer of excavated material to the soil treatment area;
- active aerobic bio-treatment of the hydrocarbon impacted gravel, that involved treatment with an oxidizer (RegenOx®); and,
- sampling and analytical testing of the treated gravel.

Five remedial excavations were advanced based on areas of impact identified in the 2006 ESA (See figure in Appendix VII):

- Ex 1 - Historical Fuel Spills Area (1,260 m<sup>3</sup>);
- Ex 2 - Southwest Corner of Tank Farm (8.4 m<sup>3</sup>);
- Ex 3 - Midway on South Side of Tank Farm (10.5 m<sup>3</sup>);
- Ex 4 - Storage Area on Pad (8.6 m<sup>3</sup>); and,
- Ex 5 - Camp Day Tank (12 m<sup>3</sup>).

Three additional areas were identified during the 2006 ESA that were not remediated at this time:

1. Herc tank – at the time of the 2009 remediation, the tank was still in use;
2. burn pit – at the time of the 2009 remediation, the pit was still in use; and,
3. vegetated area – the area of the gravel pad supporting extensive vegetation was not considered a remediation priority in 2009.

In 2013, remedial excavation of the sewage lagoon was conducted from July 15 to August 18. Approximately 1,900 m<sup>3</sup> of excavated impacted soil was barged to Hay River and hauled by truck to the Tervita Rainbow Lake Landfill in Rainbow Lake, AB where it was disposed. No other areas were remediated in 2013.

### 3.4.2.2 Treatment

In 2009, hydrocarbon impacted soils were transferred to the soil treatment area (in the central portion of the gravel pad) where it was treated in three separate windrows. An attempt was made to keep the windrows separated based on source to reduce excessive mixing and allow the material to return to the point of origin.

The treatment cells were constructed by grading the area flat and constructing an earthen berm to control water. The berm measured approximately 0.5 m high and was approximately 1.5 m wide at the base and extended around the outside perimeter of the treatment area. Final measurement of the treatment area was approximately 70 m by 140 m.

The intent of the soil treatment method was to utilize volatilization and bioremediation to promote the biodegradation of the hydrocarbon concentrations. An Allu bucket was used to promote mixing and aeration, while the volatilization and enhancement of bioremediation was facilitated by the use of an oxidizing additive, RegenOx® (IEG, 2010).

Confirmatory soil samples were collected from the remedial excavations. Samples were submitted for BTEX and F1 to F4 hydrocarbon fraction analysis from locations representative of no more than 400 m<sup>2</sup> and no less than 200 m<sup>2</sup> areas.

Soils were treated and placed back in the originating excavations. Analytical results reported elevated pH, SAR and EC values associated with elevated sodium and sulphate concentrations. Elevated F2 concentrations were also reported from Windrow 1. Windrow 1 was transferred into EX-1. Further



details are contained in the 2010 IEG petroleum hydrocarbon soil remediation report included as Appendix VIII.

### **3.4.3 Soil Assessment**

Results of the 2015 Soil Assessment Program will be included in the Camp Farewell 2015 annual report as well as the updated Closure and Reclamation Plan in 2017.

## **3.5 Temporary Closure Monitoring, Maintenance and Reporting Program**

Previous assessment reports are available for the Site as discussed in Section 2.3.

Until 2014, the Canadian Wildlife Service (CWS) Migratory Bird Sanctuary permit required that the Site be inspected approximately every 50 days to assess the integrity of the buildings, record visual signs of wildlife and assess any fuel on-site. In 2013, IEG conducted site visits in April, June, July, August, and October (see Site Activities summary, Appendix V) as was documented in IEG's December 2013 Summary Activities letter submitted to the CWS and Shell.

The CWS Migratory Bird Sanctuary permit issued in 2014 did not stipulate site inspections be conducted every 50 days, however, Shell aimed to continue to conduct site inspections as frequently as possible in due diligence. IEG conducted site visits in March and August 2014 (Appendix V).

In 2015, IEG attempted to make a Site visit in February but was unsuccessful due to poor weather. IEG noted Site conditions during the 2015 decommissioning and soil assessment activities.

Ongoing soil and groundwater monitoring is recommended. Groundwater sampling is expected to occur on an annual basis, as well as sampling and analytical testing of the treated soils. It is suggested that the following analytical parameters be tested:

- BTEX, PHC fractions (F1 to F4 in soil, F1 and F2 in groundwater);
- Heavy metals (total metals in soil, dissolved metals in groundwater); and,
- Major ions and general chemistry (detailed salinity in soil, routine potability in groundwater).

Reporting requirements, as outlined by specific permits and licenses, are submitted as required in addition to an annual report summarizing yearly activities.

## **3.6 Temporary Closure Contingency Program**

A contingency program is not required as the primary activities associated with the Temporary Closure of the Site have been completed.

## **3.7 Updated Temporary Closure Schedule and Costs**

The Temporary Closure schedule has been completed and costs associated with the Temporary Closure have been incurred.

## 4 PERMANENT CLOSURE AND RECLAMATION

A Permanent Closure and Reclamation Plan (the Plan) is a summary of activities intended to be implemented in a manner that is protective of people and the environment, to return the lands associated with the mine (Camp Farewell) to a condition comparable to its surrounding, and undisturbed lands. This plan is consistent with the *Mine Site Reclamation Guidelines for the Northwest Territories* (Guideline) (INAC, 2007) which is the latest, and therefore most applicable, published literature associated with the abandonment and restoration of similar sites in the NT.

### 4.1 Reclamation Principles

The Guideline acknowledges that every site is unique and that site-specific challenges, issues, and characteristics should be considered. Camp Farewell is a unique situation, as it may continue to be used for staging and storage purposes following the decommissioning of camp operations. Restoration of the Site, is considered separately from the reclamation of the Site. Restoration requirements are included to provide an inclusive understanding of potential site requirements; however, implementation of restoration options will require review by Shell as well as various regulatory bodies.

The Plan adheres to the principles adopted and adhered to by the federal government, and industry, within the existing regulatory framework of the NT. The Guideline defines reclamation as the *process of returning a disturbed site to its natural state or one for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety*.

As identified in the Guideline, the Plan incorporates:

- both traditional knowledge and scientific information;
- the application of adaptive management principles making use of the best available information and technology;
- the promotion of environmental protection; and,
- the application of precautionary principles in the absence of conclusive information.

### 4.2 Permanent Closure Management and Accountability

The management and accountability structure of the Permanent Closure and Reclamation of Camp Farewell will be similar to that described in Section 3.2. Ultimately Shell is responsible for permanent closure of the Site even though individuals and companies involved may change. Shell will assign a project manager to implement the Shell approved program. Permanent closure activities will be supervised and designed by an environmental consulting company that is permitted to provide such services in the NT and that is experienced in similar activities. As well, contractor services will be provided by a company that utilizes local resources (people and equipment).

### 4.3 Community Values

Shell has worked to develop positive community relations through the consideration of community values and feedback during the design of plans pertaining to Camp Farewell, as well as by involving local people and services during the operation and closure phases of the Site.

As discussed in Section 2.2.6, Shell values the involvement of community stakeholders, and will repeat similar consultations with the community if activities are to be re-established at Camp Farewell and/or when Permanent Closure (enforcement of this plan) are implemented.

An agreement exists between Shell and the Inuvialuit Regional Corporation (IRC) which Shell continues to honor and comply with. As part of this agreement, Shell reports the commitments and involvements including the local people on an annual basis. Shell continues to meet or exceed the commitments as defined in the agreement.

### 4.4 Reclamation Components

Reclamation activities have been divided into the following, based on the Guideline, and the specific purposes of this plan:

- Water Facility Management – dismantling and reclamation of water related facilities;
- Infrastructure, Buildings, and Equipment – dismantling and removal of camp facilities, supplies, and equipment;
- Contaminated Soil (and Water) – remediation of soil and water impacts; and,
- Surrounding Land – reclamation of the lands associated with Camp Farewell.

### 4.5 Reclamation Objectives and Applicable Criteria

#### 4.5.1 Dismantling

Remaining facilities, consumable materials, and equipment existing at Camp Farewell will be removed. Although unlikely, it is possible that additional materials, equipment, and consumables may be stored at this site following the dismantling of remaining infrastructure (ie. Shed #1 building), as the Site's primary function is a staging/storage area.

#### 4.5.2 Soil Remediation Guidelines

Remediation guidelines utilized during the assessments of the Site have been based on background soil conditions and the *Environmental Guideline for Contaminated Site Remediation, 2003*, as enforced by the NT government (ENR) as identified by the *NWT EPA*. Where NT specific guidelines do not exist, Alberta Environment (AENV) guidelines have been applied where applicable.

#### 4.5.2.1 Background Conditions

As organic matter decays, an interference with the analysis of PHC compounds occurs at the laboratory level. It is important to have a comprehensive understanding of the naturally occurring middle to heavy end hydrocarbon fractions (F2, F3, and F4) that may exist on-site when considering if laboratory reported parameters are a result of anthropogenic sources. Chromatograms are useful in identifying background “signatures” that occur as a result of natural conditions rather than historical site activities. Hydrocarbon fraction F1 and BTEX generally do not occur naturally due to organic decay and therefore are compared directly to guideline values and not determined background concentrations.

The 2006 assessment conducted by WorleyParsons Komex included an evaluation of the textural differences of the site soil, and the effects the texture had on soil chemistry and the influence of the rich organics on the measurements of middle to heavy end hydrocarbon fractions concentrations naturally occurring in the soil.

WorleyParsons used a 95% confidence interval to calculate the measured F2, F3, and F4 expected as a result of natural conditions to be as follows:

- F2 – 176 mg/kg;
- F3 – 3,127 mg/kg; and,
- F4 – 2,016 mg/kg (WorleyParsons, 2011).

Background salinity parameters were assessed in one soil sample collected from north and east of the airstrip from 0.2 – 0.4 m bgs in 2006. Reported parameters met the NT Industrial and Residential/Parkland guideline.

#### 4.5.2.2 Land Use

The 2003 NT Tier 1 guidelines are intended to be protective of human and environmental health based on the intended future use of the land. Land use at the Camp Farewell site is considered currently to be classified as Industrial, with a likely future use as Residential/Parkland.

“Land uses in which the primary activity is related to the production, manufacture or storage of materials” constitutes an Industrial land use. It is assumed that “the public does not usually have uncontrolled access to this type of land”, and while access is not actually limited, the remoteness of the Site is considered restrictive (NT 2003).

“Land in which dwelling on a permanent, temporary or seasonal basis is the primary activity” constitutes a Residential/Parkland land use. “This includes activity that is recreational in nature, and requires the natural or human designed capability of the land to sustain that activity (and) is often readily accessible to the public”. This land use considers the traditional access and aboriginal harvesting activities that may occur (NT 2003).

Should the base pad material (sandy gravel) be removed from the site surface to be reused or sold as an industrial substrate, the Industrial land use guideline will be applied to this material.

Exposure pathways are considered based on definitions provided by the Canadian Council of Ministers of the Environment (CCME) and adopted by the NT 2003 contaminated sites guidelines. The most restrictive pathways associated with the above mentioned land uses for coarse-grained soils are the protection of groundwater for aquatic life and the ecological soil contact pathways.

#### 4.5.2.3 Regulatory Guidelines

Currently NT Tier 1 guidelines (generic) are considered for the Site. In the future, site specific (Tier 2) or risk based (Tier 3) guidelines may be more appropriate. At the time of Permanent Closure, the selected applicable guidelines will be reassessed and formally approved.

Historically and currently, the guidelines that have been applied to the Site, for site assessment and confirmation of remediation, include:

- NT Tier 1 PHC – hydrocarbon fractions F1 to F4 in fine or coarse-grained surface soil (<1.5 m bgs) and subsoil (>1.5 m bgs).
- Remediation Criteria for other Contaminants in soil including: general parameters, inorganic parameters, and PAHs – Residential/Parkland and Industrial land use categories.
- AENV Soil Quality Guidelines for Barite (AENV 2009) – barium (total and extractable) concentrations.
- AENV Salt Contamination and Remediation Guidelines (AENV 2001) – adaptation of SAR and EC guidelines.

Previous soil analytical reports have included EC and SAR values exceeding the guideline values included in the Remediation Criteria for other Contaminants in Soil from the NT Tier 1 guidelines. The sodium and sulphate concentrations related to these elevated values suggest natural conditions. Application of the AENV Salt Contamination Guidelines may be more appropriate at this site if natural saline conditions are identified at the site. Further assessment of background conditions is required to establish if the AENV guideline is more appropriate.

#### 4.5.3 Surface Water and Groundwater Remediation Criteria

Currently, the NT does not employ specific water quality guidelines. The CCME developed guidelines for freshwater aquatic life (FWAL) and Marine Aquatic Life (MAL) are used for comparative values (CCME, 1999a), although an exceedance does not necessarily indicate a contamination concern.

#### 4.5.4 Reclamation Guidelines

Site specific information will be considered during determination of restoration activities that will return the site to a state comparable with original conditions. The *Mine Site Reclamation Policy for the Northwest Territories* (INAC 2007) is the regulatory driver from which the reclamation plan is developed.

### 4.6 Listing and Assessment of Possible Reclamation Activities

Due to the remote site location, limited options regarding reclamation activities exist.

Excavated base pad gravel and soils may be treated in one of two ways:

- On-site Ex Situ treatment of hydrocarbon impacted material and reuse as backfill; or,
- Excavation, transportation, and disposal of materials at an appropriate off-site landfill facility.

Both options are discussed further in Section 4.8.3.1.

## 4.7 Selection of Preferred Reclamation Activities

While the selection of these options is dependent on the type of impact (for example, chloride contamination reduces treatability), the preferred option is to treat and reuse impacted soils/gravels for similar purposes, as gravel and backfill material is a limited resource in the Mackenzie Delta region.

## 4.8 Reclamation Plan (incorporation of selected activities)

This section is structured to reflect the components as identified in Section 4.4, Reclamation Components.

### 4.8.1 Water Facility Management (WFM)

During the 2013 remediation program, water supply and sewage treatment facilities were decommissioned and removed. There are no water related systems remaining on-site. The removal of on-site water facilities included:

- decommissioning of the facilities related to water collection, distribution, use, treatment and disposal, including dismantling and removal activities;
- excavation of lagoon sediments following the decommissioning (dewatering and remediation) of the lagoon, as described in section 2.4.1; and,
- the management of wastes generated by the completion of the above mentioned activities, as described in section 2.4.1.

#### 4.8.1.1 WFM Dismantling and Decommissioning

Efforts were made to re-use and recycle materials, however, due to the condition of the facilities the majority of materials were packaged and removed for disposal. The dismantling and decommissioning included the following:

- Facilities related to the collection, transfer, and treatment of water were packaged and removed for disposal.
- Metal and piping materials were segregated and transported south for recycling or disposal.

Costs associated with these activities included the equipment to conduct the removal and sorting activities, and the transportation to either a recycling facility or facility for disposal.

#### **4.8.1.2 WFM Remediation**

Details regarding the remediation of the Former Sewage Lagoon in 2013 can be found in Section 2.4.1.

#### **4.8.1.3 WFM Reclamation**

Following remediation activities, the lagoon was backfilled with clean on-site fill material, which was compacted with the use of a dozer, or equivalent piece of equipment, and mounded to account for settling of backfill material.

The excavation was left to revegetate naturally. Revegetation of the entire site will be conducted in one event, and is discussed in Section 4.8.4.2.

#### **4.8.2 Infrastructure, Equipment and Buildings (IEB)**

The infrastructure, buildings and equipment included in this portion of the plan include:

- accommodation buildings and associated utility buildings;
- storage sheds;
- stored equipment and drilling materials;
- metal storage tanks;
- bermed tank farm;
- burn pit; and,
- fuel storage.

Contaminated soils associated with the above mentioned infrastructure is considered in Section 4.8.3.

##### **4.8.2.1 IEB Dismantling and Decommissioning**

The removal of infrastructure was initiated in 2013 with the demolition and removal of the water treatment facilities. Further removal of infrastructure was conducted in 2014 with the demolition of the camp building and the dismantling and removal of the Shed #2 and Shed #3 buildings as well as various materials that were stored on-Site. In 2015, the tank farm was demolished and also removed from Site. Currently the fuel trailer, emergency shelter, and Shed #1 building are the only remaining pieces of infrastructure at the Site. No infrastructure is expected to remain on-Site. Efforts will be made to re-use and recycle materials where practical and possible. The dismantling and decommissioning included the following:

- Drilling materials (pipes, rig mats, etc.) that were still in sufficient condition were sold for re-use and/or transported south. Drilling materials that were no longer salvageable were transferred to appropriate facilities for recycling or disposal.

- Fuel storage was minimized to what was required for future remedial operations. Usable fuel was transferred to Inuvik for reuse and excess storage tanks were transported for recycling or disposal.
- Miscellaneous materials (construction materials) were salvaged for resale and re-use where possible. Unsalvageable materials were transported for recycling or disposal.
- The camp facilities were built in 1985, resulting in a low risk of mercury switches, asbestos and lead paint; however, a comprehensive survey for the potential of these hazardous materials was conducted. Due to the age and present condition of the facilities, there was little salvage value. The facilities were removed from the Site and recycled or disposed of at an appropriate facility.
- Metal and piping materials were segregated. Materials in good condition were sold for re-use, while remaining material was shipped south for recycling.
- Scrap metal from the tank farm was shipped south for recycling.

Costs associated with these activities included the equipment to conduct the removal and sorting activities, and for the cost of transportation to either a recycling facility, disposal facility, or alternate locations for re-use.

#### 4.8.2.2 IEB Remediation

A Soil Assessment Program of the lease area and air strip was conducted in 2015. Results of the 2015 Soil Assessment Program will be included in the Camp Farewell 2015 annual report as well as the updated Closure and Reclamation Plan in 2017.

#### 4.8.2.3 IEB Reclamation

Should active remediation of impacted soil be required, excavations will be backfilled with confirmed clean on-Site fill material and contoured to match the surrounding ground levels.

Revegetation will be conducted of the entire Site in one event, and is discussed in Section 4.8.4.2.

### 4.8.3 Contaminated Soil and Water (CSW)

Impacted soils previously identified at Camp Farewell include:

- Treated gravel fill – approximately 600 m<sup>3</sup> of treated gravel re-used as fill (Windrow 1 in excavation 1 in Appendix VII) continues to contain reported elevated F2 hydrocarbon fraction concentrations despite soil treatment on-site.
- Fuel tank Area – approximately 370 m<sup>3</sup> of gravel fill material and underlying natural soil exists to an approximate depth of 1.2 m bgs and requires excavation.
- Burn pit soil – approximately 75 m<sup>3</sup> of gravel fill material requires excavation to approximately 0.5 m bgs (or to the expected liner or layer of organic material).
- Burn pit groundwater – an un-quantified volume of ethylbenzene and PHC impacted groundwater has been identified down-gradient of the burn pit.



- Fuel spill soil – an un-quantified volume of native tundra soil affected as a result of the historical fuel spill (1981).
- Fuel spill groundwater – detectable concentrations (below guidelines) of xylenes and F2 hydrocarbon fractions were reported from a groundwater monitoring well located down-gradient of the historical fuel spill (1981).
- Former sewage lagoon – 1,700 m<sup>3</sup> of soil/sediment and garbage associated with the lagoon as discussed in Section 4.8.1.

Areas of environmental concern are identified in Appendix VII.

#### 4.8.3.1 CSW Remediation

Impacted soils associated with the treated gravel fill, the fuel tank area, and the burn pit will be excavated. Required equipment will be transported to site via barge (in the summer) or ice road (in the winter). Confirmatory soil samples will be collected and analyzed for appropriate parameters at appropriate intervals to ensure remediation objectives have been met.

Prior to excavation additional characterization of the impacted soils will be conducted. This will include analysis of organic and inorganic parameters to determine the best route of soil management. Two options for the remediation of impacted soils exist:

- On-site ex-situ treatment – This option is only applicable if the contaminant of concern is limited to PHC concentrations. Chloride, pH, EC, and SAR have not been proven to be effectively remediated using bio-treatment methods.
- Off-site disposal – Soils impacted with multiple contaminants of concern, or inorganic contaminants, will be removed from site and disposed of at an appropriate landfill facility.

Prior to remediation activities, a thorough assessment of background site soil salinity conditions is required to determine if the previously reported pH, EC and SAR values are a result of anthropogenic or natural conditions.

Impacted soils associated with the historical fuel spill (1981) will not be actively remediated. Previous assessment (WorleyParsons, 2010) has indicated that natural attenuation is occurring. Active remediation would be damaging to the land and is not warranted considering the lack of adverse effect on environmental receptors. Continued monitoring of the natural attenuation is recommended.

#### CSW On-Site Ex-Situ Treatment

An on-site soil treatment program will include the following:

- construction of an appropriate soil treatment area, including sampling of receiving soils and proper construction (berm, liner, etc.);
- excavation of hydrocarbon impacted soils and transport to the treatment cell area;
- employment of aerobic bio-remediation and volatilization methods including the addition of an oxidizing agent and possible use of an allu bucket; and,

- analysis of treated soils to confirm the effectiveness of the treatment program.

### CSW Off-Site Disposal

Should impacted soils contain multiple contaminants of concern, or inorganic contaminants, the following activities will be required:

- excavation of impacted soils and placement in soil bags; and,
- transport of the soil bags from the Site to Hay River, NT (via barge) where they will be loaded into trucks and hauled to the Tervita Rainbow Lake Landfill for disposal.

### 4.8.3.2 CSW Reclamation

Excavations will be backfilled with confirmed clean on-site fill material and contoured to match the surrounding ground levels.

Revegetation will be conducted of the entire site in one event, and is discussed in Section 4.8.4.2.

### 4.8.3.3 CSW Groundwater

Following removal of the source material (impacted soil) from the burn pit area, subsequent groundwater monitoring will continue to determine the extent of groundwater impact. Excavation of impacted soil may result in the natural attenuation of elevated contaminant levels within the associated groundwater. If natural attenuation is not identified, an active groundwater remediation plan may be required.

Groundwater monitoring results from groundwater wells near the historical fuel spill indicate that while PHC concentrations have been detected, they are not greater than the guideline concentrations. Monitoring of natural attenuation is therefore applicable for the groundwater near the historical fuel spill.

### 4.8.4 Site and Surrounding Lands (SSL)

Reclamation and revegetation plans are based on the entire Camp Farewell Site rather than individual components.

The Site is delicate and a comprehensive understanding of natural northern conditions is required to restore the site to a level compatible with the surrounding undisturbed land. The soils of the Mackenzie Delta are subject to extreme conditions, by way of thawing and freezing cycles. These cycles can result in reduced soil stability and depressions.

The Site was constructed with gravel pad and urethane layers to act as protection for the underlying native soils and provide stability to the Site. Removal of this layer could prove detrimental to the Site. Removal of this layer would expose the natural subsurface, which has been compromised due to subsidence resulting from the static loading of camp activities and the accelerated seasonal melting resulting from the gravel/urethane layer. This natural surface would lack vegetation, resulting in a dark absorbent surface that would thaw easily and depressions of the site base would likely result. Associated with these depressions, soils could become compacted, the ground temperature would

elevate and ponding would occur. Maintenance of the base pad will result in stability of the site and the topography will remain relatively unchanged.

WorleyParsons included an assessment of the biodegradation of polyurethane (PU) that makes up the foam urethane layer of the site pad (included in Appendix IX). The assessment summarized that the foam is not susceptible to degradation and that if degradation does occur; the by-products are not particularly soluble. Should degradation occur, a by-product would be nitrogen, and therefore; total nitrogen (as well as nitrate and nitrite) should be target parameters considered in the annual groundwater monitoring program. WorleyParsons concluded that the potential for environmental impact associated with leaving the foam layer in place is less than that associated with removing it.

#### 4.8.4.1 SSL Reclamation Activities

The current reclamation plan includes:

- grading the area to match surrounding topography;
- reducing soil compaction and enhancing micro-topography via 'ripping and scarifying' activities;
- covering the Site with a thin layer of natural alluvial soil consistent with surrounding soil cover;
- assist revegetation with appropriate species and amendments.

If excess gravel is identified on-Site, it may be beneficial for re-use, as gravel is scarce in the area.

Current remediation plans depend on the availability of clean fill material on-Site. Should remediation activities result in a deficit of clean soil on-Site, a designed wetland/water body, may be considered. Land use altering plan would have to be carefully considered and stakeholder and regulatory buy-in and participation in planning would be required.

#### 4.8.4.2 SSL Re-vegetation Activities

Active re-vegetation is required for this Site. Due to the shorter growing season of northern Canada, gradual encroachment of native species from the surrounding land is not likely. Appropriate amendments (fertilizer) will be applied along with a native seed mixture to encourage successful germination. The final application rate and seed mix will be developed with assistance from the local Government Land Use Inspector. The purpose of the seed mix is to:

- help stabilize the soil on-Site;
- provide a habitat equivalent to the surrounding lands;
- allow the natural succession of native vegetation and therefore minimize additional maintenance; and,
- provide consistent vegetation across the entire area (by utilizing an appropriate seed mix).

## 4.9 Uncertainties and Required Information

Previous environmental assessments exist that summarize the level of investigation completed to date and the site conditions (Section 2.4). Additional site assessment will be conducted as decommissioning and dismantling activities occur. Following additional assessment activities, further remediation requirements may be identified resulting in uncertainties. Until final reclamation activities are completed, uncertainties will remain to exist.

## 4.10 Monitoring, Maintenance and Reporting Program

### 4.10.1 Monitoring and Maintenance Program

Following remediation, restoration, and abandonment activities, Site inspections will be conducted on an annual basis for the first five years or until vegetation is well established. The growth status of both desirable and non-desirable species will be documented. Unusual soil conditions (ie. erosion, bare areas, etc.) will be identified and addressed. The Site will be maintained, as required, until reclamation is considered complete and sustainable.

Soil and groundwater monitoring will be required following excavation and remediation activities at one, two, and five year intervals following completion of Permanent Closure activities.

Parameters that should be analyzed for each groundwater sample include:

- BTEX, PHC F1-F4 hydrocarbon fractions;
- routine water chemistry parameters; and,
- total nitrogen (in addition to nitrogen included in routine parameters) as identified in Section 4.8.4.

Parameters that should be analyzed for soil samples will be based on contaminants of concern previously identified and may include some or all of the following:

- BTEX, PHC F1-F4 hydrocarbon fractions;
- detailed soil salinity; pH, EC, SAR, soluble anions and cations;
- total metals (CCME metals); and,
- PAHs.

Soil and vegetation quality will be assessed in areas that were previously identified as areas of concern, as well as areas surrounding the gravel pad. Soil samples may be submitted for laboratory analysis, and vegetation will be monitored for signs of stress or scarcity.

Annual inspections will be conducted at a minimum of once per year until Permanent Closure is accepted. Inspections will focus on the stability and health of the reclaimed area. Required maintenance will be conducted until the Site is comparable to the surrounding natural tundra. Issues that may arise at the site and will be identified and addressed during these annual inspections include: vegetation stress, invasive species colonies, permafrost degradation, development of depressions or subsidence, and unfavorable run-off patterns or surface erosion.

#### **4.10.2 Reporting Program**

Program Completions Reports will be created and submitted to the applicable authorities as Permanent Closure activities occur. Annual inspections and monitoring will be summarized and submitted in annual reports.

#### **4.11 Contingency Program**

Should future assessments result in information that differs from that used in the development of this plan, additional planning will be conducted. Additional assessment data will be considered in the subsequent interim Permanent Closure and Reclamation Plans until final closure activities can be conducted.

#### **4.12 Costs**

Costs associated with the implementation of the CRP have not been calculated. As plans regarding individual components of this plan are finalized, cost estimates will be created. Further detail regarding financial security is discussed in Section 5.

#### **4.13 Progressive Reclamation**

Progressive reclamation includes the activities undertaken during operation to assist in the subsequent reclamation activities upon closure. This does not apply to the Camp Farewell Site.

#### **4.14 Permanent Closure and Reclamation Schedule**

Presently it is estimated that Permanent Closure activities will be conducted in a staged approach and take 5 to 10 years following Shell's final decision to close the camp, and acceptance of the closure plan by applicable regulators. An expected time of final camp closure has not been identified; therefore the Permanent Closure schedule is undefined at this time.

#### **4.15 Post-Closure Conditions and Potential Risks to Human and Environmental Health**

Following completion of permanent closure and reclamation activities, site specific conditions will be assessed to verify that the Site has been restored to a state comparable with undisturbed conditions. It will be confirmed that the Site has been restored in a manner that is consistent with current licenses and permits, and that is protective of human health and the environment. Though not expected, potential remaining risks will be identified and addressed as required.

### **5 FINANCIAL SECURITY**

As mentioned in Section 4.12, specific costs associated with implementing the CRP have not been identified, and are not required at this time. Shell has posted financial security for Camp Farewell, in the form of a letter of credit, totaling \$2 million as required by AANDC.

## 6 SUPPORTING DOCUMENTATION

The following is a list of documents utilized in the development of past and current Camp Farewell Closure and Remediation Plans.

### Regional Environmental Studies

- AANDC (Aboriginal Affairs and Northern Development Canada), 2007. Mine Site Reclamation Guidelines for the Northwest Territories. Ottawa, 2007.
- Canadian Wildlife Service. October, 2000. Migratory Bird Sanctuaries (Kendall Island). [\[http://mb.ec.gc.ca/nature/migratorybirds/sanctuaries/kendall/dc10s01.en.html\]](http://mb.ec.gc.ca/nature/migratorybirds/sanctuaries/kendall/dc10s01.en.html). October, 2000.
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- Heginbottom, J.A. 1995. Canada Permafrost, National Atlas of Canada. Map MCR4177, Scale 1:7.5 million. Ottawa: Natural Resources Canada.
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### Remediation and Reclamation Studies and Guidelines

- AENV (Alberta Environment), 2001. Salt Contamination Assessment and Remediation Guidelines. Information Centre, Alberta Environment. Edmonton, Alberta. May, 2001.
- AENV (Alberta Environment), 2009. Soil Quality Guidelines for Barite: Environmental Health and Human Health. Information Centre, Alberta Environment. Edmonton, Alberta. February 2009.
- CCME (Canadian Council of Ministers of the Environment). 1994. Environmental Code of Practice for Aboveground Storage Tanks Systems Containing Petroleum Products. CCME-EPC-LST-71E.
- CCME (Canadian Council of Ministers of the Environment). 1996a. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. Report CCME EPC-101E, March 1996.
- CCME (Canadian Council of Ministers of the Environment). 1996b. A framework for Ecological Risk Assessment: General Guidance. The National Contaminated Sites Remediation Program, March 1996.
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- CCME (Canadian Council of Ministers of the Environment). 1999a and updates. Canadian Environmental Quality Guidelines. Canadian Council of Ministers of the Environment, Winnipeg. 1999-2006.
- CCME (Canadian Council of Ministers of the Environment). 1999b. Canadian Environmental Quality Guidelines. Winnipeg: CCME.
- CCME (Canadian Council of Ministers of the Environment). 2000. Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (PHC CWS). June 6, 2000. Winnipeg: CCME.
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CCME (Canadian Council of Ministers of the Environment). 2003. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines.

INAC (Indian and Northern Affairs Canada currently Aboriginal Affairs and Northern Development Canada [AANDC]), 1987. Reclamation Guidelines for Northern Canada.

INAC (Indian and Northern Affairs Canada currently Aboriginal Affairs and Northern Development Canada [AANDC]), 2007. Mine Site Reclamation Guidelines for the Northwest Territories. Renewable Resources and Environment. Yellowknife, NT. January 2007.

NTWB (Northwest Territories Water Board), 1990. Guidelines for Abandonment and Restoration Planning for Mines in the Northwest Territories. Published September, 1990.

NT (Northwest Territories), 2003. Environmental Guideline for Contaminated Site Remediation. November 2003.

WHO (World Health Organization), 1996. Guidelines for drinking-water quality, 2nd ed. Vol.2. Health criteria and other supporting information. World Health Organization, Geneva, 1996.

### Reclamation Research Reports

EPS (Environmental Protection Service), 1977. Assessment of Ridged Urethane Foams as Liners for Petroleum Product Storage Areas in Northern Canada. Edmonton, Alberta. EPS-4-EC-77-13.

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### Community Participation Reports

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### Environmental Investigation Reports

Golder (Golder Associates Ltd.), 2000. Baseline Environmental Site Assessment, Camp Farewell, Mackenzie Delta, Northwest Territories. Unpublished report prepared for Geco-Prakla, March, 2000.

IEG (IEG Consultants Ltd.), 2010. 2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report (DRAFT). Prepared for: Shell Canada Energy. February 24th, 2010.

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IEG (IEG Consultants Ltd.), 2013a. 2012 Aklavik Hunters and Trappers Committee Consultation Letter. Letter report prepared for: Shell Canada Energy and Aklavik Hunters and Trappers Committee. March 26, 2013.

IEG (IEG Consultants Ltd.), 2013b. 2012 Annual Report, Type "B" Water License #N7L1-1834. Prepared for: Shell Canada Energy and the Northwest Territories Water Board. March 28, 2013.

IEG (IEG Consultants Ltd.), 2014a. Shell Canada Energy Canadian Wildlife Service Kendall Island Bird Sanctuary Permit Summary of 2013 Camp Farewell Activities. January 2014.

IEG (IEG Consultants Ltd.), 2014b. Camp Farewell Lagoon Remediation. April, 2014.

IEG (IEG Consultants Ltd.), 2015a. Shell Canada Energy Canadian Wildlife Service Kendall Island Bird Sanctuary Permit Summary of 2014 Camp Farewell Activities. January 2015.

IEG (IEG Consultants Ltd.), 2015b. Camp Farewell Environmental Supervision during 2014 Decommissioning Program. September 2015.

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Komex (Komex International Ltd.), 2002. Interim Abandonment and Restoration Plan. Unpublished report prepared for Shell Canada Limited, July, 2002. C52360000.

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

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

### **Reclamation Planning and Implementation Reports**

WorleyParsons Komex, 2006. Interim Abandonment and Reclamation Plan, 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.

WorleyParsons, 2011. 2010 Interim Abandonment and Restoration Program, Camp Farewell, NT. Unpublished report prepared for Shell Canada Energy Limited, March, 2011. C52360500.

### **Risk Assessment Reports**

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



## 7 CLARIFICATIONS REGARDING THIS REPORT

The conclusions in the report are based on IEG Consultants Ltd.'s observations of existing site conditions and interpretations of site history and site usage information that were made available to IEG Consultants Ltd. IEG Consultants Ltd. assumes that information or data provided by the Client and by third parties are factual, complete and accurate. Conclusions about site conditions under no circumstances comprise a warranty that conditions in all areas within the site and beneath structures are of the same quality as those inferred from observable site conditions and readily available site history.

This report is an instrument of service of IEG Consultants Ltd. The report has been prepared for the exclusive use of Shell Canada Energy (Client) and Government of the Northwest Territories Department of Lands for the specific application to the Camp Farewell Site. The report's contents may not be relied upon by any other party without the express written permission of IEG Consultants Ltd. In this report, IEG Consultants Ltd has endeavoured to comply with generally-accepted professional practice common to the local area. IEG Consultants Ltd makes no warranty, express or implied.

## 8 CLOSING

We trust this plan meets the requirements of Shell. Inquiries can be directed to Nicole Wills, at (403) 730-6809.

### IEG CONSULTANTS LTD.



Nicole Wills, P.Ag.  
Project Manager

## FIGURES

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**Legend**  
 ☆ Site Location

NOT FOR CONSTRUCTION  
To be read with IEG report dated November 2015

NOTES:  
 1. IMAGE SOURCE: Worley Parsons

CLIENT  
**Shell Canada Energy**

PROJECT  
 Camp Farewell Closure and Reclamation Plan

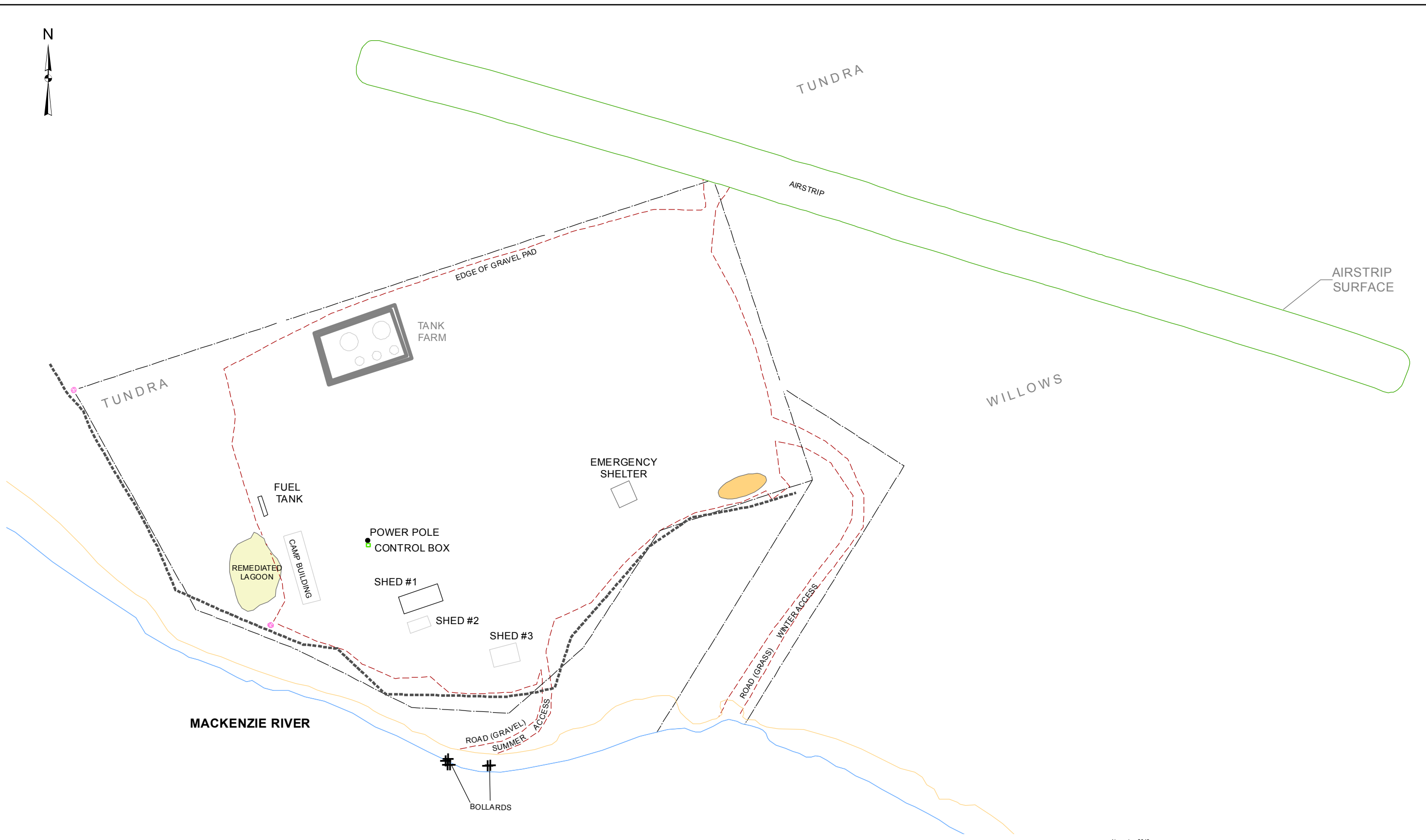


TITLE  
 Site Location Map

SCALE NTS PROJECT No. A04012A06 FIG No. 1

Time: 08:48:39 AM  
 Date: October 09, 2015  
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File: Z:\ACGY\Alberta\A04012A06\_SCE Camp Farewell Remediation\300 Design\2015 Rem Rec Plan\Figures\A04012A06\_Figure2\_Site\_Plan\_151009.mxd Date: October 09, 2015 Time: 09:01:56 AM Creator: tchung



**Legend**

- Removed Aboveground Storage Tank
- Airstrip
- Removed infrastructure
- Burn Pit
- Boundary
- Edge of Gravel
- River
- Sand
- Top of Bank



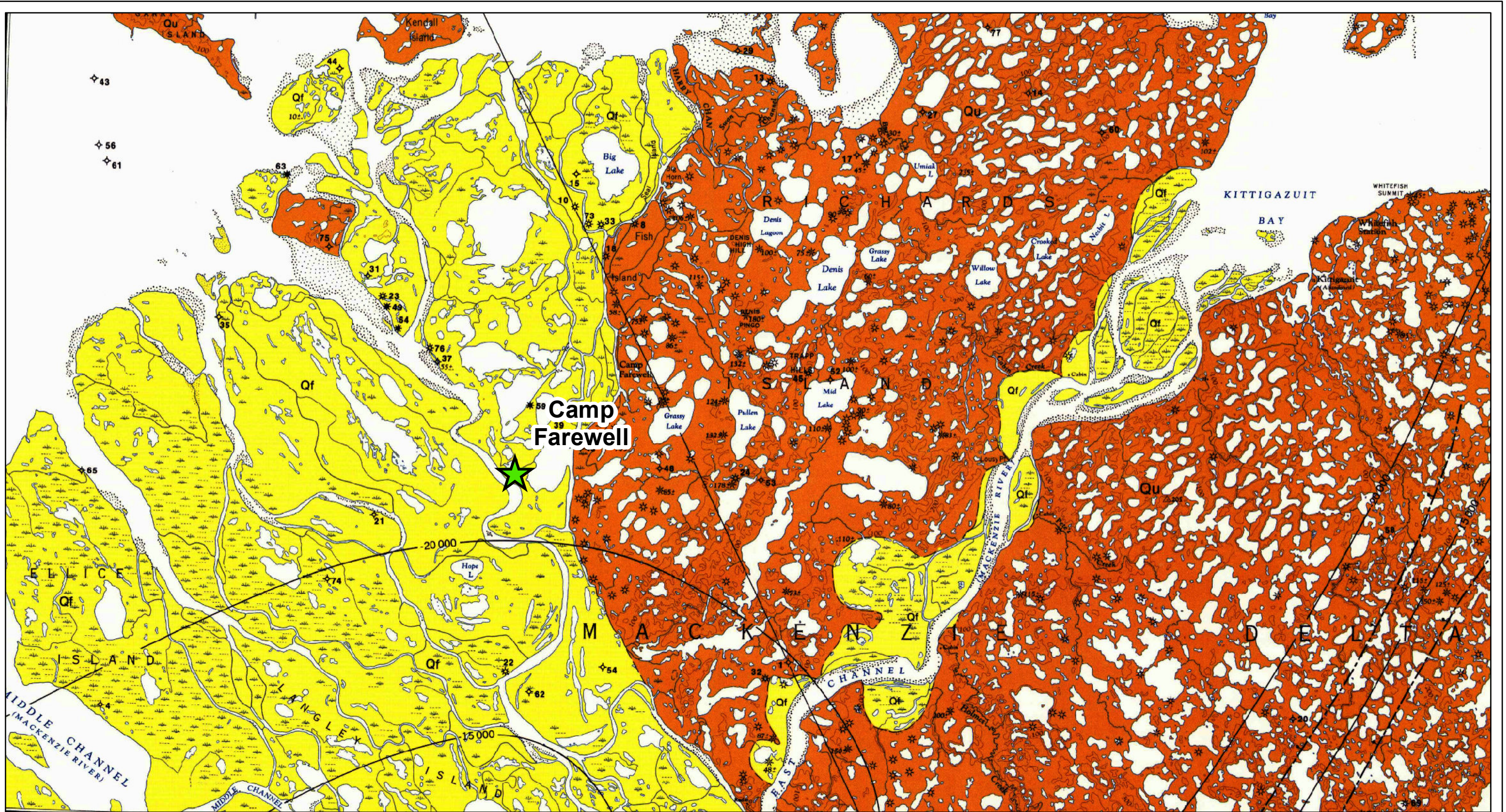
NOT FOR CONSTRUCTION

NOTES:  
 1. HORIZONTAL DATUM: NAD83  
 2. GRID ZONE: UTM8N  
 3. SOURCE: Site survey plan prepared for Shell Canada Limited by Inukshuk Geomatics Inc.; original scale 12000.

CLIENT

PROJECT Camp Farewell Closure and Reclamation Plan		
TITLE Camp Farewell Site Plan		
SCALE 1:2,500	PROJECT No. A04012A06	FIG No. 2

To be read with IEG Consultants Ltd. report dated November 2015



**Legend**  
 ★ Site Location

**NOT FOR CONSTRUCTION**  
 To be read with IEG report dated November 2015

**NOTES:**  
 1. IMAGE SOURCE: Map 1515A Geology - Mackenzie Delta, District of Mackenzie, Geology by D.K. Norris, 1975.  
 2. Image provided by Worley Parsons

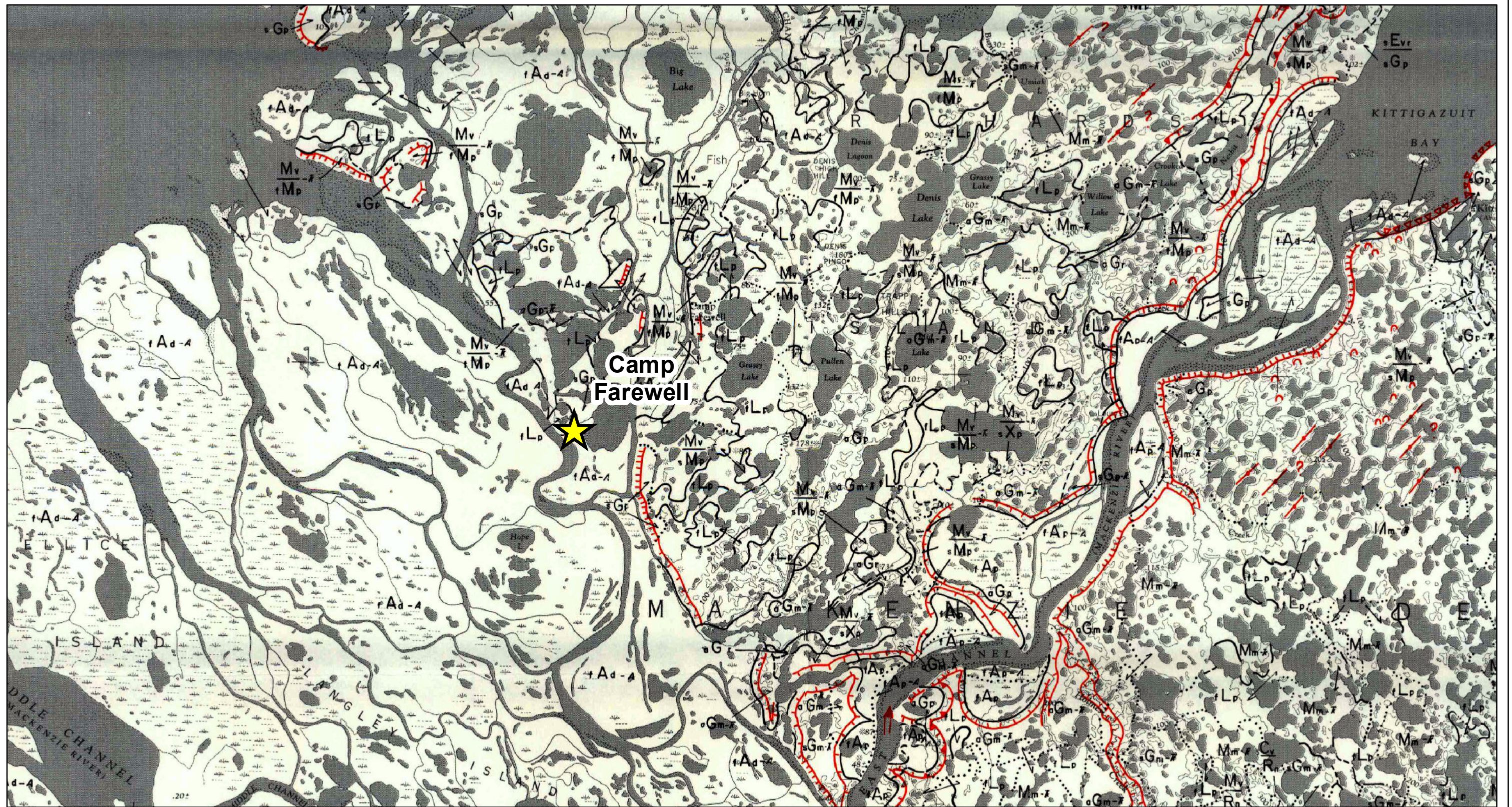
**CLIENT**  
**Shell Canada Energy**



**PROJECT**  
 Camp Farewell Closure and Reclamation Plan

**TITLE**  
 Area Geology

**SCALE** NTS    **PROJECT No.** A04012A06    **FIG No.** 3



**Legend**  
 ★ Site Location  
 See Figure 4B for Surficial Geology legend.

NOT FOR CONSTRUCTION

To be read with IEG report dated November 2015

NOTES:  
 1. IMAGE SOURCE: Map 32-1979 Surficial Geology - Mackenzie Delta, District of Mackenzie, Geology by V.N. Rampton, 1974.  
 2. Image provided by Worley Parsons

CLIENT  
**Shell Canada Energy**

PROJECT  
 Camp Farewell Closure and Reclamation Plan



TITLE  
 Area Surficial Geology

SCALE NTS PROJECT No. A04012A06 FIG No. 4A

DESCRIPTION OF TERRAIN UNITS

SYMBOL	NAME	MATERIALS AND THICKNESS	PERMAFROST DISTRIBUTION AND ICE CONTENTS <sup>1</sup>	GEOMORPHOLOGY <sup>2</sup> AND DRAINAGE	ORIGIN AND AGE
$\frac{sC}{R_n}$	Sandy colluvium over bedrock	Sand; possibly contains few interbeds of silt clay and gravel; 0.5-4 m thick. Swales contain peat up to 3 m thick.	Continuous permafrost; variable ice contents.	Moderate to steep escarpments; moderately 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).
$\frac{sE}{sG_p}$	Sand dune on glaciofluvial plain	Fine to medium sand, in places silty, isolated 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, 3-10 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.
$tA_p$	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; thaw pools, lakes, and marshy areas common; low surfaces occasionally inundated.	Alluvium deposited by streams in recent past.
$tA_p-A$	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 surface; inundated annually.	Floodplain alluvium presently being deposited.
$tA_d-A$	Alluvial delta; 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 decrease 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.
$tM_p-A$	Tidal flats	Interbedded silt, clayey silt, and sand; 1-8 m thick.	Irregular distribution of permafrost; ice lenses 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.
$tM_v-A$ $tL_p$	Intertidal lagoons	Interbedded silt, clayey silt, and sand; predominantly sand on northeastern part of Richards Island. Marine 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 whose seaward edges have been breached during the postglacial rise in sea level; deposition has continued subsequently, mainly during last 5000 years.
$\frac{sM_r-A}{sM_r-A}$	Beaches, spits and bars	Sand (sM) or gravel and sand (sM), 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.
$tL_p$	Lacustrine plain and pond	Interbedded silt, clayey silt, and silty sand with peaty layers; predominantly silty sand and sand in areas of outwash and till-veneered sandy deposits; sediment 1.5-8 m thick.	Rare isolated taliks present within continuous permafrost; ice contents generally low to medium in 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 due to terracing, inset channels, and thermokarst basins; drainage moderately good to good, but imperfect to poor in channel traces and on extensive broad flat areas where ice-thaw pools are common.	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 Kugaliuk River estuary.
$tL_m-X$	Rolling lacustrine plain; modified by thermokarst	Interbedded clayey silt and clay; generally 3-10 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.	Sediment deposited in glacially fed basin of probable early Wisconsin age.
$\frac{t/sG_p}{sG_p}$	Outwash plain	Silty sand over sand (t/sG), sand (sG), and interbedded sand and gravel (sG), local veneer of fine sand and silt and surface patches of thin peat. Outwash generally 3-10 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 basins; drainage moderately good to good, but imperfect to poor in channel traces 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.
$\frac{sG_p-X}{sG_p-X}$	Outwash plain; modified by thermokarst	Sand with few pebbly beds and channels of gravel (sG) and interbedded sand and gravel (sG); generally 10-20 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.
$\frac{sG_m-X}{sG_m-X}$	Hummocky thermokarst-modified outwash	Sand (sG) or interbedded sand and gravel (sG); 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.
$\frac{sG_r}{sG_r}$	Esker	Gravel with sandy interbeds (sG) or interbedded sand and gravel (sG); 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.
$M_m-X$	Rolling and hummocky moraine; modified by thermokarst	Clayey diamicton containing pockets of sorted silty and clayey materials; diamicton is 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.	Hummocky to rolling with local relief between 30 and 70 m. Many hills around Tuktoyaktuk show an "involute" pattern of ridges with 1-4 m relief. Slopes moderately well drained; hill 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.
$\frac{M_v-X}{sM_p-X}$ $\frac{M_v-X}{sM_p-X}$ $\frac{M_v-X}{sM_p-X}$ $\frac{M_v-X}{sM_p-X}$	Hummocky till-veneered sand; modified by thermokarst	Clayey diamicton or 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 1-5 m but thin or absent in areas between Kittigazuit and Pete's Creek, and between Cabin Creek and Pullen Island, where sand is commonly capped by thin poorly sorted gravel; 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 foresets 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.
$\frac{M_v-X}{tM_p-X}$	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 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 10-30 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.
$\frac{M_v-X}{sX_p-X}$	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.
$\frac{M_v}{R_n}$	Till veneer on bedrock	Clayey diamicton over poorly consolidated Tertiary rocks; diamicton up to 5 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 10-30 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.

<sup>1</sup> See Mackay (1962) for distribution of pingos.

<sup>2</sup> See Mackay (1966a) for distribution of retrogressive thaw flow slides.

To be read with IEG report dated November 2015

NOTES: 1. IMAGE SOURCE: Map 32-1979 Surficial Geology - Mackenzie Delta, District of Mackenzie, Geology by V.N. Rampbn, 1974. 2. Image provided by Worley Parsons	CLIENT <b>Shell Canada Energy</b>	PROJECT Camp Farewell Closure and Reclamation Plan
		TITLE Area Surficial Geology Legend
		SCALE - PROJECT No. A04012A06 FIG No. 4B

# APPENDIX I

## Water Licence N7L1-1762

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July 18, 2012

Mr. Randal Warren  
Manager; DAR and Drilling Waste  
Projects and Technology  
Shell Canada Energy  
400- 4th Avenue S.W.  
P.O. Box 100, Station M  
Calgary, Alberta T2P 2H5

Dear Mr. Warren:

**Re: Issuance of a Type “B” Water Licence- Camp Farewell**

Attached is Water Licence N7L1-1834 granted by the Northwest Territories Water Board (the Board) in accordance with the *Northwest Territories Waters Act*. A copy of this Licence has been filed in the Public Registry at the Board offices in Yellowknife and in Inuvik. Water Licence N7L1-1834 has been approved for a period of five years commencing July 18, 2012 and expiring July 17, 2017. Also attached are the general procedures for the administration of Licences in the Northwest Territories. Please review these carefully and address any questions to one of the Board offices.

Please be advised that this letter, with attached procedures, all inspection reports and correspondence related thereto are part of the Board public registry and are intended to keep all interested parties informed of the manner in which the Licence requirements are being met. All public registry material will be considered if an amendment to the Licence or its renewal is requested.

In accordance with the Northwest Territories Water Regulations (NTWR) section 6(1) and 9(1)(b) there will be a requirement for a further payment of the water use fee based on the approved water use of 150 cubic metres per day. The annual water use fee has been calculated to be \$547.50 and is payable to the Receiver General of Canada on the anniversary of the date of issuance of the licence as per section 9(6)(b)(ii) of the NTWR. At the time of your Water Licence application there was a payment of \$30.00 for the first year fee payment and there remains a balance of \$517.50 to be paid for the water use fee at the time the Licence is issued.

Please note for future Water Licence applications in accordance with NTWR section 6(1) an application for a Licence or for the amendment or renewal of a Licence shall be accompanied by a deposit equal to any water use fee that would be payable in respect of the first year of the Licence that is being applied for.

Please read all the conditions carefully and note that in accordance with the attached Water Licence Part B, condition 10, a security deposit in the amount of \$2,000,000.00 shall be posted with the Minister and copied to the Board prior to the start of the operation pursuant to section 17 of the *Northwest*

*Territories Waters Act.* Submit payment of the security, made out to the Receiver General for Canada in the amount of \$2,000,000.00, to: Aboriginal Affairs and Northern Development Canada, P.O. Box 1500, Yellowknife, NT, X1A 2R3 Attention: Robert Jenkins.

Supplemental information to be submitted by Licensee as required through Licence conditions:

- post and maintain security deposit (by August 17, 2012)
- an Annual Report (by March 31, 2013-2017);
- a map or drawing of SNP sampling locations (by August 17, 2012)
- post signs to identify SNP sampling stations (by August 17, 2012)
- an updated operation and maintenance plan for the Waste Disposal Facilities (by August 17, 2012)
- an updated Emergency Response & Spill Contingency Plan (by August 17, 2012)
- an updated Abandonment and Restoration Plan (by July 17, 2013)
- submit to an Analyst for approval a Quality Assurance/Quality Control Plan (by August 17, 2012)

The full cooperation of Shell Canada Energy is anticipated and appreciated.

Should you have any further questions or concerns, please communicate with the Northwest Territories Water Board by telephone at (867) 678-2942 or via e-mail at [info@nwtwb.com](mailto:info@nwtwb.com).

Sincerely,



Eddie Dillon  
Chairperson  
NWT Water Board

Attached: Water Licence N7L1-1834  
General Procedures for the administration of licences issued under the *Northwest Territories Waters Act* in the Northwest Territories

Distribution: Conrad Baetz, AANDC-NMDO  
Robert Jenkins, AANDC-WRD  
Krista Beavis, Klohn Crippen Berger  
Patrick Clancy, GNWT-ENR  
Rick Walbourne, DFO  
Stacey LeBlanc, EC

## **GENERAL PROCEDURES FOR THE ADMINISTRATION OF LICENCES ISSUED UNDER THE *NORTHWEST TERRITORIES WATERS ACT* IN THE NORTHWEST TERRITORIES**

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1. At the time of issuance, a copy of the Licence is placed on the Northwest Territories Water Board public registry in the Yellowknife and Inuvik Offices, and is then available to the public.
2. To enforce the terms and conditions of the Licence, the Minister of Aboriginal Affairs and Northern Development Canada has appointed Inspectors in accordance with Section 35(1) of the *Northwest Territories Waters Act*. The Inspectors coordinate their activities with officials of the Water Resources Division of Aboriginal Affairs and Northern Development Canada. The Inspector responsible for Licence N7L1-1834 is located in the North Mackenzie District Office in Inuvik.
3. To keep the Northwest Territories Water Board and members of the public informed of the Licensee's conformity to Licence conditions, the Inspectors prepare reports which detail observations on how each item in the Licence has been met. These reports are forwarded to the Licensee with a covering letter indicating what action, if any, should be taken. The inspection reports and covering letters are placed on the Northwest Territories Water Board public registry, as are any responses received from the Licensee pertaining to the inspection reports. It is therefore of prime importance that you react in all areas of concern regarding all inspection reports so that these concerns may be clarified.
4. If the renewal of Licence N7L1-1834 is contemplated it is the responsibility of the Licensee to apply to the Northwest Territories Water Board for renewal of the Licence. The past performance of the Licensee, new documentation and information, and points raised during a public hearing, if required, will be used to determine the terms and conditions of any Licence renewal. Please note that if the Licence expires and another has not been issued, then water and Waste disposal must cease, or you, the Licensee, would be in contravention of the *Northwest Territories Waters Act*. An application for renewal of Licence N7L1-1834 should be made at least eight (8) months in advance of the Licence expiry date.
5. If, for some reason, Licence N7L1-1834 requires amendment, then a public hearing may be required. You are reminded that applications for amendments should be submitted as soon as possible to provide the Northwest Territories Water Board with ample time to go through the amendment process. The process may take up to six (6) months or more depending on the scope of the amendment requested.

6. Specific clauses of your Licence make reference to the Board, Analyst or Inspector. The contact person, address, phone and fax number of each is:

Board: Executive Director  
Northwest Territories Water Board  
P.O. Box 2531  
Inuvik, NT X0E 0T0  
Phone No: (867) 678-2942  
Fax No: (867) 678-2943

Analyst: Analyst  
Taiga Environmental Laboratory  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 1500, 4601 – 52<sup>nd</sup> Avenue  
Yellowknife, NT X1A 2R3  
Phone No: (867) 669-2788  
Fax No: (867) 669-2718

Inspector: Water Resource Officer  
North Mackenzie District Office  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 2100  
Inuvik, NT X0E 0T0  
Phone No: (867) 777-8900  
Fax No: (867) 777-2090

7. Your Licence requires a security deposit be submitted. Should the security deposit be submitted in the form of a "letter of credit", recommended wording is outlined below. It is advised that a "draft" letter of credit be forwarded to Water Resources Division for review. The contact person, address, phone and fax number of the individual administering security deposits is:

Manager  
Water Resources Division  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 1500, 4923 – 52<sup>nd</sup> Street  
YELLOWKNIFE, NT X1A 2R3  
Phone No: (867) 669-2654  
Fax No: (867) 669-2716

[BANK

ADDRESS]

**IRREVOCABLE LETTER OF CREDIT**

[The term “DOCUMENTARY CREDIT” may also be used instead of “Letter of Credit”]

**DATE OF ISSUE:** [Date]      **OUR REFERENCE NUMBER:** [Bank’s reference number]

**AMOUNT:** CAD\$#####.00

**MAXIMUM** #####.00

**CANADIAN DOLLARS ONLY**

**APPLICANT:**

[“Customer” can be used instead of “Applicant”]

[Company’s Name]

[Company’s Address]

**BENEFICIARY:**

RECEIVER GENERAL FOR CANADA

ON BEHALF OF THE MINISTER OF

INDIAN AFFAIRS AND NORTHERN

DEVELOPMENT

4923 – 52<sup>nd</sup> STREET, 2<sup>nd</sup> FLOOR

P.O. BOX 1500

YELLOWKNIFE, NT X1A 2R3

ATTENTION: REGIONAL DIRECTOR GENERAL  
DIAND - NT REGION

**RE: SECURITY PURSUANT TO** [the Water Licence Type and Number]

AT THE REQUEST AND FOR THE ACCOUNT OF [Company’s Name] (THE “APPLICANT”), WE, [Bank’s Name], HEREBY ESTABLISH IN YOUR FAVOUR OUR IRREVOCABLE LETTER OF CREDIT NO. [Bank’s Reference Number] (“CREDIT”) FOR SUMS NOT EXCEEDING IN THE AGGREGATE [Amount of Security required stated in Canadian Dollars].

THIS CREDIT IS AVAILABLE WITH US FOR DRAWING AT SIGHT, WITHOUT ENQUIRY AS TO WHETHER YOU HAVE RIGHT AS BETWEEN YOURSELF AND THE APPLICANT TO MAKE SUCH DEMAND AND WITHOUT RECOGNIZING ANY CLAIM OF THE APPLICANT, AGAINST PRESENTATION TO US, BY YOU OR YOUR DULY AUTHORIZED REPRESENTATIVE OR AGENT, OF THE FOLLOWING DOCUMENTS:

1. A SIGHT DRAFT DRAWN ON [Bank’s Name and Address of the Branch that the security can be drawn at, usually one of the Bank’s larger commercial banking centres]; AND
2. THE ORIGINAL OF THIS IRREVOCABLE LETTER OF CREDIT NO. [Bank’s Reference Number] FOR ENDORSEMENT OF PAYMENT THEREON; AND

3. A STATEMENT SIGNED BY AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT CERTIFYING

- A) THAT THE SIGNATORY IS AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT AND HAS AUTHORITY TO SIGN THE STATEMENT ON BEHALF OF THE MINISTER OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT (THE "MINISTER"), AND
- B) EITHER
- I THAT THE MINISTER IS ENTITLED TO APPLY THE AMOUNT DRAWN, BEING ALL OR PART OF THE SECURITY POSTED AND MAINTAINED PURSUANT TO [the Water Licence Type and Number] ISSUED BY THE NORTHWEST TERRITORIES WATER BOARD, WHETHER AS ORIGINALLY ISSUED OR AS AMENDED OR RENEWED FROM TIME TO TIME, OR
- II THAT THIS LETTER OF CREDIT IS DUE TO EXPIRE IN THIRTY (30) DAYS OR LESS AND THAT THE APPLICANT HAS NOT REPLACED THIS CREDIT BY POSTING WITH THE MINISTER OTHER SECURITY SATISFACTORY TO THE MINISTER.

PARTIAL DRAWINGS ARE PERMITTED.

THIS CREDIT IS EFFECTIVE FROM [Time] .AM. ON [Effective Date as required by Water Licence] AND SHALL EXPIRE AT OUR COUNTERS AT [Time] P.M. [Expiry Date] (THE "INITIAL EXPIRATION DATE"). THIS CREDIT SHALL BE RENEWED AUTOMATICALLY FOR AN ADDITIONAL ONE-YEAR PERIOD FROM THE INITIAL EXPIRATION DATE, AND FOR AN ADDITIONAL ONE-YEAR PERIOD FROM EACH FUTURE EXPIRATION DATE, UNLESS AT LEAST NINETY (90) DAYS PRIOR TO THE OPERATIVE EXPIRATION DATE WE NOTIFY YOU IN WRITING BY REGISTERED MAIL OR COURIER THAT WE ELECT NOT TO CONSIDER THIS CREDIT RENEWED FOR SUCH ADDITIONAL PERIOD.

WE HEREBY AGREE THAT ALL DRAFTS DRAWN UNDER AND IN COMPLIANCE WITH THE TERMS OF THIS CREDIT SHALL BE DULY HONOURED BY US IF PRESENTED FOR PAYMENT ON OR BEFORE THE OPERATIVE EXPIRATION DATE.

EXCEPT SO FAR AS IS OTHERWISE EXPRESSLY STATED HEREIN, THIS CREDIT IS SUBJECT TO THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS (1993 REVISION), INTERNATIONAL CHAMBER OF COMMERCE, PUBLICATION NO. 500. NOTWITHSTANDING ARTICLE 17 OF SAID PUBLICATION, IS THIS CREDIT EXPIRES DURING AN INTERRUPTION OF BUSINESS AS DESCRIBED IN ARTICLE 17, WE AGREE TO EFFECT PAYMENT IF THIS CREDIT IS

DRAWN ON US WITHIN FIFTEEN (15) DAYS AFTER THE RESUMPTION OF BUSINESS.

[Bank's Name]

\_\_\_\_\_  
[Official's Name and Position]

\_\_\_\_\_  
[Official's Name and Position]

# 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 ENERGY  
(Licensee)  
400- 4 Avenue S.W., P.O. Box 100, Station M  
of CALGARY, ALBERTA T2P 2H5  
(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 N7L1-1834

Licence Type "B"

Water Management Area NORTHWEST TERRITORIES 07

Location Within a two kilometre radius of  
Latitude 69°12'30" N.  
Longitude 135°06'04" W.  
MACKENZIE RIVER DELTA, N.W.T

Purpose TO USE WATER AND DISPOSE OF WASTE  
FOR INDUSTRIAL UNDERTAKINGS AND  
ASSOCIATED USES

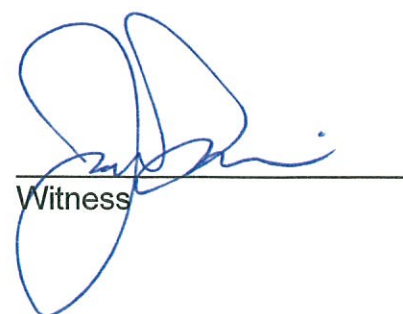
Description OIL AND GAS EXPLORATION  
AND DEVELOPMENT

Quantity of Water Not  
To Be Exceeded 150 CUBIC METRES DAILY

Effective Date of Licence JULY 18<sup>TH</sup>, 2012

Expiry Date of Licence JULY 17<sup>TH</sup>, 2017

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

  
Witness

**NORTHWEST TERRITORIES WATER BOARD**

  
Chairperson (Eddie Dillon)



**PART A: SCOPE AND DEFINITIONS**

**1. Scope**

- a) This Licence entitles Shell Canada Energy to use water and dispose of Waste as an industrial undertaking 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 conforming to 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.
- d) This Licence is issued subject to the conditions contained herein with respect to the use of Waters as prescribed in Section 8 of the *Act* and the deposit of Waste to any Waters as prescribed in Section 9 of the *Act*.

**2. Definitions**

In this Licence: **N7L1-1834**

“**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”** means the discrete average of up to four (4) 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 the lowest elevation of the effective water containment crest on a dam or dyke’s upstream slope;

**“Geotechnical Engineer”** means a professional engineer registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists whose principal field of specialization 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 Waste;

**“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;

**“Minister”** means the Minister of Aboriginal Affairs and Northern Development Canada (AANDC);

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

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

**“Sewage”** means all toilet Wastes and Greywater;

**“Sewage Treatment Facilities”** comprises the area and engineered structures designed to contain Sewage as identified in the project description and also include 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*;

**“Waste Disposal Facilities”** mean all facilities designated for the disposal of Waste and include the Sewage disposal facilities, solid Waste disposal facilities, and bagged toilet Wastes disposal facilities;

**“Water Supply Facilities”** mean all facilities designed to collect, treat and supply water for industrial purposes; 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 31<sup>st</sup> of the year following the calendar year reported which shall contain the following information:
  - a) the monthly and annual quantities in cubic metres of fresh water obtained from all sources;
  - b) the monthly and annual quantities in cubic metres of each and all Waste discharged;
  - c) the location and direction of flow of all Waste discharged to the water or the land;
  - d) a summary of the monthly and annual quantities of Waste stored on site and transported off site;
  - e) the results of sampling carried out under the “Surveillance Network Program”;
  - f) a summary of any Modifications carried out on the Water Supply Facilities and Sewage Treatment Facilities, including all associated structures;
  - g) a list of any spills and unauthorized discharges;
  - h) details on the restoration of any Sumps;
  - i) a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

- j) a summary of any studies requested by the Board that relate to Waste disposal, water use, or reclamation, and a brief description of any future studies planned;
  - k) notation of updates and/or revisions to the approved Spill Contingency Plan, Waste Disposal Facilities operations and maintenance plan, and sewage treatment plan;
  - l) an outline of any spill training and communications exercises carried out; and
  - m) 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 this Licence, submit to the Board for approval a map or drawing indicating the location of all Surveillance Network Program sampling stations.
  5. The Licensee shall, within thirty (30) days of the issuance of this 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.
  6. Any meters, devices or other such methods used for measuring the volumes of water used or Waste disposed and discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.
  7. The Licensee shall immediately report to the 24 Hour Spill Report Line (**867-920-8130**) any spills which are reported to, or observed by, the Licensee within the project boundaries.
  8. 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.
  9. 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.

10. Within thirty (30) days of issuance of this Licence, the Licensee shall have posted and shall maintain a security deposit in the amount of Two Million (\$2,000,000.00) Dollars pursuant to Section 17 of the *Act* and Section 12 of the Regulations, in a form suitable to the Minister. The security deposit shall be maintained until such time as it is fully or in part refunded by the Minister pursuant to Section 17 of the *Act*.
11. 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. The daily quantity of water used for all purposes shall not exceed 150 cubic metres.

**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 Waste Disposal 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 lagoon shall be directed to the channel of the Mackenzie River at a location approved by an Inspector.
5. There should be no discharge of floating solids, garbage, grease, free oil or foam.

6. All effluent discharged by the Licensee from the Sewage lagoon at "Surveillance Network Program" Station Number 1834-1 shall meet the following effluent quality requirements:

Sample Parameter	Average Concentration
BOD <sub>5</sub>	70.0 mg/L
Total Suspended Solids	70.0 mg/L
Faecal Coliforms	1 X 10 <sup>4</sup> CFU/dL
Oil and Grease	5.0 mg/L
Total Residual Chlorine (TRC)	0.1 mg/L

7. The effluent discharged shall have a pH between six (6) and nine (9) and no visible sheen of oil and grease.
8. Introduction of water to Waste for the purpose of achieving effluent quality requirements in Part D, Item 7 is prohibited.
9. A Freeboard limit of 1.0 metre shall be maintained at all times in the Sewage lagoon, or as recommended by a qualified Geotechnical Engineer and/or as approved by the Board.
10. The Licensee shall advise an Inspector at least five (5) days prior to initiating and decant of the Sewage lagoon.
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.
12. The Licensee shall contain all contaminated soil or contaminated snow in such a manner as to minimize the potential for migration of contaminants into any Waters, to the satisfaction of an Inspector.
13. The Licensee shall store, segregate and dispose of all solid and hazardous Wastes in a manner acceptable to the Inspector.
14. Unless authorized by this Licence, the Licensee shall ensure that any Wastes associated with this undertaking do not enter any water body.
15. The Licensee shall submit to the Board a copy of each agreement(s) between third parties to store, transport or dispose of Wastes. The copy submitted to the Board shall include, at a minimum, the following:

- a. type of Waste;
- b. quantities of Waste;
- c. disposal location(s), and
- d. proof of acceptance from third parties.

**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 the 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 F, 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 issuance of this Licence an updated Emergency Response & Spill Contingency Plan in accordance, for example, with the *Guidelines for Spill Contingency Planning, April 2007*, developed by AANDC-Water Resources Division.

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 unauthorised 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.

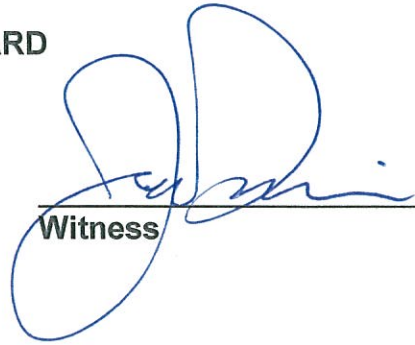
**PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION**

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 plans for the abandonment and restoration of the Sewage lagoon and a complete Phase II environmental site 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.
2. The Licensee shall implement this Plan as and when approved by the Board.
3. Following approval of the Plan, the Licensee shall review the 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**

  
\_\_\_\_\_  
**Chairman**

  
\_\_\_\_\_  
**Witness**

## NORTHWEST TERRITORIES WATER BOARD

**LICENSEE:** Shell Canada Energy  
**LICENCE NUMBER:** N7L1-1834  
**EFFECTIVE DATE OF LICENCE:** July 18, 2012  
**EFFECTIVE DATE OF SURVEILLANCE NETWORK PROGRAM:** July 18, 2012

### SURVEILLANCE NETWORK PROGRAM

#### A. Location of Sampling Stations

<u>Station Number</u>	<u>Description</u>
1834-1	Discharge from the Sewage lagoon.

#### B. Sampling and Analysis Requirements

1. Water at Station Number 1834-1 shall be sampled prior to, and once during decanting. Each sample shall be analyzed for the following parameters:

BOD5	Total Suspended Solids
Oil and Grease	Faecal Coliforms
Ammonia	pH
Phosphorous	Total Residual Chlorine

2. More frequent sample collection may be 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 analysis shall be performed in a laboratory approved by an Analyst.
5. The Licensee shall, by August 17, 2012, 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.

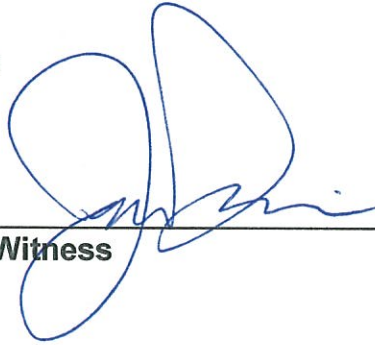
**C. Reports**

1. The Licensee shall, within thirty (30) days following the month of discharge from the Sewage lagoon, submit to the Board and an Inspector all data and information required by the "Surveillance Network Program" including the results of the approved Quality Assurance/Quality Control Plan.

**NORTHWEST TERRITORIES WATER BOARD**



Chairman



Witness

**Northwest Territories Water Board  
Reasons for Decision**

Issued pursuant to section 26 of the  
*Northwest Territories Waters Act, S.C. 1992 C.39*

Water Licence Number: N7L1-1834(Type B)

This is the decision of the Northwest Territories Water Board (Board) for the issuance of Water Licence N7L1-1834. The project is located at Latitude 69°12'30" North and Longitude 135°06'04" West in the Northwest Territories.

The Northwest Territories Water Board issued Licence N7L1-1834 in accordance with Section 14 of the *Northwest Territories Waters Act*.

**Background:**

Shell Canada Energy applied to the Board on March 5<sup>th</sup>, 2012 for a Water Licence for Farewell Camp and Stockpile Site (Camp Farewell) in the Mackenzie Delta. The Board deemed the application complete on May 23, 2011.

Canadian Environmental Assessment Act (CEAA)

The Water Licence application was exempt from the Canadian Environmental Assessment Act under Section 7(1)(a), specifically under Schedule 1, Part 1, Section 3(a) of the Exclusion List Regulations.

Environmental Impact Screening Committee (EISC)

On April 20, 2012 the Board received an official notification from the Environmental Impact Screening Committee that determined the application met the definition of development and that it was exempt from the screening process, as it qualified under exclusion #1 of Environmental Impact Screening Guidelines, Appendix C.

Notice of Application

In accordance with rule 38 of the Board Rules of Procedure, the Board gave notice of the application for a Water Licence regarding Camp Farewell, on May 28, 2012 in News North in English, May 31, 2012 in the Inuvik Drum in Inuvialuktun, and May 25, 2012 in L'Aquilon in French.

Reviewers' Comments

The Board sent the Water Licence application and supporting information for review to the following agencies: AANDC-NMDO, AANDC-WRD, EC, DFO and GNWT-ENR on May 23, 2012. The Board received written comments from AANDC (June 15, 2012), EC (June 15, 2012), DFO (May 28, 2012) and GNWT-ENR (June 14, 2012).

The Board considered all submitted comments at a Board meeting held via teleconference on July 10, 2012. The Board approved a Water Licence for the applicant's review. The Licence was submitted to the applicant on July 11, 2012 and it indicated in its response on July 16, 2012 that the Licence was acceptable.

**Requirements of the Northwest Territories Waters Act:**

Shell Canada Energy has provided the Board with its Schedule III application and supporting information for its consideration as required by section 16 of the *Northwest Territories Waters Act*.

The Board is in accordance with Paragraph 14(4)(a) of the *Northwest Territories Waters Act* by ensuring that the granting of the Water Licence to Shell Canada Energy will not adversely affect, in a significant way, any existing Licensee, providing the conditions of Water Licence N7L1-1834 are met. There are no other applicants with precedence.

The Board does not believe that any users nor persons listed in Paragraph 14(4)(b) of the *Northwest Territories Waters Act* will be adversely affected by the use of waters or the deposit of waste proposed by the Licensee provided that the Licensee operates in accordance with the terms and conditions of Water Licence N7L1-1834.

The Board is of the view that compliance with Water Licence N7L1-1834 terms and conditions will ensure that the waste will be treated and deposited in a manner that will maintain water quality in the area and will be consistent with applicable water quality standards in accordance with Sub-Paragraph 14(4)(c) (i) of the *Northwest Territories Waters Act*.

The Board drafted the terms and conditions of Water Licence N7L1-1834 in accordance with Section 15 of the *Northwest Territories Waters Act*.

In Accordance with Sub-Section 17(1) of the *Northwest Territories Waters Act*, the Board requested that a security deposit in the amount of two million dollars (\$2,000,000.00) be posted and shall be maintained in a form suitable to the Minister of Aboriginal Affairs and Northern Development Canada.

**Decision to issue Water Licence N7L1-1834:**

The Board has reviewed the Camp Farewell Project Application and draft Water Licence N7L1-1834 for issuance. Upon consideration of the facts and circumstances, the purpose, scope and intent of the *Northwest Territories Waters Act*, the Board has determined that it can issue Water Licence N7L1-1834.

For the above reasons the Board has determined to issue Water Licence N7L1-1834 in accordance with Sub-Section 14(1) and Sub-Paragraph 14(6)(b)(i) of the *Northwest Territories Waters Act* for the use of water and the deposit of wastes.

**SIGNED** this 18 day of July, 2012 on behalf of the Northwest Territories Water Board.



**Eddie Dillon**

**Chairperson, Northwest Territories Water Board**

## **APPENDIX II**

### **Lease - No. 107 C/4-2-15**

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N.W.T. Lease No.: 107 C/4-1-8

File No.: 107 C/4-1

THIS LEASE made this 7 day of April 2009.

BETWEEN: Her Majesty the Queen in right of Canada,

Hereinafter called "Her Majesty"

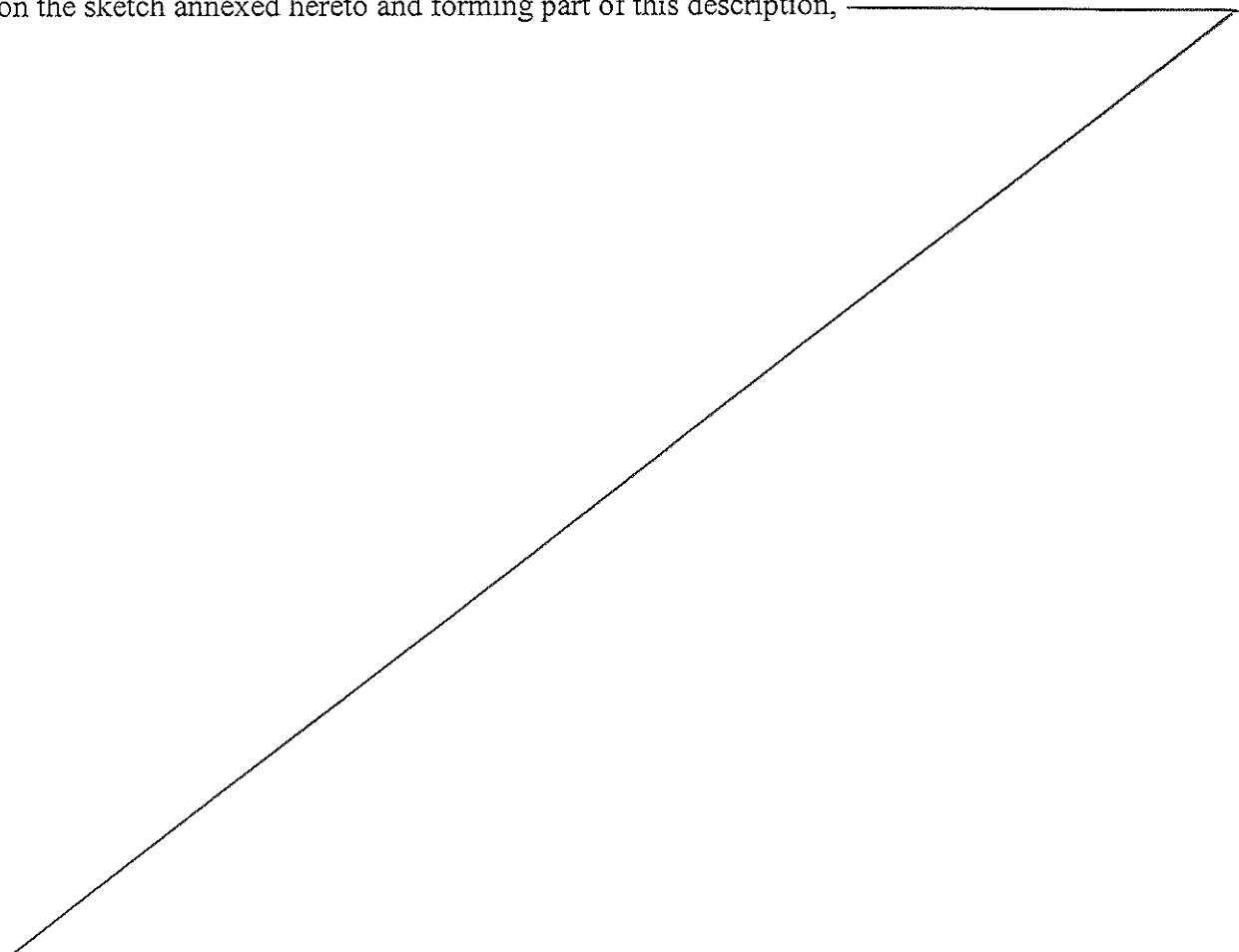
OF THE FIRST PART

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 that parcel of land at Farewell, located at approximately on 69° 12' 41" North Latitude and 135° 05' 33" West Longitude, in QUAD 107 C/4, in the Northwest Territories, as said parcel is shown outlined in red on the sketch annexed hereto and forming part of this description,



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

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- (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;
- (f) "airstrip" means any area, either water or land, which is adapted for the take off and landing of aircraft and which provides facilities for the shelter and repair of aircraft, or for the regular receiving and discharging of passengers or cargo;

**TERM:**

2. The term of this lease shall be for a period of **twenty (20) years** commencing on the **1<sup>st</sup> day of January, 2009 AD.** and terminating on the **31<sup>st</sup> day of December, 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 **one hundred and fifty (150.00) dollars.**

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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 AIRSTRIP purposes only.

**SUBLETTING OR ASSIGNMENTS:**


7. The lessee shall not sublet the land or assign or transfer this lease or any portion thereof without the consent of the Minister in writing, which consent shall not be unreasonably withheld.
8. No Sublease, assignment or transfer of this lease to any party will receive the consent of the Minister unless Lease number 107 C/4-2-15 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.

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**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 daily 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 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:**

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

**FUEL AND HAZARDOUS CHEMICALS:**

18. 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.
19. 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.
20. 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.
21. The lessee shall prevent the possibility of migration of spilled fuel over the ground surface or through seepage in the ground.
22. The lessee shall take all reasonable precautions to prevent the migration of petroleum products into bodies of water.
23. 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:**

24. Her Majesty is not responsible for the establishment on the ground of the boundaries of the land.
25. The boundaries of the land are subject to such adjustment and alteration as may be shown to be necessary by survey.

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26. 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:**

27. The lessee is responsible for ensuring that all improvements to the land are made within the boundaries of the land.
28. The lessee shall not erect any building or structure nearer than a distance of three (3) metres from any boundary of the land.
29. 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.

**ACCESS:**

30. Her Majesty assumes no responsibility, express or implied, to provide access to the land.
31. 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.

**INDEMNIFICATION:**


32. 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.
33. 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.
34. Her Majesty will not be liable for damages caused by vandalism or interference by others with the lessee's facilities and equipment.

**REVIEW:**

35. 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:**

36. 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.

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37. 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.

38. 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.

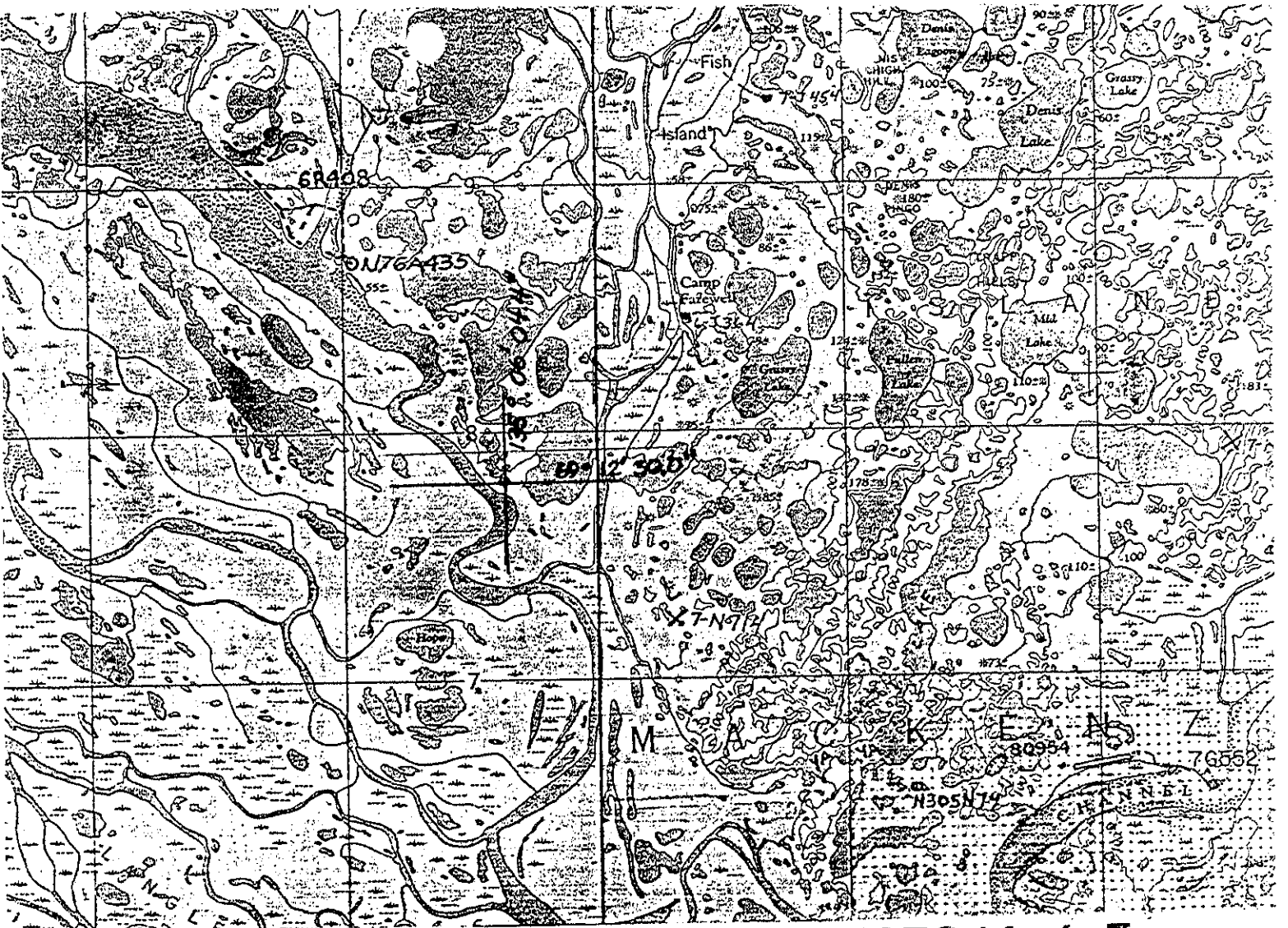
**GENERAL:**

39. 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.
40. This lease enures to the benefit of and is binding upon Her Majesty, Her Heirs and Successors and the lessee, its successors and assigns.
41. No implied covenant or implied liability on the part of Her Majesty is created by the use of the words "demises and leases" herein.
42. The lessee shall at all times permit emergency landings on the airstrip without the payment of fees.
43. Aircraft owned or under contract to the Government of Canada or the Government of the Northwest Territories shall be exempt from the payment of any charges of landing fees for the use of the airstrip.
44. The lessee shall not levy charges or landing fees for the use of the airstrip by other users without the written consent of the Minister.

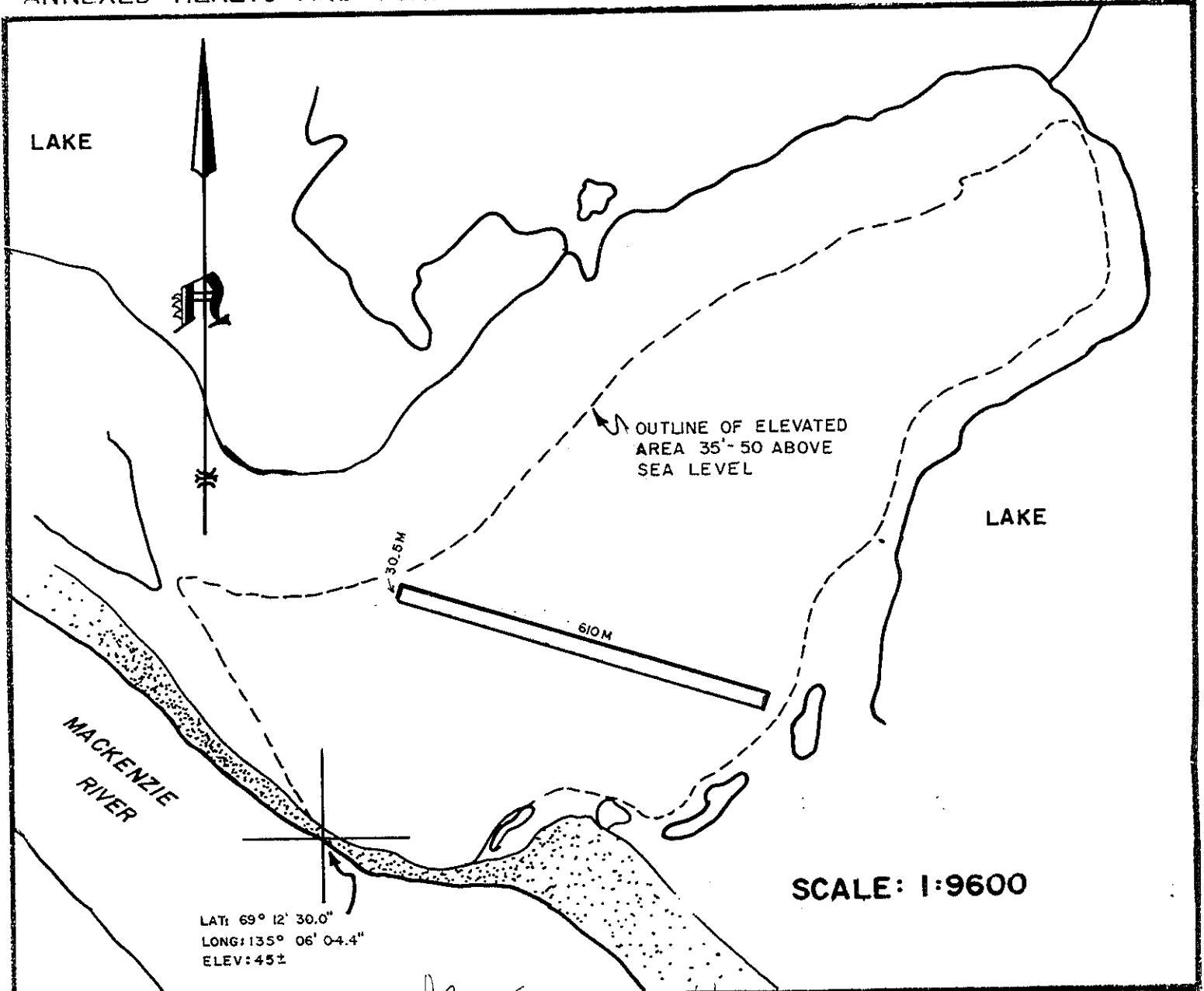
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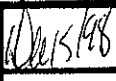


ANNEXED HERETO AND FORMING PART OF LEASE **107C/4-1-7**



LAT: 69° 12' 30.0"  
 LONG: 135° 06' 04.4"  
 ELEV: 45±

SCALE: 1:9600

 REGIONAL MANAGER LAND RESOURCES	 DATE	DWN. BY: <i>Mcc.</i>	SCALE: AS STATED	DATE: 1979-06-13
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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"

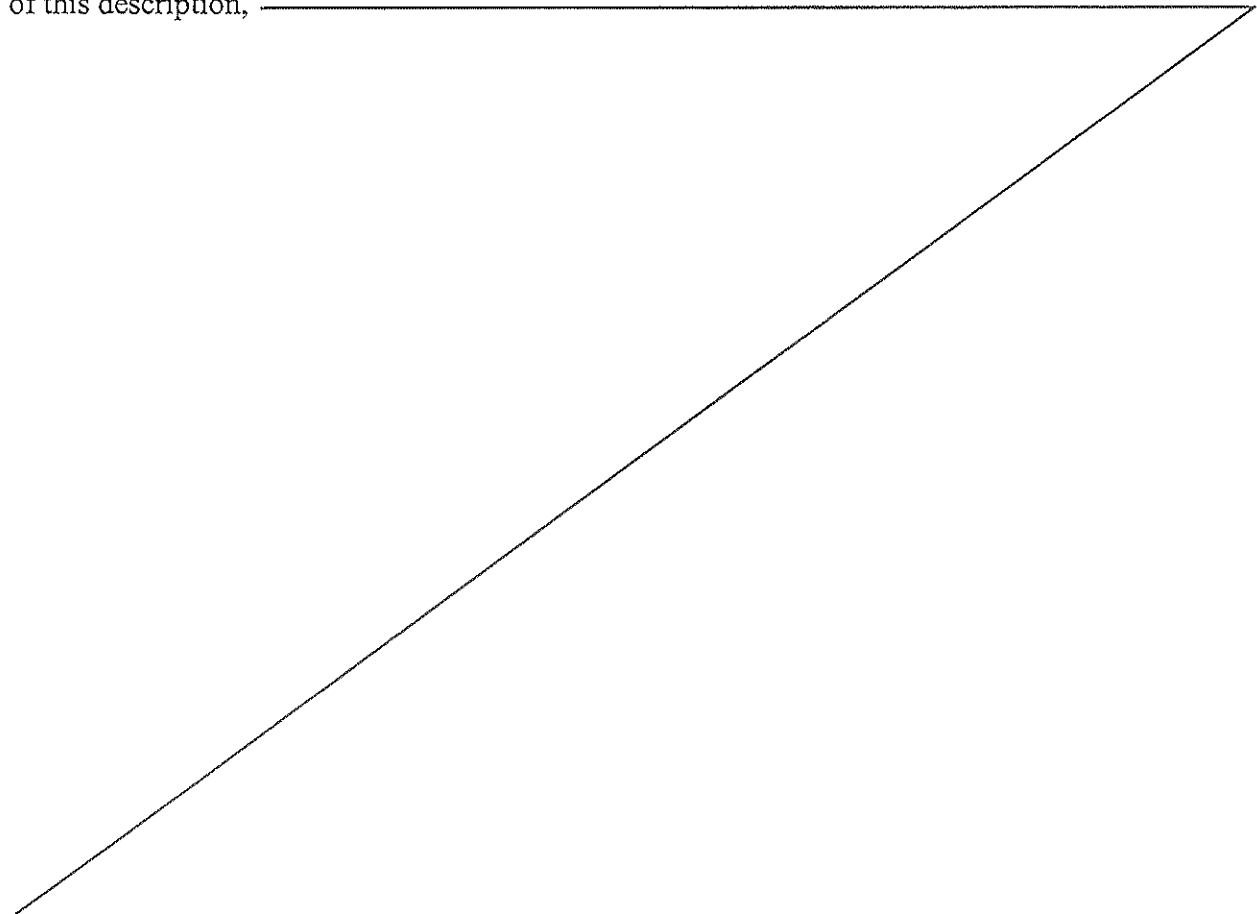
OF THE FIRST PART

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:

Initial(s) \_\_\_\_\_

SHELL'S COPY

- (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 **1<sup>st</sup> day of January A.D. 2009 AD.** and terminating on the **31<sup>st</sup> 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.**

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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.

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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.

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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.

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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

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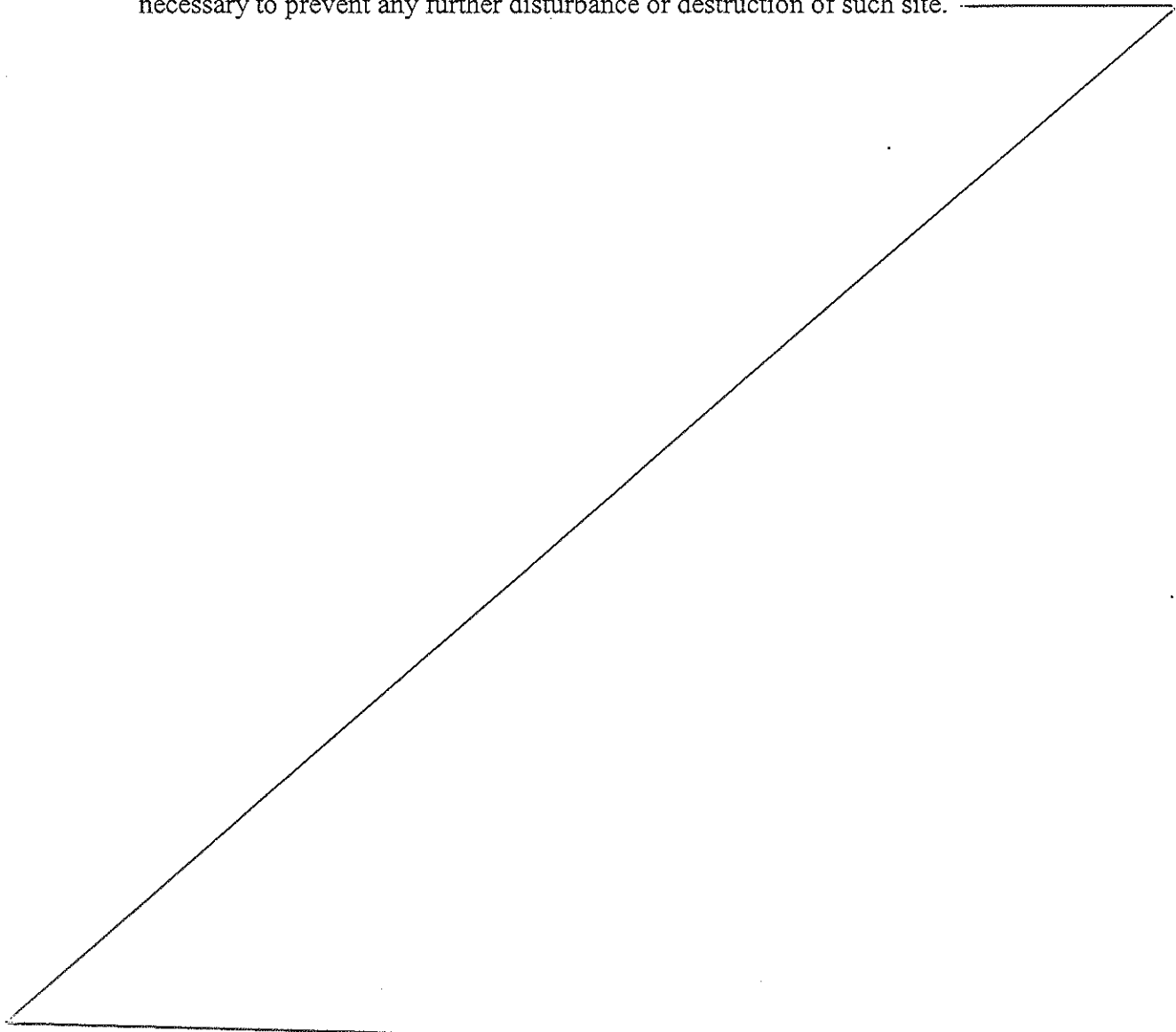
To the Lessee: SHELL CANADA LIMITED  
P.O. Box 100 Station Main  
Calgary, AB T2P 2H5

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.

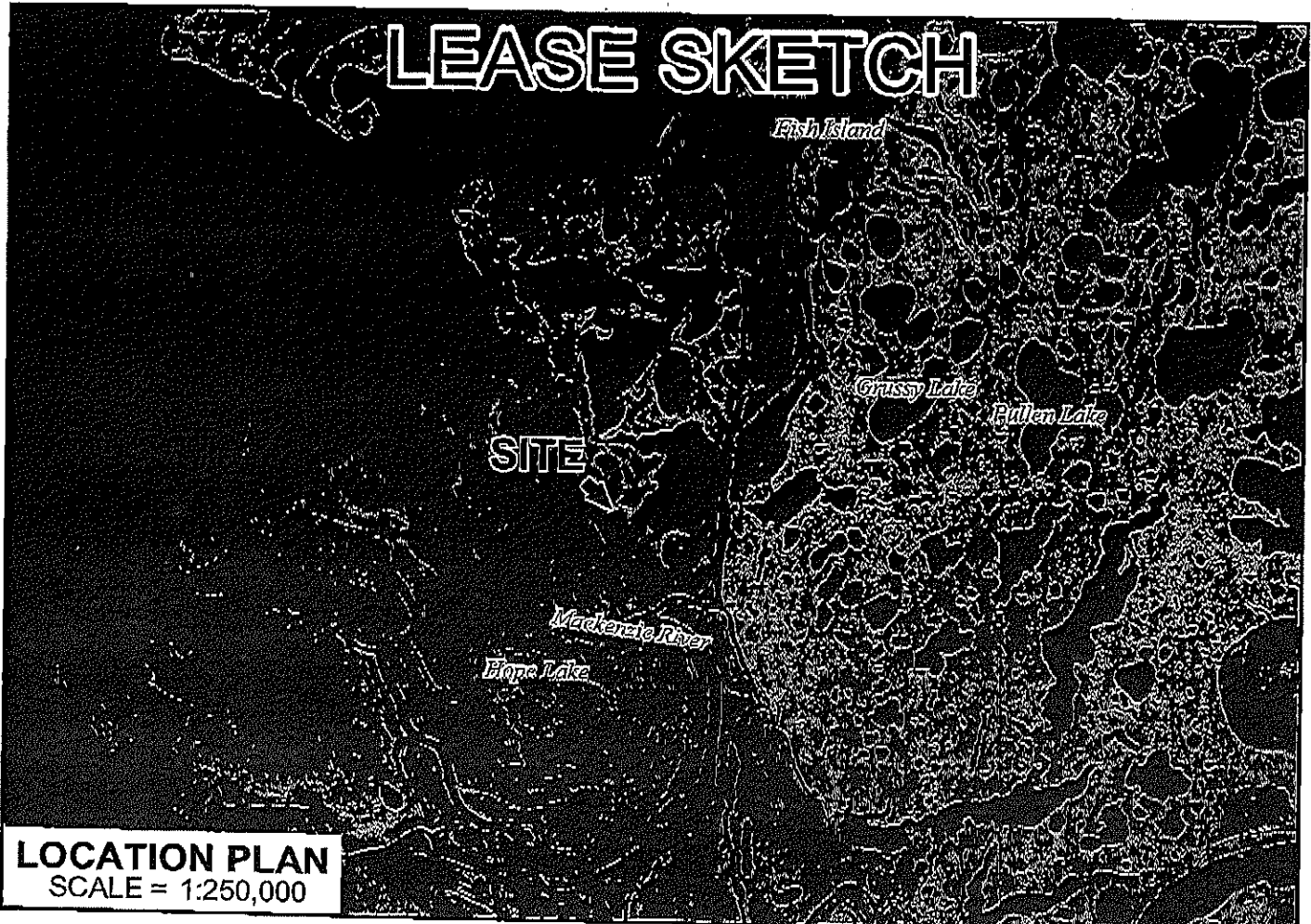
**GENERAL:**

- 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.

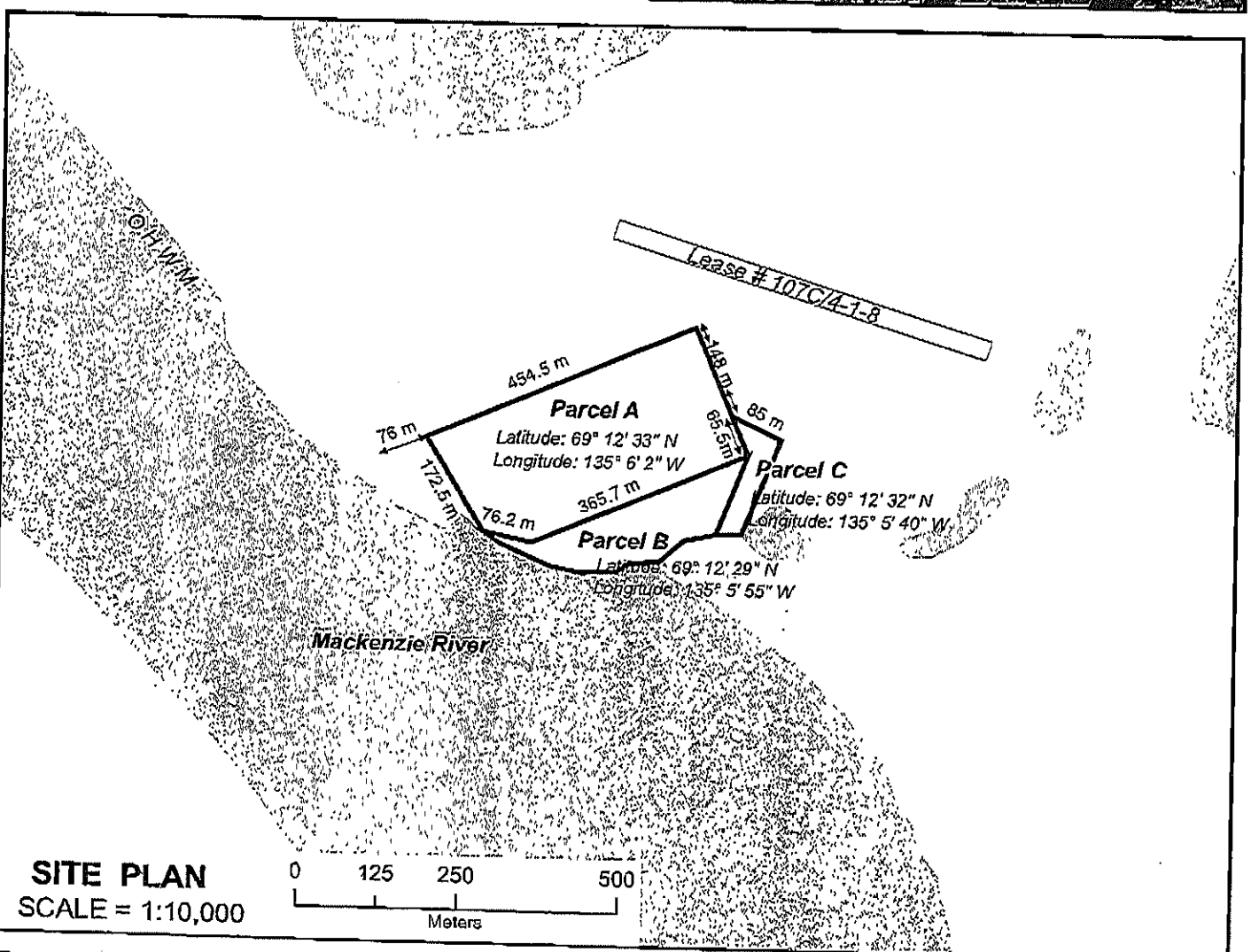


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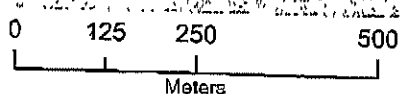


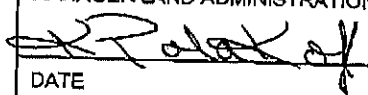




**LOCATION PLAN**  
SCALE = 1:250,000



**SITE PLAN**  
SCALE = 1:10,000



<b>ANNEXED HERETO AND FORMING PART OF N.W.T. LEASE No. 107C/4-2-15</b>			
LATITUDE: LONGITUDE: PROJECTION : UTM, zone 8 DATUM: NAD 83 SKETCH AREA = 12.4 ha± <small>Area obtained by Arctiva calculation using X7000s</small>	DRAWN BY: E.M., IMAG DATE: February 6, 2008 REVISED: DATE:	MANAGER LAND ADMINISTRATION  DATE Dec. 4, 2008	
	 Indian and Northern Affairs Canada	Affaires indiennes et du Nord Canada	

## **APPENDIX III**

### **CWS Permit # NT-MBS-15-01**

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Canadian Wildlife Service  
Prairie and Northern Region  
Box 2310, 5019 - 52 Street  
Yellowknife NT X1A 2P7

DATE: January 15, 2015

FROM: Paul Latour  
CWS  
Yellowknife,

TO: Randall Warren  
Shell Canada  
Calgary, AB

TEL:  
FAX: 867- 403-269-7948

TEL: 867-669-4769  
FAX: 867-873-8185

TOTAL # OF PAGES: 4  
SUBJECT: EC/CWS Migratory Bird  
Sanctuary Permit

MESSAGE:

Randall:

Attached is a Migratory Bird Sanctuary Permit authorizing you to conduct care, maintenance, and remediation work at the Camp Farewell Stockpile and Lease. Please note Special Conditions 1.(4.) and 6.(1.) which are specific to this permit.

Please sign the "Permittee" line on page 4 and return to me.

Thanks.



Paul L.



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Canada

### ENVIRONMENT CANADA PERMIT

Migratory Birds - Sanctuary

NWT-MBS-15-01

Permit for  
Northwest Territories

Permit no.

province(s), territories

9.

Issued under section

Randall Warren  
Shell Canada Ltd.,  
P.O. Box 100 Station "M"  
Calgary, AB  
T2P 2H5

Migratory Bird Sanctuary Regulations

Permittee

For the Minister

Date of issue: January 14, 2015

Date of expire: December 31, 2015

The Permittee is authorized to enter the Kendall Island Migratory Bird Sanctuary to conduct care, maintenance and remediation of the Camp Farewell and Stockpile lease area.



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## GENERAL CONDITIONS

1. The permit is not valid unless signed by the Permittee (holder) or authorized representative, in the space designated as "Permittee".
2. By signing this document you bind yourself to respect all terms and conditions of this permit.
3. The Permittee must comply with all other applicable Canadian laws and regulations.
4. Copy of signed permit must be carried by nominees and Permittee when conducting this work and will be presented if asked by Police or Game Officer.
5. The Permittee shall display a copy of this permit in a conspicuous place in each campsite established to carry out this program.
6. The conditions of this permit apply to all employees, agents, contractors, volunteers, and visitors of the Permittee.
7. The Permittee shall ensure that a copy of this Permit, operating conditions and definitions is provided, understood and adhered to by all contractors and sub-contractors prior to the start-up of the permitted activity
8. Additional restrictions may be required and may be added to this permit by the Minister if it is deemed necessary to ensure compliance with the Migratory Birds Convention Act and the Regulations.
9. Issuance of this permit does not supersede the necessity or legal requirement to acquire any other pertinent Territorial or Municipal license and or permit which may otherwise be applicable. This permit is not transferable to any other person(s) or organization(s) and is not valid if altered in any way.
10. If the Permittee proposes to conduct any activities that are not identified in the original permit application, the Permittee shall notify the Manager and, if necessary, apply for a new or amended permit to conduct the new activities.
11. The Permittee is authorized to possess firearms in the Kendall Island Migratory Bird Sanctuary for protection from dangerous wildlife only.
12. This permit may be revoked at any time at the discretion of the Minister.

## SPECIAL CONDITIONS

### 1. PROTECTION OF TERRESTRIAL HABITAT

1. The Permittee shall not conduct any activities in the Kendall Island Bird Sanctuary outside the Camp Farewell and Stockpile lease area.
2. The Permittee shall use portable ramps during loading or unloading ships or barges.
3. The Permittee shall not remove or relocate earth, except contaminated soils collected as part of a clean-up program.
4. The Permittee shall, during the cutting up and removal of fuel tanks, ensure that all residual fuel or sludge does not escape or come into contact with the surrounding earth.



### **3. PROTECTION OF AQUATIC HABITAT**

1. The Permittee shall not place dirt or debris into streams to serve as ramps for loading or unloading ships or barges.
2. The Permittee shall not cut any bank of a waterbody.

### **2. WILDLIFE DISTURBANCE AND INTERACTION**

1. The Permittee shall not feed wildlife or attempt to attract wildlife.
2. The Camp Farewell airstrip is not permitted to be used from 10 May – 20 June and 25 August – 30 September, except for emergencies.
3. Aircraft activity is restricted to flights necessary to carry out care and maintenance of the Camp Farewell and Stockpile lease area.
4. Aircraft shall maintain a minimum horizontal distance of 1.5 km from any observed concentrations of migratory birds.
5. The Permittee shall notify the Manager of any birds nesting on the infrastructure within the lease area.

### **3. FUEL STORAGE AND HANDLING**

1. The Permittee shall not allow oil, oil wastes or any other substance harmful to migratory birds to be deposited in waters or other areas frequented by migratory birds, or in a place from which the substances may enter waters frequented by migratory birds.
2. The Permittee shall permanently mark all fuel containers, including 205 L drums, with the Permittee's name.

### **4. HAZARDOUS MATERIALS AND CONTAMINANTS – HANDLING AND DISPOSAL**

1. The Permittee shall have the appropriate Workplace Hazardous Material Information System, 'Material Safety Data Sheets' identification available on site.
2. The Permittee shall remove and dispose of all hazardous materials at an approved facility.
3. The Permittee shall conduct maintenance, oil changes, refueling and lubricating of mobile equipment no closer than 100 m from waterbodies (lakes, ponds and streams).

### **5. GARBAGE AND WASTE WATER HANDLING AND REMOVAL**

1. The Permittee shall ensure that all domestic garbage and other wildlife attractants are inaccessible to wildlife at all times.
2. The Permittee shall regularly collect all waste, debris and domestic garbage and dispose of it using appropriate technology and accepted practices.
3. The Permittee shall inventory and dispose of any waste materials, construction materials, drilling materials or other materials on at least an annual basis to minimize accumulation within the permit area. The inventory of materials disposed and materials remaining within the permit area must be reported to the Manager.

### **6. REPORTING**

1. The Permittee shall submit a report within thirty (30) days of the expiration date of this permit. The report shall describe all activities that occurred at Camp Farewell during 2015 including the time period of the Permittee's activities on site, location of soil sampling and laboratory results (if available) as well as remaining infrastructure and photos showing the current state of the Camp Farewell lease area in particular the former tank location.



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## DEFINITIONS

**Manager:** 'The Manager', Northern Conservation Section, Canadian Wildlife Service, Environment Canada or his/her designate.

**Minister:** The Minister of the Environment.

**Permittee:** The party to whom a CWS Sanctuary Permit is issued for conducting activities in a Migratory Bird Sanctuary.

**Waterbody:** Any river, stream, creek, lake, or pond.

**Camp:** A collection of accommodations, maintenance, transportation, and storage facilities located either permanently or temporarily at a site.

**Sub-permit holder and/or nominee(s):**

I declare that I have read and understand this Permit, including all the conditions attached.

Signature of Permittee

*RANDALL WARREN*

## APPENDIX IV

### Site Inventory

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**FAREWELL INVENTORY 2009**

Quantity	Description	Condition	Container Type	Size	Location
49	Wooden Timbers	Some Rough	None	12x12 - 12/14/16 ft.	Disposed
25	Wooden Timbers	Fair	None	12x12 - Shorter Lengths	Disposed
35	Wooden Timbers	Fair	None	12x12 - 6/8/10 ft.	Disposed
20	Pipe	Rusty	Bundles	3 packs of 5 inch - 18 ft.	Yard
436	Seacans (left for cement summer 2002)	Good	Seacan		CCS landfill
56	Cement (Secan Rebanding)	Bad	Seacan	4x4	CCS landfill
18	Potash	Good	Seacan	4x6	MGM
138	Potash	Good	Seacan	4x6	MGM
33	Potash	Good	Seacan	2x4	MGM
22	Potash	Bad	Seacan	4x6	CCS landfill
222	Barite	Good	Seacan	4x4/4200 lb. Each	MGM/CCS Landfill
377	Barite	Bad	Seacan	4x4/4200 lb. Each	CCS landfill
13	Barite	Bad	Seacan	4x6	CCS landfill
32	Bentonite	Good	Seacan	4x4	CCS landfill
1	Bentonite	Good	Seacan	4x2	CCS landfill
5	Bentonite	Bad	Seacan	4x6	CCS landfill
31	Caustic Soda	Bad	Seacan	Needs to be overpacked.	CCS landfill
5	Spercene		Seacan	4x6	CCS landfill
37	Sawdust	Good	Seacan	4x4/4x6	Inuvik Landfill/ NW
632	Cement (Go through summer 2002)	Unkown	Seacan		CCS landfill
1	Batteries-Dead	Waste	Seacan		ETS Hazco
3	Banding-Garbage	Garbage	Seacan		CCS landfill
80 ft	Armored 4 Wire 2 Gauge	Fair	None		Lower Shop C
1	Tank-Stove Oil with 1" Fuel	Junk	Tank	150 gallon	Inuvik Landfill/ NW
7	Solvent-Shell Indusol	Good	Drum	45 gallon	Disposed
5	Methanol	Waste (Outdated)	Drum	45 gallons	Lower Shop C
15	Dresser Magcobar Pipe Lax	Fair	Pails	5 gallon	Lower Shop C
4	Methanol	Waste (Outdated)	Drum	45 gallons	Lower Shop C
~30	Lumber	Good	None	2x6/12 feet	Lower Shop C
1	Waste Oil Tank-Round (with some oil in it)	Waste	Tank	500 gallons	Lower Shop C



**FAREWELL INVENTORY 2009**

Quantity	Description	Condition	Container Type	Size	Location
2	Ends for Hallway/Sin Sleigh Camp	Junk	None		Lower Shop C
2	Tarp Pieces(Blue)	Junk	None		Lower Shop C
7	Sleighs: Steps for Sleigh Camp	Good	None		Lower Shop C
100	Wood Chips	Good	Bags		Lower Shop C
9	Samples: Wooden Insulated Seacans	Fair	Seacan	4x4x1.5 feet	Lower Shop C
100	Samples: Metal Boxes	Good	Pallet	3x1x1 feet	Lower Shop C
1	Hole Plugs (Red)	Good	Box - Broken		Lower Shop C
~32	Samples: Wooden Boxes (No Tops)	Fair	Pallet	3x1ftx4in	Lower Shop C
1	Hydraulic Fluid-Shell Aircraft	Waste	Pail	5 gallon (0.5full)	Lower Shop C
1	Rimula Shell ct 20w	Waste	Pail	5 gallon	Lower Shop C
40	Culvert Couplers	Good	Seacan	12 inch	Lower Shop C
20	Sleighs: Runners (Unit Nos. 9132, 9136, 913, 9138)	Good	None		Lower Shop C
10	Sleighs: Bunks	Good	None		Lower Shop C
3	Sleighs: Hitches	Good	None		Lower Shop C
1	Sleighs:Box with Pins, 10 hitch ends 2	Good	Box		Lower Shop C
1	TV Dish	Junk	None	12 foot	Lower Shop C
1	Power Cable	Junk	Box	3x3	Lower Shop C
2	Oil Sorbant for Containment	Fair		20 ft.	Lower Shop C
2	Pipe for lifting camp trailers	Good	None	8 inches x 12 feet	Lower Shop C
10	ABS Pipe	Fair	Pieces	4 inch	Lower Shop C
7	Samples: Bottles Wide Mouth	Good	Cases		Lower Shop C
1	Samples: Bottles	Good	Bag (Yellow)		Lower Shop C
~10	Radio Antennas	Outdated	None		Mid Shop B





**FAREWELL INVENTORY 2009**

Quantity	Description	Condition	Container Type	Size	Location
Several	Radio Cables	Fair	None		Mid Shop B
	Communication Supplies Misc.	Outdated	None		Mid Shop B
1	Rotela 15-40	Good	Drum	45 gallon	Mid Shop B
1	Air Strip Lights (broken)	Junk	Seacan	4x4	Mid Shop B
1	Solvent-Shell Indusol	Good	Drum	45 gallon	Mid Shop B
1	Bolts & Nuts (5'8"x2")	Rusty	Drum	45 gallon	Mid Shop B
8	Fuel Hoses	Garbage	None	50 feet	Mid Shop B
36	Structural Bolts 5'8"x2" with Nuts	Rusty	Pails	5 gallon (3 secans)	Mid Shop B
1	Washers, Nuts & Studs	Rusty	Seacan	2 inch	Mid Shop B
2	5/8" Lag Bolts	Rusty	Pails	5 gallon	Mid Shop B
	Pipe Fittings ( Assortment)	Rusty			Mid Shop B
11	Roof Sections for Sleigh Camp	Garbage			Mid Shop B
	Drilling Tools (Assortment)	Old			Mid Shop B
	Wipers & Rat Hole Bits (Assortment)	Old			Mid Shop B
	Seals and Gaskets (Assortment)	Old			Mid Shop B
	Tank Farm Hose (Assortment)	Garbage			Mid Shop B
~75	Air Strip Light Cones				Mid Shop B
2	Gas (Put in for start-up May 4, 2001)	Good	Drum	45 gallon	Oil Spill Container
1	Skimmer	Fair			Oil Spill Container
1	Engine and Pump	Parts Missing			Oil Spill Container
100	Hydraulic Hose	Poor		feet	Oil Spill Container
3	Life Jackets	Junk			Oil Spill Container
2	Shovels	Good			Oil Spill Container
5	Anchors	Good			Oil Spill Container
2	Sorbant (Rolls)	Poor			Oil Spill Container
34	Floats	Fair			Oil Spill Container
2	Life Buoys	Fair			Oil Spill Container



**FAREWELL INVENTORY 2009**

Quantity	Description	Condition	Container Type	Size	Location
12	Cables with Clevises	Good		2 feet - 1/4 inch	Oil Spill Container
1	Fire Hose with Camlock	Outdated		50 feet	Oil Spill Container
27	Containment Booms (Vinyl Covered, 4 Rolls)	Fair		100 feet	Oil Spill Container
	Cable	Good		1/4 inch	Oil Spill Container
1	Rag Wringer	Good			Oil Spill Container
	Suction Hose (2 inch)	Good		50 feet	Oil Spill Container
8	Boards for Oil Sorbant Container	Good		10 feet	Oil Spill Container
2	Sorbant (Rolls)	Fair			Oil Spill Container
	Sorbant (6 inch) in Fish Net Material	Fair		200 feet	Oil Spill Container
1	Sleigh Irrigation Pipe (375)	Good		20 feet	Yard
1	Sleigh Irrigation Pipe (300)	Good		20 feet	Yard
3	Sleighs: Assembled (Newer), Wide Runners with Thongs; No Deck; Unit Nos. 9134, 9139 & 9140	Good SOLD		SOLD to GDC Civil Construction	
1	Incinerator Pipe Runners on Sleigh	Junk			Inuvik Landfill/ NW
1	Incinerator Narrow Runners on Sleigh	Junk			Inuvik Landfill/ NW
2	Gravel Boxes - One Full of Steel; other Aluminum	Scrap			Inuvik Landfill/ NW
1	Sleigh (5 - 500 gallon Fuel Tanks)	Sold		500 gallon	MDIOS
1	Skid with 3 - 500 gallon gas Tanks; No Berm	Sold		500 gallon	MDIOS
4	Narrow Runner Sleighs with Rig Mat on Bunks	Sold			MDIOS
9	Tanks - Upright Primered	Sold	Tank	300 bbl	MDIOS
2	Tanks - Heli	Sold	Tank	100 gallon	MDIOS
1	Tank 1/2 - bolted	Sold	Tank	1000 bbl	MDIOS
2	Tanks - Welded in Bermed Area	Good	Tank	5000 bbl	Yard Norh Side



**FAREWELL INVENTORY 2009**

Quantity	Description	Condition	Container Type	Size	Location
3	Tanks - Welded in Bermed Area	Good	Tank	2000 bbl	Yard Norh Side
11	Tanks - Bolted (one with old camp roof garbage in it)	Sold	Tank	1000 bbl	MDIOS
5	Tanks - Welded on Skids; can be moved by bed truck	Sold	Tank	800 bbl	MDIOS
100	Culverts	New		13 inch x 21 feet	Yard Norh Side
3	Culverts	New		24 inch x 20 feet	Yard Norh Side
2	Culverts	New		6 inch x 20 feet	Yard Norh Side
5	Culverts - Insulated	Fair		8 inch x 20 feet	Yard Norh Side
3	Pipe	Rusty		40 inch/10 and 15 feet	Inuvik Landfill/ NW
2	Pipe	Rusty		34 inch/10 & 15 feet	Inuvik Landfill/ NW
	Assorted Pipe	Scrap	Pile		Inuvik Landfill/ NW
5	Pile Caps	Rusty Moss and Dirt in Several	Basket		Inuvik Landfill/ NW
27	Rig Mats	Couple Damaged		8x35 feet	Yard Norh Side
47	Pipe	Fair		3 1/4 inch, 24 feet	Inuvik Landfill/ NW
30	Pipe	Fair		4 1/4 inch, 24 feet	Inuvik Landfill/ NW
50	I-Beam	Good		30 feet	Yard East End
29	I-Beam	Good		20 feet	Yard East End
50	I-Beam	Good		15 feet	Yard East End
7	I-Beam	Good		10 feet	Yard East End
2	I-Beam	Good		8 feet	Yard East End
49	I-Beam	Good		40 feet	Yard East End
230	Rig Mats	Good		8x35 feet	Yard East End
8	Tank - 1 Square Hex Top	Sold	Tank	500 gallon	MDIOS
1	Tank - Top Missing	Sold	Tank	1000 gallon	MDIOS
1	Tank - Water Truck	Sold	Tank	2000 gallon	MDIOS



**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

# APPENDIX V

## 2013 to 2015 IEG Site Inspection Summaries

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## Summary of 2013 Camp Farewell Activities

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January 29, 2014

Canadian Wildlife Service  
PO Box 1939  
Inuvik, NT  
X0E 0T0

**Mr. Paul Latour**  
**Habitat Biologist**

Dear Mr. Latour:

**Shell Canada Energy Canadian Wildlife Service (CWS) Kendall Island Bird Sanctuary Permit  
Summary of 2013 Camp Farewell Activities**

This letter has been prepared by IEG Consultants Ltd. (IEG) on behalf of Shell Canada Energy (Shell) to outline the activities that Shell undertook at the Camp Farewell site in 2013. Camp Farewell is located along the Middle Channel of the Mackenzie River, within the boundaries of the Kendall Island Bird Sanctuary (KIBS).

The Canadian Wildlife Service (CWS) Migratory Bird Sanctuary permit number NWT-MBS-13-01 issued in 2013 (Appendix I) did not stipulate site inspections be conducted every 50 days, however, Shell aimed to continue to conduct site inspections approximately every 50 days in due diligence. In addition to the site inspections, Shell continued routine maintenance of the camp and its associated facilities and collected surface water samples from the onsite lagoon. Each of these activities is described below.

## **1 SITE INSPECTIONS**

Site inspections of Camp Farewell were conducted by IEG personnel approximately every 50 days. Photographs are attached in Appendix II. The CWS permit was issued on March 26, 2013 and the first 2013 site visit was conducted in April. Five site inspections and approximately 40 days of monitoring during on-site remedial activities occurred in 2013. Details of the inspections are included in Table 1.

## **2 MAINTENANCE**

During the 2013 site visits, the tanks and buildings on-site were noted to be secure and in good condition. Remediation of the former sewage lagoon occurred for approximately 40 days in July and August 2013.

### 3 SAMPLING

On June 12, 2013, IEG personnel travelled to the site to collect a surface water sample from the former sewage lagoon, and submitted the sample for chemical analyses. Surface water parameters analyzed were below applicable guidelines. The Northwest Territories Water Board issued a type “B” water license (N7L1-1834) on July 18, 2012 to allow for discharge of the lagoon water into the Mackenzie River (Appendix III). In July 2013, the lagoon water was discharged. A water sample was collected during discharge, however, it did not reach the lab within the applicable holding times for parameters being analyzed. The sample collected in June 2013 is considered to be representative of water conditions at the time of discharge in July 2013.

### 4 CLOSING

If you have any questions or concerns regarding the 2013 Camp Farewell Activities, please do not hesitate to contact the undersigned at 403.730.6809.

Yours truly,  
**IEG CONSULTANTS LTD.**



Nicole Wills, P.Ag.  
Project Manager

NW

#### Attachments:

- Table 1: Summary of 2013 Site Activities
- Appendix I: Canadian Wildlife Service Migratory Bird Sanctuary Permit
- Appendix II: Site Photographs
- Appendix III: Northwest Territories Water Board Type “B” Water License

c.c. Randall Warren – Shell Canada Energy



## TABLES

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**Table 1: Summary of 2013 Site Activities**

Location	Date on Site	Personnel	Transportation	Wildlife/Tracks on Site	Activities	Notes
Camp Farewell	27-Apr-13	Fraser Grant (IEG) WL Monitor	Snowmobile	None	CWS inspection	None
Camp Farewell	12-Jun-13	Nicole Wills (IEG) WL Monitor	Helicopter	Goose tracks	CWS inspection / Sample lagoon water	Surface water sample collected from the lagoon.
Camp Farewell	July 15 - August 25	Tervita, IEG, and MDIOS	Boat	Cranes	Remediation of Lagoon	Lagoon discharged, excavated, and backfilled.
Camp Farewell	25-Aug-13	Jesse Collins (IEG) WL Monitor	Boat	Cranes	CWS inspection	None
Camp Farewell	09-Oct-13	Nathan Shirley (IEG) WL Monitor	Boat	None	CWS inspection	None

**Notes:**

IEG - IEG Consultants Ltd.

WL Monitor - Wildlife Monitor

CWS - Canadian Wildlife Service

MDIOS - Mackenzie Delta Integrated Oilfield Services

# APPENDIX I

## Canadian Wildlife Service Migratory Bird Sanctuary Permit

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Canadian Wildlife Service  
Prairie and Northern Region  
Box 2310, 5019 - 52 Street  
Yellowknife NT X1A 2P7

DATE: March 26, 2013  
TO: Randall Warren,  
Shell Canada Ltd.,

FROM: Paul Latour,  
CWS,  
Yellowknife, NT

TEL:  
FAX: 403-234-5947

TEL: 867-669-4769  
FAX: 867-873-8185

TOTAL # OF PAGES: 3  
SUBJECT: EC/CWS Sanctuary Permit

MESSAGE:

Attached is Sanctuary Permit NWT-MBS-13-01.

Please sign the 'Permittee' line on the last page and fax back to me.

Regarding the fuel tanks and fuel storage at Camp Farewell I am sending via regular mail information related to the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* (<http://www.gazette.gc.ca/rp-pr/p2/2008/2008-06-25/html/sor-dors197-eng.html>) under the *Canadian Environmental Protection Act*, as they pertain to your operations at Camp Farewell.

Paul Latour



Environment  
Canada

Environnement  
Canada

# ENVIRONMENT CANADA PERMIT

Migratory Birds - Sanctuary

NWT-MBS-13-01

Permit for  
Northwest Territories

Permit no.

9.

province(s), territories

Issued under section

Randall Warren  
Shell Canada Ltd.,  
P.O. Box 100 Station "M"  
Calgary, AB  
T2P 2H5

Migratory Bird Sanctuary Regulations

Permittee

For the Minister

Date of issue : **March 26, 2013**

Date of expire: **December 31, 2013**

**The Permittee is authorized to enter the Kendall Island Migratory Bird Sanctuary to conduct care and maintenance of the Camp Farewell and Stockpile lease area.**



## GENERAL CONDITIONS

1. The permit is not valid unless signed by the Permittee (holder) or authorized representative, in the space designated as "Permittee".
2. By signing this document you bind yourself to respect all terms and conditions of this permit.
3. The Permittee must comply with all other applicable Canadian laws and regulations.
4. Copy of signed permit must be carried by nominees and Permittee when conducting this work and will be presented if asked by Police or Game Officer.
5. The Permittee shall display a copy of this permit in a conspicuous place in each campsite established to carry out this program.
6. The conditions of this permit apply to all employees, agents, contractors, volunteers, and visitors of the Permittee.
7. The Permittee shall ensure that a copy of this Permit, operating conditions and definitions is provided, understood and adhered to by all contractors and sub-contractors prior to the start-up of the permitted activity
8. Additional restrictions may be required and may be added to this permit by the Minister if it is deemed necessary to ensure compliance with the Migratory Birds Convention Act and the Regulations.
9. Issuance of this permit does not supersede the necessity or legal requirement to acquire any other pertinent Territorial or Municipal license and or permit which may otherwise be applicable. This permit is not transferable to any other person(s) or organization(s) and is not valid if altered in any way.
10. If the Permittee proposes to conduct any activities that are not identified in the original permit application, the Permittee shall notify the Manager and, if necessary, apply for a new or amended permit to conduct the new activities.
11. The Permittee is authorized to possess firearms in the Kendall Island Migratory Bird Sanctuary for protection from dangerous wildlife only.
12. This permit may be revoked at any time at the discretion of the Minister.



## SPECIAL CONDITIONS

### 1. PROTECTION OF TERRESTRIAL HABITAT

1. The Permittee shall not conduct any activities in the Kendall Island Bird Sanctuary outside the Camp Farewell and Stockpile lease area.
2. The Permittee shall use portable ramps during loading or unloading ships or barges.
3. The Permittee shall not remove or relocate earth, except contaminated soils collected as part of a clean-up program.

### 3. PROTECTION OF AQUATIC HABITAT

1. The Permittee shall not place dirt or debris into streams to serve as ramps for loading or unloading ships or barges.
2. The Permittee shall not cut any bank of a waterbody.

### 2. WILDLIFE DISTURBANCE AND INTERACTION

1. The Permittee shall not feed wildlife or attempt to attract wildlife.
2. The Camp Farewell airstrip is not permitted to be used from 10 May – 20 June and 25 August – 30 September, except for emergencies.
3. Aircraft activity is restricted to flights necessary to carry out care and maintenance of the Camp Farewell and Stockpile lease area.
4. Aircraft shall maintain a minimum horizontal distance of 1.5 km from any observed concentrations of migratory birds.
5. The Permittee shall notify the Manager of any birds nesting on the infrastructure within the lease area.

### 3. FUEL STORAGE AND HANDLING

1. The Permittee shall not allow oil, oil wastes or any other substance harmful to migratory birds to be deposited in waters or other areas frequented by migratory birds, or in a place from which the substances may enter waters frequented by migratory birds.
2. The Permittee shall permanently mark all fuel containers, including 205 L drums, with the Permittee's name.

### 4. HAZARDOUS MATERIALS AND CONTAMINANTS – HANDLING AND DISPOSAL

1. The Permittee shall have the appropriate Workplace Hazardous Material Information System, 'Material Safety Data Sheets' identification available on site.
2. The Permittee shall remove and dispose of all hazardous materials at an approved facility.
3. The Permittee shall conduct maintenance, oil changes, refueling and lubricating of mobile equipment no closer than 100 m from waterbodies (lakes, ponds and streams).

### 5. GARBAGE AND WASTE WATER HANDLING AND REMOVAL

1. The Permittee shall ensure that all domestic garbage and other wildlife attractants are inaccessible to wildlife at all times.
2. The Permittee shall regularly collect all waste, debris and domestic garbage and dispose of it using appropriate technology and accepted practices.
3. The Permittee shall inventory and dispose of any waste materials, construction materials, drilling materials or other materials on at least an annual basis to minimize accumulation within the permit area. The inventory of materials disposed and materials remaining within the permit area must be reported to the Manager.



Environment  
Canada

Environnement  
Canada

## 6. REPORTING

1. The Permittee shall submit a detailed report within thirty (30) days of the expiration date of this permit. The report shall include all activities that occurred at Camp Farewell during 2012, the number and species name of all wildlife observed, and other items of interest.

## DEFINITIONS

Manager: 'The Manager', Northern Conservation Section, Canadian Wildlife Service, Environment Canada or his/her designate.

Minister: The Minister of the Environment.

Permittee: The party to whom a CWS Sanctuary Permit is issued for conducting activities in a Migratory Bird Sanctuary.

Waterbody: Any river, stream, creek, lake, or pond.

Camp: A collection of accommodations, maintenance, transportation, and storage facilities located either permanently or temporarily at a site.

**Sub-permit holder and/or nominee(s):**

**I declare that I have read and understand this Permit, including all the conditions attached.**

  
\_\_\_\_\_  
Signature of Permittee



## APPENDIX II

### Site Photographs

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Photograph 1: Snow covered conditions and storage tanks in good condition (April 27, 2013).



Photograph 2: Snow covered conditions and buildings in good condition (April 27, 2013).



Photograph 3: Former sewage lagoon (June 12, 2013).



Photograph 4: Diesel storage tank in good condition (June 12, 2013).



Photograph 5: Buildings on-site (June 12, 2013).



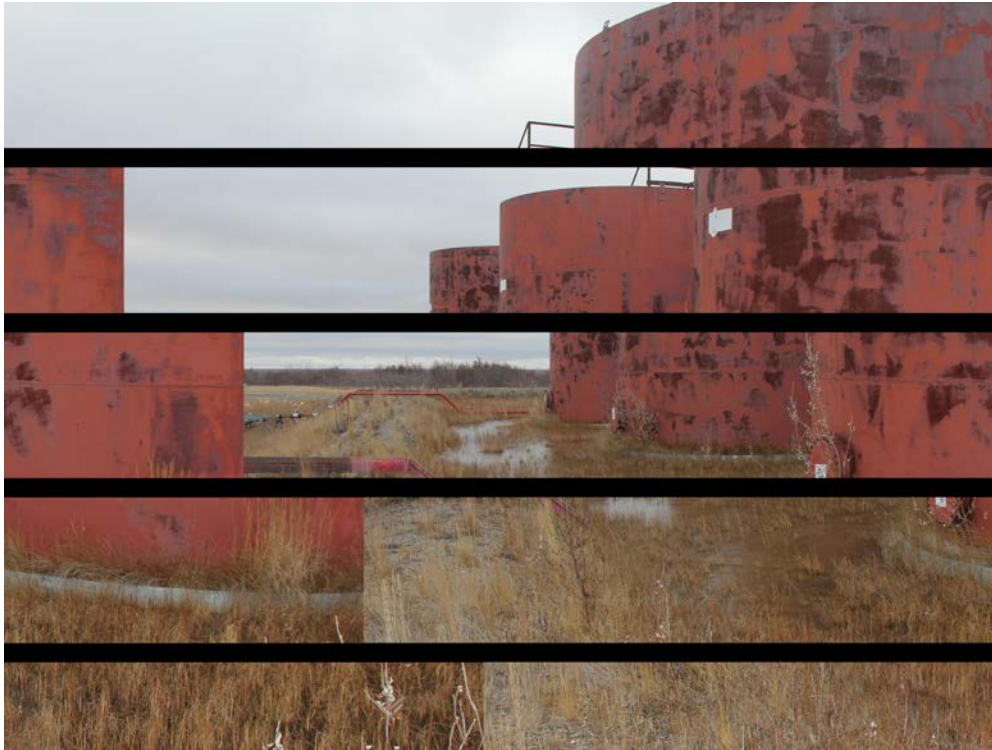
Photograph 6: Aerial view of Camp Farewell (June 12, 2013).



Photograph 7: View of soil bag staging area and buildings in good condition (August 25, 2013).



Photograph 8: Remediated and backfilled lagoon and camp building in good condition (August 25, 2013).



Photograph 9: Storage tanks in good condition at Camp Farewell (October 9, 2013).



Photograph 10: Buildings in good condition at Camp Farewell (October 9, 2013).

## **APPENDIX III**

### **Northwest Territories Water Board Type “B” Water License**

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July 18, 2012

Mr. Randal Warren  
Manager; DAR and Drilling Waste  
Projects and Technology  
Shell Canada Energy  
400- 4th Avenue S.W.  
P.O. Box 100, Station M  
Calgary, Alberta T2P 2H5

Dear Mr. Warren:

**Re: Issuance of a Type “B” Water Licence- Camp Farewell**

Attached is Water Licence N7L1-1834 granted by the Northwest Territories Water Board (the Board) in accordance with the *Northwest Territories Waters Act*. A copy of this Licence has been filed in the Public Registry at the Board offices in Yellowknife and in Inuvik. Water Licence N7L1-1834 has been approved for a period of five years commencing July 18, 2012 and expiring July 17, 2017. Also attached are the general procedures for the administration of Licences in the Northwest Territories. Please review these carefully and address any questions to one of the Board offices.

Please be advised that this letter, with attached procedures, all inspection reports and correspondence related thereto are part of the Board public registry and are intended to keep all interested parties informed of the manner in which the Licence requirements are being met. All public registry material will be considered if an amendment to the Licence or its renewal is requested.

In accordance with the Northwest Territories Water Regulations (NTWR) section 6(1) and 9(1)(b) there will be a requirement for a further payment of the water use fee based on the approved water use of 150 cubic metres per day. The annual water use fee has been calculated to be \$547.50 and is payable to the Receiver General of Canada on the anniversary of the date of issuance of the licence as per section 9(6)(b)(ii) of the NTWR. At the time of your Water Licence application there was a payment of \$30.00 for the first year fee payment and there remains a balance of \$517.50 to be paid for the water use fee at the time the Licence is issued.

Please note for future Water Licence applications in accordance with NTWR section 6(1) an application for a Licence or for the amendment or renewal of a Licence shall be accompanied by a deposit equal to any water use fee that would be payable in respect of the first year of the Licence that is being applied for.

Please read all the conditions carefully and note that in accordance with the attached Water Licence Part B, condition 10, a security deposit in the amount of \$2,000,000.00 shall be posted with the Minister and copied to the Board prior to the start of the operation pursuant to section 17 of the *Northwest*



*Territories Waters Act.* Submit payment of the security, made out to the Receiver General for Canada in the amount of \$2,000,000.00, to: Aboriginal Affairs and Northern Development Canada, P.O. Box 1500, Yellowknife, NT, X1A 2R3 Attention: Robert Jenkins.

Supplemental information to be submitted by Licensee as required through Licence conditions:

- post and maintain security deposit (by August 17, 2012)
- an Annual Report (by March 31, 2013-2017);
- a map or drawing of SNP sampling locations (by August 17, 2012)
- post signs to identify SNP sampling stations (by August 17, 2012)
- an updated operation and maintenance plan for the Waste Disposal Facilities (by August 17, 2012)
- an updated Emergency Response & Spill Contingency Plan (by August 17, 2012)
- an updated Abandonment and Restoration Plan (by July 17, 2013)
- submit to an Analyst for approval a Quality Assurance/Quality Control Plan (by August 17, 2012)

The full cooperation of Shell Canada Energy is anticipated and appreciated.

Should you have any further questions or concerns, please communicate with the Northwest Territories Water Board by telephone at (867) 678-2942 or via e-mail at [info@nwtwb.com](mailto:info@nwtwb.com).

Sincerely,



Eddie Dillon  
Chairperson  
NWT Water Board

Attached: Water Licence N7L1-1834  
General Procedures for the administration of licences issued under the *Northwest Territories Waters Act* in the Northwest Territories

Distribution: Conrad Baetz, AANDC-NMDO  
Robert Jenkins, AANDC-WRD  
Krista Beavis, Klohn Crippen Berger  
Patrick Clancy, GNWT-ENR  
Rick Walbourne, DFO  
Stacey LeBlanc, EC

## **GENERAL PROCEDURES FOR THE ADMINISTRATION OF LICENCES ISSUED UNDER THE *NORTHWEST TERRITORIES WATERS ACT* IN THE NORTHWEST TERRITORIES**

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1. At the time of issuance, a copy of the Licence is placed on the Northwest Territories Water Board public registry in the Yellowknife and Inuvik Offices, and is then available to the public.
2. To enforce the terms and conditions of the Licence, the Minister of Aboriginal Affairs and Northern Development Canada has appointed Inspectors in accordance with Section 35(1) of the *Northwest Territories Waters Act*. The Inspectors coordinate their activities with officials of the Water Resources Division of Aboriginal Affairs and Northern Development Canada. The Inspector responsible for Licence N7L1-1834 is located in the North Mackenzie District Office in Inuvik.
3. To keep the Northwest Territories Water Board and members of the public informed of the Licensee's conformity to Licence conditions, the Inspectors prepare reports which detail observations on how each item in the Licence has been met. These reports are forwarded to the Licensee with a covering letter indicating what action, if any, should be taken. The inspection reports and covering letters are placed on the Northwest Territories Water Board public registry, as are any responses received from the Licensee pertaining to the inspection reports. It is therefore of prime importance that you react in all areas of concern regarding all inspection reports so that these concerns may be clarified.
4. If the renewal of Licence N7L1-1834 is contemplated it is the responsibility of the Licensee to apply to the Northwest Territories Water Board for renewal of the Licence. The past performance of the Licensee, new documentation and information, and points raised during a public hearing, if required, will be used to determine the terms and conditions of any Licence renewal. Please note that if the Licence expires and another has not been issued, then water and Waste disposal must cease, or you, the Licensee, would be in contravention of the *Northwest Territories Waters Act*. An application for renewal of Licence N7L1-1834 should be made at least eight (8) months in advance of the Licence expiry date.
5. If, for some reason, Licence N7L1-1834 requires amendment, then a public hearing may be required. You are reminded that applications for amendments should be submitted as soon as possible to provide the Northwest Territories Water Board with ample time to go through the amendment process. The process may take up to six (6) months or more depending on the scope of the amendment requested.

6. Specific clauses of your Licence make reference to the Board, Analyst or Inspector. The contact person, address, phone and fax number of each is:

Board: Executive Director  
Northwest Territories Water Board  
P.O. Box 2531  
Inuvik, NT X0E 0T0  
Phone No: (867) 678-2942  
Fax No: (867) 678-2943

Analyst: Analyst  
Taiga Environmental Laboratory  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 1500, 4601 – 52<sup>nd</sup> Avenue  
Yellowknife, NT X1A 2R3  
Phone No: (867) 669-2788  
Fax No: (867) 669-2718

Inspector: Water Resource Officer  
North Mackenzie District Office  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 2100  
Inuvik, NT X0E 0T0  
Phone No: (867) 777-8900  
Fax No: (867) 777-2090

7. Your Licence requires a security deposit be submitted. Should the security deposit be submitted in the form of a "letter of credit", recommended wording is outlined below. It is advised that a "draft" letter of credit be forwarded to Water Resources Division for review. The contact person, address, phone and fax number of the individual administering security deposits is:

Manager  
Water Resources Division  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 1500, 4923 – 52<sup>nd</sup> Street  
YELLOWKNIFE, NT X1A 2R3  
Phone No: (867) 669-2654  
Fax No: (867) 669-2716

[BANK

ADDRESS]

**IRREVOCABLE LETTER OF CREDIT**

[The term “DOCUMENTARY CREDIT” may also be used instead of “Letter of Credit”]

**DATE OF ISSUE:** [Date]      **OUR REFERENCE NUMBER:** [Bank’s reference number]

**AMOUNT:** CAD\$#####.00

**MAXIMUM** #####.00

**CANADIAN DOLLARS ONLY**

**APPLICANT:**

[“Customer” can be used instead of “Applicant”]

[Company’s Name]

[Company’s Address]

**BENEFICIARY:**

RECEIVER GENERAL FOR CANADA

ON BEHALF OF THE MINISTER OF

INDIAN AFFAIRS AND NORTHERN

DEVELOPMENT

4923 – 52<sup>nd</sup> STREET, 2<sup>nd</sup> FLOOR

P.O. BOX 1500

YELLOWKNIFE, NT X1A 2R3

ATTENTION: REGIONAL DIRECTOR GENERAL  
DIAND - NT REGION

**RE: SECURITY PURSUANT TO** [the Water Licence Type and Number]

AT THE REQUEST AND FOR THE ACCOUNT OF [Company’s Name] (THE “APPLICANT”), WE, [Bank’s Name], HEREBY ESTABLISH IN YOUR FAVOUR OUR IRREVOCABLE LETTER OF CREDIT NO. [Bank’s Reference Number] (“CREDIT”) FOR SUMS NOT EXCEEDING IN THE AGGREGATE [Amount of Security required stated in Canadian Dollars].

THIS CREDIT IS AVAILABLE WITH US FOR DRAWING AT SIGHT, WITHOUT ENQUIRY AS TO WHETHER YOU HAVE RIGHT AS BETWEEN YOURSELF AND THE APPLICANT TO MAKE SUCH DEMAND AND WITHOUT RECOGNIZING ANY CLAIM OF THE APPLICANT, AGAINST PRESENTATION TO US, BY YOU OR YOUR DULY AUTHORIZED REPRESENTATIVE OR AGENT, OF THE FOLLOWING DOCUMENTS:

1. A SIGHT DRAFT DRAWN ON [Bank’s Name and Address of the Branch that the security can be drawn at, usually one of the Bank’s larger commercial banking centres]; AND
2. THE ORIGINAL OF THIS IRREVOCABLE LETTER OF CREDIT NO. [Bank’s Reference Number] FOR ENDORSEMENT OF PAYMENT THEREON; AND

3. A STATEMENT SIGNED BY AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT CERTIFYING

- A) THAT THE SIGNATORY IS AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT AND HAS AUTHORITY TO SIGN THE STATEMENT ON BEHALF OF THE MINISTER OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT (THE "MINISTER"), AND
- B) EITHER
- I THAT THE MINISTER IS ENTITLED TO APPLY THE AMOUNT DRAWN, BEING ALL OR PART OF THE SECURITY POSTED AND MAINTAINED PURSUANT TO [the Water Licence Type and Number] ISSUED BY THE NORTHWEST TERRITORIES WATER BOARD, WHETHER AS ORIGINALLY ISSUED OR AS AMENDED OR RENEWED FROM TIME TO TIME, OR
- II THAT THIS LETTER OF CREDIT IS DUE TO EXPIRE IN THIRTY (30) DAYS OR LESS AND THAT THE APPLICANT HAS NOT REPLACED THIS CREDIT BY POSTING WITH THE MINISTER OTHER SECURITY SATISFACTORY TO THE MINISTER.

PARTIAL DRAWINGS ARE PERMITTED.

THIS CREDIT IS EFFECTIVE FROM [Time] .AM. ON [Effective Date as required by Water Licence] AND SHALL EXPIRE AT OUR COUNTERS AT [Time] P.M. [Expiry Date] (THE "INITIAL EXPIRATION DATE"). THIS CREDIT SHALL BE RENEWED AUTOMATICALLY FOR AN ADDITIONAL ONE-YEAR PERIOD FROM THE INITIAL EXPIRATION DATE, AND FOR AN ADDITIONAL ONE-YEAR PERIOD FROM EACH FUTURE EXPIRATION DATE, UNLESS AT LEAST NINETY (90) DAYS PRIOR TO THE OPERATIVE EXPIRATION DATE WE NOTIFY YOU IN WRITING BY REGISTERED MAIL OR COURIER THAT WE ELECT NOT TO CONSIDER THIS CREDIT RENEWED FOR SUCH ADDITIONAL PERIOD.

WE HEREBY AGREE THAT ALL DRAFTS DRAWN UNDER AND IN COMPLIANCE WITH THE TERMS OF THIS CREDIT SHALL BE DULY HONOURED BY US IF PRESENTED FOR PAYMENT ON OR BEFORE THE OPERATIVE EXPIRATION DATE.

EXCEPT SO FAR AS IS OTHERWISE EXPRESSLY STATED HEREIN, THIS CREDIT IS SUBJECT TO THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS (1993 REVISION), INTERNATIONAL CHAMBER OF COMMERCE, PUBLICATION NO. 500. NOTWITHSTANDING ARTICLE 17 OF SAID PUBLICATION, IS THIS CREDIT EXPIRES DURING AN INTERRUPTION OF BUSINESS AS DESCRIBED IN ARTICLE 17, WE AGREE TO EFFECT PAYMENT IF THIS CREDIT IS

DRAWN ON US WITHIN FIFTEEN (15) DAYS AFTER THE RESUMPTION OF BUSINESS.

[Bank's Name]

\_\_\_\_\_  
[Official's Name and Position]

\_\_\_\_\_  
[Official's Name and Position]

# 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 ENERGY  
(Licensee)  
400- 4 Avenue S.W., P.O. Box 100, Station M  
of CALGARY, ALBERTA T2P 2H5  
(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 N7L1-1834

Licence Type "B"

Water Management Area NORTHWEST TERRITORIES 07

Location Within a two kilometre radius of  
Latitude 69°12'30" N.  
Longitude 135°06'04" W.  
MACKENZIE RIVER DELTA, N.W.T

Purpose TO USE WATER AND DISPOSE OF WASTE  
FOR INDUSTRIAL UNDERTAKINGS AND  
ASSOCIATED USES

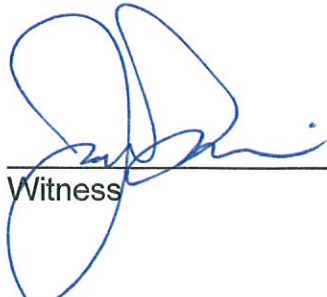
Description OIL AND GAS EXPLORATION  
AND DEVELOPMENT

Quantity of Water Not  
To Be Exceeded 150 CUBIC METRES DAILY

Effective Date of Licence JULY 18<sup>TH</sup>, 2012

Expiry Date of Licence JULY 17<sup>TH</sup>, 2017

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

  
\_\_\_\_\_  
Witness

**NORTHWEST TERRITORIES WATER BOARD**

  
\_\_\_\_\_  
Chairperson (Eddie Dillon)

**PART A: SCOPE AND DEFINITIONS**

**1. Scope**

- a) This Licence entitles Shell Canada Energy to use water and dispose of Waste as an industrial undertaking 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 conforming to 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.
- d) This Licence is issued subject to the conditions contained herein with respect to the use of Waters as prescribed in Section 8 of the *Act* and the deposit of Waste to any Waters as prescribed in Section 9 of the *Act*.

**2. Definitions**

In this Licence: **N7L1-1834**

“**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”** means the discrete average of up to four (4) 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 the lowest elevation of the effective water containment crest on a dam or dyke’s upstream slope;

**“Geotechnical Engineer”** means a professional engineer registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists whose principal field of specialization 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 Waste;

**“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;

**“Minister”** means the Minister of Aboriginal Affairs and Northern Development Canada (AANDC);

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

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

**“Sewage”** means all toilet Wastes and Greywater;

**“Sewage Treatment Facilities”** comprises the area and engineered structures designed to contain Sewage as identified in the project description and also include 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*;

**“Waste Disposal Facilities”** mean all facilities designated for the disposal of Waste and include the Sewage disposal facilities, solid Waste disposal facilities, and bagged toilet Wastes disposal facilities;

**“Water Supply Facilities”** mean all facilities designed to collect, treat and supply water for industrial purposes; 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 31<sup>st</sup> of the year following the calendar year reported which shall contain the following information:
  - a) the monthly and annual quantities in cubic metres of fresh water obtained from all sources;
  - b) the monthly and annual quantities in cubic metres of each and all Waste discharged;
  - c) the location and direction of flow of all Waste discharged to the water or the land;
  - d) a summary of the monthly and annual quantities of Waste stored on site and transported off site;
  - e) the results of sampling carried out under the “Surveillance Network Program”;
  - f) a summary of any Modifications carried out on the Water Supply Facilities and Sewage Treatment Facilities, including all associated structures;
  - g) a list of any spills and unauthorized discharges;
  - h) details on the restoration of any Sumps;
  - i) a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

- j) a summary of any studies requested by the Board that relate to Waste disposal, water use, or reclamation, and a brief description of any future studies planned;
  - k) notation of updates and/or revisions to the approved Spill Contingency Plan, Waste Disposal Facilities operations and maintenance plan, and sewage treatment plan;
  - l) an outline of any spill training and communications exercises carried out; and
  - m) 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 this Licence, submit to the Board for approval a map or drawing indicating the location of all Surveillance Network Program sampling stations.
  5. The Licensee shall, within thirty (30) days of the issuance of this 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.
  6. Any meters, devices or other such methods used for measuring the volumes of water used or Waste disposed and discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.
  7. The Licensee shall immediately report to the 24 Hour Spill Report Line (**867-920-8130**) any spills which are reported to, or observed by, the Licensee within the project boundaries.
  8. 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.
  9. 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.

10. Within thirty (30) days of issuance of this Licence, the Licensee shall have posted and shall maintain a security deposit in the amount of Two Million (\$2,000,000.00) Dollars pursuant to Section 17 of the *Act* and Section 12 of the Regulations, in a form suitable to the Minister. The security deposit shall be maintained until such time as it is fully or in part refunded by the Minister pursuant to Section 17 of the *Act*.
11. 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. The daily quantity of water used for all purposes shall not exceed 150 cubic metres.

**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 Waste Disposal 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 lagoon shall be directed to the channel of the Mackenzie River at a location approved by an Inspector.
5. There should be no discharge of floating solids, garbage, grease, free oil or foam.

6. All effluent discharged by the Licensee from the Sewage lagoon at "Surveillance Network Program" Station Number 1834-1 shall meet the following effluent quality requirements:

Sample Parameter	Average Concentration
BOD <sub>5</sub>	70.0 mg/L
Total Suspended Solids	70.0 mg/L
Faecal Coliforms	1 X 10 <sup>4</sup> CFU/dL
Oil and Grease	5.0 mg/L
Total Residual Chlorine (TRC)	0.1 mg/L

7. The effluent discharged shall have a pH between six (6) and nine (9) and no visible sheen of oil and grease.
8. Introduction of water to Waste for the purpose of achieving effluent quality requirements in Part D, Item 7 is prohibited.
9. A Freeboard limit of 1.0 metre shall be maintained at all times in the Sewage lagoon, or as recommended by a qualified Geotechnical Engineer and/or as approved by the Board.
10. The Licensee shall advise an Inspector at least five (5) days prior to initiating and decant of the Sewage lagoon.
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.
12. The Licensee shall contain all contaminated soil or contaminated snow in such a manner as to minimize the potential for migration of contaminants into any Waters, to the satisfaction of an Inspector.
13. The Licensee shall store, segregate and dispose of all solid and hazardous Wastes in a manner acceptable to the Inspector.
14. Unless authorized by this Licence, the Licensee shall ensure that any Wastes associated with this undertaking do not enter any water body.
15. The Licensee shall submit to the Board a copy of each agreement(s) between third parties to store, transport or dispose of Wastes. The copy submitted to the Board shall include, at a minimum, the following:

- a. type of Waste;
- b. quantities of Waste;
- c. disposal location(s), and
- d. proof of acceptance from third parties.

**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 the 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 F, 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 issuance of this Licence an updated Emergency Response & Spill Contingency Plan in accordance, for example, with the *Guidelines for Spill Contingency Planning, April 2007*, developed by AANDC-Water Resources Division.

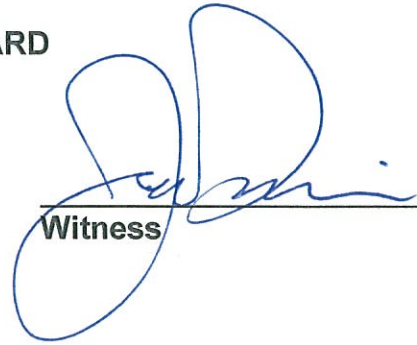
2. The Licensee will maintain a copy of the approved Emergency Response & Spill Contingency Plan onsite in a readily available location, to the satisfaction of an Inspector.
3. The Licensee shall ensure that petroleum products, hazardous material and other Wastes associated with the project do not enter 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 unauthorised 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 plans for the abandonment and restoration of the Sewage lagoon and a complete Phase II environmental site 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.
2. The Licensee shall implement this Plan as and when approved by the Board.
3. Following approval of the Plan, the Licensee shall review the 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**

  
\_\_\_\_\_  
**Chairman**

  
\_\_\_\_\_  
**Witness**



## NORTHWEST TERRITORIES WATER BOARD

**LICENSEE:** Shell Canada Energy  
**LICENCE NUMBER:** N7L1-1834  
**EFFECTIVE DATE OF LICENCE:** July 18, 2012  
**EFFECTIVE DATE OF SURVEILLANCE NETWORK PROGRAM:** July 18, 2012

### SURVEILLANCE NETWORK PROGRAM

#### A. Location of Sampling Stations

<u>Station Number</u>	<u>Description</u>
1834-1	Discharge from the Sewage lagoon.

#### B. Sampling and Analysis Requirements

1. Water at Station Number 1834-1 shall be sampled prior to, and once during decanting. Each sample shall be analyzed for the following parameters:

BOD5	Total Suspended Solids
Oil and Grease	Faecal Coliforms
Ammonia	pH
Phosphorous	Total Residual Chlorine

2. More frequent sample collection may be 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 analysis shall be performed in a laboratory approved by an Analyst.
5. The Licensee shall, by August 17, 2012, 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.

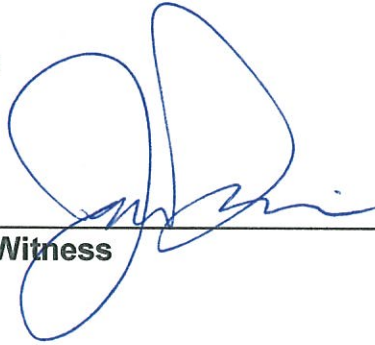
**C. Reports**

1. The Licensee shall, within thirty (30) days following the month of discharge from the Sewage lagoon, submit to the Board and an Inspector all data and information required by the "Surveillance Network Program" including the results of the approved Quality Assurance/Quality Control Plan.

**NORTHWEST TERRITORIES WATER BOARD**



Chairman



Witness

**Northwest Territories Water Board  
Reasons for Decision**

Issued pursuant to section 26 of the  
*Northwest Territories Waters Act, S.C. 1992 C.39*

Water Licence Number: N7L1-1834(Type B)

This is the decision of the Northwest Territories Water Board (Board) for the issuance of Water Licence N7L1-1834. The project is located at Latitude 69°12'30" North and Longitude 135°06'04" West in the Northwest Territories.

The Northwest Territories Water Board issued Licence N7L1-1834 in accordance with Section 14 of the *Northwest Territories Waters Act*.

**Background:**

Shell Canada Energy applied to the Board on March 5<sup>th</sup>, 2012 for a Water Licence for Farewell Camp and Stockpile Site (Camp Farewell) in the Mackenzie Delta. The Board deemed the application complete on May 23, 2011.

Canadian Environmental Assessment Act (CEAA)

The Water Licence application was exempt from the Canadian Environmental Assessment Act under Section 7(1)(a), specifically under Schedule 1, Part 1, Section 3(a) of the Exclusion List Regulations.

Environmental Impact Screening Committee (EISC)

On April 20, 2012 the Board received an official notification from the Environmental Impact Screening Committee that determined the application met the definition of development and that it was exempt from the screening process, as it qualified under exclusion #1 of Environmental Impact Screening Guidelines, Appendix C.

Notice of Application

In accordance with rule 38 of the Board Rules of Procedure, the Board gave notice of the application for a Water Licence regarding Camp Farewell, on May 28, 2012 in News North in English, May 31, 2012 in the Inuvik Drum in Inuvialuktun, and May 25, 2012 in L'Aquilon in French.

Reviewers' Comments

The Board sent the Water Licence application and supporting information for review to the following agencies: AANDC-NMDO, AANDC-WRD, EC, DFO and GNWT-ENR on May 23, 2012. The Board received written comments from AANDC (June 15, 2012), EC (June 15, 2012), DFO (May 28, 2012) and GNWT-ENR (June 14, 2012).

The Board considered all submitted comments at a Board meeting held via teleconference on July 10, 2012. The Board approved a Water Licence for the applicant's review. The Licence was submitted to the applicant on July 11, 2012 and it indicated in its response on July 16, 2012 that the Licence was acceptable.

**Requirements of the Northwest Territories Waters Act:**

Shell Canada Energy has provided the Board with its Schedule III application and supporting information for its consideration as required by section 16 of the *Northwest Territories Waters Act*.

The Board is in accordance with Paragraph 14(4)(a) of the *Northwest Territories Waters Act* by ensuring that the granting of the Water Licence to Shell Canada Energy will not adversely affect, in a significant way, any existing Licensee, providing the conditions of Water Licence N7L1-1834 are met. There are no other applicants with precedence.

The Board does not believe that any users nor persons listed in Paragraph 14(4)(b) of the *Northwest Territories Waters Act* will be adversely affected by the use of waters or the deposit of waste proposed by the Licensee provided that the Licensee operates in accordance with the terms and conditions of Water Licence N7L1-1834.

The Board is of the view that compliance with Water Licence N7L1-1834 terms and conditions will ensure that the waste will be treated and deposited in a manner that will maintain water quality in the area and will be consistent with applicable water quality standards in accordance with Sub-Paragraph 14(4)(c) (i) of the *Northwest Territories Waters Act*.

The Board drafted the terms and conditions of Water Licence N7L1-1834 in accordance with Section 15 of the *Northwest Territories Waters Act*.

In Accordance with Sub-Section 17(1) of the *Northwest Territories Waters Act*, the Board requested that a security deposit in the amount of two million dollars (\$2,000,000.00) be posted and shall be maintained in a form suitable to the Minister of Aboriginal Affairs and Northern Development Canada.

**Decision to issue Water Licence N7L1-1834:**

The Board has reviewed the Camp Farewell Project Application and draft Water Licence N7L1-1834 for issuance. Upon consideration of the facts and circumstances, the purpose, scope and intent of the *Northwest Territories Waters Act*, the Board has determined that it can issue Water Licence N7L1-1834.

For the above reasons the Board has determined to issue Water Licence N7L1-1834 in accordance with Sub-Section 14(1) and Sub-Paragraph 14(6)(b)(i) of the *Northwest Territories Waters Act* for the use of water and the deposit of wastes.

**SIGNED** this 18 day of July, 2012 on behalf of the Northwest Territories Water Board.



**Eddie Dillon**

**Chairperson, Northwest Territories Water Board**

## Summary of 2014 Camp Farewell Activities

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January 15, 2015

Canadian Wildlife Service  
PO Box 1939  
Inuvik, NT  
X0E 0T0

**Mr. Paul Latour**  
**Habitat Biologist**

Dear Mr. Latour:

**Shell Canada Energy Canadian Wildlife Service Kendall Island Bird Sanctuary Permit  
Summary of 2014 Camp Farewell Activities**

This letter has been prepared by IEG Consultants Ltd. (IEG) on behalf of Shell Canada Energy (Shell) to outline the activities that Shell undertook at the Camp Farewell site in 2014. Camp Farewell is located along the Middle Channel of the Mackenzie River, within the boundaries of the Kendall Island Bird Sanctuary.

The Canadian Wildlife Service (CWS) Migratory Bird Sanctuary permit number NWT-MBS-14-01 issued in 2014 (Appendix I) did not stipulate site inspections be conducted every 50 days, however, Shell aimed to continue to conduct site inspections as frequently as possible in due diligence. In addition to the site inspections, Shell continued routine maintenance of the camp and its associated facilities. Each of these activities is described below.

## **1 SITE INSPECTIONS**

Site inspections of Camp Farewell were conducted by IEG personnel. Photographs are attached in Appendix II. The CWS permit was issued on January 22, 2014 and the first 2014 site visit was conducted in March. Two site inspections and approximately 20 days of monitoring by IEG personnel occurred during on-site decommissioning activities in 2014. Details of the inspections are included in Table 1.

## 2 MAINTENANCE

During the 2014 site visits, the tanks and buildings on-site were noted to be secure and in good condition. Decommissioning of the camp building and two storage buildings, in addition to the removal of materials stored on-site, occurred for approximately 50 days in August and September 2014.

## 3 DECOMMISSIONING

On August 7, 2014, decommissioning activities commenced on-site. Two storage buildings and the camp building were taken down and transported from the site via barge. Materials stored in the storage building and on-site were also removed and transported via barge. The last barge departed site on September 27, 2014. The extended field program was the result of barge delays. Work did not occur on-site for 50 days inclusively, although some workers were present for the duration.

The Northwest Territories Water Board issued a type “B” water license (N7L1-1834) on July 18, 2012 for the purpose of using water and disposing of waste for industrial undertakings and associated uses (Appendix III). There was no water used or waste disposed of on-site for the purposes of the 2014 decommissioning activities.

Decommissioning of the tank farm and soil assessment activities are scheduled for 2015.

## 4 CLOSING

If you have any questions or concerns regarding the 2014 Camp Farewell Activities, please do not hesitate to contact the undersigned at 403.730.6809.

Yours truly,  
**IEG CONSULTANTS LTD.**



Nicole Wills, P.Ag.  
Project Manager

NW

### Attachments:

- Table 1: Summary of 2014 Site Activities
- Appendix I: Canadian Wildlife Service Migratory Bird Sanctuary Permit
- Appendix II: Site Photographs
- Appendix III: Northwest Territories Water Board Type “B” Water License

c.c. Randall Warren – Shell Canada Energy

## TABLES

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**Table 1: Summary of 2014 Camp Farewell Site Activities**

Location	Date on Site	Personnel	Transportation	Wildlife/Tracks on Site	Activities	Notes
Camp Farewell	March 13	Nicole Wills (IEG) WL Monitor	Snowmobile	None	CWS inspection	None
Camp Farewell	August 7 - September 27	Tervita, IEG, and MDIOS	Boat	Cranes, grizzly bear, Canada geese	Decommissioning of site infrastructure	Camp building and two storage buildings decommissioned and removed. Removal of site materials including rig mats.

**Notes:**

IEG - IEG Consultants Ltd.

WL Monitor - Wildlife Monitor

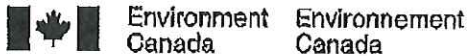
CWS - Canadian Wildlife Service

MDIOS - Mackenzie Delta Integrated Oilfield Services

# APPENDIX I

## Canadian Wildlife Service Migratory Bird Sanctuary Permit

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Canadian Wildlife Service  
Prairie and Northern Region  
Box 2310, 5019 - 52 Street  
Yellowknife NT X1A 2P7

DATE: January 22, 2014

FROM: Paul Latour  
CWS

TO: Randall Warren,  
Shell Canada,  
Calgary, AB

Yellowknife, NT

TEL:

TEL: 867-669-4769

FAX: 403-269-7948

FAX: 867-873-8185

TOTAL # OF PAGES: 4

SUBJECT: EC/CWS Sanctuary Permit

MESSAGE:

Randall:

Attached is a Migratory Birds Sanctuary Permit for care and maintenance of the Camp Farewell staging site in the Kendall Island Bird Sanctuary. Please sign the Permittee line on the last page, then fax it back to me.

A handwritten signature in cursive script that reads "Paul".

Paul Latour

Canada



Environment  
Canada

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Canada

**ENVIRONMENT CANADA  
PERMIT**

Migratory Birds - Sanctuary

NWT-MBS-14-01

Permit for  
Northwest Territories

Permit no.

province(s), territories

9  
Issued under section

Randall Warren  
Shell Canada Ltd.,  
P.O. Box 100 Station "M"  
Calgary, AB  
T2P 2H5

Migratory Bird Sanctuary Regulations

Permittee

For the Minister

Date of issue: January 22, 2014

Date of expire: December 31, 2014

The Permittee is authorized to enter the Kendall Island Migratory Bird Sanctuary to conduct care and maintenance of the Camp Farewell and Stockpile lease area.



Environment  
Canada

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Canada

## GENERAL CONDITIONS

1. The permit is not valid unless signed by the Permittee (holder) or authorized representative, in the space designated as "Permittee".
2. By signing this document you bind yourself to respect all terms and conditions of this permit.
3. The Permittee must comply with all other applicable Canadian laws and regulations.
4. Copy of signed permit must be carried by nominees and Permittee when conducting this work and will be presented if asked by Police or Game Officer.
5. The Permittee shall display a copy of this permit in a conspicuous place in each campsite established to carry out this program.
6. The conditions of this permit apply to all employees, agents, contractors, volunteers, and visitors of the Permittee.
7. The Permittee shall ensure that a copy of this Permit, operating conditions and definitions is provided, understood and adhered to by all contractors and sub-contractors prior to the start-up of the permitted activity
8. Additional restrictions may be required and may be added to this permit by the Minister if it is deemed necessary to ensure compliance with the Migratory Birds Convention Act and the Regulations.
9. Issuance of this permit does not supersede the necessity or legal requirement to acquire any other pertinent Territorial or Municipal license and or permit which may otherwise be applicable. This permit is not transferable to any other person(s) or organization(s) and is not valid if altered in any way.
10. If the Permittee proposes to conduct any activities that are not identified in the original permit application, the Permittee shall notify the Manager and, if necessary, apply for a new or amended permit to conduct the new activities.
11. The Permittee is authorized to possess firearms in the Kendall Island Migratory Bird Sanctuary for protection from dangerous wildlife only.
12. This permit may be revoked at any time at the discretion of the Minister.

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CanadaEnvironnement  
Canada

## SPECIAL CONDITIONS

### 1. PROTECTION OF TERRESTRIAL HABITAT

1. The Permittee shall not conduct any activities in the Kendall Island Bird Sanctuary outside the Camp Farewell and Stockpile lease area.
2. The Permittee shall use portable ramps during loading or unloading ships or barges.
3. The Permittee shall not remove or relocate earth, except contaminated soils collected as part of a clean-up program.

### 3. PROTECTION OF AQUATIC HABITAT

1. The Permittee shall not place dirt or debris into streams to serve as ramps for loading or unloading ships or barges.
2. The Permittee shall not cut any bank of a waterbody.

### 2. WILDLIFE DISTURBANCE AND INTERACTION

1. The Permittee shall not feed wildlife or attempt to attract wildlife.
2. The Camp Farewell airstrip is not permitted to be used from 10 May – 20 June and 25 August – 30 September, except for emergencies.
3. Aircraft activity is restricted to flights necessary to carry out care and maintenance of the Camp Farewell and Stockpile lease area.
4. Aircraft shall maintain a minimum horizontal distance of 1.5 km from any observed concentrations of migratory birds.
5. The Permittee shall notify the Manager of any birds nesting on the infrastructure within the lease area.

### 3. FUEL STORAGE AND HANDLING

1. The Permittee shall not allow oil, oil wastes or any other substance harmful to migratory birds to be deposited in waters or other areas frequented by migratory birds, or in a place from which the substances may enter waters frequented by migratory birds.
2. The Permittee shall permanently mark all fuel containers, including 205 L drums, with the Permittee's name.

### 4. HAZARDOUS MATERIALS AND CONTAMINANTS – HANDLING AND DISPOSAL

1. The Permittee shall have the appropriate Workplace Hazardous Material Information System, 'Material Safety Data Sheets' identification available on site.
2. The Permittee shall remove and dispose of all hazardous materials at an approved facility.
3. The Permittee shall conduct maintenance, oil changes, refuelling and lubricating of mobile equipment no closer than 100 m from waterbodies (lakes, ponds and streams).

### 5. GARBAGE AND WASTE WATER HANDLING AND REMOVAL

1. The Permittee shall ensure that all domestic garbage and other wildlife attractants are inaccessible to wildlife at all times.
2. The Permittee shall regularly collect all waste, debris and domestic garbage and dispose of it using appropriate technology and accepted practices.
3. The Permittee shall inventory and dispose of any waste materials, construction materials, drilling materials or other materials on at least an annual basis to minimize accumulation within the permit area. The inventory of materials disposed and materials remaining within the permit area must be reported to the Manager.

Environment  
CanadaEnvironnement  
Canada

## 6. REPORTING

1. The Permittee shall submit a detailed report within thirty (30) days of the expiration date of this permit. The report shall include all activities that occurred at Camp Farewell during 2014, the number and species name of all wildlife observed, and other items of interest.

## DEFINITIONS

Manager: 'The Manager', Northern Conservation Section, Canadian Wildlife Service, Environment Canada or his/her designate.

Minister: The Minister of the Environment.

Permittee: The party to whom a CWS Sanctuary Permit is issued for conducting activities in a Migratory Bird Sanctuary.

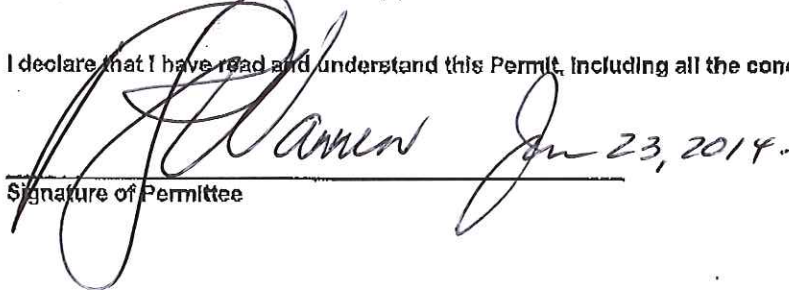
Waterbody: Any river, stream, creek, lake, or pond.

Camp: A collection of accommodations, maintenance, transportation, and storage facilities located either permanently or temporarily at a site.

Sub-permit holder and/or nominee(s):

I declare that I have read and understand this Permit, including all the conditions attached.

Signature of Permittee

  
Jun 23, 2014.

## APPENDIX II

### Site Photographs

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**Photograph 1:** Former lagoon, remediated and backfilled (March 13, 2014).



**Photograph 2:** : Snow covered ground conditions and buildings in good condition (March 13, 2014).



**Photograph 3:** Tank farm in good condition (March 13, 2014).



**Photograph 4:** Camp building and snow covered ground conditions (March 13, 2014).



**Photograph 5:** Camp building in the process of being taken down (August 19, 2014).



**Photograph 6:** Storage buildings (August 19, 2014).



**Photograph 7:** View of Site, facing northwest (August 19, 2014).



**Photograph 8:** View of tank farm (August 19, 2014).



**Photograph 9:** Geese and grizzly bear tracks along the shoreline at Camp Farewell (August 9, 2014).

## **APPENDIX III**

### **Northwest Territories Water Board Type “B” Water License**

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July 18, 2012

Mr. Randal Warren  
Manager; DAR and Drilling Waste  
Projects and Technology  
Shell Canada Energy  
400- 4th Avenue S.W.  
P.O. Box 100, Station M  
Calgary, Alberta T2P 2H5

Dear Mr. Warren:

**Re: Issuance of a Type “B” Water Licence- Camp Farewell**

Attached is Water Licence N7L1-1834 granted by the Northwest Territories Water Board (the Board) in accordance with the *Northwest Territories Waters Act*. A copy of this Licence has been filed in the Public Registry at the Board offices in Yellowknife and in Inuvik. Water Licence N7L1-1834 has been approved for a period of five years commencing July 18, 2012 and expiring July 17, 2017. Also attached are the general procedures for the administration of Licences in the Northwest Territories. Please review these carefully and address any questions to one of the Board offices.

Please be advised that this letter, with attached procedures, all inspection reports and correspondence related thereto are part of the Board public registry and are intended to keep all interested parties informed of the manner in which the Licence requirements are being met. All public registry material will be considered if an amendment to the Licence or its renewal is requested.

In accordance with the Northwest Territories Water Regulations (NTWR) section 6(1) and 9(1)(b) there will be a requirement for a further payment of the water use fee based on the approved water use of 150 cubic metres per day. The annual water use fee has been calculated to be \$547.50 and is payable to the Receiver General of Canada on the anniversary of the date of issuance of the licence as per section 9(6)(b)(ii) of the NTWR. At the time of your Water Licence application there was a payment of \$30.00 for the first year fee payment and there remains a balance of \$517.50 to be paid for the water use fee at the time the Licence is issued.

Please note for future Water Licence applications in accordance with NTWR section 6(1) an application for a Licence or for the amendment or renewal of a Licence shall be accompanied by a deposit equal to any water use fee that would be payable in respect of the first year of the Licence that is being applied for.

Please read all the conditions carefully and note that in accordance with the attached Water Licence Part B, condition 10, a security deposit in the amount of \$2,000,000.00 shall be posted with the Minister and copied to the Board prior to the start of the operation pursuant to section 17 of the *Northwest*

*Territories Waters Act.* Submit payment of the security, made out to the Receiver General for Canada in the amount of \$2,000,000.00, to: Aboriginal Affairs and Northern Development Canada, P.O. Box 1500, Yellowknife, NT, X1A 2R3 Attention: Robert Jenkins.

Supplemental information to be submitted by Licensee as required through Licence conditions:

- post and maintain security deposit (by August 17, 2012)
- an Annual Report (by March 31, 2013-2017);
- a map or drawing of SNP sampling locations (by August 17, 2012)
- post signs to identify SNP sampling stations (by August 17, 2012)
- an updated operation and maintenance plan for the Waste Disposal Facilities (by August 17, 2012)
- an updated Emergency Response & Spill Contingency Plan (by August 17, 2012)
- an updated Abandonment and Restoration Plan (by July 17, 2013)
- submit to an Analyst for approval a Quality Assurance/Quality Control Plan (by August 17, 2012)

The full cooperation of Shell Canada Energy is anticipated and appreciated.

Should you have any further questions or concerns, please communicate with the Northwest Territories Water Board by telephone at (867) 678-2942 or via e-mail at [info@nwtwb.com](mailto:info@nwtwb.com).

Sincerely,



Eddie Dillon  
Chairperson  
NWT Water Board

Attached: Water Licence N7L1-1834  
General Procedures for the administration of licences issued under the *Northwest Territories Waters Act* in the Northwest Territories

Distribution: Conrad Baetz, AANDC-NMDO  
Robert Jenkins, AANDC-WRD  
Krista Beavis, Klohn Crippen Berger  
Patrick Clancy, GNWT-ENR  
Rick Walbourne, DFO  
Stacey LeBlanc, EC



## **GENERAL PROCEDURES FOR THE ADMINISTRATION OF LICENCES ISSUED UNDER THE *NORTHWEST TERRITORIES WATERS ACT* IN THE NORTHWEST TERRITORIES**

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1. At the time of issuance, a copy of the Licence is placed on the Northwest Territories Water Board public registry in the Yellowknife and Inuvik Offices, and is then available to the public.
2. To enforce the terms and conditions of the Licence, the Minister of Aboriginal Affairs and Northern Development Canada has appointed Inspectors in accordance with Section 35(1) of the *Northwest Territories Waters Act*. The Inspectors coordinate their activities with officials of the Water Resources Division of Aboriginal Affairs and Northern Development Canada. The Inspector responsible for Licence N7L1-1834 is located in the North Mackenzie District Office in Inuvik.
3. To keep the Northwest Territories Water Board and members of the public informed of the Licensee's conformity to Licence conditions, the Inspectors prepare reports which detail observations on how each item in the Licence has been met. These reports are forwarded to the Licensee with a covering letter indicating what action, if any, should be taken. The inspection reports and covering letters are placed on the Northwest Territories Water Board public registry, as are any responses received from the Licensee pertaining to the inspection reports. It is therefore of prime importance that you react in all areas of concern regarding all inspection reports so that these concerns may be clarified.
4. If the renewal of Licence N7L1-1834 is contemplated it is the responsibility of the Licensee to apply to the Northwest Territories Water Board for renewal of the Licence. The past performance of the Licensee, new documentation and information, and points raised during a public hearing, if required, will be used to determine the terms and conditions of any Licence renewal. Please note that if the Licence expires and another has not been issued, then water and Waste disposal must cease, or you, the Licensee, would be in contravention of the *Northwest Territories Waters Act*. An application for renewal of Licence N7L1-1834 should be made at least eight (8) months in advance of the Licence expiry date.
5. If, for some reason, Licence N7L1-1834 requires amendment, then a public hearing may be required. You are reminded that applications for amendments should be submitted as soon as possible to provide the Northwest Territories Water Board with ample time to go through the amendment process. The process may take up to six (6) months or more depending on the scope of the amendment requested.

6. Specific clauses of your Licence make reference to the Board, Analyst or Inspector. The contact person, address, phone and fax number of each is:

Board: Executive Director  
Northwest Territories Water Board  
P.O. Box 2531  
Inuvik, NT X0E 0T0  
Phone No: (867) 678-2942  
Fax No: (867) 678-2943

Analyst: Analyst  
Taiga Environmental Laboratory  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 1500, 4601 – 52<sup>nd</sup> Avenue  
Yellowknife, NT X1A 2R3  
Phone No: (867) 669-2788  
Fax No: (867) 669-2718

Inspector: Water Resource Officer  
North Mackenzie District Office  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 2100  
Inuvik, NT X0E 0T0  
Phone No: (867) 777-8900  
Fax No: (867) 777-2090

7. Your Licence requires a security deposit be submitted. Should the security deposit be submitted in the form of a "letter of credit", recommended wording is outlined below. It is advised that a "draft" letter of credit be forwarded to Water Resources Division for review. The contact person, address, phone and fax number of the individual administering security deposits is:

Manager  
Water Resources Division  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 1500, 4923 – 52<sup>nd</sup> Street  
YELLOWKNIFE, NT X1A 2R3  
Phone No: (867) 669-2654  
Fax No: (867) 669-2716

[BANK

ADDRESS]

**IRREVOCABLE LETTER OF CREDIT**

[The term “DOCUMENTARY CREDIT” may also be used instead of “Letter of Credit”]

**DATE OF ISSUE:** [Date]      **OUR REFERENCE NUMBER:** [Bank’s reference number]

**AMOUNT:** CAD\$#####.00

**MAXIMUM** #####.00

**CANADIAN DOLLARS ONLY**

**APPLICANT:**

[“Customer” can be used instead of “Applicant”]

[Company’s Name]

[Company’s Address]

**BENEFICIARY:**

RECEIVER GENERAL FOR CANADA

ON BEHALF OF THE MINISTER OF

INDIAN AFFAIRS AND NORTHERN

DEVELOPMENT

4923 – 52<sup>nd</sup> STREET, 2<sup>nd</sup> FLOOR

P.O. BOX 1500

YELLOWKNIFE, NT X1A 2R3

ATTENTION: REGIONAL DIRECTOR GENERAL  
DIAND - NT REGION

**RE: SECURITY PURSUANT TO** [the Water Licence Type and Number]

AT THE REQUEST AND FOR THE ACCOUNT OF [Company’s Name] (THE “APPLICANT”), WE, [Bank’s Name], HEREBY ESTABLISH IN YOUR FAVOUR OUR IRREVOCABLE LETTER OF CREDIT NO. [Bank’s Reference Number] (“CREDIT”) FOR SUMS NOT EXCEEDING IN THE AGGREGATE [Amount of Security required stated in Canadian Dollars].

THIS CREDIT IS AVAILABLE WITH US FOR DRAWING AT SIGHT, WITHOUT ENQUIRY AS TO WHETHER YOU HAVE RIGHT AS BETWEEN YOURSELF AND THE APPLICANT TO MAKE SUCH DEMAND AND WITHOUT RECOGNIZING ANY CLAIM OF THE APPLICANT, AGAINST PRESENTATION TO US, BY YOU OR YOUR DULY AUTHORIZED REPRESENTATIVE OR AGENT, OF THE FOLLOWING DOCUMENTS:

1. A SIGHT DRAFT DRAWN ON [Bank’s Name and Address of the Branch that the security can be drawn at, usually one of the Bank’s larger commercial banking centres]; AND
2. THE ORIGINAL OF THIS IRREVOCABLE LETTER OF CREDIT NO. [Bank’s Reference Number] FOR ENDORSEMENT OF PAYMENT THEREON; AND

3. A STATEMENT SIGNED BY AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT CERTIFYING

- A) THAT THE SIGNATORY IS AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT AND HAS AUTHORITY TO SIGN THE STATEMENT ON BEHALF OF THE MINISTER OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT (THE "MINISTER"), AND
- B) EITHER
  - I THAT THE MINISTER IS ENTITLED TO APPLY THE AMOUNT DRAWN, BEING ALL OR PART OF THE SECURITY POSTED AND MAINTAINED PURSUANT TO [the Water Licence Type and Number] ISSUED BY THE NORTHWEST TERRITORIES WATER BOARD, WHETHER AS ORIGINALLY ISSUED OR AS AMENDED OR RENEWED FROM TIME TO TIME, OR
  - II THAT THIS LETTER OF CREDIT IS DUE TO EXPIRE IN THIRTY (30) DAYS OR LESS AND THAT THE APPLICANT HAS NOT REPLACED THIS CREDIT BY POSTING WITH THE MINISTER OTHER SECURITY SATISFACTORY TO THE MINISTER.

PARTIAL DRAWINGS ARE PERMITTED.

THIS CREDIT IS EFFECTIVE FROM [Time] .AM. ON [Effective Date as required by Water Licence] AND SHALL EXPIRE AT OUR COUNTERS AT [Time] P.M. [Expiry Date] (THE "INITIAL EXPIRATION DATE"). THIS CREDIT SHALL BE RENEWED AUTOMATICALLY FOR AN ADDITIONAL ONE-YEAR PERIOD FROM THE INITIAL EXPIRATION DATE, AND FOR AN ADDITIONAL ONE-YEAR PERIOD FROM EACH FUTURE EXPIRATION DATE, UNLESS AT LEAST NINETY (90) DAYS PRIOR TO THE OPERATIVE EXPIRATION DATE WE NOTIFY YOU IN WRITING BY REGISTERED MAIL OR COURIER THAT WE ELECT NOT TO CONSIDER THIS CREDIT RENEWED FOR SUCH ADDITIONAL PERIOD.

WE HEREBY AGREE THAT ALL DRAFTS DRAWN UNDER AND IN COMPLIANCE WITH THE TERMS OF THIS CREDIT SHALL BE DULY HONOURED BY US IF PRESENTED FOR PAYMENT ON OR BEFORE THE OPERATIVE EXPIRATION DATE.

EXCEPT SO FAR AS IS OTHERWISE EXPRESSLY STATED HEREIN, THIS CREDIT IS SUBJECT TO THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS (1993 REVISION), INTERNATIONAL CHAMBER OF COMMERCE, PUBLICATION NO. 500. NOTWITHSTANDING ARTICLE 17 OF SAID PUBLICATION, IS THIS CREDIT EXPIRES DURING AN INTERRUPTION OF BUSINESS AS DESCRIBED IN ARTICLE 17, WE AGREE TO EFFECT PAYMENT IF THIS CREDIT IS

DRAWN ON US WITHIN FIFTEEN (15) DAYS AFTER THE RESUMPTION OF BUSINESS.

[Bank's Name]

\_\_\_\_\_  
[Official's Name and Position]

\_\_\_\_\_  
[Official's Name and Position]

# 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 ENERGY  
(Licensee)  
400- 4 Avenue S.W., P.O. Box 100, Station M  
of CALGARY, ALBERTA T2P 2H5  
(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 N7L1-1834

Licence Type "B"

Water Management Area NORTHWEST TERRITORIES 07

Location Within a two kilometre radius of  
Latitude 69°12'30" N.  
Longitude 135°06'04" W.  
MACKENZIE RIVER DELTA, N.W.T

Purpose TO USE WATER AND DISPOSE OF WASTE  
FOR INDUSTRIAL UNDERTAKINGS AND  
ASSOCIATED USES

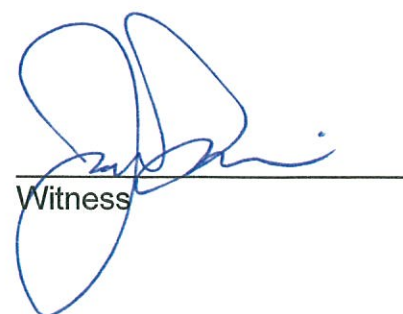
Description OIL AND GAS EXPLORATION  
AND DEVELOPMENT

Quantity of Water Not  
To Be Exceeded 150 CUBIC METRES DAILY

Effective Date of Licence JULY 18<sup>TH</sup>, 2012

Expiry Date of Licence JULY 17<sup>TH</sup>, 2017

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

  
Witness

**NORTHWEST TERRITORIES WATER BOARD**

  
Chairperson (Eddie Dillon)

**PART A: SCOPE AND DEFINITIONS**

**1. Scope**

- a) This Licence entitles Shell Canada Energy to use water and dispose of Waste as an industrial undertaking 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 conforming to 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.
- d) This Licence is issued subject to the conditions contained herein with respect to the use of Waters as prescribed in Section 8 of the *Act* and the deposit of Waste to any Waters as prescribed in Section 9 of the *Act*.

**2. Definitions**

In this Licence: **N7L1-1834**

“**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”** means the discrete average of up to four (4) 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 the lowest elevation of the effective water containment crest on a dam or dyke’s upstream slope;

**“Geotechnical Engineer”** means a professional engineer registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists whose principal field of specialization 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 Waste;

**“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;

**“Minister”** means the Minister of Aboriginal Affairs and Northern Development Canada (AANDC);

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

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

**“Sewage”** means all toilet Wastes and Greywater;

**“Sewage Treatment Facilities”** comprises the area and engineered structures designed to contain Sewage as identified in the project description and also include 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*;



**“Waste Disposal Facilities”** mean all facilities designated for the disposal of Waste and include the Sewage disposal facilities, solid Waste disposal facilities, and bagged toilet Wastes disposal facilities;

**“Water Supply Facilities”** mean all facilities designed to collect, treat and supply water for industrial purposes; 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 31<sup>st</sup> of the year following the calendar year reported which shall contain the following information:
  - a) the monthly and annual quantities in cubic metres of fresh water obtained from all sources;
  - b) the monthly and annual quantities in cubic metres of each and all Waste discharged;
  - c) the location and direction of flow of all Waste discharged to the water or the land;
  - d) a summary of the monthly and annual quantities of Waste stored on site and transported off site;
  - e) the results of sampling carried out under the “Surveillance Network Program”;
  - f) a summary of any Modifications carried out on the Water Supply Facilities and Sewage Treatment Facilities, including all associated structures;
  - g) a list of any spills and unauthorized discharges;
  - h) details on the restoration of any Sumps;
  - i) a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

- j) a summary of any studies requested by the Board that relate to Waste disposal, water use, or reclamation, and a brief description of any future studies planned;
  - k) notation of updates and/or revisions to the approved Spill Contingency Plan, Waste Disposal Facilities operations and maintenance plan, and sewage treatment plan;
  - l) an outline of any spill training and communications exercises carried out; and
  - m) 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 this Licence, submit to the Board for approval a map or drawing indicating the location of all Surveillance Network Program sampling stations.
  5. The Licensee shall, within thirty (30) days of the issuance of this 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.
  6. Any meters, devices or other such methods used for measuring the volumes of water used or Waste disposed and discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.
  7. The Licensee shall immediately report to the 24 Hour Spill Report Line (**867-920-8130**) any spills which are reported to, or observed by, the Licensee within the project boundaries.
  8. 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.
  9. 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.

10. Within thirty (30) days of issuance of this Licence, the Licensee shall have posted and shall maintain a security deposit in the amount of Two Million (\$2,000,000.00) Dollars pursuant to Section 17 of the *Act* and Section 12 of the Regulations, in a form suitable to the Minister. The security deposit shall be maintained until such time as it is fully or in part refunded by the Minister pursuant to Section 17 of the *Act*.
11. 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. The daily quantity of water used for all purposes shall not exceed 150 cubic metres.

**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 Waste Disposal 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 lagoon shall be directed to the channel of the Mackenzie River at a location approved by an Inspector.
5. There should be no discharge of floating solids, garbage, grease, free oil or foam.

6. All effluent discharged by the Licensee from the Sewage lagoon at "Surveillance Network Program" Station Number 1834-1 shall meet the following effluent quality requirements:

Sample Parameter	Average Concentration
BOD <sub>5</sub>	70.0 mg/L
Total Suspended Solids	70.0 mg/L
Faecal Coliforms	1 X 10 <sup>4</sup> CFU/dL
Oil and Grease	5.0 mg/L
Total Residual Chlorine (TRC)	0.1 mg/L

7. The effluent discharged shall have a pH between six (6) and nine (9) and no visible sheen of oil and grease.
8. Introduction of water to Waste for the purpose of achieving effluent quality requirements in Part D, Item 7 is prohibited.
9. A Freeboard limit of 1.0 metre shall be maintained at all times in the Sewage lagoon, or as recommended by a qualified Geotechnical Engineer and/or as approved by the Board.
10. The Licensee shall advise an Inspector at least five (5) days prior to initiating and decant of the Sewage lagoon.
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.
12. The Licensee shall contain all contaminated soil or contaminated snow in such a manner as to minimize the potential for migration of contaminants into any Waters, to the satisfaction of an Inspector.
13. The Licensee shall store, segregate and dispose of all solid and hazardous Wastes in a manner acceptable to the Inspector.
14. Unless authorized by this Licence, the Licensee shall ensure that any Wastes associated with this undertaking do not enter any water body.
15. The Licensee shall submit to the Board a copy of each agreement(s) between third parties to store, transport or dispose of Wastes. The copy submitted to the Board shall include, at a minimum, the following:

- a. type of Waste;
- b. quantities of Waste;
- c. disposal location(s), and
- d. proof of acceptance from third parties.

**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 the 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 F, 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 issuance of this Licence an updated Emergency Response & Spill Contingency Plan in accordance, for example, with the *Guidelines for Spill Contingency Planning, April 2007*, developed by AANDC-Water Resources Division.

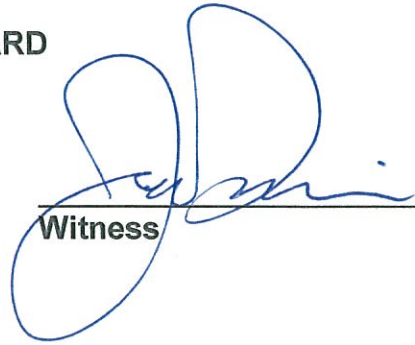
2. The Licensee will maintain a copy of the approved Emergency Response & Spill Contingency Plan onsite in a readily available location, to the satisfaction of an Inspector.
3. The Licensee shall ensure that petroleum products, hazardous material and other Wastes associated with the project do not enter 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 unauthorised 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 plans for the abandonment and restoration of the Sewage lagoon and a complete Phase II environmental site 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.
2. The Licensee shall implement this Plan as and when approved by the Board.
3. Following approval of the Plan, the Licensee shall review the 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**

  
\_\_\_\_\_  
**Chairman**

  
\_\_\_\_\_  
**Witness**

## NORTHWEST TERRITORIES WATER BOARD

**LICENSEE:** Shell Canada Energy  
**LICENCE NUMBER:** N7L1-1834  
**EFFECTIVE DATE OF LICENCE:** July 18, 2012  
**EFFECTIVE DATE OF SURVEILLANCE NETWORK PROGRAM:** July 18, 2012

### SURVEILLANCE NETWORK PROGRAM

#### A. Location of Sampling Stations

<u>Station Number</u>	<u>Description</u>
1834-1	Discharge from the Sewage lagoon.

#### B. Sampling and Analysis Requirements

1. Water at Station Number 1834-1 shall be sampled prior to, and once during decanting. Each sample shall be analyzed for the following parameters:

BOD5	Total Suspended Solids
Oil and Grease	Faecal Coliforms
Ammonia	pH
Phosphorous	Total Residual Chlorine

2. More frequent sample collection may be 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 analysis shall be performed in a laboratory approved by an Analyst.
5. The Licensee shall, by August 17, 2012, 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.

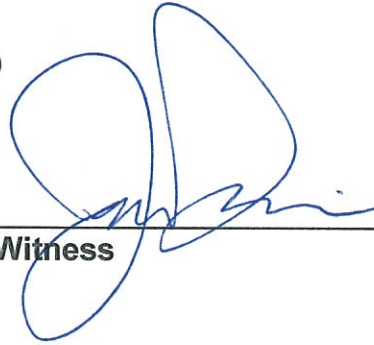
**C. Reports**

1. The Licensee shall, within thirty (30) days following the month of discharge from the Sewage lagoon, submit to the Board and an Inspector all data and information required by the "Surveillance Network Program" including the results of the approved Quality Assurance/Quality Control Plan.

**NORTHWEST TERRITORIES WATER BOARD**



Chairman



Witness

**Northwest Territories Water Board  
Reasons for Decision**

Issued pursuant to section 26 of the  
*Northwest Territories Waters Act, S.C. 1992 C.39*

Water Licence Number: N7L1-1834(Type B)

This is the decision of the Northwest Territories Water Board (Board) for the issuance of Water Licence N7L1-1834. The project is located at Latitude 69°12'30" North and Longitude 135°06'04" West in the Northwest Territories.

The Northwest Territories Water Board issued Licence N7L1-1834 in accordance with Section 14 of the *Northwest Territories Waters Act*.

**Background:**

Shell Canada Energy applied to the Board on March 5<sup>th</sup>, 2012 for a Water Licence for Farewell Camp and Stockpile Site (Camp Farewell) in the Mackenzie Delta. The Board deemed the application complete on May 23, 2011.

Canadian Environmental Assessment Act (CEAA)

The Water Licence application was exempt from the Canadian Environmental Assessment Act under Section 7(1)(a), specifically under Schedule 1, Part 1, Section 3(a) of the Exclusion List Regulations.

Environmental Impact Screening Committee (EISC)

On April 20, 2012 the Board received an official notification from the Environmental Impact Screening Committee that determined the application met the definition of development and that it was exempt from the screening process, as it qualified under exclusion #1 of Environmental Impact Screening Guidelines, Appendix C.

Notice of Application

In accordance with rule 38 of the Board Rules of Procedure, the Board gave notice of the application for a Water Licence regarding Camp Farewell, on May 28, 2012 in News North in English, May 31, 2012 in the Inuvik Drum in Inuvialuktun, and May 25, 2012 in L'Aquilon in French.

Reviewers' Comments

The Board sent the Water Licence application and supporting information for review to the following agencies: AANDC-NMDO, AANDC-WRD, EC, DFO and GNWT-ENR on May 23, 2012. The Board received written comments from AANDC (June 15, 2012), EC (June 15, 2012), DFO (May 28, 2012) and GNWT-ENR (June 14, 2012).

The Board considered all submitted comments at a Board meeting held via teleconference on July 10, 2012. The Board approved a Water Licence for the applicant's review. The Licence was submitted to the applicant on July 11, 2012 and it indicated in its response on July 16, 2012 that the Licence was acceptable.

**Requirements of the Northwest Territories Waters Act:**

Shell Canada Energy has provided the Board with its Schedule III application and supporting information for its consideration as required by section 16 of the *Northwest Territories Waters Act*.

The Board is in accordance with Paragraph 14(4)(a) of the *Northwest Territories Waters Act* by ensuring that the granting of the Water Licence to Shell Canada Energy will not adversely affect, in a significant way, any existing Licensee, providing the conditions of Water Licence N7L1-1834 are met. There are no other applicants with precedence.

The Board does not believe that any users nor persons listed in Paragraph 14(4)(b) of the *Northwest Territories Waters Act* will be adversely affected by the use of waters or the deposit of waste proposed by the Licensee provided that the Licensee operates in accordance with the terms and conditions of Water Licence N7L1-1834.

The Board is of the view that compliance with Water Licence N7L1-1834 terms and conditions will ensure that the waste will be treated and deposited in a manner that will maintain water quality in the area and will be consistent with applicable water quality standards in accordance with Sub-Paragraph 14(4)(c) (i) of the *Northwest Territories Waters Act*.

The Board drafted the terms and conditions of Water Licence N7L1-1834 in accordance with Section 15 of the *Northwest Territories Waters Act*.

In Accordance with Sub-Section 17(1) of the *Northwest Territories Waters Act*, the Board requested that a security deposit in the amount of two million dollars (\$2,000,000.00) be posted and shall be maintained in a form suitable to the Minister of Aboriginal Affairs and Northern Development Canada.

**Decision to issue Water Licence N7L1-1834:**

The Board has reviewed the Camp Farewell Project Application and draft Water Licence N7L1-1834 for issuance. Upon consideration of the facts and circumstances, the purpose, scope and intent of the *Northwest Territories Waters Act*, the Board has determined that it can issue Water Licence N7L1-1834.

For the above reasons the Board has determined to issue Water Licence N7L1-1834 in accordance with Sub-Section 14(1) and Sub-Paragraph 14(6)(b)(i) of the *Northwest Territories Waters Act* for the use of water and the deposit of wastes.

**SIGNED** this 18 day of July, 2012 on behalf of the Northwest Territories Water Board.



**Eddie Dillon**

**Chairperson, Northwest Territories Water Board**

## Summary of 2015 Camp Farewell Activities

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November 2, 2015

Canadian Wildlife Service  
PO Box 1939  
Inuvik, NT  
X0E 0T0

**Mr. Paul Latour**  
**Habitat Biologist**

Dear Mr. Latour:

**Shell Canada Energy Canadian Wildlife Service Kendall Island Bird Sanctuary Permit  
Summary of 2015 Camp Farewell Activities**

This letter has been prepared by IEG Consultants Ltd. (IEG) on behalf of Shell Canada Energy (Shell) to outline the activities that Shell undertook at the Camp Farewell site in 2015. Camp Farewell is located along the Middle Channel of the Mackenzie River, within the boundaries of the Kendall Island Bird Sanctuary.

The Canadian Wildlife Service (CWS) Migratory Bird Sanctuary permit number NWT-MBS-15-01 issued in 2015 (Appendix I) did not stipulate site inspections be conducted every 50 days, however, Shell aimed to continue to conduct site inspections as frequently as possible in due diligence. In addition to the site inspections, Shell continued routine maintenance of remaining infrastructure and facilities. Each of these activities is described below.

## **1 SITE INSPECTIONS**

The CWS permit was issued on January 14, 2015 (Appendix I). IEG travelled to Inuvik to conduct a site visit in February but was unsuccessful due to cold and blizzard conditions on the delta. One site inspection was conducted during decommissioning and soil assessment activities in August. Personnel on-site at the time of the inspection included staff from Tervita Corporation, Mackenzie Delta Integrated Oilfield Services (MDIOS), and IEG Consultants Ltd. (IEG). Wildlife observations included cranes and Canada geese. Site photographs are included in Appendix II.

## 2 MAINTENANCE

During the 2015 site visit, the fuel storage trailer, shed #1 building, and emergency shelter on-site were noted to be secure and in good condition (Appendix II). Decommissioning of the tank farm as well as a soil assessment program occurred for approximately 12 days in August.

## 3 DECOMMISSIONING AND SOIL ASSESSMENT

On August 14, 2015, decommissioning and soil assessment activities commenced on-site. The tank farm was demolished and scrap metal was transported south for recycling. Soil assessment activities occurred simultaneously with the advancement of boreholes and collection of soil samples from across the lease and the airstrip. On-site activities occurred for twelve days.

The Northwest Territories Water Board issued a type "B" water license (N7L1-1834) on July 18, 2012 for the purpose of using water and disposing of waste for industrial undertakings and associated uses (Appendix III). There was no water used or waste disposed of on-site for the purposes of the 2015 decommissioning or soil assessment activities.

Remedial activities are scheduled for 2016.

## 4 CLOSING

If you have any questions or concerns regarding the 2015 Camp Farewell Activities, please contact the undersigned at 403.730.6809.

Yours truly,  
**IEG CONSULTANTS LTD.**



Nicole Wills, P.Ag.  
Project Manager

NW

### Attachments:

- Appendix I: Canadian Wildlife Service Migratory Bird Sanctuary Permit
- Appendix II: Site Photographs
- Appendix III: Northwest Territories Water Board Type "B" Water License

c.c. Randall Warren – Shell Canada Energy

# APPENDIX I

## Canadian Wildlife Service Migratory Bird Sanctuary Permit

---

Canadian Wildlife Service  
Prairie and Northern Region  
Box 2310, 5019 - 52 Street  
Yellowknife NT X1A 2P7

DATE: January 15, 2015

FROM: Paul Latour  
CWS

TO: Randall Warren  
Shell Canada  
Calgary, AB

Yellowknife,

TEL:

TEL: 867-669-4769

FAX: 867- 403-269-7948

FAX: 867-873-8185

TOTAL # OF PAGES: 4

SUBJECT: EC/CWS Migratory Bird  
Sanctuary Permit

MESSAGE:

Randall:

Attached is a Migratory Bird Sanctuary Permit authorizing you to conduct care, maintenance, and remediation work at the Camp Farewell Stockpile and Lease. Please note Special Conditions 1.(4.) and 6.(1.) which are specific to this permit.

Please sign the "Permittee" line on page 4 and return to me.

Thanks.



Paul L.





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Canada

### ENVIRONMENT CANADA PERMIT

Migratory Birds - Sanctuary

NWT-MBS-15-01

Permit for  
Northwest Territories

Permit no.

province(s), territories

9.

Issued under section

Randall Warren  
Shell Canada Ltd.,  
P.O. Box 100 Station "M"  
Calgary, AB  
T2P 2H5

Migratory Bird Sanctuary Regulations

Permittee

For the Minister

Date of issue: January 14, 2015

Date of expire: December 31, 2015

The Permittee is authorized to enter the Kendall Island Migratory Bird Sanctuary to conduct care, maintenance and remediation of the Camp Farewell and Stockpile lease area.



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Canada

## GENERAL CONDITIONS

1. The permit is not valid unless signed by the Permittee (holder) or authorized representative, in the space designated as "Permittee".
2. By signing this document you bind yourself to respect all terms and conditions of this permit.
3. The Permittee must comply with all other applicable Canadian laws and regulations.
4. Copy of signed permit must be carried by nominees and Permittee when conducting this work and will be presented if asked by Police or Game Officer.
5. The Permittee shall display a copy of this permit in a conspicuous place in each campsite established to carry out this program.
6. The conditions of this permit apply to all employees, agents, contractors, volunteers, and visitors of the Permittee.
7. The Permittee shall ensure that a copy of this Permit, operating conditions and definitions is provided, understood and adhered to by all contractors and sub-contractors prior to the start-up of the permitted activity
8. Additional restrictions may be required and may be added to this permit by the Minister if it is deemed necessary to ensure compliance with the Migratory Birds Convention Act and the Regulations.
9. Issuance of this permit does not supersede the necessity or legal requirement to acquire any other pertinent Territorial or Municipal license and or permit which may otherwise be applicable. This permit is not transferable to any other person(s) or organization(s) and is not valid if altered in any way.
10. If the Permittee proposes to conduct any activities that are not identified in the original permit application, the Permittee shall notify the Manager and, if necessary, apply for a new or amended permit to conduct the new activities.
11. The Permittee is authorized to possess firearms in the Kendall Island Migratory Bird Sanctuary for protection from dangerous wildlife only.
12. This permit may be revoked at any time at the discretion of the Minister.

## SPECIAL CONDITIONS

### 1. PROTECTION OF TERRESTRIAL HABITAT

1. The Permittee shall not conduct any activities in the Kendall Island Bird Sanctuary outside the Camp Farewell and Stockpile lease area.
2. The Permittee shall use portable ramps during loading or unloading ships or barges.
3. The Permittee shall not remove or relocate earth, except contaminated soils collected as part of a clean-up program.
4. The Permittee shall, during the cutting up and removal of fuel tanks, ensure that all residual fuel or sludge does not escape or come into contact with the surrounding earth.



### **3. PROTECTION OF AQUATIC HABITAT**

1. The Permittee shall not place dirt or debris into streams to serve as ramps for loading or unloading ships or barges.
2. The Permittee shall not cut any bank of a waterbody.

### **2. WILDLIFE DISTURBANCE AND INTERACTION**

1. The Permittee shall not feed wildlife or attempt to attract wildlife.
2. The Camp Farewell airstrip is not permitted to be used from 10 May – 20 June and 25 August – 30 September, except for emergencies.
3. Aircraft activity is restricted to flights necessary to carry out care and maintenance of the Camp Farewell and Stockpile lease area.
4. Aircraft shall maintain a minimum horizontal distance of 1.5 km from any observed concentrations of migratory birds.
5. The Permittee shall notify the Manager of any birds nesting on the infrastructure within the lease area.

### **3. FUEL STORAGE AND HANDLING**

1. The Permittee shall not allow oil, oil wastes or any other substance harmful to migratory birds to be deposited in waters or other areas frequented by migratory birds, or in a place from which the substances may enter waters frequented by migratory birds.
2. The Permittee shall permanently mark all fuel containers, including 205 L drums, with the Permittee's name.

### **4. HAZARDOUS MATERIALS AND CONTAMINANTS – HANDLING AND DISPOSAL**

1. The Permittee shall have the appropriate Workplace Hazardous Material Information System, 'Material Safety Data Sheets' identification available on site.
2. The Permittee shall remove and dispose of all hazardous materials at an approved facility.
3. The Permittee shall conduct maintenance, oil changes, refueling and lubricating of mobile equipment no closer than 100 m from waterbodies (lakes, ponds and streams).

### **5. GARBAGE AND WASTE WATER HANDLING AND REMOVAL**

1. The Permittee shall ensure that all domestic garbage and other wildlife attractants are inaccessible to wildlife at all times.
2. The Permittee shall regularly collect all waste, debris and domestic garbage and dispose of it using appropriate technology and accepted practices.
3. The Permittee shall inventory and dispose of any waste materials, construction materials, drilling materials or other materials on at least an annual basis to minimize accumulation within the permit area. The inventory of materials disposed and materials remaining within the permit area must be reported to the Manager.

### **6. REPORTING**

1. The Permittee shall submit a report within thirty (30) days of the expiration date of this permit. The report shall describe all activities that occurred at Camp Farewell during 2015 including the time period of the Permittee's activities on site, location of soil sampling and laboratory results (if available) as well as remaining infrastructure and photos showing the current state of the Camp Farewell lease area in particular the former tank location.



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Canada

## DEFINITIONS

**Manager:** 'The Manager', Northern Conservation Section, Canadian Wildlife Service, Environment Canada or his/her designate.

**Minister:** The Minister of the Environment.

**Permittee:** The party to whom a CWS Sanctuary Permit is issued for conducting activities in a Migratory Bird Sanctuary.

**Waterbody:** Any river, stream, creek, lake, or pond.

**Camp:** A collection of accommodations, maintenance, transportation, and storage facilities located either permanently or temporarily at a site.

**Sub-permit holder and/or nominee(s):**

I declare that I have read and understand this Permit, including all the conditions attached.

Signature of Permittee

*RANDALL WARREN*

## APPENDIX II

### Site Photographs

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**Photograph 1:** View northwest of Shed #1 (August 11, 2015).



**Photograph 2:** View north of laydown area and tank farm (August 11, 2015).



**Photograph 3:** View northwest of laydown area and drilling activities (August 18, 2015).



**Photograph 4:** View east of emergency shelter and decommissioning activities (August 18, 2014).

## **APPENDIX III**

### **Northwest Territories Water Board Type “B” Water License**

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July 18, 2012

Mr. Randal Warren  
Manager; DAR and Drilling Waste  
Projects and Technology  
Shell Canada Energy  
400- 4th Avenue S.W.  
P.O. Box 100, Station M  
Calgary, Alberta T2P 2H5

Dear Mr. Warren:

**Re: Issuance of a Type “B” Water Licence- Camp Farewell**

Attached is Water Licence N7L1-1834 granted by the Northwest Territories Water Board (the Board) in accordance with the *Northwest Territories Waters Act*. A copy of this Licence has been filed in the Public Registry at the Board offices in Yellowknife and in Inuvik. Water Licence N7L1-1834 has been approved for a period of five years commencing July 18, 2012 and expiring July 17, 2017. Also attached are the general procedures for the administration of Licences in the Northwest Territories. Please review these carefully and address any questions to one of the Board offices.

Please be advised that this letter, with attached procedures, all inspection reports and correspondence related thereto are part of the Board public registry and are intended to keep all interested parties informed of the manner in which the Licence requirements are being met. All public registry material will be considered if an amendment to the Licence or its renewal is requested.

In accordance with the Northwest Territories Water Regulations (NTWR) section 6(1) and 9(1)(b) there will be a requirement for a further payment of the water use fee based on the approved water use of 150 cubic metres per day. The annual water use fee has been calculated to be \$547.50 and is payable to the Receiver General of Canada on the anniversary of the date of issuance of the licence as per section 9(6)(b)(ii) of the NTWR. At the time of your Water Licence application there was a payment of \$30.00 for the first year fee payment and there remains a balance of \$517.50 to be paid for the water use fee at the time the Licence is issued.

Please note for future Water Licence applications in accordance with NTWR section 6(1) an application for a Licence or for the amendment or renewal of a Licence shall be accompanied by a deposit equal to any water use fee that would be payable in respect of the first year of the Licence that is being applied for.

Please read all the conditions carefully and note that in accordance with the attached Water Licence Part B, condition 10, a security deposit in the amount of \$2,000,000.00 shall be posted with the Minister and copied to the Board prior to the start of the operation pursuant to section 17 of the *Northwest*

*Territories Waters Act.* Submit payment of the security, made out to the Receiver General for Canada in the amount of \$2,000,000.00, to: Aboriginal Affairs and Northern Development Canada, P.O. Box 1500, Yellowknife, NT, X1A 2R3 Attention: Robert Jenkins.

Supplemental information to be submitted by Licensee as required through Licence conditions:

- post and maintain security deposit (by August 17, 2012)
- an Annual Report (by March 31, 2013-2017);
- a map or drawing of SNP sampling locations (by August 17, 2012)
- post signs to identify SNP sampling stations (by August 17, 2012)
- an updated operation and maintenance plan for the Waste Disposal Facilities (by August 17, 2012)
- an updated Emergency Response & Spill Contingency Plan (by August 17, 2012)
- an updated Abandonment and Restoration Plan (by July 17, 2013)
- submit to an Analyst for approval a Quality Assurance/Quality Control Plan (by August 17, 2012)

The full cooperation of Shell Canada Energy is anticipated and appreciated.

Should you have any further questions or concerns, please communicate with the Northwest Territories Water Board by telephone at (867) 678-2942 or via e-mail at [info@nwtwb.com](mailto:info@nwtwb.com).

Sincerely,



Eddie Dillon  
Chairperson  
NWT Water Board

Attached: Water Licence N7L1-1834  
General Procedures for the administration of licences issued under the *Northwest Territories Waters Act* in the Northwest Territories

Distribution: Conrad Baetz, AANDC-NMDO  
Robert Jenkins, AANDC-WRD  
Krista Beavis, Klohn Crippen Berger  
Patrick Clancy, GNWT-ENR  
Rick Walbourne, DFO  
Stacey LeBlanc, EC

## **GENERAL PROCEDURES FOR THE ADMINISTRATION OF LICENCES ISSUED UNDER THE *NORTHWEST TERRITORIES WATERS ACT* IN THE NORTHWEST TERRITORIES**

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1. At the time of issuance, a copy of the Licence is placed on the Northwest Territories Water Board public registry in the Yellowknife and Inuvik Offices, and is then available to the public.
2. To enforce the terms and conditions of the Licence, the Minister of Aboriginal Affairs and Northern Development Canada has appointed Inspectors in accordance with Section 35(1) of the *Northwest Territories Waters Act*. The Inspectors coordinate their activities with officials of the Water Resources Division of Aboriginal Affairs and Northern Development Canada. The Inspector responsible for Licence N7L1-1834 is located in the North Mackenzie District Office in Inuvik.
3. To keep the Northwest Territories Water Board and members of the public informed of the Licensee's conformity to Licence conditions, the Inspectors prepare reports which detail observations on how each item in the Licence has been met. These reports are forwarded to the Licensee with a covering letter indicating what action, if any, should be taken. The inspection reports and covering letters are placed on the Northwest Territories Water Board public registry, as are any responses received from the Licensee pertaining to the inspection reports. It is therefore of prime importance that you react in all areas of concern regarding all inspection reports so that these concerns may be clarified.
4. If the renewal of Licence N7L1-1834 is contemplated it is the responsibility of the Licensee to apply to the Northwest Territories Water Board for renewal of the Licence. The past performance of the Licensee, new documentation and information, and points raised during a public hearing, if required, will be used to determine the terms and conditions of any Licence renewal. Please note that if the Licence expires and another has not been issued, then water and Waste disposal must cease, or you, the Licensee, would be in contravention of the *Northwest Territories Waters Act*. An application for renewal of Licence N7L1-1834 should be made at least eight (8) months in advance of the Licence expiry date.
5. If, for some reason, Licence N7L1-1834 requires amendment, then a public hearing may be required. You are reminded that applications for amendments should be submitted as soon as possible to provide the Northwest Territories Water Board with ample time to go through the amendment process. The process may take up to six (6) months or more depending on the scope of the amendment requested.

6. Specific clauses of your Licence make reference to the Board, Analyst or Inspector. The contact person, address, phone and fax number of each is:

Board: Executive Director  
Northwest Territories Water Board  
P.O. Box 2531  
Inuvik, NT X0E 0T0  
Phone No: (867) 678-2942  
Fax No: (867) 678-2943

Analyst: Analyst  
Taiga Environmental Laboratory  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 1500, 4601 – 52<sup>nd</sup> Avenue  
Yellowknife, NT X1A 2R3  
Phone No: (867) 669-2788  
Fax No: (867) 669-2718

Inspector: Water Resource Officer  
North Mackenzie District Office  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 2100  
Inuvik, NT X0E 0T0  
Phone No: (867) 777-8900  
Fax No: (867) 777-2090

7. Your Licence requires a security deposit be submitted. Should the security deposit be submitted in the form of a "letter of credit", recommended wording is outlined below. It is advised that a "draft" letter of credit be forwarded to Water Resources Division for review. The contact person, address, phone and fax number of the individual administering security deposits is:

Manager  
Water Resources Division  
Aboriginal Affairs and Northern Development Canada  
P.O. Box 1500, 4923 – 52<sup>nd</sup> Street  
YELLOWKNIFE, NT X1A 2R3  
Phone No: (867) 669-2654  
Fax No: (867) 669-2716

[BANK

ADDRESS]

**IRREVOCABLE LETTER OF CREDIT**

[The term “DOCUMENTARY CREDIT” may also be used instead of “Letter of Credit”]

**DATE OF ISSUE:** [Date]      **OUR REFERENCE NUMBER:** [Bank’s reference number]

**AMOUNT:** CAD\$#####.00

**MAXIMUM** #####.00

**CANADIAN DOLLARS ONLY**

**APPLICANT:**

[“Customer” can be used instead of “Applicant”]

[Company’s Name]

[Company’s Address]

**BENEFICIARY:**

RECEIVER GENERAL FOR CANADA

ON BEHALF OF THE MINISTER OF

INDIAN AFFAIRS AND NORTHERN

DEVELOPMENT

4923 – 52<sup>nd</sup> STREET, 2<sup>nd</sup> FLOOR

P.O. BOX 1500

YELLOWKNIFE, NT X1A 2R3

ATTENTION: REGIONAL DIRECTOR GENERAL  
DIAND - NT REGION

**RE: SECURITY PURSUANT TO** [the Water Licence Type and Number]

AT THE REQUEST AND FOR THE ACCOUNT OF [Company’s Name] (THE “APPLICANT”), WE, [Bank’s Name], HEREBY ESTABLISH IN YOUR FAVOUR OUR IRREVOCABLE LETTER OF CREDIT NO. [Bank’s Reference Number] (“CREDIT”) FOR SUMS NOT EXCEEDING IN THE AGGREGATE [Amount of Security required stated in Canadian Dollars].

THIS CREDIT IS AVAILABLE WITH US FOR DRAWING AT SIGHT, WITHOUT ENQUIRY AS TO WHETHER YOU HAVE RIGHT AS BETWEEN YOURSELF AND THE APPLICANT TO MAKE SUCH DEMAND AND WITHOUT RECOGNIZING ANY CLAIM OF THE APPLICANT, AGAINST PRESENTATION TO US, BY YOU OR YOUR DULY AUTHORIZED REPRESENTATIVE OR AGENT, OF THE FOLLOWING DOCUMENTS:

1. A SIGHT DRAFT DRAWN ON [Bank’s Name and Address of the Branch that the security can be drawn at, usually one of the Bank’s larger commercial banking centres]; AND
2. THE ORIGINAL OF THIS IRREVOCABLE LETTER OF CREDIT NO. [Bank’s Reference Number] FOR ENDORSEMENT OF PAYMENT THEREON; AND

3. A STATEMENT SIGNED BY AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT CERTIFYING

- A) THAT THE SIGNATORY IS AN OFFICIAL OF THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT AND HAS AUTHORITY TO SIGN THE STATEMENT ON BEHALF OF THE MINISTER OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT (THE "MINISTER"), AND
- B) EITHER
- I THAT THE MINISTER IS ENTITLED TO APPLY THE AMOUNT DRAWN, BEING ALL OR PART OF THE SECURITY POSTED AND MAINTAINED PURSUANT TO [the Water Licence Type and Number] ISSUED BY THE NORTHWEST TERRITORIES WATER BOARD, WHETHER AS ORIGINALLY ISSUED OR AS AMENDED OR RENEWED FROM TIME TO TIME, OR
- II THAT THIS LETTER OF CREDIT IS DUE TO EXPIRE IN THIRTY (30) DAYS OR LESS AND THAT THE APPLICANT HAS NOT REPLACED THIS CREDIT BY POSTING WITH THE MINISTER OTHER SECURITY SATISFACTORY TO THE MINISTER.

PARTIAL DRAWINGS ARE PERMITTED.

THIS CREDIT IS EFFECTIVE FROM [Time] .AM. ON [Effective Date as required by Water Licence] AND SHALL EXPIRE AT OUR COUNTERS AT [Time] P.M. [Expiry Date] (THE "INITIAL EXPIRATION DATE"). THIS CREDIT SHALL BE RENEWED AUTOMATICALLY FOR AN ADDITIONAL ONE-YEAR PERIOD FROM THE INITIAL EXPIRATION DATE, AND FOR AN ADDITIONAL ONE-YEAR PERIOD FROM EACH FUTURE EXPIRATION DATE, UNLESS AT LEAST NINETY (90) DAYS PRIOR TO THE OPERATIVE EXPIRATION DATE WE NOTIFY YOU IN WRITING BY REGISTERED MAIL OR COURIER THAT WE ELECT NOT TO CONSIDER THIS CREDIT RENEWED FOR SUCH ADDITIONAL PERIOD.

WE HEREBY AGREE THAT ALL DRAFTS DRAWN UNDER AND IN COMPLIANCE WITH THE TERMS OF THIS CREDIT SHALL BE DULY HONOURED BY US IF PRESENTED FOR PAYMENT ON OR BEFORE THE OPERATIVE EXPIRATION DATE.

EXCEPT SO FAR AS IS OTHERWISE EXPRESSLY STATED HEREIN, THIS CREDIT IS SUBJECT TO THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS (1993 REVISION), INTERNATIONAL CHAMBER OF COMMERCE, PUBLICATION NO. 500. NOTWITHSTANDING ARTICLE 17 OF SAID PUBLICATION, IS THIS CREDIT EXPIRES DURING AN INTERRUPTION OF BUSINESS AS DESCRIBED IN ARTICLE 17, WE AGREE TO EFFECT PAYMENT IF THIS CREDIT IS

DRAWN ON US WITHIN FIFTEEN (15) DAYS AFTER THE RESUMPTION OF BUSINESS.

[Bank's Name]

\_\_\_\_\_  
[Official's Name and Position]

\_\_\_\_\_  
[Official's Name and Position]

# 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 ENERGY  
(Licensee)  
400- 4 Avenue S.W., P.O. Box 100, Station M  
of CALGARY, ALBERTA T2P 2H5  
(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 N7L1-1834

Licence Type "B"

Water Management Area NORTHWEST TERRITORIES 07

Location Within a two kilometre radius of  
Latitude 69°12'30" N.  
Longitude 135°06'04" W.  
MACKENZIE RIVER DELTA, N.W.T

Purpose TO USE WATER AND DISPOSE OF WASTE  
FOR INDUSTRIAL UNDERTAKINGS AND  
ASSOCIATED USES

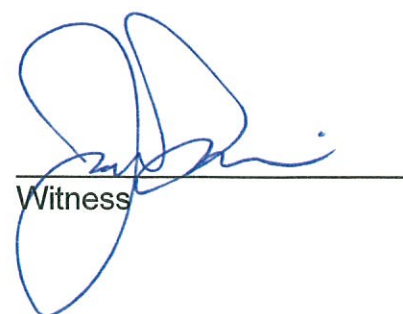
Description OIL AND GAS EXPLORATION  
AND DEVELOPMENT

Quantity of Water Not  
To Be Exceeded 150 CUBIC METRES DAILY

Effective Date of Licence JULY 18<sup>TH</sup>, 2012

Expiry Date of Licence JULY 17<sup>TH</sup>, 2017

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

  
Witness

**NORTHWEST TERRITORIES WATER BOARD**

  
Chairperson (Eddie Dillon)



**PART A: SCOPE AND DEFINITIONS**

**1. Scope**

- a) This Licence entitles Shell Canada Energy to use water and dispose of Waste as an industrial undertaking 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 conforming to 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.
- d) This Licence is issued subject to the conditions contained herein with respect to the use of Waters as prescribed in Section 8 of the *Act* and the deposit of Waste to any Waters as prescribed in Section 9 of the *Act*.

**2. Definitions**

In this Licence: **N7L1-1834**

“**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”** means the discrete average of up to four (4) 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 the lowest elevation of the effective water containment crest on a dam or dyke’s upstream slope;

**“Geotechnical Engineer”** means a professional engineer registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists whose principal field of specialization 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 Waste;

**“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;

**“Minister”** means the Minister of Aboriginal Affairs and Northern Development Canada (AANDC);

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

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

**“Sewage”** means all toilet Wastes and Greywater;

**“Sewage Treatment Facilities”** comprises the area and engineered structures designed to contain Sewage as identified in the project description and also include 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*;

**“Waste Disposal Facilities”** mean all facilities designated for the disposal of Waste and include the Sewage disposal facilities, solid Waste disposal facilities, and bagged toilet Wastes disposal facilities;

**“Water Supply Facilities”** mean all facilities designed to collect, treat and supply water for industrial purposes; 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 31<sup>st</sup> of the year following the calendar year reported which shall contain the following information:
  - a) the monthly and annual quantities in cubic metres of fresh water obtained from all sources;
  - b) the monthly and annual quantities in cubic metres of each and all Waste discharged;
  - c) the location and direction of flow of all Waste discharged to the water or the land;
  - d) a summary of the monthly and annual quantities of Waste stored on site and transported off site;
  - e) the results of sampling carried out under the “Surveillance Network Program”;
  - f) a summary of any Modifications carried out on the Water Supply Facilities and Sewage Treatment Facilities, including all associated structures;
  - g) a list of any spills and unauthorized discharges;
  - h) details on the restoration of any Sumps;
  - i) a summary of any abandonment and restoration work completed during the year and an outline of any work anticipated for the next year;

- j) a summary of any studies requested by the Board that relate to Waste disposal, water use, or reclamation, and a brief description of any future studies planned;
  - k) notation of updates and/or revisions to the approved Spill Contingency Plan, Waste Disposal Facilities operations and maintenance plan, and sewage treatment plan;
  - l) an outline of any spill training and communications exercises carried out; and
  - m) 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 this Licence, submit to the Board for approval a map or drawing indicating the location of all Surveillance Network Program sampling stations.
  5. The Licensee shall, within thirty (30) days of the issuance of this 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.
  6. Any meters, devices or other such methods used for measuring the volumes of water used or Waste disposed and discharged shall be installed, operated and maintained by the Licensee to the satisfaction of an Inspector.
  7. The Licensee shall immediately report to the 24 Hour Spill Report Line (**867-920-8130**) any spills which are reported to, or observed by, the Licensee within the project boundaries.
  8. 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.
  9. 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.

10. Within thirty (30) days of issuance of this Licence, the Licensee shall have posted and shall maintain a security deposit in the amount of Two Million (\$2,000,000.00) Dollars pursuant to Section 17 of the *Act* and Section 12 of the Regulations, in a form suitable to the Minister. The security deposit shall be maintained until such time as it is fully or in part refunded by the Minister pursuant to Section 17 of the *Act*.
11. 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. The daily quantity of water used for all purposes shall not exceed 150 cubic metres.

**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 Waste Disposal 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 lagoon shall be directed to the channel of the Mackenzie River at a location approved by an Inspector.
5. There should be no discharge of floating solids, garbage, grease, free oil or foam.

6. All effluent discharged by the Licensee from the Sewage lagoon at "Surveillance Network Program" Station Number 1834-1 shall meet the following effluent quality requirements:

Sample Parameter	Average Concentration
BOD <sub>5</sub>	70.0 mg/L
Total Suspended Solids	70.0 mg/L
Faecal Coliforms	1 X 10 <sup>4</sup> CFU/dL
Oil and Grease	5.0 mg/L
Total Residual Chlorine (TRC)	0.1 mg/L

7. The effluent discharged shall have a pH between six (6) and nine (9) and no visible sheen of oil and grease.
8. Introduction of water to Waste for the purpose of achieving effluent quality requirements in Part D, Item 7 is prohibited.
9. A Freeboard limit of 1.0 metre shall be maintained at all times in the Sewage lagoon, or as recommended by a qualified Geotechnical Engineer and/or as approved by the Board.
10. The Licensee shall advise an Inspector at least five (5) days prior to initiating and decant of the Sewage lagoon.
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.
12. The Licensee shall contain all contaminated soil or contaminated snow in such a manner as to minimize the potential for migration of contaminants into any Waters, to the satisfaction of an Inspector.
13. The Licensee shall store, segregate and dispose of all solid and hazardous Wastes in a manner acceptable to the Inspector.
14. Unless authorized by this Licence, the Licensee shall ensure that any Wastes associated with this undertaking do not enter any water body.
15. The Licensee shall submit to the Board a copy of each agreement(s) between third parties to store, transport or dispose of Wastes. The copy submitted to the Board shall include, at a minimum, the following:

- a. type of Waste;
- b. quantities of Waste;
- c. disposal location(s), and
- d. proof of acceptance from third parties.

**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 the 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 F, 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 issuance of this Licence an updated Emergency Response & Spill Contingency Plan in accordance, for example, with the *Guidelines for Spill Contingency Planning, April 2007*, developed by AANDC-Water Resources Division.

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 unauthorised 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.

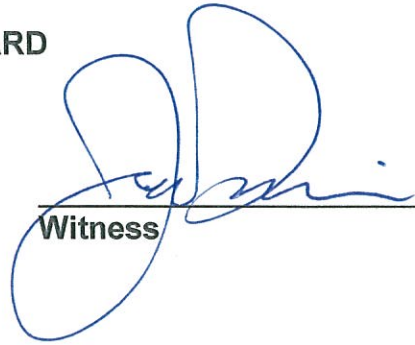
**PART G: CONDITIONS APPLYING TO ABANDONMENT AND RESTORATION**

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 plans for the abandonment and restoration of the Sewage lagoon and a complete Phase II environmental site 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.
2. The Licensee shall implement this Plan as and when approved by the Board.
3. Following approval of the Plan, the Licensee shall review the 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**

  
\_\_\_\_\_  
**Chairman**

  
\_\_\_\_\_  
**Witness**

## NORTHWEST TERRITORIES WATER BOARD

**LICENSEE:** Shell Canada Energy  
**LICENCE NUMBER:** N7L1-1834  
**EFFECTIVE DATE OF LICENCE:** July 18, 2012  
**EFFECTIVE DATE OF SURVEILLANCE NETWORK PROGRAM:** July 18, 2012

### SURVEILLANCE NETWORK PROGRAM

#### A. Location of Sampling Stations

<u>Station Number</u>	<u>Description</u>
1834-1	Discharge from the Sewage lagoon.

#### B. Sampling and Analysis Requirements

1. Water at Station Number 1834-1 shall be sampled prior to, and once during decanting. Each sample shall be analyzed for the following parameters:

BOD5	Total Suspended Solids
Oil and Grease	Faecal Coliforms
Ammonia	pH
Phosphorous	Total Residual Chlorine

2. More frequent sample collection may be 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 analysis shall be performed in a laboratory approved by an Analyst.
5. The Licensee shall, by August 17, 2012, 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.

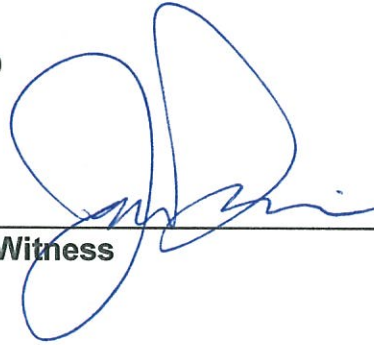
**C. Reports**

1. The Licensee shall, within thirty (30) days following the month of discharge from the Sewage lagoon, submit to the Board and an Inspector all data and information required by the "Surveillance Network Program" including the results of the approved Quality Assurance/Quality Control Plan.

**NORTHWEST TERRITORIES WATER BOARD**



Chairman



Witness

**Northwest Territories Water Board  
Reasons for Decision**

Issued pursuant to section 26 of the  
*Northwest Territories Waters Act, S.C. 1992 C.39*

Water Licence Number: N7L1-1834(Type B)

This is the decision of the Northwest Territories Water Board (Board) for the issuance of Water Licence N7L1-1834. The project is located at Latitude 69°12'30" North and Longitude 135°06'04" West in the Northwest Territories.

The Northwest Territories Water Board issued Licence N7L1-1834 in accordance with Section 14 of the *Northwest Territories Waters Act*.

**Background:**

Shell Canada Energy applied to the Board on March 5<sup>th</sup>, 2012 for a Water Licence for Farewell Camp and Stockpile Site (Camp Farewell) in the Mackenzie Delta. The Board deemed the application complete on May 23, 2011.

Canadian Environmental Assessment Act (CEAA)

The Water Licence application was exempt from the Canadian Environmental Assessment Act under Section 7(1)(a), specifically under Schedule 1, Part 1, Section 3(a) of the Exclusion List Regulations.

Environmental Impact Screening Committee (EISC)

On April 20, 2012 the Board received an official notification from the Environmental Impact Screening Committee that determined the application met the definition of development and that it was exempt from the screening process, as it qualified under exclusion #1 of Environmental Impact Screening Guidelines, Appendix C.

Notice of Application

In accordance with rule 38 of the Board Rules of Procedure, the Board gave notice of the application for a Water Licence regarding Camp Farewell, on May 28, 2012 in News North in English, May 31, 2012 in the Inuvik Drum in Inuvialuktun, and May 25, 2012 in L'Aquilon in French.

Reviewers' Comments

The Board sent the Water Licence application and supporting information for review to the following agencies: AANDC-NMDO, AANDC-WRD, EC, DFO and GNWT-ENR on May 23, 2012. The Board received written comments from AANDC (June 15, 2012), EC (June 15, 2012), DFO (May 28, 2012) and GNWT-ENR (June 14, 2012).

The Board considered all submitted comments at a Board meeting held via teleconference on July 10, 2012. The Board approved a Water Licence for the applicant's review. The Licence was submitted to the applicant on July 11, 2012 and it indicated in its response on July 16, 2012 that the Licence was acceptable.

**Requirements of the Northwest Territories Waters Act:**

Shell Canada Energy has provided the Board with its Schedule III application and supporting information for its consideration as required by section 16 of the *Northwest Territories Waters Act*.

The Board is in accordance with Paragraph 14(4)(a) of the *Northwest Territories Waters Act* by ensuring that the granting of the Water Licence to Shell Canada Energy will not adversely affect, in a significant way, any existing Licensee, providing the conditions of Water Licence N7L1-1834 are met. There are no other applicants with precedence.

The Board does not believe that any users nor persons listed in Paragraph 14(4)(b) of the *Northwest Territories Waters Act* will be adversely affected by the use of waters or the deposit of waste proposed by the Licensee provided that the Licensee operates in accordance with the terms and conditions of Water Licence N7L1-1834.

The Board is of the view that compliance with Water Licence N7L1-1834 terms and conditions will ensure that the waste will be treated and deposited in a manner that will maintain water quality in the area and will be consistent with applicable water quality standards in accordance with Sub-Paragraph 14(4)(c) (i) of the *Northwest Territories Waters Act*.

The Board drafted the terms and conditions of Water Licence N7L1-1834 in accordance with Section 15 of the *Northwest Territories Waters Act*.

In Accordance with Sub-Section 17(1) of the *Northwest Territories Waters Act*, the Board requested that a security deposit in the amount of two million dollars (\$2,000,000.00) be posted and shall be maintained in a form suitable to the Minister of Aboriginal Affairs and Northern Development Canada.

**Decision to issue Water Licence N7L1-1834:**

The Board has reviewed the Camp Farewell Project Application and draft Water Licence N7L1-1834 for issuance. Upon consideration of the facts and circumstances, the purpose, scope and intent of the *Northwest Territories Waters Act*, the Board has determined that it can issue Water Licence N7L1-1834.

For the above reasons the Board has determined to issue Water Licence N7L1-1834 in accordance with Sub-Section 14(1) and Sub-Paragraph 14(6)(b)(i) of the *Northwest Territories Waters Act* for the use of water and the deposit of wastes.

**SIGNED** this 18 day of July, 2012 on behalf of the Northwest Territories Water Board.



**Eddie Dillon**

**Chairperson, Northwest Territories Water Board**

## APPENDIX VI

### Previous Environmental Reports

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## **I-1 PREVIOUS ENVIRONMENTAL SITE ASSESSMENT PROGRAMS**

### **I-1.1.1 2000**

In 2000, Golder and Associates (Golder) conducted a baseline environmental assessment of the Site and Geco-Prakla, a division of Schlumberger Canada, conducted a baseline assessment prior to sub-leasing a portion of the Site from shell. The area of the sub-lease included the main camp accommodations, associated accommodation trailers, the lagoon area and the area south of the storage crates and racks (including Shed #1), and extended to the east of the lease (Worley Parsons, 2011).

### **I-1.1.2 2001**

Phase I and Phase II Environmental Site Assessments (ESAs) were conducted by Komex in 2001. Analyzed parameters reported to exceed applicable guidelines included: total petroleum hydrocarbons (TPHs), polycyclic aromatic hydrocarbons (PAHs), and selected trace metals within (and down gradient of) the burn pit; xylenes and TPHs in the area of the tank farm and the area of the historical tank release; TPHs and barium concentrations from surface stained areas and throughout the gravel base pad; and electrical conductivity (EC) and pH on the base pad where mud additives were reportedly stored.

In addition, two background samples were collected from locations located to the northeast of the Site; one situated in native tundra (organic soil) and the second located on the gravel airstrip (mineral soil). Salinity parameters, including EC (180 to 360 uS/cm), pH (6.3 to 8.0) and sodium adsorption ratio (SAR) (0.9 to 1.1) were reported within the applicable guidelines for residential/parkland and industrial land uses for both locations. Concentrations of metals parameters were reported below applicable guidelines (WorleyParsons Komex, 2006).

Following the ESAs conducted in 2001, Komex submitted an Interim Abandonment and Restoration Plan to the NWTWB (Komex, 2002).

### **I-1.1.3 2006**

A more detailed Phase II ESA was conducted by WorleyParsons Komex in 2006. The purpose of the additional Phase II ESA was to further delineate previously identified soil impacts and to identify potential groundwater impacts.

Two background soil and groundwater sample locations were established and tested to the northeast of the Site, in areas not likely to have been affected by historical operations. Background soil locations were advance to 0.4 m bgs, to the depth of permafrost. Findings for the background soil and groundwater locations indicated concentrations of hydrocarbons which were attributed to naturally occurring organic material. Salinity parameters EC, pH, and SAR were reported at 251 uS/cm, 6.7, and 0.6, respectively, within and/or below applicable guidelines (WorleyParsons Komex, 2006). Metals parameters were not analyzed.

Hydrocarbon impacts were identified in the vicinity of the burn pit, tank farm, above ground fuel storage tanks, and across the gravel pad including the perimeter. Salinity and barium impacts were identified on the gravel pad (WorleyParsons Komex, 2006).

#### **I-1.1.4 2008**

WorleyParsons submitted a second Interim Abandonment and Restoration Plan in 2008 following the 2006 Phase II. A summary of the 2006 results were included as well as specific Progressive Reclamation Plans to be conducted in 2009 and 2010 (WorleyParsons, 2008).

#### **I-1.1.5 2010**

WorleyParsons submitted an updated Interim Abandonment and Restoration Program Report that described the activities that were conducted in 2008 and 2009 (WorleyParsons, 2010).

IEG also summarized the 2008 and 2009 Site activities in the 2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report (IEG, 2010). The 2006 Phase II ESA results were summarized, and the remediation activities were described in detail, including the sampling schedule and results.

#### **I-1.1.6 2012**

IEG conducted required Site inspections and collected water samples from the lagoon. Site inspections indicated no sign of spills, leaks, and animal or human activity on the Site. Laboratory analytical results for water samples reported values below applicable guidelines and lagoon water was subsequently discharged to the Mackenzie River in accordance with licence number N7L1-1762 (IEG 2012b, IEG 2013a, and IEG 2013b).

#### **I-1.1.7 2013**

In 2013, IEG conducted a remediation program at the former lagoon at Camp Farewell. The lagoon excavation was located on the west side of the camp building with the Mackenzie River bordering the south and east sides. The dimensions of the excavation were approximately 52 m by 34 m. The maximum depth of the excavation was approximately 7.5 m. Prior to remedial activities, the lagoon had a depth of approximately 2.5 m. Domestic waste debris was observed in the excavated material, including metal cans, fragments, and plastic debris. Water supply facilities and sewage treatment facilities were also decommissioned and removed during the 2013 Remediation Program.

A total of 96 soil samples were taken from the lagoon excavation: 25 interim soil samples and 71 confirmatory soil samples.

Petroleum Hydrocarbon (PHC) affected soil resulting from previous operations was effectively removed from the lagoon area during the 2013 Remediation Program based on laboratory analytical data. Approximately 1,900 m<sup>3</sup> of excavated soil was barged to Hay River and hauled to and disposed at the Tervita Rainbow Lake Landfill in Rainbow Lake, AB. The last load of the barged impacted soil arrived at the landfill on October 16, 2013. Approximately 100 m<sup>3</sup> remained on-site in a secured metal shed, to be barged to the landfill during 2014 decommissioning activities (IEG, 2014).



### I-1.1.8 2014

In 2014, Shell retained IEG for environmental supervision of the 2014 Decommissioning Program, conducted between August 7, 2014 and September 18, 2014.

Infrastructure and materials were decommissioned and removed strategically and required the use of equipment including a back hoe, bull dozer, skid steer, and loaders. Shed #2, Shed #3, and the camp building were disassembled. Materials that could be recycled such as metals were separated from debris and waste material, for shipment to appropriate facilities.

On August 13, 2014, two barges loaded with approximately 410 rig mats, three loaders, a hydro vac truck, and miscellaneous materials including office furniture, scrap metal, and piping, departed the Site for Hay River. Additional barges arrived at Site in late August for transport of the remaining infrastructure and materials. Materials to be barged included scrap metal, cable wire, assorted hoses, assorted pieces of pipe, five gallon pails of nuts, bolts and screws, pieces of conduit, steel caps, pup joints, tarps, rolls of polyliner, absorbants, steel skis for sleighs, large drums of jet fuel and engine oil, and assorted chemicals in small quantities. Approximately 18 m<sup>3</sup> of remaining waste soil from the 2013 remediation program was packed into soil bags or wooden crates and also loaded on the barge.

Wood materials containing no paint or contaminants were burned in a burn pit located on the southeast corner of the Site.

Remaining contents of the tank farm on-Site were transferred with a pump to a small portable AST. ASTs at the on-Site tank farm are currently empty.

Following the 2014 Decommissioning Program, the following facilities remain at the Site:

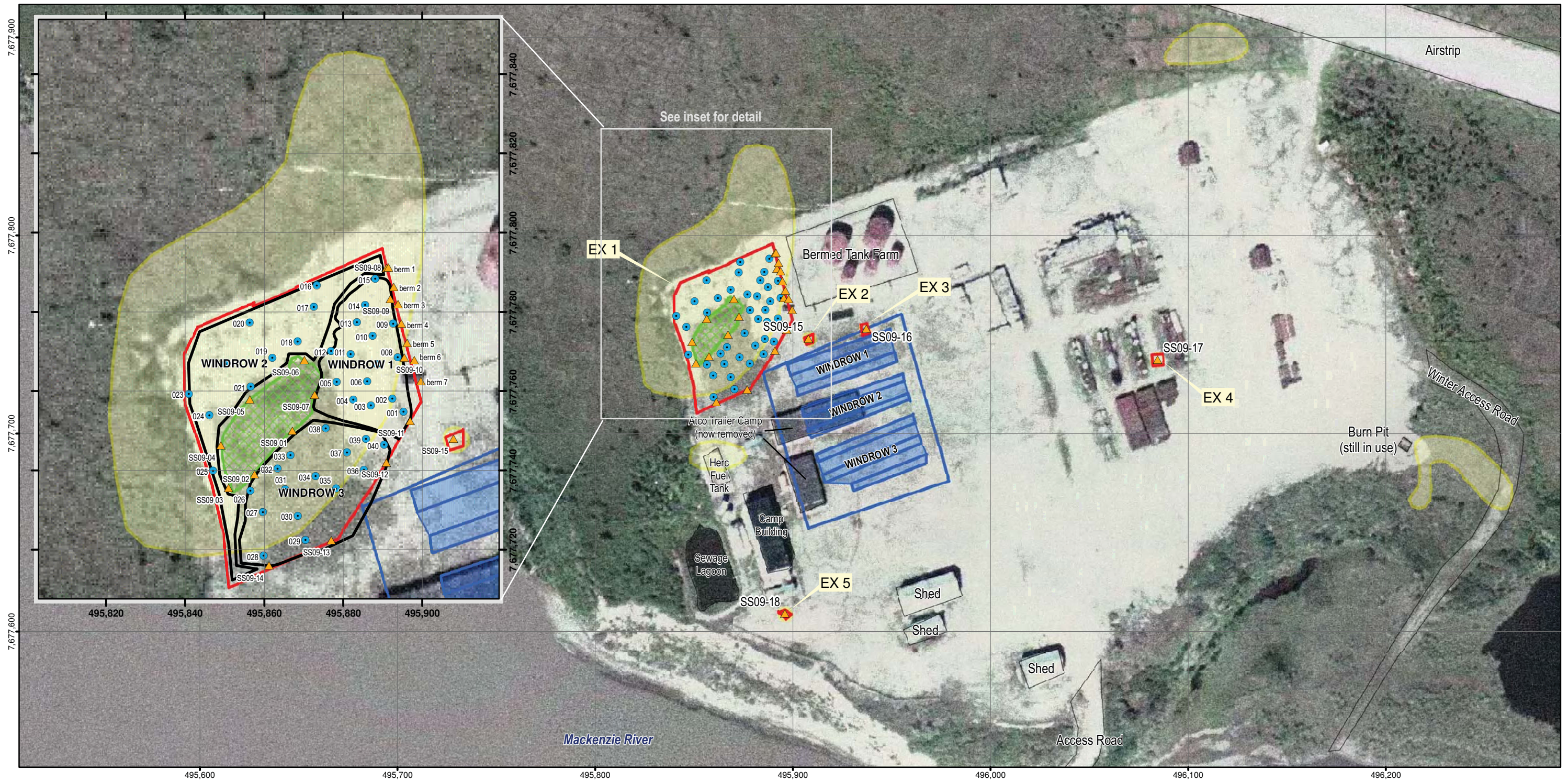
- bermed tank farm with five tanks;
- fuel trailer;
- one storage shed (shed #1);
- a burn pit area containing an open top metal bin for incineration of construction debris; and,
- the airstrip (occasionally aviation fuel has been stored in tanks on the airstrip for regional helicopter operations).

As a result of minor investigative sampling conducted on August 14, 2014, PHC parameters F2 and F3 were identified as contaminants in the dirt floor of Shed #1. Further investigation was recommended in this area during the 2015 Environmental Site Assessment (ESA).

## **APPENDIX VII**

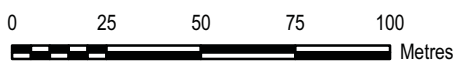
### **IEG 2009 Remediation Site Diagram**

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**NOTES**

- Horizontal Datum: NAD83
- Grid Zone: UTM ZONE 8
- Vertical Datum: MEAN SEA LEVEL
- Scale: 1 : 2,000



- ▲ July Sampling Locations
- September Sampling Locations
- Camp Infrastructure
- Excavated Extent
- Unexcavated Vegetated Extent
- Original Windrows
- Consolidated Windrows
- Interpreted Spill Extent (WPK, 2006)
- Backfilled Areas

Sources:

- Indian and Northern Affairs Canada, (2005) Mackenzie Delta and Valley Airphoto Mapping Program. OrthoTile 490767. 1:30,000. Yellowknife, NWT.
- WorleyParsons Komex (WPK) and IEG Consultants Ltd (2006) 2006 Environmental Site Assessment, Camp Farewell NT.

**NOT FOR CONSTRUCTION**

TO BE READ WITH IEG REPORT DATED: DEC 2009

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.	<b>Shell Canada Energy</b>	<b>CAMP FAREWELL MAINTENANCE</b>	
		<b>Petroleum Hydrocarbon Remediation - 2009</b>	
		PROJECT No.	FIG No.
		A04012A01	FIGURE 2

Thursday, December 17, 2009 10:06:20 PM \\A04012A01 - Camp Farewell.maintenance\400 Design\GIS\2009\Summer\Work\1117.mxd

# **APPENDIX VIII**

## **IEG 2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report- Draft**

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**Shell Canada Energy**

**2009 Camp Farewell Hydrocarbon  
Impacted Soil Remediation Report –  
*DRAFT***

A04012A01





February 24, 2010

Shell Canada Energy  
400 - 4th Street SW  
PO Box 100, Station Main  
Calgary, Alberta  
T2P 2H5

**Mr. Randall Warren**

Dear Mr. Warren;

**2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report**

Please find enclosed two hard copies of IEG Consultants Ltd. report entitled, *2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report*. A PDF electronic copy of the same report has been delivered on a CD with these hard copy reports.

Your comments or questions regarding this report are welcomed and you can contact Sam Bird ([sbird@ieg.ca](mailto:sbird@ieg.ca) or 403-731-6851) at your convenience.

Yours truly,

**IEG CONSULTANTS LTD.**

Sam Bird, B. Sc.  
Project Manager

100210R2 Camp Farewell PHC Soil Remediation\_PDF.doc  
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# **Shell Canada Energy**

## **2009 Camp Farewell Hydrocarbon Impacted Soil Remediation Report - *DRAFT***

February 2010

## EXECUTIVE SUMMARY

IEG Consultants Ltd (IEG) was retained by Shell Canada Energy (Shell) to provide on-site supervision and support for clean-up activities at the Camp Farewell staging site located on the Mackenzie Delta in the Kendall Island Bird Sanctuary at 69° 12' 30.0" N latitude, 135° 06' 04.4" W longitude, approximately 110 km northwest of Inuvik, Northwest Territories (Figure 1).

The objectives of the 2009 clean-up program were to remove stockpiled supplies, conduct building maintenance and remediate hydrocarbon impacted soils from within the site's gravel pad. The remediation program was designed by WorelyParsons and carried out by Hazco and IEG. The objective of this report is to describe activities involving the remediation of hydrocarbon impacted soils that took place from July to September 2009.

An Environmental Site Assessment (ESA) conducted in 2006 identified hydrocarbon impacted soil at several locations on the gravel pad and on adjacent tundra. The 2009 remediation program targeted the treatment of soil from the gravel pad at a historical fuel spill area (excavation 1) and at small localized impacts near the tank farm and camp day tank (excavations 2 through 5) (Figure 2).

Approximately 1300 m<sup>3</sup> of hydrocarbon impacted soil was excavated from the historical spill area on the gravel pad and placed in a treatment cell to be remediated. Soil was generally excavated to a depth where a geomembrane of polyurethane foam insulation was encountered. The soil in the treatment cell was placed in windrows, aerated with an Allu bucket and treated with an oxidizing compound called RegenOx. RegenOx was also added to the base and sidewalls of the main open excavation to encourage the remediation of residual hydrocarbons near the geomembrane. Following the final application of RegenOx to the windrows, the soil was placed back into the excavations.

Soil samples were collected for analysis of BTEX and F1 to F4 hydrocarbons midway through the treatment process and approximately six weeks following replacement of soil in the excavations. Laboratory analysis indicates that BTEX and F1 hydrocarbon concentrations were reduced and are below Government of the Northwest Territories (GNWT) Contaminated Site Remediation (CSR) guidelines for industrial and residential/parkland land use sites. Fraction 2 hydrocarbon concentrations in approximately 600 m<sup>3</sup> of soil backfilled in excavation 1 remain above GNWT CSR industrial and residential/parkland guidelines while fraction 3 hydrocarbons exceed only the residential/parkland land use guidelines (Table 3).

An attempt was made to treat soil at the side of excavation 1 in situ (along the west side of the tank farm berm). However, hydrocarbon concentrations in soil along west side of the tank farm berm likely remain above GNWT CSR industrial guidelines.



pH levels of treated soil measured following treatment indicate that the soil is basic, ranging from pH 9.78 to pH 9.97 and is above industrial and residential/parkland guidelines (pH 6-8). Both sulphate and sodium concentrations from the treated soil were elevated these elevated concentrations resulted in electrical conductivity (EC), pH and sodium adsorption ratios (SAR) above industrial and residential/parkland land uses (Table 4).

IEG recommends that EC, SAR and pH levels in the treated soil be monitored and compared to untreated hydrocarbon impacted soil to determine the source of the elevated sodium and sulphate concentrations.

DRAFT

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## 1. INTRODUCTION

Camp Farewell is a gas exploration base camp and staging area located within the Inuvialuit Settlement Region (ISR) in the Kendall Island Bird Sanctuary (KIBS), Northwest Territories at latitude 69° 12' 30.0" N, longitude 135° 06' 04.4" W. Camp Farewell is on the northeast bank of the Middle Channel near Harry Channel, approximately 109 km northwest of Inuvik and approximately 85 km west of Tuktoyaktuk (Figure 1).

Camp Farewell has been used by Shell as a base camp and staging area for over thirty years. A Phase II environmental site assessment (ESA) was conducted in 2006 by WorleyParsons Komex and IEG Consultants Ltd (IEG). The ESA identified petroleum hydrocarbon (PHC) concentrations in soil exceeding applicable guidelines in several areas of the gravel pad and adjacent tundra (WorelyParsons Komex, 2006a). The areas interpreted as impacted soil are shown in Figure 2. An Interim Abandonment and Restoration Plan for the site were developed by WorleyParsons Komex in 2006 as required by the existing Northwest Territories Water License N7L1-1762 (WorelyParsons Komex, 2006b).

In 2009, Shell Canada Energy undertook a program to clean-up Camp Farewell. The program involved removal of stockpiled supplies, building maintenance and remediation of hydrocarbon impacted soil as specified in a July 6, 2009 memorandum from WorleyParsons (Appendix I). IEG was retained by Shell Canada Energy to provide on-site supervision and support for the 2009 clean-up activities. This report describes the hydrocarbon impacted soil remediation work undertaken during the summer of 2009.

## 2. SITE DESCRIPTION

Camp Farewell is located on a small plateau in the outer Mackenzie Delta. The surrounding area is tundra composed of peat and low lying shrubs. The site consists of a gravel pad of approximately 6.5 ha, a gravel airstrip and two access roads from the Middle Channel of the Mackenzie River to the pad. The majority of the gravel pad is approximately 0.5 m to 0.7 m thick and was constructed on a foam and fibre geomembrane which overlays native tundra.

Existing infrastructure at Camp Farewell includes a two storey 32 man camp, a large mechanical garage, two storage sheds, fuel storage for the camp, a disused sewage lagoon and a disused bermed petroleum tank farm.

## 3. ASSESSMENT GUIDELINES

The site is remote and currently used for industrial purposes with occasional use of the camp facilities. The treated soils are coarse-textured sands and gravels and are surface soil less than 1.5 m deep (WorleyParsons Komex , 2006a).

The regulatory guidelines used for comparison in this report are as follows:

- **Hydrocarbons, salinity, sodicity and pH:** Coarse surface soils for an industrial land use (GNWT, 2003). The applicable exposure pathways are eco soil contact and protection of groundwater for aquatic life.

Although industrial land use guidelines are applied, future environmental assessments may require the use of other guidelines. Residential/parkland guidelines have also been included for comparison. In particular, residential/parkland land use guidelines may apply following site decommissioning.

## **4. SOIL REMEDIATION PROGRAM**

### **4.1 Areas of Hydrocarbon Impacted Soil**

The areas of hydrocarbon impacted soils at Camp Farwell were identified during the 2006 Phase II ESA (WorleyParsons Komex, 2006a). The ESA identified four main areas of hydrocarbon impacted soil (Figure 2):

- Historical fuel spill (adjacent to west side of the existing tank farm), containing toluene, xylenes and F1 to F4 hydrocarbons;
- Tundra area close to the airstrip access road the between the gravel pad and the airstrip containing toluene and F2 to F4 hydrocarbons;
- New fuel spill area (adjacent to west and east side of existing “Herc” tank northwest of the camp building) containing F2 and F3 hydrocarbons; and,
- The burn pit area containing ethylbenzene, F1 and F2 hydrocarbons as well as other compounds.

Four small, localized areas of impacted soil (approximately 9 m<sup>2</sup> to 16 m<sup>2</sup>) were also identified (Figure 2).

- Outside the southwest corner of the tank farm containing F3 hydrocarbons and barium;
- Midway along the south berm of the tank farm containing toluene, ethylbenzene, xylenes, and F1 to F3;
- On the pad area between former storage racks containing F3 hydrocarbons; and,
- Near the camp building day tank containing F2 hydrocarbons.

### **4.2 Hydrocarbon Impacted Soil Treatment**

Hydrocarbon impacted soil from portions of the gravel pad at Camp Farewell was excavated, treated within an on-site treatment cell and used to backfill the excavations

following treatment. WorelyParsons designed the remediation program and outlined the specifications in a July 6, 2009 memorandum to the prime contractor (Hazco), Shell, and IEG (Appendix I). Deviations from the memorandum are outlined in an IEG memorandum from July 17, 2009 (Appendix I).

As part of the strategy, approximately 3,300 m<sup>2</sup> of the historical fuel spill area was excavated. Only unvegetated portions of the area located on the gravel pad were excavated. Based on sampling results, a vegetated island on the gravel pad within the suspected plume was determined to be free of contamination and was not excavated. Portions of the spill located on healthy, well vegetated tundra were not excavated. The eastern extent of the excavation was limited to avoid damage to the integrity and liner of the berm at the tank farm. An area of soil approximately 2.5 m x 32 m between the historical fuel spill excavation and the western tank farm berm was left in place to maintain stability of the berm.

Only impacted areas on the gravel pad were targeted for remediation in 2009. Areas where hydrocarbon impacts were identified within native tundra (at the historic fuel spill area and between the pad and the airstrip) were left untouched.

The impacted soil around the Herc tank and new spill area was not excavated because the tank is currently in use and there were concerns that work in the area would have the potential to damage infrastructure.

Impacted soil around the burn pit was not excavated because the burn pit is still in use. It was determined that the best course of action is to remediate this area following the active service life of the burn pit.



Soil from the four small impacted areas were excavated, treated in the treatment cell and used as backfill in the excavations.

### **4.3 Soil Sampling Methodology**

Soil samples were collected from the soil undergoing treatment twice during the remediation program to monitor the progress of hydrocarbon degradation. Samples were collected either directly from the windrows or from the backfilled soil (locations on Figure 2).

Each soil sample was collected from approximately 0.5 m below the surface of the windrow using a dutch auger. The samplers wore new nitrile gloves and decontaminated the dutch auger with Alconox soap, methanol and distilled water between composite sampling locations to avoid cross contamination of the samples.

Approximately four samples were taken for each 200 m<sup>3</sup> of soil undergoing treatment. The discrete samples were placed in new, laboratory supplied ziplock bags and glass jars with Teflon lined lids and minimum headspace. Samples were analysed at the laboratory for volatile hydrocarbons (BTEX and F1) from the glass jars. Soil from within the bags was used to field screen volatile organic compounds using an RKI Eagle organic vapour analyzer (OVA) with methane elimination mode turned on. For each group of four discrete samples, the corresponding jarred sample with the highest OVA reading was sent for analysis of BTEX and F1 hydrocarbons.

Following field screening, soil from the bagged samples was blended to form composite samples for laboratory analysis of non-volatile hydrocarbons. Soil from four discrete samples was blended to form a composite sample representing approximately 200 m<sup>3</sup>. Following blending, the composite samples were then placed in appropriate glass jars

with minimum headspace and sent to the laboratory for analysis of F2 to F4 hydrocarbons.

While most mid-treatment samples were taken directly from the windrows, samples from Windrow 3 were delayed during transport to the laboratory and were replaced by collecting new soil samples from the same windrow after it had been placed in the excavation. In this case, the soil was collected from depths of 0.1 m to 0.4 m below ground surface. Samples were kept as discrete and composite samples using the same methodology used for the windrows.

On September 16, approximately six weeks following placement of soil back into the excavations, 40 soil samples were collected from the historical spill area in order to characterise the post treatment conditions of the soil. The soil samples were collected following the same methodology described above. Eight discrete samples were analysed for BTEX and F1 hydrocarbons. Eight composite samples were analysed for F2 to F4 hydrocarbons. Five of the composite samples were analysed for pH and salinity parameters.

For each of the small excavations, confirmatory samples were a composite of soil taken from the four sides of the excavation. Where a liner was not encountered (near the day tank), the sample also contained material from the base of the excavation.

Confirmatory samples from excavation 1 were taken from a depth of 0 m to 0.5 m around the vegetated island and along southern and western walls.

Samples for analytical analysis were shipped to Maxxam Laboratories in Edmonton.

#### **4.4 Ex Situ Remediation Methodology**

The methodology followed for ex situ hydrocarbon contaminated soil remediation is outlined in the July 6, 2009 memorandum from WorleyParsons to the prime contractor (Hazco), Shell, and IEG (Appendix I). Areas of hydrocarbon contaminated soil were excavated to a depth where impacts were below criteria or until a geomembrane was encountered (generally 0.5 m to 0.7 m), placed in windrows in a bermed treatment cell and aerated with an Allu bucket (Photograph 1). The treatment cell was located between the tank farm and the camp accommodation building.

Following the initial aeration, the soil was treated with a two part hydrocarbon oxidizing agent called RegenOx. The RegenOx was added to the windrows following the manufacturer's instructions (Photograph 2). Part B of the oxidizing agent (the activator complex) was mixed with water and sprayed on each of the windrows. The windrow soils were then mixed using the Allu bucket and Part A (the oxidizing agent supplied as a powder) was distributed over the surface of the windrows. The Part A was then mixed into the windrows with the Allu bucket (Photograph 3). After mixing of both Part A and Part B into the soil on July 24 and 25, 2009, water from a nearby lake was applied to the windrows until the soil was saturated to a point where water pooled on the surface of the soil (Photograph 4). Water was generally applied to the windrows daily to maximize the moisture content of the windrows.

To complete the process, RegenOx was added to the windrows a second time following the same procedures between July 29 and August 1. For the second application, water was not added to the windrows after the final pass with the Allu bucket. Instead, the soil was placed as backfill in the excavations. The areas where each windrow was placed were mapped using a GPS (Figure 2). Following placement of the soil back in the

excavations, water was pumped onto the surface of the main excavation at the historic fuel spill area until water pooled on the surface.

#### **4.5 In Situ Surface Treatment Methodology**

Parts A and B of RegenOx were added to the base of the historic fuel spill excavation on July 24 and July 25, 2009 to deal with residual hydrocarbon impacts near the geomembrane. The RegenOx was mixed into the upper layer of base soils using a metal drag pulled behind an all terrain vehicle. For areas where the drag was ineffective, or might damage the geomembrane, hand rakes were used to mix the RegenOx into the soil. Approximately 3000 L of water was applied to the base of the excavation to increase moisture content and in an attempt to leach some of the RegenOx through the foam and fibre geomembrane into the underlying soil.

#### **4.6 In Situ Subsurface Treatment Methodology**

The subsurface in situ system was primarily set up to determine the mechanical effectiveness and limiting factors that this sort of system may encounter at the site. Observations and discussion on the findings are in Section 5.3.

Using equipment and supplies available on-site, aqueous solutions of Part A and Part B RegenOx were applied through subsurface piping to the shallow subsurface soils located between the historical fuel spill excavation and the west side tank farm berm. An area of soil approximately 2.5 m x 32 m was left in place between the toe of the berm and the excavation to maintain the stability of the berm. A shallow trench was dug approximately 0.4 m deep and 1 m from the toe of the berm (Photograph 5 and Photograph 6). Seven bagged samples (berm 1 to berm 7) were collected from the base of the trench to field screen with the OVA. Perforated 50 mm PVC pipe was placed at the base of the trench. The three meter sections of perforated pipe were alternating lengths of factory produced

size 0.020 slotted pipe and solid pipe that was perforated on-site with 7 mm holes drilled through it at approximately 100 mm intervals (Photograph 7). The perforated pipe was attached to four vertical pipes which rose to approximately one meter above grade. The trench was backfilled with soil and solutions of Part A and Part B were added via the vertical pipes. The piping system was flushed with water following the application of each RegenOx solution.

**Table 1:** Subsurface Application of RegenOx in situ

Date	Part	# of Pails	Volume of solution	Volume of flushing water	Notes
July 26	B	4	1600 L	700 L	Some water surfacing at 2 points.
July 26	A	2	1100 L	300 L	1/3 <sup>rd</sup> added to surface due to saturation/preferential surfacing of solution.
Aug 1	B	2	600 L	200 L	Solution surfacing after ~300 L of water added. Shallow trench and berm dug to impound surface water at location. Vigorous reaction at surface.
Aug 3	A	2	600 L	100 L	Same as Aug 1. The horizontal pipe was exposed with a shovel. The RegenOx was observed to be flowing freely through the perforations.

The vertical pipes were removed following the final application of RegenOx. The perforated pipe within the trench was left in place.

## 5. RESULTS AND DISCUSSION

Analytical results for samples taken from excavation walls and the treated soils are summarized in Tables 3 and 4.

### 5.1 Historical Fuel Spill Area

Laboratory results from soil samples collected during mid treatment (early August) and post treatment (mid September) reported a slight decrease in hydrocarbon concentrations. However, concentrations of F2 hydrocarbons remain above NWT industrial and

residential parkland guidelines for soils treated in Windrow 1. The same soil contained concentrations of F3 hydrocarbons below industrial guidelines but above residential/parkland guidelines.

Results for one soil sample from Windrow 2 reported an F2 hydrocarbon concentration above industrial and residential/parkland guidelines. All remaining hydrocarbon parameters from soil samples collected from Windrows 1 and 2 were below the applicable guidelines for both land uses. All reported hydrocarbon concentrations from Windrow 3 were below NWT guidelines for industrial and residential/parkland land uses (Table 3).

To determine if the treatment strategy was effective, there are a number of sample location results from the 2006 ESA that may be used to compare pre-treatment hydrocarbon exceedance characteristics. Soil sample S06-23 was taken from near the northeast corner of the excavation and contained F2 concentrations up to 4220 mg/kg and F3 concentrations up to 3980 mg/kg (WorleyParsons Komex, 2006a). These results were greater than five times the highest 2009 post treatment analytical results. In 2006, soil sample S06-40 contained F2 concentrations up to 787 mg/kg and F3 concentrations up to 754 mg/kg (WorleyParsons Komex, 2006a). For this sample, the 2006 and post treatment 2009 results for F3 hydrocarbons are similar while the 2006 F2 result is 1.3 times higher than the highest post treatment 2009 result. The 2006 ESA had determined that a soil sample in this area contained xylenes and two samples contained toluene above guidelines (WorleyParsons Komex, 2006a). Analytical results for treated soils in 2009 reported concentrations of BTEX below NWT industrial and residential/parkland guidelines.

Confirmatory samples (SS09-01 to SS09-07) taken from 0 m to 0.5 m depths along the perimeter of the unexcavated vegetated island were below guidelines for BTEX and F1 to

F4 hydrocarbons (Table 3). This supports the field assessment that this 400 m<sup>2</sup> portion of vegetated pad material is not impacted by hydrocarbons.

Laboratory results from characterization samples (SS09-08 to SS09-10) taken from the eastern wall of the excavation adjacent to the tank farm berm reported concentrations of F2 and F3 hydrocarbons above both NWT industrial and residential/parkland guidelines with the exception of the F3 hydrocarbon concentration reported in SS09-08 below industrial guidelines but above residential/parkland (Table 3).

Two soil samples (SS09-11 and SS09-12) were collected from the southeast wall. Soil sample SS09-11 exceeded both industrial and residential/parkland guidelines while reported hydrocarbons in SS09-12 were below both land use guidelines. The excavation was not enlarged near these sample locations so that the integrity of the adjacent tank farm and treatment cell berms would not be compromised.

A reported F2 hydrocarbon concentration from soil sample SS09-14 collected from the south wall of the excavation exceeded both the industrial and residential/parkland land use guidelines. All other hydrocarbon parameters from this sample and SS09-15 were below the applicable guidelines for both land uses (Table 3).

Confirmatory soil sample SS09-15 was collected from excavation 2, approximately 12 m towards the southwest. Results from this sample were below guidelines for BTEX and F1 to F4 hydrocarbons, indicating that at least 30 m<sup>3</sup> of hydrocarbon impacted soil may remain between excavation 1, 2 and the tank farm berm. However, delineation of impacts in this area is incomplete.

## 5.2 Small Localized Excavations

Four small localized areas of hydrocarbon impacts were excavated and later sampled for BTEX and F1 to F4 hydrocarbons.

- Outside the southwest corner of the tank farm (Excavation 2);
- Midway along the south berm of the tank farm (Excavation 3);
- On the pad area between former storage racks (Excavation 4); and,
- Near the camp building day tank (Excavation 5).

All hydrocarbon concentrations were below industrial and residential/parkland guidelines for the samples taken from excavation 2 at the southwest corner of the tank farm (SS09-15) and excavation 5 at the day tank area (SS09-18).

Fraction 2 hydrocarbon concentrations exceeded both NWT industrial guidelines and residential/parkland for excavation 3 (SS09-16) south of the tank farm. Reported F3 hydrocarbon concentrations were below the industrial criteria but exceeded the residential/parkland guidelines. In excavation 4 in the storage area of the pad, reported concentrations of F3 hydrocarbons from soil sample SS09-17 were also below NWT industrial guidelines and above residential/parkland guidelines. All other hydrocarbon parameters were below the applicable guidelines for both land uses (Table 3).

After receiving initial laboratory results, both of these excavations were subsequently enlarged by 0.5 m on all four sides. The confirmatory samples from the sidewalls of the enlarged excavations were lost in transport between Camp Farewell and Canadian North's cargo facility. However, soil from the side walls of the enlarged excavations showed no visible signs of staining and low OVA readings.



### **5.3 In Situ Subsurface Treatment**

It was anticipated that the porous gravel soil on the pad would allow the solutions of RegenOx to be transmitted laterally through the soil. However, the primary observation from the installed system was that pathways of preferential flow developed from the perforated piping, through the backfilled soil, to the surface. The solution did not seep through the soil into the adjacent open excavation (less than two meters to the west).

Solutions of Part A and Part B RegenOx that pooled on the surface reacted vigorously for several hours after application and the resulting solution turned brown. A brown staining on the soil remained following infiltration/evaporation of the solution.

Laboratory samples were not collected from the area where soils were treated in situ. Field screening OVA results indicated that initial volatile hydrocarbon concentrations were similar along the length of the trench (10 ppm to 25 ppm).

### **5.4 Remediation Observations**

Following treatment, five soil samples from the ex situ treated soil were submitted and analysed for a salinity package. The reported pH results ranged from 9.78 to 9.97 and therefore exceeded the NWT guideline of pH 8 (Table 4). The elevated pH is a result of the high concentrations of sodium (up to 2600 mg/L) reported in the soil. The high concentration of sodium in the treated soil also impacted the sodium adsorption ratio (SAR). The SAR values reported from the treated soil exceed both the NWT industrial and residential/parkland land use guidelines.

Electrical conductivity (EC) from the treated soil was also elevated above industrial and residential/parkland land use guidelines. Reported EC results from the treated soil ranged from 3.7 dS/m to 8.7 dS/m. Only one sample from windrow 2 did not exceed the NWT

industrial guidelines. The elevated EC reported in the treated soil is a result of elevated concentrations of soluble sulphate (up to 770 mg/L).

Soil in this area was not characterized for salinity and sodicity parameters during the 2006 Phase II ESA (WorleyParsons Komex, 2006a) and soil samples were not submitted prior to treatment therefore the source of the elevated sodium and sulphate cannot be determined. However, material safety data sheets from the RegenOx indicate the active ingredient contains sodium.

## **5.5 Backfilling Excavations**

The backfill in the large excavation west of the tank farm was placed in approximately 0.5 m lifts over a newly placed woven geotextile. Placement in thinner, compacted lifts of 0.15 m to 0.3 m was not possible with the equipment available on-site. This, along with the geotechnical properties of the soil, resulted in a soft, uncompacted backfill. Heavy equipment on the newly backfilled pad caused visible deflection of the surface during and immediately following soil placement.

The original contours of the pad in this area were difficult to replicate during backfilling and some shallow ponding of water on the backfilled material was observed during the site visit on September 16, 2009. The areas of ponded water also displayed the same brown soil staining associated with soils that were treated in situ.

## **5.6 Treatment Summary**

The soil in the treatment cell was treated with aeration by approximately five passes of an Allu bucket and one complete treatment of RegenOx applied separately as parts A and B in two applications each.

Details of the soil treatment are shown in Table 2 below.

**Table 2:** 2009 Ex Situ Soil Treatment Summary Table

Location	Exc. # on Fig 2	Soil Volume Excavated & Treated	Soil Backfilled in Area	PHC Result below Guideline?	Industrial or Residential/ Parkland Guideline Exceedances
Historical Fuel Spill (On Pad)	1	410 m <sup>3</sup>	Windrow 1 Location (700 m <sup>2</sup> )	No	pH, salinity F1 and F2
		410 m <sup>3</sup>	Windrow 2 Location (1600 m <sup>2</sup> )	No	pH, salinity, F2
		440 m <sup>3</sup>	Windrow 3 Location (1000 m <sup>2</sup> ) 4 small excavations.	Yes	pH, salinity
Southwest Corner of Tank Farm	2	~ 8.4 m <sup>3</sup> (3 x 4 x 0.7 m)	Windrow 3 Location (12 m <sup>2</sup> )	Yes	pH, salinity
Midway Along South Side of Tank Farm	3	~ 10.5 m <sup>3</sup> (5 x 3 x 0.7 m)	Windrow 3 Location (15 m <sup>2</sup> )	Confirmatory samples missing	pH, salinity, formerly F2 and F3
Storage Area on Pad	4	~ 8.6 m <sup>3</sup> (3.5 x 3.5 x 0.7 m)	Windrow 3 Location (12.25 m <sup>2</sup> )	Confirmatory samples missing	pH, salinity formerly F3
Camp Day Tank	5	~ 12 m <sup>3</sup> (3 x 4 x 1 m)	Windrow 3 Location (12 m <sup>2</sup> )	Yes	pH, salinity

Previously identified areas of hydrocarbon impacted soil that were not treated in 2009 are: the tundra portions of the historic fuel spill; tundra between pad and airstrip; the Herc tank area; and, the burn pit area.

## 6. CONCLUSIONS

Lab results reported that confirmatory soil samples collected from the vegetated island within the historical spill area, south and southeast wall were below applicable hydrocarbon criteria. Hydrocarbon impacts above NWT industrial and

residential/parkland guidelines remain in the soil adjacent to the tank farm berm and in the unexcavated plume locations identified in the 2006 ESA.

Reported hydrocarbon concentrations from soil samples collected from excavations 2 and 5 were below the applicable guidelines. Prior to excavation enlargement, F2 hydrocarbons exceeded both land use guidelines in excavation 3 and F3 hydrocarbons exceeded the residential/parkland guidelines in both excavations 3 and 4. New samples should be collected from these areas to confirm that impacted soil was successfully removed and hydrocarbons are below guidelines.

The BTEX and F1 hydrocarbon concentrations in the ex situ treated soils were reduced below NWT industrial and residential/parkland guidelines in all three windrows. All hydrocarbon parameters are below both land use guidelines for all samples collected from windrow 3. Laboratory results reported that only Fraction 2 hydrocarbon concentrations from one soil sample exceeded both NWT industrial and residential/parkland guidelines in windrow 2. Hydrocarbon impacts in the soil from windrow 1 exceed both NWT industrial and residential/parkland for F2 and residential/parkland guidelines for F3 hydrocarbons (Table 3).

Soil samples collected from windrows 1-3 following RegenOx treatment reported pH, SAR and EC values that exceeded the residential/parkland land use guidelines. All of the samples also exceeded the industrial land use guidelines for pH, SAR and EC with the exception of EC from soil collected from windrow 2 (Table 4).

IEG estimates that approximately 600 m<sup>3</sup> of the approximately 1300 m<sup>3</sup> of soils treated ex situ, still contain concentrations of F2 hydrocarbons above NWT industrial and residential/parkland guidelines as well as F3 hydrocarbons above residential/parkland guidelines. The in situ treated soil along the western side of the tank farm berm remains

above guidelines for both land uses and will require delineation and remediation following site decommissioning.

## **7. RECOMMENDATIONS**

The treated soil that remains above applicable guidelines should be re-sampled prior to site decommissioning and if hydrocarbon concentrations remain above guidelines be remediated in conjunction with impacted soil from other areas of the pad.

Soil samples should be collected from the periphery of excavations 3 and 4 for analysis of F2 and F3 hydrocarbons to confirm that hydrocarbon impacts at these locations were successfully remediated.

The pH, salinity and sodicity of the backfilled excavations and surrounding soils should be monitored to determine if the treated soils remain constant or are influencing surrounding soil. Methods of reducing the pH of the treated soils to between pH 6 and 8 should be examined if results indicate that pH levels are impacting surrounding soils.

The backfilled areas should be contoured to limit pooling of water and promote drainage of surface water off of the pad. Drainage from the treated soils should be directed away from adjacent marshy areas to limit salinity impacts in adjacent standing water.

If the backfilled portion of the pad is to be used for material storage or vehicle traffic during periods when it is not frozen, the area should be compacted to improve surface stability. If available, fine silt or clay could be added to the soil to improve compaction.

**8. CLOSURE**

If you have any questions regarding this report or any further requests, please contact Sam Bird at (403) 731-6851, or by e-mail at [sbird@ieg.ca](mailto:sbird@ieg.ca).

Yours truly,

**IEG CONSULTANTS LTD.**

Sam Bird, B.Sc.  
Project Manager

DRAFT

## REFERENCES

Government of the Northwest Territories (GNWT). (2003). "Environmental Guideline for Contaminated Site Remediation (CSR)", November 2003.

Regensis. (2005a). "Regen OX – Part A (Oxidizer Complex) Material Safety Data Sheet (MSDS)", San Clemente, CA, USA.

Regensis. (2005b). "Regen OX – Part B (Activator Complex) Material Safety Data Sheet (MSDS)", San Clemente, CA, USA.

WorleyParsons Komex. (2006a). "2006 Environmental Site Assessment Camp Farewell, NT", prepared for Shell Canada Ltd, WPK Project No. C52360300, December 2006.

WorleyParsons Komex. (2006b). "Interim Abandonment and Restoration Plan Camp Farewell, NT", prepared for Shell Canada Ltd, WPK Project No. C52360300, December 2006.

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**TABLES**





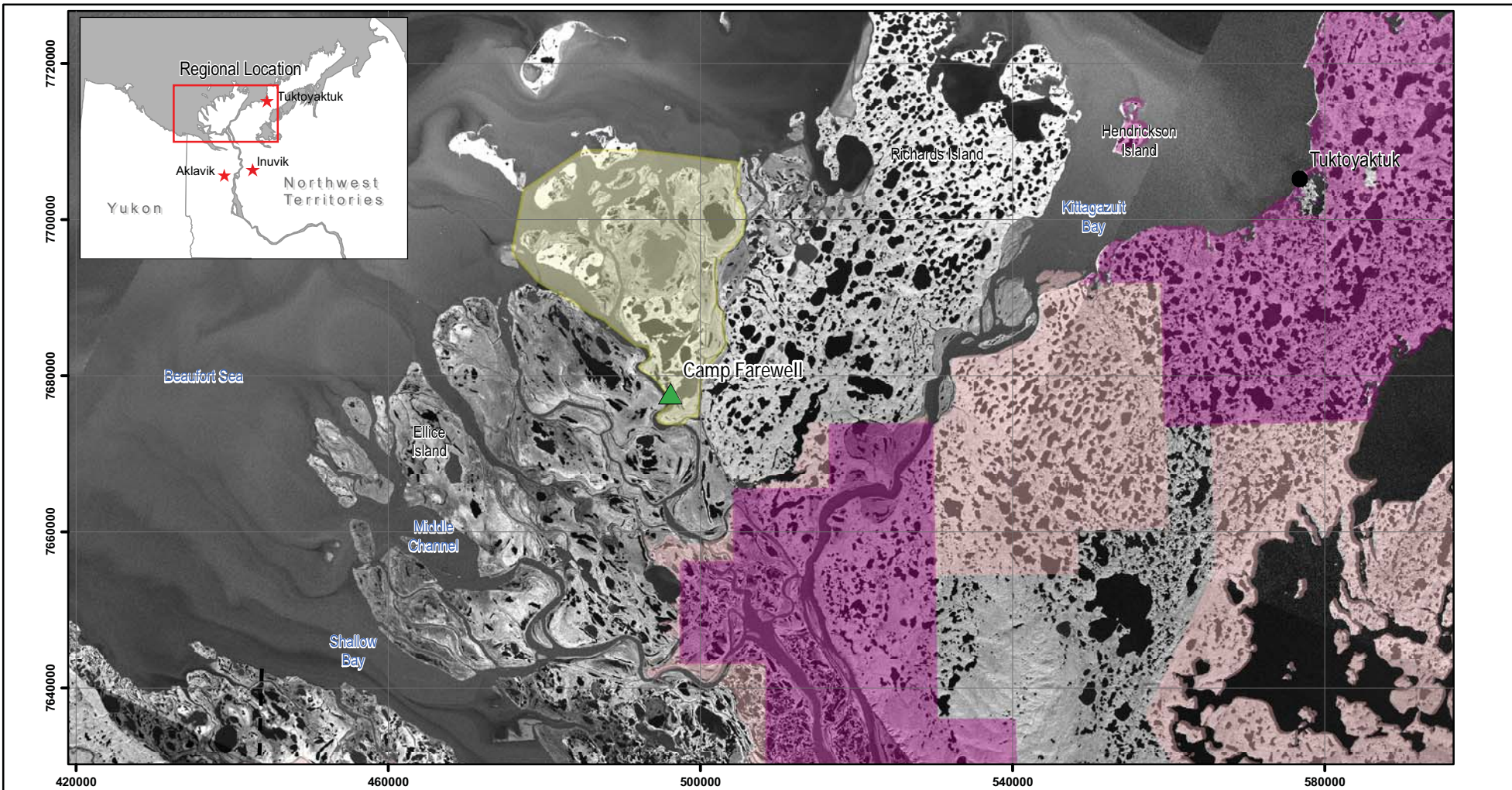
**Table 4: 2009 CAMP FAREWELL SOIL SALINITY ANALYTICAL RESULTS**

SAMPLE INFORMATION					Soluble Conductivity	Soluble (CaCl2) pH	pH	Sodium Absorption Ratio	Soluble Chloride	Soluble Calcium	Soluble Magnesium	Soluble Sodium	Soluble Potassium	Soluble Sulphate	% Saturation	Theoretical Gypsum Requirement
Sample ID	Sample Date	Sample Type	Depth (m)	Location	dS/m	-		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	tons/ac
NWT Industrial Coarse Grained Surface Soil Guidelines					4	-	6-8	12	-	-	-	-	-	-	-	-
NWT Residential/Parkland Coarse Grained Surface Soil Guidelines					2	-	6-8	5	-	-	-	-	-	-	-	-
<b>WINDROW 1</b>																
0916-SS09-WR1-1	16-Sep-09	Composite	0.1-0.4	Windrow 1	6.8	8.27	9.78	70	19	43	15	2100	4	580	61.0	98
0916-SS09-WR1-3	16-Sep-09	Composite	0.1-0.4	Windrow 1	8.7	8.47	9.90	62	48	93	26	2600	10	770	40.0	99
<b>WINDROW 2</b>																
0916-SS09-WR2-1	16-Sep-09	Composite	0.1-0.4	Windrow 2	3.7	8.21	9.88	30	72	79	22	1200	6.4	480	44.1	14
<b>WINDROW 3</b>																
0916-SS09-WR3-1	16-Sep-09	Composite	0.1-0.4	Windrow 3	7.5	8.63	9.97	56	46	89	26	2400	7.1	700	44.0	86
0916-SS09-WR3-3	16-Sep-09	Composite	0.1-0.4	Windrow 3	5.9	8.43	9.85	50	24	65	23	1800	4.7	590	48.5	57

<b>Highlighted Bold</b>	Sample exceeds NWT Industrial Land Use Guideline (Eco Soil Contact and Protection of Groundwater for Aquatic Life Exposure Pathways)
<b>Bold</b>	Sample exceeds NWT Residential/Parkland Land Use Guideline (Eco Soil Contact and Protection of Groundwater for Aquatic Life Exposure Pathways)

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**FIGURES**



**LEGEND/NOTES**

- Kendall Island Bird Sanctuary
- 7(1)a Inuvialuit (Private) Lands
- 7(1)b Inuvialuit (Private) Lands

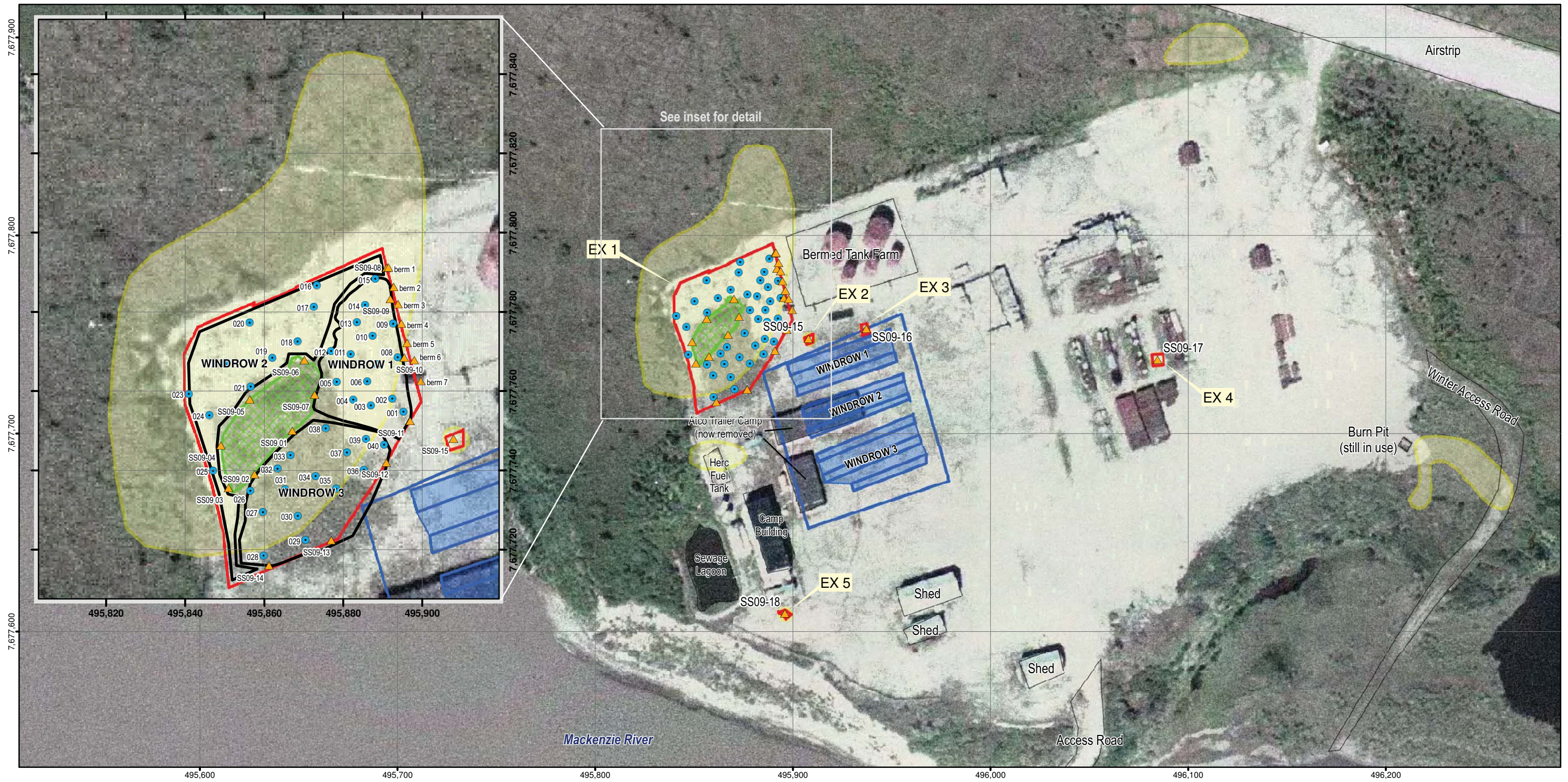
1. Horizontal Datum: NAD83
2. Grid Zone: UTM ZONE 8
3. Vertical Datum: MEAN SEA LEVEL
4. Scale: 1 : 750,000



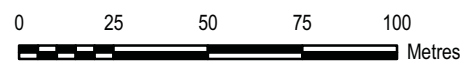
TO BE READ WITH IEG REPORT DATED: DEC 2009

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL

<p>CLIENT</p> <p><b>Shell Canada Energy</b></p>	<p>PROJECT</p> <p><b>CAMP FAREWELL MAINTENANCE</b></p>
	<p>TITLE</p> <p><b>Camp Farewell Location</b></p>
<p>PROJECT No.</p> <p><b>A04012A01</b></p>	<p>FIG No.</p> <p><b>FIGURE 1</b></p>



- NOTES**
- Horizontal Datum: NAD83
  - Grid Zone: UTM ZONE 8
  - Vertical Datum: MEAN SEA LEVEL
  - Scale: 1 : 2,000



- ▲ July Sampling Locations
- September Sampling Locations
- Camp Infrastructure
- Excavated Extent
- Unexcavated Vegetated Extent
- Original Windrows
- Consolidated Windrows
- Interpreted Spill Extent (WPK, 2006)
- Backfilled Areas

Sources:  
 1. Indian and Northern Affairs Canada, (2005) Mackenzie Delta and Valley Airphoto Mapping Program. OrthoTile 490767. 1:30,000. Yellowknife, NWT.  
 2. WorleyParsons Komex (WPK) and IEG Consultants Ltd (2006) 2006 Environmental Site Assessment, Camp Farewell NT.

**NOT FOR CONSTRUCTION**

TO BE READ WITH IEG REPORT DATED: DEC 2009

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL.

CLIENT  
**Shell Canada Energy**

PROJECT	CAMP FAREWELL MAINTENANCE	
TITLE	Petroleum Hydrocarbon Remediation - 2009	
PROJECT No.	A04012A01	FIG No. FIGURE 2

Thursday, December 17, 2009 10:06:20 PM \\A04012A01 - Camp Farewell.maintenance\400 Design\GIS\2009\Summer\Work\1117.mxd

**APPENDIX I**  
**Memorandums**

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## MEMORANDUM

**TO:** Randall Warren – Shell Canada  
Gord Johnson – Worley Parsons  
Kevin Ericson – Hazco Project Manager  
Davide Careddu – Hazco Onsite Supervisor

**DATE:** July 17, 2009

**FROM:** David Wells – IEG Consultants Ltd.

**FILE** A04012A01.02.01  
**NO:**  
**LOG NO:** 090717M

**SUBJECT:** UPDATE – PHC Contaminate Soils Camp Farewell

---

### 1. BACKGROUND

A Phase II ESA was conducted by Worley Parsons (WP) at the Camp Farewell site in 2006. Camp Farewell is owned and operated by Shell Canada. The site is located in the Mackenzie Delta, Northwest Territories. The ESA found petroleum hydrocarbon (PHC) concentrations in soil exceeding applicable guidelines in several areas of the gravel pad and adjacent tundra. An Interim Abandonment and Restoration Plan for the site was developed by WP in 2006 as required by the existing Northwest Territories Water License N7L1-1762.

### 2. SCOPE OF WORK

A scope of work was developed by WP for the treatment of PHC contaminated soils located within the gravel pad area of the site (attached). The scope of work details the areas of PHC contaminated soil. In total approximately 2500 cubic meters of PHC soils were identified for excavation and onsite treatment. Four areas at the site were identified for excavation and onsite treatment. These areas include:

- Historical fuel spill (adjacent to west side of existing tank farm);
- New fuel spill area (adjacent to west and east side of existing “Herc” tank);
- Burn pit; and,
- Remaining areas throughout the site.

### 3. DEVIATIONS FORM THE SCOPE OF WORK

Gord Johnson (GJ) and Kevin Ericson (KE) visited the site on Monday July 13, 2009. David Wells (DW) of IEG and GJ inspected the historical fuel spill area and the burn pit area. During the inspection it was noted that the majority of the PHC contaminated soils surrounding the burn pit are either located off of the existing lease, or are located within the adjacent tundra. GJ decided that the PHC contaminated soils located at the burn pit area will not be excavated, as the burn pit continues to be used for onsite activities, and as mentioned above the majority of the soils are located off lease and/or in the tundra. It is recommended that the burn pit PHC contaminated soils should be removed during facility decommissioning.

090717M Update PHC Remediation Camp Farewell

## MEMORANDUM

A large area of willow/alder is present within the historical fuel spill area. GJ decided that the trees should be removed. DW reviewed the Phase II ESA and determined that soil samples collected within the treed area did not contain PHC concentrations exceeding the guidelines with the exception of Toluene. KE and DW discussed the trees with Randall Warren (RW). It was determined that the treed area would not be excavated, but that soil samples would be collected from the excavation side walls and analyzed using an Organic Vapour Analyzer (OVA) and submitted for confirmatory analysis at an accredited analytical laboratory.

The western portion of the new fuel spill area is currently inaccessible to the excavator due to the proximity of adjacent tundra, vegetation, and the fuel tank which currently holds approximately 160,000 L of diesel fuel. While the eastern portion of the new fuel spill area is accessible, it was discussed by DW, KE, and Davide Careduu (DC) that the excavation not proceed due to the proximity of the fuel tank. If excavation is required it is recommended that a geotechnical engineer assess the situation as the granular material used for the berm and gravel pad construction does not contain many fine grained materials, and hence does not compact adequately.

Excavation of the PHC contaminated soils throughout the remainder of the gravel pad will continue as per the original scope of work.

#### **4. WORK UPDATE**

As of end of day Thursday July 16, 2009 approximately 1200 cubic meters of PHC contaminated soils have been excavated from the historical fuel spill area and transported to the treatment area. Polyurethane insulation has been encountered throughout the excavation area ranging in depth from 15 to 60 cm below ground surface. Soil has been placed in windrows in the treatment area. Each windrow contains approximately 200 cubic meters.

The current plan is to mix each windrow using the Allu bucket attached to the excavator. KE has contacted the supplier of the RegenOx oxidation additives. The supplier recommends that the Type B material be added first, the soil mixed again using the Allu bucket. Afterwards the Type A material would be added and mixed using the Allu bucket. Application methods are presently under consideration by onsite staff. The soils will sit in windrows for approximately 1 week while being hydrated. Following the one week hydration period the RegenOx would be added as per the above description and then placed back into the excavation area.

Because of the presence of the polyurethane foam, PHC contaminated soils remain on the floor of the excavation. It is recommended that the RegenOx be applied to the excavation floor to reduce the concentration of PHC in the remaining soils.

Finally it is recommended that "Filter Cloth" Geotextile be laid on the floor of the excavation prior to backfilling. It is anticipated that the Geotextile will help alleviate the surface subsidence



MEMORANDUM

that has occurred in the area of the historical spill. The onsite contractor, MDIOS, will supply onsite staff with the cost of Geotextile which will be forwarded to RW for approval.

**5. CLOSURE**

If you have any questions or concerns regarding the above, please contact the undersigned via email at [dwells@klohn.com](mailto:dwells@klohn.com).

Yours truly,

IEG CONSULTANTS LTD.

A handwritten signature in black ink, appearing to read "David Wells". The signature is written in a cursive style with a large, looping initial "D".

David Wells, M.A.Sc  
Northern Manger

**Encl. Worley Parsons Memorandum: Camp Farewell – 2009 Remediation Program**



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## MEMORANDUM

<b>DATE</b>	6 July 2009
<b>TO</b>	Randall Warren, Shell
<b>FROM</b>	Gordon Johnson
<b>COPY</b>	David Wells, IEG Keith, HAZCO
<b>PROJECT NAME</b>	Camp Farewell - 2009 Remediation Program
<b>PROJECT NO.</b>	C5236-05-00
<b>SUBJECT</b>	Work Plan and Safety Interface Document
<b>FILE LOC.</b>	Calgary

### Introduction

This document summarizes the scope and nature of the 2009 Remediation Program for the Camp Farewell Site, referred to herein as the 2009 Program. A detailed description of the basis of the 2009 Program is provided in the following documents:

- Interim Abandonment and Restoration Plan, Camp Farewell NT (WorleyParsons, 2008)
- 2006 Environmental Site Assessment, Camp Farewell NT (WorleyParsons, 2006)

These documents should be consulted to understand the nature of the site conditions, the goals of the 2009 Program, and the constraints that are imparted on the 2009 Program. Activities described in the Interim Abandonment and Restoration Plan have been reviewed and accepted by the appropriate federal and territorial regulators and for the purpose of the 2009 Program may be considered regulatory commitments. For the purpose of this document, activities have been grouped as follows:

- removal and packaging of surplus materials and debris
- remedial excavations
- construction of the treatment area
- handling and treatment of contaminated soils
- soil testing



- draining and reclamation of the sewage lagoon

## Removal of Materials and Debris

The materials and debris that are currently present in the areas of the remedial excavations and soil treatment area will encumber efficient execution of the work and, in the case of drilling consumables and like materials, represent a potential source of additional soil contamination. Hence, these materials must be carefully removed and either stored or disposed properly prior to execution of remedial works. The following procedures are recommended for this work.

- All inert materials (steel, wood, packaging, etc.) should be removed from the remedial excavation and soil treatment areas, and either removed from the Site or stockpiled at an appropriate, out of the way, on-Site location.
- All contained materials (e.g. drilling consumables in C-Cans) should be removed from the work area and either removed from the Site or stockpiled at an appropriate, out of the way location.
- Spilled materials, such as drilling consumables, that have the potential to contaminate soils, should be excavated and placed in sealed containers such as C-Cans. Mechanical equipment can be used provided that the spilled materials can be collected without incorporating excessive quantities of underlying materials and without mixing spilled materials into the underlying soils. Otherwise, hand shovels should be used to collect spilled materials.
- Collected spilled materials and inert debris that serve no further function at Camp Farewell should be transferred to Inuvik for ongoing storage or disposal at an approved facility licensed to accept the wastes in question.

## Remedial Excavations

The areas of the planned remedial excavations are illustrated in the Interim Abandonment and Restoration Plan. The principles of the remedial excavation program are summarized as follows.

- Areas planned for remedial excavation that are located within the proposed soil treatment area should be excavated first. Then the historical fuel spill area, which comprises the largest proportion of the contaminated materials, should be excavated and transferred to the treatment area once the treatment area is established.
- The remaining areas should be remediated in the following order
  - The new fuel spill area
  - The burn pit
  - Remaining areas
- Remedial excavations should be initiated at one edge of the inferred area of contamination as shown in the Interim Abandonment and Restoration Plan. Once a clean edge has been determined, the remedial excavation would be expanded to include the entire contaminated mass.



4. Gravel soils containing visible evidence of contamination by drilling consumables should be removed and stockpiled separately to prevent potential additional mineral contamination (salts or metals). Samples of these materials should be collected to determine whether these materials can be effectively treated or whether they need to be disposed separately to prevent cross-contamination by metals and/or salts.
5. The remedial excavation will be advanced based on the presence of visible contamination, hydrocarbon odours, or elevated organic vapour measurements. Based on WorleyParsons experience on similar projects, diesel contamination is evidenced by OVA readings in excess of 80 ppm.
6. The remedial excavation should be advanced vertically until either native tundra or polyurethane foam insulation is encountered. Care should be taken to prevent damage to the underlying polyurethane insulation.

Contaminated materials from each individual source area should be transferred directly to the soil treatment area. These materials should be treated separately (to as reasonable a degree as practically possible) as the plan is to return the treated soils to their approximate point of origin.

The underlying text provides a summary of the OVA testing protocol to be implemented for the 2009 Program.

### **Field Organic Vapour Analyzer Procedure**

*Field Organic Vapour Analyzer (OVA) measurements can provide a reliable indicator of hydrocarbon contamination levels, provided that the hydrocarbons are in the volatile range (approximately C<sub>16</sub> and below). Procedures for implementing OVA screening of hydrocarbon contaminated soils in the field are as follows:*

1. *Collect representative soil samples at selected locations, within a depth of 150 mm of the soil surface. Place soils in sealed ziplock bags (minimum size 2 L) such that the bag is approximately 1/3 full.*
2. *Collect representative samples of the soils at the limits of the excavations using judgement of typical conditions based on visual characteristics and odour. Collect representative samples of the stockpiled or treated soils using the pre-set grid pattern.*
3. *Allow the samples to come to equilibrium at room temperature (usually 20 minutes) with the ziplock bag sealed.*
4. *Measure the organic vapours using a Gastech organic vapour analyzer (OVA). Charge and calibrate the unit before each shift. Turn the OVA on and allow to equalize in a fresh air environment over a period of approximately 5 minutes prior to use. Once the read-out is stable, zero the unit prior to initiating each test.*
5. *Position the methane eliminator button to "on".*
6. *Measure the air in the bag head-space by inserting the vacuum tube while taking care to avoid venting the head-space of the sample while completing the test.*

Verification sampling in accordance with the Soil Sampling methodology will be completed once the remedial excavation has been completed. Where the base of the remedial excavation encounters foam insulation, no verification sampling is required.



## Treatment Pad Construction

Treatment of hydrocarbon contaminated soils will occur in the central portion of the Camp Farewell gravel pad, as close as practical to the location of the large historical fuel spill. The desired area for treatment is approximately 1 hectare (100 m by 100m, or equivalent). No preparation of the treatment pad is required other than grading flat and filling in any remedial excavations that may have occurred in the treatment area.

The outside perimeter of the treatment area will be established by constructing perimeter berms a minimum of 0.4 m high and 2 metres wide at the base. Perimeter berms should be constructed using a thin lift of gravel soils obtained from the base of the treatment area to form a smooth, competent and firm surface.

The outer perimeter of the berm should be sloped to drain into the surrounding lands. If pooling water occurs around the outside of the perimeter berms, a drainage ditch should be constructed to promote free outer drainage of the Site. Water that may collect on the inside of the treatment cell can be used to moisten the soils in the treatment process.

## Soil Treatment

The goal is to achieve remediation of the soils in question through volatilization and bioremediation of the hydrocarbon contaminated soils. Mixing and aeration will be achieved through the use of an Allu Bucket. Enhancement of longer term bioremediation will be achieved by inoculating the mixed soils using an oxidizing additive, RegenOx (see Appendix 1). The following procedure should be used to optimize the effect of the remedial effort.

- Contaminated soils should be mixed on a continuous basis, throughout the duration of the 2009 Program, using an Allu Bucket. Continuous mixing will be achieved by cycling the treatment around and around the contaminated soils.
- Contaminated soils should be placed in windrows oriented east-west and approximately 1 m high. The grade of the windrow on the south facing side should be about 5H:1V. The grade of the windrow on the north facing side should be about 1.5H:1V. This arrangement will optimize thermal adsorption from the sun.
- Rocks having sizes greater than 100 mm diameter should be removed from the gravel to prevent damage to the Allu Bucket.
- The oxidizing additive should be introduced to the soils after they have been mixed at least once and preferably twice. The RegenOx should be mixed into the soils in accordance with the manufacturer's instructions, which are attached as Appendix 1. Once these soils have been amended and placed, the treated soils should be kept moist by pumping water from the sewage lagoon onto the amended mass or by using water that collects in the treatment area.
- The base plan is to mix the soils once or twice, in their dry state, prior to amending using RegenOx. The soils would then be re-mixed in a dry state, between the first and second application of RegenOx. Ideally, the mass of soil would be retreated with RegenOx just prior to



demobilization from the Site. This planned treatment schedule is subject to change depending on progress and weather.

## Soil Sampling

Sampling of the remedial excavations will be completed following the remedial excavation. Composite samples of the perimeter of the excavation should be collected in accordance with the underlying protocol and should be analyzed for BTEX and F1 to F4 PHC Fractions by Maxxam Analytics. Samples should be collected to represent minimum 200 m<sup>2</sup> and maximum 400 m<sup>2</sup> areas, including the base and sidewalls.

Sampling of the treated soils will be completed following the final stage of treatment, one week following the second RegenOx application. Composite samples of the treated soils should be collected in accordance with the underlying protocol and should be analyzed for BTEX and F1 to F4 PHC Fractions by Maxxam Analytics. Samples should be collected to represent minimum 100 m<sup>3</sup> and maximum 200 m<sup>3</sup> volumes of soil undergoing treatment and those zones of soil should be managed separately so that the sample results remain relevant to the treated soils in question.

### **Soil Sampling Protocol**

*Soil samples should be collected as follows:*

- *Prior to sampling, appropriate jars, bags and coolers should be ordered from the laboratory ahead of time.*
- *For treated soils, select discrete and discernible windrows or stockpiles of treated soils.*
- *Representative composite samples should be taken for discrete and discernible windrows or stockpiles of treated soils.*
- *For remedial excavations, select an area for sampling equivalent to between 200 m<sup>2</sup> and 400 m<sup>2</sup>.*
- *Collect samples for field testing of OVA measurements in a sealable ziplock bag. Collect jarred samples for laboratory analysis of organic parameters (wide mouth, 250 mL, glass container with teflon lined plastic lid).*
- *Label each bag and jar in accordance with the identification included on the Chain of Custody form.*
- *Collect enough soil (using a clean trowel) to fill 1 jar and 1 sealable bag.*
- **For discrete samples**, *do not mix soil from sampling locations.*
- **For composite samples**, *mix soil samples in a clean container before filling containers. Composite samples should consist of a minimum of 5 discrete samples collected and mixed to fairly represent the soils in question. These samples should be homogenized and quartered. The sample for laboratory testing will comprise the combined sample generated by each of these quarters. Composite sampling is valid only for analysis of non-volatile compounds. Analysis of volatile compounds (BTEX, F1 and F2 hydrocarbon fractions) should be completed on the composite soil sample representing the highest OVA readings of the samples that are collected to form the composite.*
- *Fill jars completely, compressing soil to remove air pockets and screw the lids on tightly. Ensure soil is removed from the threads of the jar and does not cause the lid to bulge.*
- *Place jars and bags in cooler with ice or freezer packs, to ensure samples stay cold until arrival at laboratory. Packing material inserted around the sample jars should prevent breakage in transit.*
- *Deliver all samples to the laboratory in a manner consistent with the requisite hold times for each analysis. Samples should be analyzed by Maxxam Analytics.*



In sampling stockpiles and windrows samples will be collected throughout the pile in order to properly characterize the soil.

## Lagoon Decommissioning

The following procedure should be followed for drainage and decommissioning of the sewage lagoon:

1. Collect a sample of the water impounded in the lagoon. This sample should be tested for the following parameters:
  - a. Routine potability parameters
  - b. Dissolved hydrocarbons (BTEX, F1 and F2 PHC)
2. Once results verify that the water in the sewage lagoon complies with the release criteria for the lagoon, pump this into a natural drainage course.
3. Once the water in the sewage lagoon is entirely removed, scrape the accumulated sediments in the lagoon so that these sediments stack against the inner slopes of the lagoon.
4. Once these sediments have dried to achieve a solid consistency, remove the dried sediments and stockpile inside the soil treatment area.
5. Sample the dried and stockpiled sediments and analyze for heavy metals, salinity parameters, BTEX, and F1 to F4 PHCs.
6. If the dried and stockpiled sediments comply with the Tier 1 standard for the NWT, maintain these soils for ultimate reclamation of the ground surface of the lagoon.

It is assumed that some impounded water will remain in the lagoon following use of this water in the soil treatment and RegenOx amendment process. Hence, sampling to verify that this water is suitable for discharge is also required, at least as a contingency measure.



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## **Responsibilities**

Shell Canada Limited: Funding and budgeting, provision of a safe work Site, regulatory interface, safety audit.

HAZCO Environmental Services Ltd: Project execution, implementation of safety program, mobilization and demobilization of equipment and materials, safe handling of all products and wastes, record keeping related to project implementation and safety.

IEG: Monitoring of remedial excavations and soil treatment. Record keeping related to same.

E. Gruben Transport: Provision of a working, fit for purpose camp.

WorleyParsons: Site characterization, development of the 2009 Program plan, and final reporting.

Acknowledged:

Randall Warren, Shell Canada Limited

Kevin Erickson, HAZCO Environmental Services

David Wells, IEG

Gordon Johnson, WorleyParsons





## Camp Farewell - 2009

### Safety Interface Document

By: Gordon Johnson

Date: 5/30/2009

The objectives of this document are to describe how the safety and environmental elements of the 2009 Camp Farewell Remediation Program (2009 Program) will be handled and to describe each party's responsibility for implementing safe work procedures during project execution. HAZCO Environmental Services Ltd. is the Prime Contractor as defined by applicable Health and Safety Legislation and has primary responsibility for all site activities and safety for the 2009 Program.

### **Health and Safety Procedures and Requirements**

Shell Canada has entered into Master Services Agreements with each of the parties involved in the 2009 Program. As Prime Contractor, HAZCO is responsible for ensuring that all activities are completed in accordance with its own corporate health and safety procedures as well as specific safety and environmental requirements developed for the 2009 Program. Each member of the project team is required to be familiar with HAZCO corporate health and safety procedures as well as the following documents.

- Shell's Alcohol and Drug Policy
- Tool and Equipment Use and Inspection

This document elaborates on the following additional requirements related to health, safety and environmental protection that are specific to this project:

- Personal Protective Equipment (PPE) and Training Requirements
- Response to / Preparation for Inclement Weather
- First Aid / Medical Care Response and Provisions
- Safety Coverage and Call-Out
- Site Access Requirements / Work Permitting
- Accident / Incident Investigation
- Safety Observations and Audits
- Workforce Accountability

### **Personal Protective Equipment (PPE) and Training Requirements**

The following PPE must be worn at all times while working on the Camp Farewell site and surrounding lands:



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- Hardhat
- Safety glasses with side shields
- Gloves Steel toed safety shoes/boots
- Hearing protection (if required)
- High visibility vest
- Flotation vest (when working on or immediately adjacent to water)

The following training is required, at a minimum, for all Site workers:

- Workplace Hazards Information System
- Industrial First Aid
- Shell 12 Life Saving Rules
- Appropriate training in equipment operation (for operators)

## **Response to / Preparation for Inclement Weather**

In the event of severe weather work crews shall:

- Monitor weather reports
- Stop work before severe weather is incurred
- Secure equipment and materials
- Move any vehicles as required
- Shelter in the Permanent Work Camp.

## **First Aid / Medical Care Response and Provisions**

First aid, medical care response, and other provisions are addressed in the HAZCO Safe Work Procedures. In addition to these standard first aid requirements, the following first aid equipment and facilities shall be mobilized to the Site.

- 2 Standard First Aiders
- No. 3 First Aid Kit
- 3 Blankets, stretcher, splints

The Program Manager, Randall Warren, is ultimately responsible for the safety of this project. In the event of an injury or safety / environmental incident HAZCO will make the following communications:



Name	Company	Role	Cell Phone or Pager	E-mail	Maximum Duration After Event
Randall Warren	Shell Canada	Project Manager	(403) 813 0408	<a href="mailto:randall.warren@shell.com">randall.warren@shell.com</a>	1 hour
Gordon Johnson	Worley Parsons	Environmental Consultant	403 473 8371	<a href="mailto:gord.johnson@worleyparsonscm">gord.johnson@worleyparsonscm</a>	24 hours
Kevin Erickson	HAZCO	Site Manager	403 297 0444	<a href="mailto:kerickson@hazco.com">kerickson@hazco.com</a>	1 hour
Randall Warren or Kevin Erickson will, In-turn, contact the following individuals					
	Shell Canada	Safety Manager			4 hours

HAZCO's Site supervisor will, at a minimum, contact the Shell Canada Project Manager (or his back-up). The Shell Project Manager (or his back-up) will then contact the remaining people on the list if required.

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- If site activities deviate (in a significant manner) from that contemplated in the daily work permit, work shall stop and the permitting and safety meeting process shall be repeated prior to resuming work.
- Documentation of orientation, permitting, safety meetings, incidents and near misses is the responsibility of the HAZCO Site Supervisor.

Shell Canada is responsible for authorizing the safe work procedures for the 2009 Program prior to mobilizing to the Site. This authorization is provided by the written acknowledgement of this document, as provided above. In issuing this authorization, Shell acknowledges that the safe work and environmental protection procedures outlined in this document comprise the Contractors' responsibilities and authorities for the 2009 Program. Specifically, Shell acknowledges the following with respect to the 2009 Program.

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- The Site is vacant, but is otherwise fit for safe execution of the 2009 Program in accordance with this Work Plan and Safety Interface Document.
- HAZCO is primarily responsible for safety and environmental protection for the 2009 Program. All other Contractors working on the Site are required to follow the direction of HAZCO respecting these aspects of execution of the 2009 Program.

## **Accident / Incident Investigations**

All incidents, regardless of severity, must be thoroughly investigated to identify the basic and indirect causes. The Shell Project Manager must be notified per the above call out protocol and should receive a written preliminary report from HAZCO by the end of the workday. A follow-up investigation will be scheduled. Lessons learned and corrective actions from each incident must be reviewed and communicated in order to avoid similar incidents in the future.

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Any and all personnel have the responsibility and duty to intervene in any field activity which, in the view of the observer, is being conducted or planned in an unsafe or in a questionable manner.

The Shell Project Manager will organize and lead formal safety audits of the job site when and as deemed appropriate. Given the remote location of the work, no more than one audit would be conducted over the duration of the 2009 Program.

## **Work Force Accountability**

At the start of each work shift all Site workers who plan on working on that day or shift must:

- Have received Site Orientation



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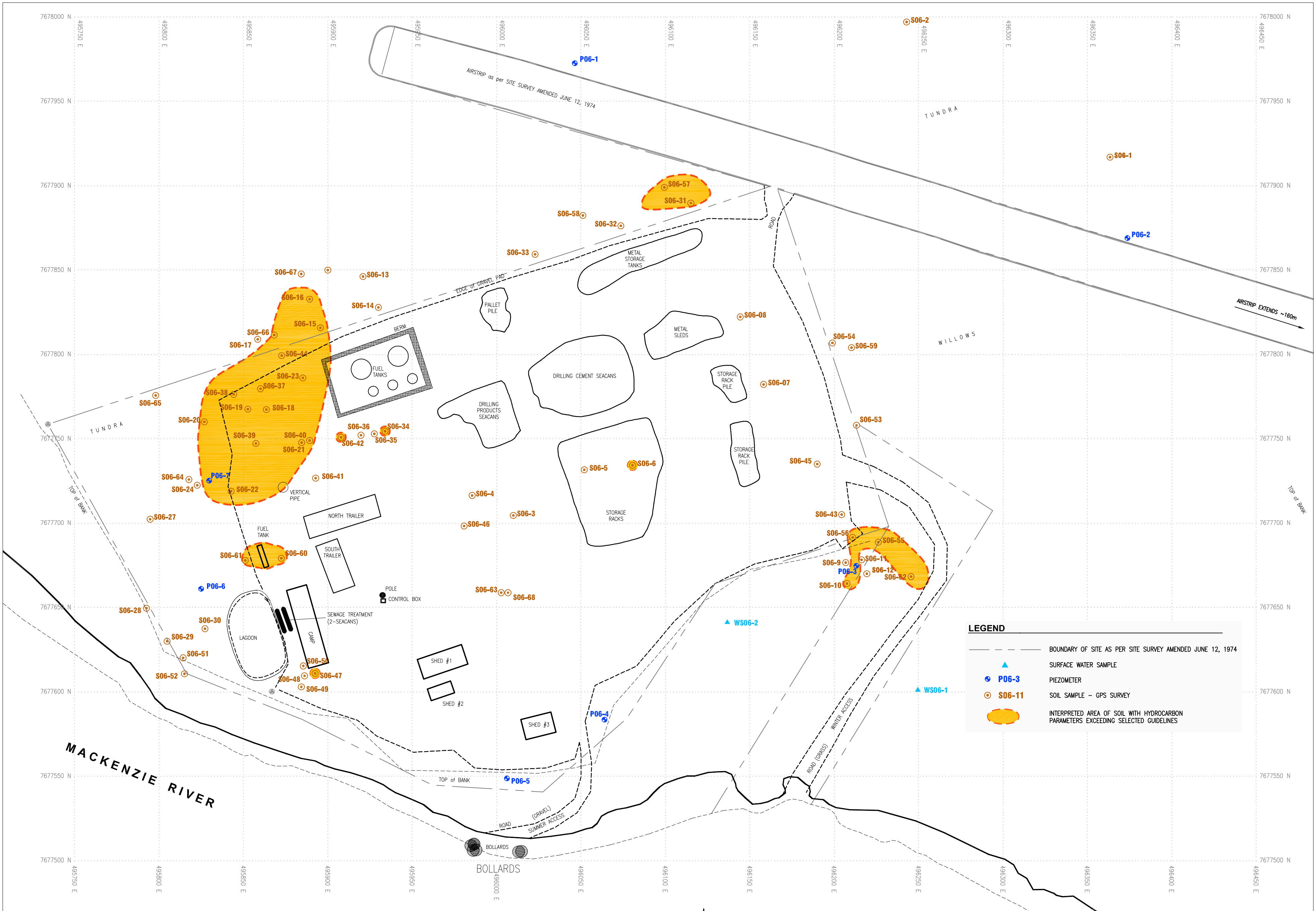
resources & energy

- Sign the Daily Work Permit
- Attend the daily safety meeting
- Have the requisite training
- Don the required PPE
- Be trained and familiar with their assigned tasks for that day's work
- Have read and be familiar with this Work Plan and Safety Interface Document as well as HAZCO's corporate safe work procedures

## Environmental Protection

The following environmental controls must be implemented throughout the execution of the 2009 Program.

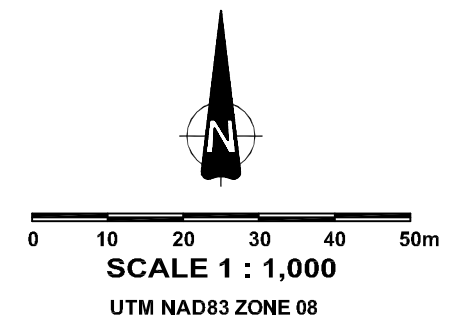
- Schedule work in accordance with the permissible work window for the Kendall Island Bird Sanctuary.
- Contain all precipitation runoff water within the soil treatment area, preventing direct discharge of this water into the Mackenzie River.
- Prevent spills or accidental releases to the environment of any materials and wastes associated with or generated by implementation of the 2009 Program. This includes industrial wastes, domestic wastes and sewage.



**LEGEND**

- BOUNDARY OF SITE AS PER SITE SURVEY AMENDED JUNE 12, 1974
- SURFACE WATER SAMPLE
- P06-3
- PIEZOMETER
- S06-11
- SOIL SAMPLE - GPS SURVEY
- INTERPRETED AREA OF SOIL WITH HYDROCARBON PARAMETERS EXCEEDING SELECTED GUIDELINES

SOURCES:  
 1. PLAN SHOWING SITE SURVEY OF CAMP FAREWELL MACKENZIE DELTA NORTHWEST TERRITORIES; PREPARED FOR SHELL CANADA LIMITED BY INUKSHUK GEOMATICS INC.; 04/08/2006; ORIGINAL SCALE 1:2000.  
 2. PIEZOMETER AND SOIL SAMPLES LOCATED USING WORLEYPARSONS KOMEX GPS SURVEY DATA.



<b>SHELL CANADA LIMITED</b>				Infrastructure & Environment	
<b>ENVIRONMENTAL SITE ASSESSMENT AT CAMP FAREWELL, NWT</b>					
<b>INTERPRETED AREAS OF SOIL WITH HYDROCARBON PARAMETERS EXCEEDING REFERENCE GUIDELINES</b>					
07-JUL-09	date	B.M.F.	edited by	OTHERS	drawn by
				app by	
				PROJECT NUMBER:	FIGURE:
				C52360500	12
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.					

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



# WorleyParsons

resources & energy

**Infrastructure & Environment**

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Calgary, AB T3B 0M6 CANADA

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Facsimile: +1 403 247 4811

www.worleyparsons.com

## MEMORANDUM

<b>DATE</b>	6 July 2009
<b>TO</b>	Randall Warren, Shell
<b>FROM</b>	Gordon Johnson
<b>COPY</b>	David Wells, IEG Keith, HAZCO
<b>PROJECT NAME</b>	Camp Farewell - 2009 Remediation Program
<b>PROJECT NO.</b>	C5236-05-00
<b>SUBJECT</b>	Work Plan and Safety Interface Document
<b>FILE LOC.</b>	Calgary

### Introduction

This document summarizes the scope and nature of the 2009 Remediation Program for the Camp Farewell Site, referred to herein as the 2009 Program. A detailed description of the basis of the 2009 Program is provided in the following documents:

- Interim Abandonment and Restoration Plan, Camp Farewell NT (WorleyParsons, 2008)
- 2006 Environmental Site Assessment, Camp Farewell NT (WorleyParsons, 2006)

These documents should be consulted to understand the nature of the site conditions, the goals of the 2009 Program, and the constraints that are imparted on the 2009 Program. Activities described in the Interim Abandonment and Restoration Plan have been reviewed and accepted by the appropriate federal and territorial regulators and for the purpose of the 2009 Program may be considered regulatory commitments. For the purpose of this document, activities have been grouped as follows:

- removal and packaging of surplus materials and debris
- remedial excavations
- construction of the treatment area
- handling and treatment of contaminated soils
- soil testing



- draining and reclamation of the sewage lagoon

## Removal of Materials and Debris

The materials and debris that are currently present in the areas of the remedial excavations and soil treatment area will encumber efficient execution of the work and, in the case of drilling consumables and like materials, represent a potential source of additional soil contamination. Hence, these materials must be carefully removed and either stored or disposed properly prior to execution of remedial works. The following procedures are recommended for this work.

- a. All inert materials (steel, wood, packaging, etc.) should be removed from the remedial excavation and soil treatment areas, and either removed from the Site or stockpiled at an appropriate, out of the way, on-Site location.
- b. All contained materials (e.g. drilling consumables in C-Cans) should be removed from the work area and either removed from the Site or stockpiled at an appropriate, out of the way location.
- c. Spilled materials, such as drilling consumables, that have the potential to contaminate soils, should be excavated and placed in sealed containers such as C-Cans. Mechanical equipment can be used provided that the spilled materials can be collected without incorporating excessive quantities of underlying materials and without mixing spilled materials into the underlying soils. Otherwise, hand shovels should be used to collect spilled materials.
- d. Collected spilled materials and inert debris that serve no further function at Camp Farewell should be transferred to Inuvik for ongoing storage or disposal at an approved facility licensed to accept the wastes in question.

## Remedial Excavations

The areas of the planned remedial excavations are illustrated in the Interim Abandonment and Restoration Plan. The principles of the remedial excavation program are summarized as follows.

1. Areas planned for remedial excavation that are located within the proposed soil treatment area should be excavated first. Then the historical fuel spill area, which comprises the largest proportion of the contaminated materials, should be excavated and transferred to the treatment area once the treatment area is established.
2. The remaining areas should be remediated in the following order
  - a. The new fuel spill area
  - b. The burn pit
  - c. Remaining areas
3. Remedial excavations should be initiated at one edge of the inferred area of contamination as shown in the Interim Abandonment and Restoration Plan. Once a clean edge has been determined, the remedial excavation would be expanded to include the entire contaminated mass.





4. Gravel soils containing visible evidence of contamination by drilling consumables should be removed and stockpiled separately to prevent potential additional mineral contamination (salts or metals). Samples of these materials should be collected to determine whether these materials can be effectively treated or whether they need to be disposed separately to prevent cross-contamination by metals and/or salts.
5. The remedial excavation will be advanced based on the presence of visible contamination, hydrocarbon odours, or elevated organic vapour measurements. Based on WorleyParsons experience on similar projects, diesel contamination is evidenced by OVA readings in excess of 80 ppm.
6. The remedial excavation should be advanced vertically until either native tundra or polyurethane foam insulation is encountered. Care should be taken to prevent damage to the underlying polyurethane insulation.

Contaminated materials from each individual source area should be transferred directly to the soil treatment area. These materials should be treated separately (to as reasonable a degree as practically possible) as the plan is to return the treated soils to their approximate point of origin.

The underlying text provides a summary of the OVA testing protocol to be implemented for the 2009 Program.

### **Field Organic Vapour Analyzer Procedure**

*Field Organic Vapour Analyzer (OVA) measurements can provide a reliable indicator of hydrocarbon contamination levels, provided that the hydrocarbons are in the volatile range (approximately C<sub>16</sub> and below). Procedures for implementing OVA screening of hydrocarbon contaminated soils in the field are as follows:*

1. *Collect representative soil samples at selected locations, within a depth of 150 mm of the soil surface. Place soils in sealed ziplock bags (minimum size 2 L) such that the bag is approximately 1/3 full.*
2. *Collect representative samples of the soils at the limits of the excavations using judgement of typical conditions based on visual characteristics and odour. Collect representative samples of the stockpiled or treated soils using the pre-set grid pattern.*
3. *Allow the samples to come to equilibrium at room temperature (usually 20 minutes) with the ziplock bag sealed.*
4. *Measure the organic vapours using a Gastech organic vapour analyzer (OVA). Charge and calibrate the unit before each shift. Turn the OVA on and allow to equalize in a fresh air environment over a period of approximately 5 minutes prior to use. Once the read-out is stable, zero the unit prior to initiating each test.*
5. *Position the methane eliminator button to "on".*
6. *Measure the air in the bag head-space by inserting the vacuum tube while taking care to avoid venting the head-space of the sample while completing the test.*

Verification sampling in accordance with the Soil Sampling methodology will be completed once the remedial excavation has been completed. Where the base of the remedial excavation encounters foam insulation, no verification sampling is required.



## Treatment Pad Construction

Treatment of hydrocarbon contaminated soils will occur in the central portion of the Camp Farewell gravel pad, as close as practical to the location of the large historical fuel spill. The desired area for treatment is approximately 1 hectare (100 m by 100m, or equivalent). No preparation of the treatment pad is required other than grading flat and filling in any remedial excavations that may have occurred in the treatment area.

The outside perimeter of the treatment area will be established by constructing perimeter berms a minimum of 0.4 m high and 2 metres wide at the base. Perimeter berms should be constructed using a thin lift of gravel soils obtained from the base of the treatment area to form a smooth, competent and firm surface.

The outer perimeter of the berm should be sloped to drain into the surrounding lands. If pooling water occurs around the outside of the perimeter berms, a drainage ditch should be constructed to promote free outer drainage of the Site. Water that may collect on the inside of the treatment cell can be used to moisten the soils in the treatment process.

## Soil Treatment

The goal is to achieve remediation of the soils in question through volatilization and bioremediation of the hydrocarbon contaminated soils. Mixing and aeration will be achieved through the use of an Allu Bucket. Enhancement of longer term bioremediation will be achieved by inoculating the mixed soils using an oxidizing additive, RegenOx (see Appendix 1). The following procedure should be used to optimize the effect of the remedial effort.

- Contaminated soils should be mixed on a continuous basis, throughout the duration of the 2009 Program, using an Allu Bucket. Continuous mixing will be achieved by cycling the treatment around and around the contaminated soils.
- Contaminated soils should be placed in windrows oriented east-west and approximately 1 m high. The grade of the windrow on the south facing side should be about 5H:1V. The grade of the windrow on the north facing side should be about 1.5H:1V. This arrangement will optimize thermal adsorption from the sun.
- Rocks having sizes greater than 100 mm diameter should be removed from the gravel to prevent damage to the Allu Bucket.
- The oxidizing additive should be introduced to the soils after they have been mixed at least once and preferably twice. The RegenOx should be mixed into the soils in accordance with the manufacturer's instructions, which are attached as Appendix 1. Once these soils have been amended and placed, the treated soils should be kept moist by pumping water from the sewage lagoon onto the amended mass or by using water that collects in the treatment area.
- The base plan is to mix the soils once or twice, in their dry state, prior to amending using RegenOx. The soils would then be re-mixed in a dry state, between the first and second application of RegenOx. Ideally, the mass of soil would be retreated with RegenOx just prior to



demobilization from the Site. This planned treatment schedule is subject to change depending on progress and weather.

## Soil Sampling

Sampling of the remedial excavations will be completed following the remedial excavation. Composite samples of the perimeter of the excavation should be collected in accordance with the underlying protocol and should be analyzed for BTEX and F1 to F4 PHC Fractions by Maxxam Analytics. Samples should be collected to represent minimum 200 m<sup>2</sup> and maximum 400 m<sup>2</sup> areas, including the base and sidewalls.

Sampling of the treated soils will be completed following the final stage of treatment, one week following the second RegenOx application. Composite samples of the treated soils should be collected in accordance with the underlying protocol and should be analyzed for BTEX and F1 to F4 PHC Fractions by Maxxam Analytics. Samples should be collected to represent minimum 100 m<sup>3</sup> and maximum 200 m<sup>3</sup> volumes of soil undergoing treatment and those zones of soil should be managed separately so that the sample results remain relevant to the treated soils in question.

### **Soil Sampling Protocol**

*Soil samples should be collected as follows:*

- *Prior to sampling, appropriate jars, bags and coolers should be ordered from the laboratory ahead of time.*
- *For treated soils, select discrete and discernible windrows or stockpiles of treated soils.*
- *Representative composite samples should be taken for discrete and discernible windrows or stockpiles of treated soils.*
- *For remedial excavations, select an area for sampling equivalent to between 200 m<sup>2</sup> and 400 m<sup>2</sup>.*
- *Collect samples for field testing of OVA measurements in a sealable ziplock bag. Collect jarred samples for laboratory analysis of organic parameters (wide mouth, 250 mL, glass container with teflon lined plastic lid).*
- *Label each bag and jar in accordance with the identification included on the Chain of Custody form.*
- *Collect enough soil (using a clean trowel) to fill 1 jar and 1 sealable bag.*
- **For discrete samples**, *do not mix soil from sampling locations.*
- **For composite samples**, *mix soil samples in a clean container before filling containers. Composite samples should consist of a minimum of 5 discrete samples collected and mixed to fairly represent the soils in question. These samples should be homogenized and quartered. The sample for laboratory testing will comprise the combined sample generated by each of these quarters. Composite sampling is valid only for analysis of non-volatile compounds. Analysis of volatile compounds (BTEX, F1 and F2 hydrocarbon fractions) should be completed on the composite soil sample representing the highest OVA readings of the samples that are collected to form the composite.*
- *Fill jars completely, compressing soil to remove air pockets and screw the lids on tightly. Ensure soil is removed from the threads of the jar and does not cause the lid to bulge.*
- *Place jars and bags in cooler with ice or freezer packs, to ensure samples stay cold until arrival at laboratory. Packing material inserted around the sample jars should prevent breakage in transit.*
- *Deliver all samples to the laboratory in a manner consistent with the requisite hold times for each analysis. Samples should be analyzed by Maxxam Analytics.*



In sampling stockpiles and windrows samples will be collected throughout the pile in order to properly characterize the soil.

## Lagoon Decommissioning

The following procedure should be followed for drainage and decommissioning of the sewage lagoon:

1. Collect a sample of the water impounded in the lagoon. This sample should be tested for the following parameters:
  - a. Routine potability parameters
  - b. Dissolved hydrocarbons (BTEX, F1 and F2 PHC)
2. Once results verify that the water in the sewage lagoon complies with the release criteria for the lagoon, pump this into a natural drainage course.
3. Once the water in the sewage lagoon is entirely removed, scrape the accumulated sediments in the lagoon so that these sediments stack against the inner slopes of the lagoon.
4. Once these sediments have dried to achieve a solid consistency, remove the dried sediments and stockpile inside the soil treatment area.
5. Sample the dried and stockpiled sediments and analyze for heavy metals, salinity parameters, BTEX, and F1 to F4 PHCs.
6. If the dried and stockpiled sediments comply with the Tier 1 standard for the NWT, maintain these soils for ultimate reclamation of the ground surface of the lagoon.

It is assumed that some impounded water will remain in the lagoon following use of this water in the soil treatment and RegenOx amendment process. Hence, sampling to verify that this water is suitable for discharge is also required, at least as a contingency measure.



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## Responsibilities

Shell Canada Limited: Funding and budgeting, provision of a safe work Site, regulatory interface, safety audit.

HAZCO Environmental Services Ltd: Project execution, implementation of safety program, mobilization and demobilization of equipment and materials, safe handling of all products and wastes, record keeping related to project implementation and safety.

IEG: Monitoring of remedial excavations and soil treatment. Record keeping related to same.

E. Gruben Transport: Provision of a working, fit for purpose camp.

WorleyParsons: Site characterization, development of the 2009 Program plan, and final reporting.

Acknowledged:

Randall Warren, Shell Canada Limited

Kevin Erickson, HAZCO Environmental Services

David Wells, IEG

Gordon Johnson, WorleyParsons



## Camp Farewell - 2009

### Safety Interface Document

By: Gordon Johnson

Date: 5/30/2009

The objectives of this document are to describe how the safety and environmental elements of the 2009 Camp Farewell Remediation Program (2009 Program) will be handled and to describe each party's responsibility for implementing safe work procedures during project execution. HAZCO Environmental Services Ltd. is the Prime Contractor as defined by applicable Health and Safety Legislation and has primary responsibility for all site activities and safety for the 2009 Program.

### **Health and Safety Procedures and Requirements**

Shell Canada has entered into Master Services Agreements with each of the parties involved in the 2009 Program. As Prime Contractor, HAZCO is responsible for ensuring that all activities are completed in accordance with its own corporate health and safety procedures as well as specific safety and environmental requirements developed for the 2009 Program. Each member of the project team is required to be familiar with HAZCO corporate health and safety procedures as well as the following documents.

- Shell's Alcohol and Drug Policy
- Tool and Equipment Use and Inspection

This document elaborates on the following additional requirements related to health, safety and environmental protection that are specific to this project:

- Personal Protective Equipment (PPE) and Training Requirements
- Response to / Preparation for Inclement Weather
- First Aid / Medical Care Response and Provisions
- Safety Coverage and Call-Out
- Site Access Requirements / Work Permitting
- Accident / Incident Investigation
- Safety Observations and Audits
- Workforce Accountability

### **Personal Protective Equipment (PPE) and Training Requirements**

The following PPE must be worn at all times while working on the Camp Farewell site and surrounding lands:



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- Hardhat
- Safety glasses with side shields
- Gloves Steel toed safety shoes/boots
- Hearing protection (if required)
- High visibility vest
- Flotation vest (when working on or immediately adjacent to water)

The following training is required, at a minimum, for all Site workers:

- Workplace Hazards Information System
- Industrial First Aid
- Shell 12 Life Saving Rules
- Appropriate training in equipment operation (for operators)

## **Response to / Preparation for Inclement Weather**

In the event of severe weather work crews shall:

- Monitor weather reports
- Stop work before severe weather is incurred
- Secure equipment and materials
- Move any vehicles as required
- Shelter in the Permanent Work Camp.

## **First Aid / Medical Care Response and Provisions**

First aid, medical care response, and other provisions are addressed in the HAZCO Safe Work Procedures. In addition to these standard first aid requirements, the following first aid equipment and facilities shall be mobilized to the Site.

- 2 Standard First Aiders
- No. 3 First Aid Kit
- 3 Blankets, stretcher, splints

The Program Manager, Randall Warren, is ultimately responsible for the safety of this project. In the event of an injury or safety / environmental incident HAZCO will make the following communications:



Name	Company	Role	Cell Phone or Pager	E-mail	Maximum Duration After Event
Randall Warren	Shell Canada	Project Manager	(403) 813 0408	<a href="mailto:randall.warren@shell.com">randall.warren@shell.com</a>	1 hour
Gordon Johnson	Worley Parsons	Environmental Consultant	403 473 8371	<a href="mailto:gord..johnson@worleyparsonsc.com">gord..johnson@worleyparsonsc.com</a>	24 hours
Kevin Erickson	HAZCO	Site Manager	403 297 0444	<a href="mailto:kerickson@hazco.com">kerickson@hazco.com</a>	1 hour
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HAZCO's Site supervisor will, at a minimum, contact the Shell Canada Project Manager (or his back-up). The Shell Project Manager (or his back-up) will then contact the remaining people on the list if required.

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- If site activities deviate (in a significant manner) from that contemplated in the daily work permit, work shall stop and the permitting and safety meeting process shall be repeated prior to resuming work.
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- Have received Site Orientation



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- Sign the Daily Work Permit
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## Environmental Protection

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- Prevent spills or accidental releases to the environment of any materials and wastes associated with or generated by implementation of the 2009 Program. This includes industrial wastes, domestic wastes and sewage.

**APPENDIX II**  
**Site Photographs**

DRAFT



**Photograph 1:** Impacted soils being aerated with an allu bucket inside the treatment cell.



**Photograph 2:** RegenOx (Part B) being applied to a windrow



**Photograph 3:** RegenOx (Part A) being mixed into windrow 3.



**Photograph 4:** North end of Camp Farewell treatment cell, water is being applied to windrow 2. Excavation 1, the largest area of excavation is visible in the right background.



**Photograph 5:** In situ subsurface treatment trench looking south.



**Photograph 6:** In situ subsurface treatment trench and 50 mm piping system prior to backfilling looking north. Tank farm berm at right, excavation #1 at left.



**Photograph 7:** Perforations made on-site. Holes are spaced around all sides of the pipe.



**Photograph 8:** Excavation #1 following backfilling.



**Photograph 9:** Panorama looking north from camp building. Herc fuel tank at left, backfilled excavation #1 at centre and tank farm at far right.



**Photograph 10:** Panorama looking northeast from camp building. Portion of backfilled excavation #1 at left and regraded treatment cell area in centre.



**APPENDIX III**

**Laboratory Analytical Results**



Your P.O. #: 47001127 005 OD  
 Your Project #: A04012A01  
 Site: CAMPFAREWELL, NT  
 Your C.O.C. #: 81063, 81064, 81065, 81066, 81067

**Attention: DAVID WELLS**  
 IEG CONSULTANTS  
 PO Box 3178  
 INUVIK, NT  
 CANADA X0E0T0

**Report Date: 2010/02/08**

This report supersedes all previous reports with the same Maxxam job number

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: A941973**  
**Received: 2009/08/07, 8:35**

Sample Matrix: Soil  
 # Samples Received: 9

Analyses	Quantity	Date		Laboratory Method	Analytical Method
		Extracted	Analyzed		
BTEX/F1 by HS GC/MS (MeOH extract)	9	2009/08/10	2009/08/12	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
CCME Hydrocarbons (F2-F4 in soil)	4	2009/08/14	2009/08/15	EENVSOP-00007 EENVSOP-00006	CCME PHC-CWS
Moisture	9	N/A	2009/08/11	EENVSOP-00139	Carter SSMA 51.2

Encryption Key

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

ALAINA HUNTER, Project Manager  
 Email: [alaina.hunter@maxxamanalytics.com](mailto:alaina.hunter@maxxamanalytics.com)  
 Phone# (780) 577-7100

=====  
 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. SCC and CALA have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

**RESULTS OF CHEMICAL ANALYSES OF SOIL**

Maxxam ID		Q17445	Q17446	Q17447	Q17448		
Sampling Date		2009/08/02	2009/08/02	2009/08/02	2009/08/02		
COC Number		81063	81063	81063	81063		
	<b>Units</b>	<b>SS09-CWR1-1</b>	<b>SS09-CWR1-2</b>	<b>SS09-CWR2-1</b>	<b>SS09-CWR2-2</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>							
Moisture	%	7.1	7.7	8.2	7.5	0.3	3338854

RDL = Reportable Detection Limit

Maxxam ID		Q17453	Q17457	Q17466	Q17469	Q17475		
Sampling Date		2009/08/02	2009/08/02	2009/08/02	2009/08/02	2009/08/02		
COC Number		81064	81064	81065	81065	81066		
	<b>Units</b>	<b>SS09-WR1-3</b>	<b>SS09-WR1-7</b>	<b>SS09-WR2-3</b>	<b>SS09-WR2-6</b>	<b>SS09-WR2-12</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>								
Moisture	%	8.7	6.8	6.7	7.2	6.8	0.3	3338854

RDL = Reportable Detection Limit

**PETROLEUM HYDROCARBONS (CCME)**

Maxxam ID		Q17445	Q17446	Q17447	Q17448		
Sampling Date		2009/08/02	2009/08/02	2009/08/02	2009/08/02		
COC Number		81063	81063	81063	81063		
	<b>Units</b>	<b>SS09-CWR1-1</b>	<b>SS09-CWR1-2</b>	<b>SS09-CWR2-1</b>	<b>SS09-CWR2-2</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Ext. Pet. Hydrocarbon</b>							
F2 (C10-C16 Hydrocarbons)	mg/kg	700	600	120	140	10	3350172
F3 (C16-C34 Hydrocarbons)	mg/kg	910	780	190	180	10	3350172
F4 (C34-C50 Hydrocarbons)	mg/kg	45	30	22	13	10	3350172
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3350172
<b>Surrogate Recovery (%)</b>							
O-TERPHENYL (sur.)	%	87	84	84	84	N/A	3350172

N/A = Not Applicable  
 RDL = Reportable Detection Limit

**VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		Q17445	Q17446	Q17447		
Sampling Date		2009/08/02	2009/08/02	2009/08/02		
COC Number		81063	81063	81063		
	<b>Units</b>	<b>SS09-CWR1-1</b>	<b>SS09-CWR1-2</b>	<b>SS09-CWR2-1</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Volatiles</b>						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	3337322
Toluene	mg/kg	<0.020	<0.020	<0.020	0.020	3337322
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	0.010	3337322
Xylenes (Total)	mg/kg	0.10	<0.040	<0.040	0.040	3337322
m & p-Xylene	mg/kg	0.10	<0.040	<0.040	0.040	3337322
o-Xylene	mg/kg	<0.020	<0.020	<0.020	0.020	3337322
F1 (C6-C10) - BTEX	mg/kg	<12	14	36	12	3337322
(C6-C10)	mg/kg	<12	14	36	12	3337322
<b>Surrogate Recovery (%)</b>						
4-BROMOFLUOROBENZENE (sur.)	%	107	113	98	N/A	3337322
D10-ETHYLBENZENE (sur.)	%	81	120	96	N/A	3337322
D4-1,2-DICHLOROETHANE (sur.)	%	87	87	89	N/A	3337322
D8-TOLUENE (sur.)	%	103	105	105	N/A	3337322

N/A = Not Applicable  
 RDL = Reportable Detection Limit

**VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		Q17447	Q17448	Q17453	Q17457		
Sampling Date		2009/08/02	2009/08/02	2009/08/02	2009/08/02		
COC Number		81063	81063	81064	81064		
	<b>Units</b>	<b>SS09-CWR2-1 Lab-Dup</b>	<b>SS09-CWR2-2</b>	<b>SS09-WR1-3</b>	<b>SS09-WR1-7</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Volatiles</b>							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3337322
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3337322
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3337322
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3337322
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3337322
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3337322
F1 (C6-C10) - BTEX	mg/kg	37	22	23	100	12	3337322
(C6-C10)	mg/kg	37	22	23	100	12	3337322
<b>Surrogate Recovery (%)</b>							
4-BROMOFLUOROBENZENE (sur.)	%	98	100	100	97	N/A	3337322
D10-ETHYLBENZENE (sur.)	%	89	96	98	87	N/A	3337322
D4-1,2-DICHLOROETHANE (sur.)	%	84	87	87	89	N/A	3337322
D8-TOLUENE (sur.)	%	104	104	105	107	N/A	3337322

N/A = Not Applicable  
 RDL = Reportable Detection Limit

**VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		Q17466	Q17469	Q17475		
Sampling Date		2009/08/02	2009/08/02	2009/08/02		
COC Number		81065	81065	81066		
	<b>Units</b>	<b>SS09-WR2-3</b>	<b>SS09-WR2-6</b>	<b>SS09-WR2-12</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Volatiles</b>						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	3337322
Toluene	mg/kg	<0.020	<0.020	0.022	0.020	3337322
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	0.010	3337322
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	0.040	3337322
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	0.040	3337322
o-Xylene	mg/kg	<0.020	<0.020	<0.020	0.020	3337322
F1 (C6-C10) - BTEX	mg/kg	110	49	47	12	3337322
(C6-C10)	mg/kg	110	49	47	12	3337322
<b>Surrogate Recovery (%)</b>						
4-BROMOFLUOROBENZENE (sur.)	%	114	105	104	N/A	3337322
D10-ETHYLBENZENE (sur.)	%	97	92	106	N/A	3337322
D4-1,2-DICHLOROETHANE (sur.)	%	88	96	95	N/A	3337322
D8-TOLUENE (sur.)	%	108	102	102	N/A	3337322

N/A = Not Applicable  
 RDL = Reportable Detection Limit



Maxxam Job #: A941973  
Report Date: 2010/02/08

IEG CONSULTANTS  
Client Project #: A04012A01  
Site Reference: CAMPFAREWELL,NT  
Your P.O. #: 47001127 005 OD  
Sampler Initials: RL

Package 1	9.3°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

**General Comments**

**Results relate only to the items tested.**





IEG CONSULTANTS  
 Attention: DAVID WELLS  
 Client Project #: A04012A01  
 P.O. #: 47001127 005 OD  
 Site Reference: CAMPFAREWELL,NT

Quality Assurance Report  
 Maxxam Job Number: EA941973

QA/QC Batch	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits			
Num Init			yyyy/mm/dd							
3337322	CC6 Matrix Spike [Q17448-01]	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		98	%	60 - 140			
		D10-ETHYLBENZENE (sur.)	2009/08/12		87	%	30 - 130			
		D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		89	%	60 - 140			
			D8-TOLUENE (sur.)	2009/08/12		103	%	60 - 140		
			Benzene	2009/08/12		84	%	60 - 140		
			Toluene	2009/08/12		91	%	60 - 140		
			Ethylbenzene	2009/08/12		95	%	60 - 140		
			m & p-Xylene	2009/08/12		99	%	60 - 140		
			o-Xylene	2009/08/12		94	%	60 - 140		
			(C6-C10)	2009/08/12		103	%	60 - 140		
			Spiked Blank		4-BROMOFLUOROBENZENE (sur.)	2009/08/12		97	%	60 - 140
					D10-ETHYLBENZENE (sur.)	2009/08/12		91	%	30 - 130
					D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		88	%	60 - 140
					D8-TOLUENE (sur.)	2009/08/12		102	%	60 - 140
					Benzene	2009/08/12		85	%	60 - 140
	Toluene	2009/08/12				89	%	60 - 140		
	Method Blank		Ethylbenzene	2009/08/12		96	%	60 - 140		
			m & p-Xylene	2009/08/12		96	%	60 - 140		
			o-Xylene	2009/08/12		94	%	60 - 140		
			(C6-C10)	2009/08/12		109	%	80 - 120		
			4-BROMOFLUOROBENZENE (sur.)	2009/08/12		98	%	60 - 140		
			D10-ETHYLBENZENE (sur.)	2009/08/12		88	%	30 - 130		
			D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		87	%	60 - 140		
			D8-TOLUENE (sur.)	2009/08/12		104	%	60 - 140		
			Benzene	2009/08/12	<0.0050			mg/kg		
			Toluene	2009/08/12	<0.020			mg/kg		
			Ethylbenzene	2009/08/12	<0.010			mg/kg		
			Xylenes (Total)	2009/08/12	<0.040			mg/kg		
	m & p-Xylene	2009/08/12	<0.040			mg/kg				
	o-Xylene	2009/08/12	<0.020			mg/kg				
	F1 (C6-C10) - BTEX	2009/08/12	<12			mg/kg				
	(C6-C10)	2009/08/12	<12			mg/kg				
	RPD [Q17447-01]		Benzene	2009/08/12	NC		%	50		
Toluene			2009/08/12	NC		%	50			
Ethylbenzene			2009/08/12	NC		%	50			
Xylenes (Total)			2009/08/12	NC		%	50			
m & p-Xylene			2009/08/12	NC		%	50			
o-Xylene			2009/08/12	NC		%	50			
F1 (C6-C10) - BTEX			2009/08/12	NC		%	50			
(C6-C10)			2009/08/12	NC		%	50			
3338854			SR7	Method Blank	Moisture	2009/08/11	<0.3	%		
				RPD	Moisture	2009/08/11	4.0	%	20	
	3350172	LD2		Matrix Spike	O-TERPHENYL (sur.)	2009/08/15		78	%	50 - 130
F2 (C10-C16 Hydrocarbons)			2009/08/15			104	%	50 - 130		
F3 (C16-C34 Hydrocarbons)			2009/08/15			104	%	50 - 130		
F4 (C34-C50 Hydrocarbons)			2009/08/15			100	%	50 - 130		
Spiked Blank				O-TERPHENYL (sur.)	2009/08/15		77	%	50 - 130	
				F2 (C10-C16 Hydrocarbons)	2009/08/15		117	%	80 - 120	
				F3 (C16-C34 Hydrocarbons)	2009/08/15		119	%	80 - 120	
				F4 (C34-C50 Hydrocarbons)	2009/08/15		116	%	80 - 120	
Method Blank				O-TERPHENYL (sur.)	2009/08/15		94	%	50 - 130	
				F2 (C10-C16 Hydrocarbons)	2009/08/15	<10		mg/kg		
				F3 (C16-C34 Hydrocarbons)	2009/08/15	<10		mg/kg		
				F4 (C34-C50 Hydrocarbons)	2009/08/15	<10		mg/kg		



IEG CONSULTANTS  
Attention: DAVID WELLS  
Client Project #: A04012A01  
P.O. #: 47001127 005 OD  
Site Reference: CAMPFAREWELL,NT

Quality Assurance Report (Continued)

Maxxam Job Number: EA941973

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3350172 LD2	RPD	F2 (C10-C16 Hydrocarbons)	2009/08/15	NC		%	50
		F3 (C16-C34 Hydrocarbons)	2009/08/15	12.3		%	50
		F4 (C34-C50 Hydrocarbons)	2009/08/15	NC		%	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.  
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.  
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.  
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.  
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.  
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone(780)577-7100 Fax(780)450-4187

**Validation Signature Page**

**Maxxam Job #: A941973**

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The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



HUA WO, Organics Supervisor



JIM TJATHAS, Analyst 2

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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. SCC and CALA have approved this reporting process and electronic report format.

**Invoice To:** Require Report? Yes  No   
**Company Name:** Shell Canada  
**Contact Name:** Randall Warren  
**Address:** PO Box 100, Stn main Calgary  
 Prov: Alta PC: T2P 2H5  
**Contact #s:** Ph: Fax:

**Report To:**  
 David wells  
 IEG Consultants Ltd  
 Inuvik  
 Prov: NT PC: XOE OTO  
 Ph: 867 777-8521 Fax: 867 777-2747

PO # / AFE #:  
 Quotation #:  
 Project #: A04012A01  
 Project Name: Camp farewell  
 Location: Camp farewell, NT  
 Sampler's Initials: RL, SB

**DETECTION LIMIT REQUIREMENTS:**  
 Check the applicable criterion and indicate land use  
 AT1  
 CGME  
 OTHER

**REPORT DISTRIBUTION:**  
**EMAIL ADDRESS(S):**  
 dwells@ieg.ca  
 Sbird@ieg.ca

**SERVICE REQUESTED:**  
 RUSH (Please ensure you contact the lab to reserve)  
 Date Required: \_\_\_\_\_  
 REGULAR Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)		WATERS (footnotes defined on back)										OTHER TEST(S)															
			BTEX F1-F4	Regulated Metals (CCME / AT1) <sup>3</sup>	BTEX F1	VOCs	BTEX F1-F2	BTEX F1-F4	Routine Water Package	Turb	F	Total	Preserved	Not Preserved	Dissolved	Preserved	Not Preserved	Filtered	Not Filtered	Total	Dissolved	Mercury	Ammonia	TKN	COD	TOC	DOC	*HOLD for 60 Days	# of Containers Submitted	
1 Sed09-01 0-0.3m	S	2009/08/03	X	X																										
2 02 0.3-0.5m	S	↓	X	X																										
3 03 0-0.3m	S		X	X																										
4 04 0.3-0.5m	S		X	X																										
5 05 0-0.3m	S		X	X																										
6 06 0.3-0.5m	S		X	X																										
7 07 0.5-0.75m	S		X	X																										
8 S509-CWR1-1	S		2009/08/02																											
9 S509-CWR1-2	S	↓																												
10 S509-CWR2-1	S																													
11 S509-CWR2-2	S																													
12 S509-CWR3-1	S																													

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager. Maxxam Job #:

Relinquished By: SAM BIRD Date/Time: Aug 6, 2009  
 Sign and Print: *Sam Bird*

# JARS USED & NOT SUBMITTED: Aug 7 '09 8:35  
 Received By: MGR  
 Temperature: 9 11 8  
 Ice: 8  
 CUSTODY SEAL YES / NO

A9419734# / JA Page 3 of 5

**Invoice To:**  Require Report? Yes  No   
**Company Name:** Shell Canada  
**Contact Name:** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Prov:** \_\_\_\_\_ **PC:** \_\_\_\_\_  
**Contact #s:** **Ph:** \_\_\_\_\_ **Fax:** \_\_\_\_\_

**Report To:** David wells  
\_\_\_\_\_  
\_\_\_\_\_  
**Prov:** \_\_\_\_\_ **PC:** \_\_\_\_\_  
**Ph:** \_\_\_\_\_ **Fax:** \_\_\_\_\_

**PO # / AFE #:** \_\_\_\_\_  
**Quotation #:** \_\_\_\_\_  
**Project #:** A04012A01  
**Project Name:** \_\_\_\_\_  
**Location:** \_\_\_\_\_  
**Sampler's Initials:** \_\_\_\_\_

**DETECTION LIMIT REQUIREMENTS:**  
Check the applicable criterion and indicate land use  
 AT1 \_\_\_\_\_  
 CCME \_\_\_\_\_  
 OTHER \_\_\_\_\_

**REPORT DISTRIBUTION:**  
**EMAIL ADDRESS(S):**  
dwells@ieg.ca  
Sbird@ieg.ca

**SERVICE REQUESTED:**  
 RUSH (Please ensure you contact the lab to reserve)  
**Date Required:** \_\_\_\_\_  
 REGULAR Turnaround (5 to 7 Days)

Sample Identification			Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)	WATERS (footnotes defined on back)	OTHER TEST(S)	*HOLD for 60 Days	# of Containers Submitted
1	SS09-CWR3-2	S	S	2009/08/02	<input type="checkbox"/> BTEX F1-F4 <input type="checkbox"/> Sieve (75 micron) <input type="checkbox"/> Salinity 4 <input type="checkbox"/> Regulated Metals (CCME / AT1) <input type="checkbox"/> Assessment (CP Metals) <input type="checkbox"/> Paint Filter <input type="checkbox"/> Flashpoint <input type="checkbox"/> pH (1:1) <input type="checkbox"/> TCLP <input type="checkbox"/> BTEX <input type="checkbox"/> Metals F2-F4 BTEX F1	<input type="checkbox"/> BTEX F1 <input type="checkbox"/> VOCs <input type="checkbox"/> BTEX F1-F2 <input type="checkbox"/> BTEX F1-F4 Routine Water Package <input type="checkbox"/> Turb <input type="checkbox"/> F Total <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved Dissolved <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved <input type="checkbox"/> Filtered <input type="checkbox"/> Not Filtered Mercury <input type="checkbox"/> Total <input type="checkbox"/> Dissolved <input type="checkbox"/> Ammonia <input type="checkbox"/> TKN <input type="checkbox"/> COD <input type="checkbox"/> TOC <input type="checkbox"/> DOC			
2	SS09-WR1-1	S	S		<del>DO NOT ANALYZE</del>				
3	2	S	S						
4	3	S	S						
5	4	S	S						
6	5	S	S						
7	6	S	S						
8	7	S	S						
9	8	S	S						
10	9	S	S						
11	10	S	S						
12	11	S	S						

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager. Maxxam Job #:

Relinquished By: Sam Bird Date/Time: Aug 6, 2009  
Sign and Print: \_\_\_\_\_

# JARS USED & NOT SUBMITTED	Received By	Temperature	Ice
	<u>Aug 7 '09 MG</u> <u>8:35</u>	<u>9 11 8</u>	
CUSTODY SEAL YES / NO			

256



Calgary: 4000 19st St. NE, T2E 6P8  
Edmonton: 9331 - 48 Street, T6B 2R4

Ph: (403) 291-3077 Fax: (403) 735-2240 Toll free: (800) 386-7247  
Ph: (780) 465-1212 Fax: (780) 450-4187 Toll free: (877) 465-8889  
www.maxxamanalytics.com

81065 CHAIN OF CUSTODY  
A941913 Page: 3 of 5

Invoice To: Require Report? Yes  No

Company Name: Shell Canada

Contact Name: \_\_\_\_\_

Address: \_\_\_\_\_

Prov: \_\_\_\_\_ PC: \_\_\_\_\_

Contact #: \_\_\_\_\_ Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

Report To: David wells

Prov: \_\_\_\_\_ PC: \_\_\_\_\_

Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

PO # / AFE #: \_\_\_\_\_

Quotation #: \_\_\_\_\_

Project #: A04012A01

Project Name: \_\_\_\_\_

Location: \_\_\_\_\_

Sampler's Initials: \_\_\_\_\_

**DETECTION LIMIT REQUIREMENTS:**  
Check the applicable criterion and indicate land use

AT1 \_\_\_\_\_

CCME \_\_\_\_\_

OTHER \_\_\_\_\_

**REPORT DISTRIBUTION:**  
EMAIL ADDRESS(S):  
dwells@ieg.ca  
Sbifd@ieg.ca

**SERVICE REQUESTED:**

RUSH (Please ensure you contact the lab to reserve)

Date Required: \_\_\_\_\_

REGULAR Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)						WATERS (footnotes defined on back)						OTHER TEST(S)			*HOLD for 60 Days # of Containers Submitted						
			BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1) <sup>1</sup>	Assessment (ICP Metals) <sup>2</sup>	Paint Filter <input type="checkbox"/> Flashpoint <input type="checkbox"/> pH (1:1) <input type="checkbox"/>	TCLP <input type="checkbox"/> BTEX <input type="checkbox"/> Metals	BTEX F1	VOCs	BTEX F1-F2	BTEX F1-F4	Routine Water Package <input type="checkbox"/> Turb <input type="checkbox"/> F	Total <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Dissolved <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Filtered <input type="checkbox"/> Not Filtered		Mercury <input type="checkbox"/> Total <input type="checkbox"/> Dissolved	Ammonia <input type="checkbox"/> TKN <input type="checkbox"/> COD	TOC <input type="checkbox"/> DOC			
1 S509-WR1-12	S	2009/08/02																						
2 S509-WR2-1	S	2009/08/02																						
3 2	S																							
4 3	S																							
5 4	S																							
6 5	S																							
7 6	S																							
8 7	S																							
9 8	S																							
10 9	S																							
11 10	S																							
12 11	S																							

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #: \_\_\_\_\_

Relinquished By: Gambard

Date/Time: Aug 6, 2009

# JARS USED & NOT SUBMITTED

Received By: Aug 7, 09 8:35 MC

Temperature: 9 11 8 Ice: \_\_\_\_\_

COMMENTS/SPECIAL INSTRUCTIONS:

CUSTODY SEAL YES / NO

**Invoice To:** Require Report? Yes  No

**Company Name:** Shell Canada

**Contact Name:**

**Address:**

**Prov:** **PC:**

**Contact #s:** **Ph:** **Fax:**

**Report To:** David wells

**Prov:** **PC:**

**Ph:** **Fax:**

**PO # / AFE #:**

**Quotation #:**

**Project #:** A04012A01

**Project Name:**

**Location:**

**Sampler's Initials:**

**DETECTION LIMIT REQUIREMENTS:**

Check the applicable criterion and indicate land use

AT1

CCME

OTHER

**REPORT DISTRIBUTION:**

**EMAIL ADDRESS(S):**  
dwells@ieg.ca  
dwells@ieg.ca

**SERVICE REQUESTED:**

**RUSH** (Please ensure you contact the lab to reserve)

**Date Required:**

**REGULAR** Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)				WATERS (footnotes defined on back)						OTHER TEST(S)				*HOLD for 60 Days	# of Containers Submitted				
			BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1) <sup>2</sup>	Assessment ICP Metals <sup>2</sup>	<input type="checkbox"/> Paint Filter <input type="checkbox"/> Flashpoint <input type="checkbox"/> pH (1:1)	TCLP <input type="checkbox"/> BTEX <input type="checkbox"/> Metals	BTEX FI	<input type="checkbox"/> BTEX F1 <input type="checkbox"/> VOCs	<input type="checkbox"/> BTEX F1-F2 <input type="checkbox"/> BTEX F1-F4	Routine Water Package <input type="checkbox"/> Turb <input type="checkbox"/> F	Total <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Dissolved <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	<input type="checkbox"/> Filtered <input type="checkbox"/> Not Filtered			Total <input type="checkbox"/> Dissolved	Mercury <input type="checkbox"/> Ammonia <input type="checkbox"/> TKN <input type="checkbox"/> COD	TOC <input type="checkbox"/> DOC	
1 S509-WR2-12	S	2009/08/02																				
2 S509-WR3-1	S	2009/08/01																				
3 2	S																					
4 3	S																					
5 4	S																					
6 5	S																					
7 6	S																					
8 7	S				No																	
9 8	S																					
10 9	S																					
11 10	S																					
12 11	S																					

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: [Signature] Date/Time: Aug 6, 2009

Sign and Print: [Signature]

# JARS USED & NOT SUBMITTED	Received By	Temperature		Ice
	Aug 7 '09 8:35 MC	9	11	8
CUSTODY SEAL YES / NO				

**Invoice To:** Require Report? Yes  No

**Company Name:** Shell Canada

**Contact Name:**

**Address:**

**Prov:** **PC:**

**Contact #s:** **Ph:** **Fax:**

**Report To:** David wells

**Prov:** **PC:**

**Ph:** **Fax:**

**PO # / AFE #:**

**Quotation #:**

**Project #:** A04012A01

**Project Name:**

**Location:**

**Sampler's Initials:**

**DETECTION LIMIT REQUIREMENTS:**

Check the applicable criterion and indicate land use

AT1 \_\_\_\_\_

CCME \_\_\_\_\_

OTHER \_\_\_\_\_

**REPORT DISTRIBUTION:**

**EMAIL ADDRESS(S):**  
 dwells@ieg.ca  
 Sbird@ieg.ca

**SERVICE REQUESTED:**

RUSH (Please ensure you contact the lab to reserve)

**Date Required:** \_\_\_\_\_

REGULAR Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)						WATERS (footnotes defined on back)						OTHER TEST(S)				
			BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1) <sup>1</sup>	Assessment ICP Metals <sup>2</sup>	Paint Filter <input type="checkbox"/> Flashpoint <input type="checkbox"/> pH (1:1)	TCLP <input type="checkbox"/> BTEX <input type="checkbox"/> Metals	BTEX F1 <input type="checkbox"/> VOCs	BTEX F1-F2 <input type="checkbox"/> BTEX F1-F4	Routine Water Package <input type="checkbox"/> Turb <input type="checkbox"/> F	Total <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Dissolved <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Filtered <input type="checkbox"/> Not Filtered	Mercury <input type="checkbox"/> Total <input type="checkbox"/> Dissolved	Ammonia <input type="checkbox"/> TKN <input type="checkbox"/> COD	TOC <input type="checkbox"/> DOC	*HOLD for 60 Days
1 SS09-WR3-12	S	2009/08/01																	
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD Date/Time: Aug 6, 2009

Sign and Print: Sam Bird

# JARS USED & NOT SUBMITTED	Received By	Temperature		Ice
	Aug 7 10:35 AM	9	11	8
CUSTODY SEAL YES / NO				





Your P.O. #: 47001127 005 OD  
 Your Project #: A04012A01 CAMP FAREWELL  
 Site: CAMP FAREWELL,NT  
 Your C.O.C. #: 81068, 81069

**Attention: DAVID WELLS**  
 IEG CONSULTANTS  
 PO Box 3178  
 INUVIK, NT  
 CANADA X0E0T0

**Report Date: 2009/08/15**

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: A941971**  
**Received: 2009/08/07, 8:35**

Sample Matrix: Soil  
 # Samples Received: 6

Analyses	Quantity	Date		Laboratory Method	Analytical Method
		Extracted	Analyzed		
BTEX/F1 by HS GC/MS (MeOH extract)	3	2009/08/10	2009/08/12	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
CCME Hydrocarbons (F2-F4 in soil)	3	2009/08/10	2009/08/14	EENVSOP-00007 EENVSOP-00006	CWS PHCS Tier 1
Moisture	6	N/A	2009/08/11	EENVSOP-00139	Carter SSMA 51.2

**Encryption Key**

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

ALAINA HUNTER, Project Manager  
 Email: [alaina.hunter@maxxamanalytics.com](mailto:alaina.hunter@maxxamanalytics.com)  
 Phone# (780) 577-7100

=====

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. SCC and CALA have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1



Maxxam Job #: A941971  
 Report Date: 2009/08/15

IEG CONSULTANTS  
 Client Project #: A04012A01 CAMP FAREWELL  
 Site Reference: CAMP FAREWELL,NT  
 Your P.O. #: 47001127 005 OD  
 Sampler Initials: SB

**RESULTS OF CHEMICAL ANALYSES OF SOIL**

Maxxam ID		Q17410	Q17415	Q17422	Q17425		
Sampling Date		2009/08/04	2009/08/04	2009/08/04	2009/08/04		
COC Number		81068	81068	81069	81069		
	<b>Units</b>	<b>SS09-WR3-13</b>	<b>SS09-WR3-18</b>	<b>SS09-WR3-25</b>	<b>SS09-CWR3-3</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>							
Moisture	%	14	9.0	7.8	6.3	0.3	3337922

RDL = Reportable Detection Limit

Maxxam ID		Q17426	Q17426	Q17427		
Sampling Date		2009/08/04	2009/08/04	2009/08/04		
COC Number		81069	81069	81069		
	<b>Units</b>	<b>SS09-CWR3-4</b>	<b>SS09-CWR3-4 Lab-Dup</b>	<b>SS09-CWR3-5</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>						
Moisture	%	7.3	7.6	12	0.3	3338854

RDL = Reportable Detection Limit

**PETROLEUM HYDROCARBONS (CCME)**

Maxxam ID		Q17425	Q17426	Q17427		
Sampling Date		2009/08/04	2009/08/04	2009/08/04		
COC Number		81069	81069	81069		
	<b>Units</b>	<b>SS09-CWR3-3</b>	<b>SS09-CWR3-4</b>	<b>SS09-CWR3-5</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Ext. Pet. Hydrocarbon</b>						
F2 (C10-C16 Hydrocarbons)	mg/kg	95	85	110	10	3337697
F3 (C16-C34 Hydrocarbons)	mg/kg	100	120	120	10	3337697
F4 (C34-C50 Hydrocarbons)	mg/kg	20	13	12	10	3337697
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3337697
<b>Surrogate Recovery (%)</b>						
O-TERPHENYL (sur.)	%	99	120	118	N/A	3337697

N/A = Not Applicable  
 RDL = Reportable Detection Limit

**VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		Q17410	Q17415	Q17422		
Sampling Date		2009/08/04	2009/08/04	2009/08/04		
COC Number		81068	81068	81069		
	<b>Units</b>	<b>SS09-WR3-13</b>	<b>SS09-WR3-18</b>	<b>SS09-WR3-25</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Volatiles</b>						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	3337322
Toluene	mg/kg	0.025	0.057	0.023	0.020	3337322
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	0.010	3337322
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	0.040	3337322
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	0.040	3337322
o-Xylene	mg/kg	<0.020	<0.020	<0.020	0.020	3337322
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	12	3337322
(C6-C10)	mg/kg	<12	<12	<12	12	3337322
<b>Surrogate Recovery (%)</b>						
4-BROMOFLUOROBENZENE (sur.)	%	98	99	98	N/A	3337322
D10-ETHYLBENZENE (sur.)	%	91	85	87	N/A	3337322
D4-1,2-DICHLOROETHANE (sur.)	%	86	94	86	N/A	3337322
D8-TOLUENE (sur.)	%	104	102	102	N/A	3337322
N/A = Not Applicable RDL = Reportable Detection Limit						



Maxxam Job #: A941971  
Report Date: 2009/08/15

IEG CONSULTANTS  
Client Project #: A04012A01 CAMP FAREWELL  
Site Reference: CAMP FAREWELL,NT  
Your P.O. #: 47001127 005 OD  
Sampler Initials: SB

Package 1	9.3°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

**General Comments**

**Results relate only to the items tested.**



IEG CONSULTANTS  
 Attention: DAVID WELLS  
 Client Project #: A04012A01 CAMP FAREWELL  
 P.O. #: 47001127 005 OD  
 Site Reference: CAMP FAREWELL,NT

Quality Assurance Report  
 Maxxam Job Number: EA941971

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3337322 CC6	Matrix Spike	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		98	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2009/08/12		87	%	30 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		89	%	60 - 140
		D8-TOLUENE (sur.)	2009/08/12		103	%	60 - 140
		Benzene	2009/08/12		84	%	60 - 140
		Toluene	2009/08/12		91	%	60 - 140
		Ethylbenzene	2009/08/12		95	%	60 - 140
		m & p-Xylene	2009/08/12		99	%	60 - 140
		o-Xylene	2009/08/12		94	%	60 - 140
		(C6-C10)	2009/08/12		103	%	60 - 140
	Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		97	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2009/08/12		91	%	30 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		88	%	60 - 140
		D8-TOLUENE (sur.)	2009/08/12		102	%	60 - 140
		Benzene	2009/08/12		85	%	60 - 140
		Toluene	2009/08/12		89	%	60 - 140
		Ethylbenzene	2009/08/12		96	%	60 - 140
		m & p-Xylene	2009/08/12		96	%	60 - 140
		o-Xylene	2009/08/12		94	%	60 - 140
		(C6-C10)	2009/08/12		109	%	80 - 120
	Method Blank	4-BROMOFLUOROBENZENE (sur.)	2009/08/12		98	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2009/08/12		88	%	30 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2009/08/12		87	%	60 - 140
		D8-TOLUENE (sur.)	2009/08/12		104	%	60 - 140
		Benzene	2009/08/12	<0.0050		mg/kg	
		Toluene	2009/08/12	<0.020		mg/kg	
		Ethylbenzene	2009/08/12	<0.010		mg/kg	
		Xylenes (Total)	2009/08/12	<0.040		mg/kg	
		m & p-Xylene	2009/08/12	<0.040		mg/kg	
		o-Xylene	2009/08/12	<0.020		mg/kg	
	RPD	F1 (C6-C10) - BTEX (C6-C10)	2009/08/12	<12		mg/kg	
		Benzene	2009/08/12	<12		mg/kg	
Toluene		2009/08/12	NC		%	50	
Ethylbenzene		2009/08/12	NC		%	50	
Xylenes (Total)		2009/08/12	NC		%	50	
m & p-Xylene		2009/08/12	NC		%	50	
o-Xylene		2009/08/12	NC		%	50	
F1 (C6-C10) - BTEX (C6-C10)		2009/08/12	NC		%	50	
Benzene		2009/08/12	NC		%	50	
Toluene		2009/08/12	NC		%	50	
Ethylbenzene		2009/08/12	NC		%	50	
Xylenes (Total)		2009/08/12	NC		%	50	
3337697 KO	Matrix Spike	O-TERPHENYL (sur.)	2009/08/14		106	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2009/08/14		107	%	50 - 130
		F3 (C16-C34 Hydrocarbons)	2009/08/14		110	%	50 - 130
		F4 (C34-C50 Hydrocarbons)	2009/08/14		122	%	50 - 130
	Spiked Blank	O-TERPHENYL (sur.)	2009/08/14		92	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2009/08/14		104	%	80 - 120
		F3 (C16-C34 Hydrocarbons)	2009/08/14		106	%	80 - 120
		F4 (C34-C50 Hydrocarbons)	2009/08/14		114	%	80 - 120
	Method Blank	O-TERPHENYL (sur.)	2009/08/14		115	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2009/08/14	<10		mg/kg	
F3 (C16-C34 Hydrocarbons)		2009/08/14	<10		mg/kg		
F4 (C34-C50 Hydrocarbons)		2009/08/14	<10		mg/kg		
RPD	F2 (C10-C16 Hydrocarbons)	2009/08/14	NC		%	50	
	F3 (C16-C34 Hydrocarbons)	2009/08/14	8.0		%	50	
	F4 (C34-C50 Hydrocarbons)	2009/08/14	11.7		%	50	



IEG CONSULTANTS  
 Attention: DAVID WELLS  
 Client Project #: A04012A01 CAMP FAREWELL  
 P.O. #: 47001127 005 OD  
 Site Reference: CAMP FAREWELL,NT

Quality Assurance Report (Continued)

Maxxam Job Number: EA941971

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3337922 SR7	Method Blank	Moisture	2009/08/11	<0.3		%	
	RPD	Moisture	2009/08/11	6.1		%	20
3338854 SR7	Method Blank	Moisture	2009/08/11	<0.3		%	
	RPD [Q17426-01]	Moisture	2009/08/11	4.0		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.  
 Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.  
 Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.  
 Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.  
 Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.  
 NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone(780)577-7100 FAX(780)450-4187

**Validation Signature Page**

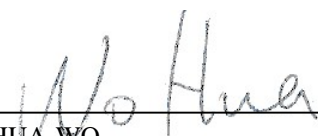
**Maxxam Job #: A941971**

---

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



CORI LUCYSHYN, Analyst II



HUA WO,



LISA CUMMINGS, Extractables Supervisor

=====

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. SCC and CALA have approved this reporting process and electronic report format.



286



Calgary: 4000 19st St. NE, T2E 6P8  
 Edmonton: 9331 - 48 Street, T6B 2R4

Ph: (403) 291-3077 Fax: (403) 735-2240 Toll free: (800) 386-7247  
 Ph: (780) 465-1212 Fax: (780) 450-4187 Toll free: (877) 465-8889  
 www.maxxamanalytics.com

81068 CHAIN OF CUSTODY

A941971ent/JA Page: 1 of 2

Invoice To: Require Report? Yes  No   
 Company Name: Shell Canada  
 Contact Name: Randall Warren  
 Address: PO Box 100, Stn main Calgary  
 Prov: Alta PC: T2P 2H5  
 Contact #s: Ph: Fax:

Report To: David wells  
 IEG Consultants - Ltd  
 Inuvik  
 Prov: NWT PC: XOE OTO  
 Ph: 867 777-8521 Fax: 867 777-2747

PO # / AFE #:  
 Quotation #:  
 Project #: A04012A01  
 Project Name: Camp Farewell  
 Location: Camp Farewell, NT  
 Sampler's Initials: SB, RL

**DETECTION LIMIT REQUIREMENTS:**  
 Check the applicable criterion and indicate land use  
 AT1  
 CCME  
 OTHER

**REPORT DISTRIBUTION:**  
 EMAIL ADDRESS(S):  
 dwells@ieg.ca  
 sbird@ieg.ca

**SERVICE REQUESTED:**  
 RUSH (Please ensure you contact the lab to reserve)  
 Date Required:  
 REGULAR Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)				WATERS (footnotes defined on back)				OTHER TEST(S)			*HOLD for 60 Days	# of Containers Submitted																								
			BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1) <sup>1</sup>	Assessment ICP Metals <sup>2</sup>	Paint Filter	Flashpoint	pH (1:1)	TCLP	BTEX	Metals			BTEX F1	VOCs	BTEX F1-F2	BTEX F1-F4	Routine Water Package	Turb	F	Total	Preserved	Not Preserved	Dissolved	Preserved	Not Preserved	Filtered	Not Filtered	Mercury	Total	Dissolved	Ammonia	TKN	COD	TOC	DOC	
1 SS09-WR3-13	S	2009/08/04																																					
2 14	S																																						
3 15	S																																						
4 16	S																																						
5 17	S																																						
6 18	S																																						
7 19	S																																						
8 20	S																																						
9 21	S																																						
10 22	S																																						
11 23	S																																						
12 24	S																																						

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager. Maxxam Job #:

Relinquished By: SAM BIRD  
 Sign and Print: Sam Bird  
 Date/Time: Aug 6, 2009  
 COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED: Aug 7 '09 MG 8:35  
 Received By: MG  
 Temperature: 9 11 8  
 Ice:   
 CUSTODY SEAL YES / NO



Calgary: 4000 19st St. NE, T2E 6P8  
Edmonton: 9331 - 48 Street, T6B 2R4

Ph: (403) 291-3077 Fax: (403) 735-2240 Toll free: (800) 386-7247  
Ph: (780) 465-1212 Fax: (780) 450-4187 Toll free: (877) 465-8889  
www.maxxamanalytics.com

81069 CHAIN OF CUSTODY

A94197141/2 of 2  
JA

**Invoice To:** Require Report? Yes  No

**Company Name:** Shell Canada

**Contact Name:**

**Address:**

**Prov:** **PC:**

**Contact #s:** **Ph:** **Fax:**

**Report To:** David Wells

**Prov:** **PC:**

**Ph:** **Fax:**

**PO # / AFE #:**

**Quotation #:**

**Project #:** A04012A01

**Project Name:**

**Location:**

**Sampler's Initials:**

**DETECTION LIMIT REQUIREMENTS:**  
Check the applicable criterion and indicate land use

AT1

CCME

OTHER

**REPORT DISTRIBUTION:**  
**EMAIL ADDRESS(S):**  
dwells@reg.ca  
sbird@reg.ca

**SERVICE REQUESTED:**

RUSH (Please ensure you contact the lab to reserve)

**Date Required:**

REGULAR Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)					WATERS (footnotes defined on back)					OTHER TEST(S)			*HOLD for 60 Days	# of Containers Submitted												
			BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)	Assessment ICP Metals <sup>2</sup>	Paint Filter	Flashpoint	pH (1:1)	TCLP	BTEX	Metals	BTEX F1	VOCs			BTEX F1-F4	Routine Water Package	Turb	F	REGULATED METALS (CCME / AT1) <sup>3</sup>	Mercury	Ammonia	TKN	COD	TOC	DOC	
1 SS09-WR3-25	S	2009/08/04																											
2 ↓ 26	S	↓																											
3 ↓ 27	S																												
4 SS09-CWR3-3	S																												
5 ↓ 4	S																												
6 ↓ 5	S																												
7																													
8																													
9																													
10																													
11																													
12																													

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

**Relinquished By:** Sam Bird **Date/Time:** Aug 6, 2009

**Sign and Print:**

**COMMENTS/SPECIAL INSTRUCTIONS:**

**# JARS USED & NOT SUBMITTED**

**Received By:** Aug 7 '09 MG 8:35

**Temperature:** 9 11 8

**Ice:**

**CUSTODY SEAL YES / NO**



Your P.O. #: 47001127 005 OD  
 Your Project #: A04012A01.02.01  
 Site: CAMP FAREWELL, NT  
 Your C.O.C. #: 116865, 116864

IEG CONSULTANTS  
 PO Box 3178  
 INUVIK, NT  
 CANADA X0E0T0

Report Date: 2009/07/30

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: A938607**  
**Received: 2009/07/24, 12:40**

Sample Matrix: Soil  
 # Samples Received: 18

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract)	18	2009/07/27	2009/07/29	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
CCME Hydrocarbons (F2-F4 in soil)	18	2009/07/27	2009/07/29	EENVSOP-00007 EENVSOP-00006	CWS PHCS Tier 1
Moisture	18	N/A	2009/07/28	EENVSOP-00139	Carter SSMA 51.2
Particle Size by Sieve (75 micron)	6	N/A	2009/07/28	EENVSOP-00077	SSMA 47.4

Encryption Key

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

ALAINA MAXXAM, account for job confirmation summary  
 Email: [alaina.hunter@maxxamanalytics.com](mailto:alaina.hunter@maxxamanalytics.com)  
 Phone# (780) 577-7100

=====

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. SCC and CALA have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

**AT1 BTEX AND F1-F4 IN SOIL (SOIL)**

Maxxam ID		P93796	P93796	P93797	P93798		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116865	116865	116865		
	<b>Units</b>	<b>SS09-01</b>	<b>SS09-01 Lab-Dup</b>	<b>SS09-02</b>	<b>SS09-03</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>							
Moisture	%	8.0	7.8	6.2	7.1	0.3	3306462
<b>Ext. Pet. Hydrocarbon</b>							
F2 (C10-C16 Hydrocarbons)	mg/kg	68	40	<10	16	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	61	39	26	52	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	11	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3306597
<b>Volatiles</b>							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	3305703
(C6-C10)	mg/kg	<12	<12	<12	<12	12	3305703
<b>Surrogate Recovery (%)</b>							
4-BROMOFLUOROBENZENE (sur.)	%	106	104	104	107	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	97	103	99	100	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	113	115	109	107	N/A	3305703
D8-TOLUENE (sur.)	%	100	100	97	101	N/A	3305703
O-TERPHENYL (sur.)	%	111	112	108	109	N/A	3306597

N/A = Not Applicable  
 RDL = Reportable Detection Limit

**AT1 BTEX AND F1-F4 IN SOIL (SOIL)**

Maxxam ID		P93799	P93800	P93801	P93802		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116865	116865	116865		
	<b>Units</b>	<b>SS09-04</b>	<b>SS09-05</b>	<b>SS09-06</b>	<b>SS09-07</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>							
Moisture	%	8.3	9.1	4.3	4.8	0.3	3306462
<b>Ext. Pet. Hydrocarbon</b>							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	56	<10	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	65	110	100	11	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	19	29	<10	<10	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3306597
<b>Volatiles</b>							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	3305703
(C6-C10)	mg/kg	<12	<12	<12	<12	12	3305703
<b>Surrogate Recovery (%)</b>							
4-BROMOFLUOROBENZENE (sur.)	%	107	109	110	112	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	106	105	104	104	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	110	115	113	114	N/A	3305703
D8-TOLUENE (sur.)	%	102	97	101	101	N/A	3305703
O-TERPHENYL (sur.)	%	101	105	99	107	N/A	3306597
N/A = Not Applicable RDL = Reportable Detection Limit							

**AT1 BTEX AND F1-F4 IN SOIL (SOIL)**

Maxxam ID		P93803	P93804	P93805	P93806		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116865	116865	116865		
	<b>Units</b>	<b>SS09-08</b>	<b>SS09-09</b>	<b>SS09-10</b>	<b>SS09-11</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>							
Moisture	%	5.4	5.4	5.3	7.8	0.3	3306462
<b>Ext. Pet. Hydrocarbon</b>							
F2 (C10-C16 Hydrocarbons)	mg/kg	400	2500	3700	1300	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	920	2900	3800	2900	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	13	36	30	64	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3306597
<b>Volatiles</b>							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	66	110	<12	12	3305703
(C6-C10)	mg/kg	<12	66	110	<12	12	3305703
<b>Surrogate Recovery (%)</b>							
4-BROMOFLUOROBENZENE (sur.)	%	103	113	108	98	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	105	100	83	82	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	112	118	115	116	N/A	3305703
D8-TOLUENE (sur.)	%	102	96	86	97	N/A	3305703
O-TERPHENYL (sur.)	%	105	98	107	88	N/A	3306597
N/A = Not Applicable RDL = Reportable Detection Limit							

**AT1 BTEX AND F1-F4 IN SOIL (SOIL)**

Maxxam ID		P93807	P93808	P93809	P93810		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116864	116864	116864		
	<b>Units</b>	<b>SS09-12</b>	<b>SS09-13</b>	<b>SS09-14</b>	<b>SS09-15</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>							
Moisture	%	5.6	5.6	5.1	6.0	0.3	3306462
<b>Ext. Pet. Hydrocarbon</b>							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	170	22	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	24	17	35	210	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	13	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	3306597
<b>Volatiles</b>							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	3305703
(C6-C10)	mg/kg	<12	<12	<12	<12	12	3305703
<b>Surrogate Recovery (%)</b>							
4-BROMOFLUOROBENZENE (sur.)	%	107	113	105	112	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	81	100	96	104	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	116	111	112	113	N/A	3305703
D8-TOLUENE (sur.)	%	96	101	102	100	N/A	3305703
O-TERPHENYL (sur.)	%	107	99	107	104	N/A	3306597
N/A = Not Applicable RDL = Reportable Detection Limit							

**AT1 BTEX AND F1-F4 IN SOIL (SOIL)**

Maxxam ID		P93811	P93812	P93813		
Sampling Date		2009/07/22	2009/07/22	2009/07/22		
COC Number		116864	116864	116864		
	<b>Units</b>	<b>SS09-16</b>	<b>SS09-17</b>	<b>SS09-18</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>						
Moisture	%	5.9	6.2	2.9	0.3	3306462
<b>Ext. Pet. Hydrocarbon</b>						
F2 (C10-C16 Hydrocarbons)	mg/kg	240	<10	<10	10	3306597
F3 (C16-C34 Hydrocarbons)	mg/kg	580	440	26	10	3306597
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	150	<10	10	3306597
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3306597
<b>Volatiles</b>						
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	0.0050	3305703
Toluene	mg/kg	<0.020	<0.020	<0.020	0.020	3305703
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	0.010	3305703
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	0.040	3305703
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	0.040	3305703
o-Xylene	mg/kg	<0.020	<0.020	<0.020	0.020	3305703
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	12	3305703
(C6-C10)	mg/kg	<12	<12	<12	12	3305703
<b>Surrogate Recovery (%)</b>						
4-BROMOFLUOROBENZENE (sur.)	%	104	97	109	N/A	3305703
D10-ETHYLBENZENE (sur.)	%	103	110	106	N/A	3305703
D4-1,2-DICHLOROETHANE (sur.)	%	113	113	117	N/A	3305703
D8-TOLUENE (sur.)	%	101	105	101	N/A	3305703
O-TERPHENYL (sur.)	%	102	80	81	N/A	3306597
N/A = Not Applicable RDL = Reportable Detection Limit						





Maxxam Job #: A938607  
 Report Date: 2009/07/30

IEG CONSULTANTS  
 Client Project #: A04012A01.02.01  
 Site Reference: CAMP FAREWELL, NT  
 Your P.O. #: 47001127 005 OD  
 Sampler Initials: DW

**RESULTS OF CHEMICAL ANALYSES OF SOIL**

Maxxam ID		P93797	P93801	P93804	P93807		
Sampling Date		2009/07/22	2009/07/22	2009/07/22	2009/07/22		
COC Number		116865	116865	116865	116865		
	<b>Units</b>	<b>SS09-02</b>	<b>SS09-06</b>	<b>SS09-09</b>	<b>SS09-12</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>							
Sieve - Pan	%	3.0	3.2	1.4	3.9	0.2	3306318
Sieve - #200 (>0.075mm)	%	97	97	99	96	0.2	3306318
Grain Size	%	COARSE	COARSE	COARSE	COARSE	0.2	3306318
RDL = Reportable Detection Limit							

Maxxam ID		P93809	P93812		
Sampling Date		2009/07/22	2009/07/22		
COC Number		116864	116864		
	<b>Units</b>	<b>SS09-14</b>	<b>SS09-17</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>					
Sieve - Pan	%	2.8	7.8	0.2	3306318
Sieve - #200 (>0.075mm)	%	97	92	0.2	3306318
Grain Size	%	COARSE	COARSE	0.2	3306318
RDL = Reportable Detection Limit					



Maxxam Job #: A938607  
Report Date: 2009/07/30

IEG CONSULTANTS  
Client Project #: A04012A01.02.01  
Site Reference: CAMP FAREWELL, NT  
Your P.O. #: 47001127 005 OD  
Sampler Initials: DW

Package 1	14.3°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

**General Comments**

**Results relate only to the items tested.**

Quality Assurance Report  
 Maxxam Job Number: EA938607

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits		
3305703 CC6	MATRIX SPIKE [P93797-01]	4-BROMOFLUOROBENZENE (sur.)	2009/07/29		106	%	60 - 140		
		D10-ETHYLBENZENE (sur.)	2009/07/29		101	%	30 - 130		
		D4-1,2-DICHLOROETHANE (sur.)	2009/07/29		110	%	60 - 140		
		D8-TOLUENE (sur.)	2009/07/29		99	%	60 - 140		
		Benzene	2009/07/29		93	%	60 - 140		
		Toluene	2009/07/29		91	%	60 - 140		
		Ethylbenzene	2009/07/29		101	%	60 - 140		
		m & p-Xylene	2009/07/29		104	%	60 - 140		
		o-Xylene	2009/07/29		93	%	60 - 140		
		(C6-C10)	2009/07/29		120	%	60 - 140		
		SPIKE	4-BROMOFLUOROBENZENE (sur.)	2009/07/29		103	%	60 - 140	
			D10-ETHYLBENZENE (sur.)	2009/07/29		97	%	30 - 130	
			D4-1,2-DICHLOROETHANE (sur.)	2009/07/29		111	%	60 - 140	
			D8-TOLUENE (sur.)	2009/07/29		102	%	60 - 140	
			Benzene	2009/07/29		90	%	60 - 140	
	Toluene		2009/07/29		90	%	60 - 140		
	Ethylbenzene		2009/07/29		100	%	60 - 140		
	m & p-Xylene		2009/07/29		103	%	60 - 140		
	o-Xylene		2009/07/29		93	%	60 - 140		
	(C6-C10)		2009/07/29		115	%	80 - 120		
	BLANK		4-BROMOFLUOROBENZENE (sur.)	2009/07/29		107	%	60 - 140	
			D10-ETHYLBENZENE (sur.)	2009/07/29		108	%	30 - 130	
			D4-1,2-DICHLOROETHANE (sur.)	2009/07/29		112	%	60 - 140	
			D8-TOLUENE (sur.)	2009/07/29		103	%	60 - 140	
			Benzene	2009/07/29	<0.0050			mg/kg	
		Toluene	2009/07/29	<0.020			mg/kg		
		Ethylbenzene	2009/07/29	<0.010			mg/kg		
		Xylenes (Total)	2009/07/29	<0.040			mg/kg		
		m & p-Xylene	2009/07/29	<0.040			mg/kg		
		o-Xylene	2009/07/29	<0.020			mg/kg		
		F1 (C6-C10) - BTEX	2009/07/29	<12			mg/kg		
		(C6-C10)	2009/07/29	<12			mg/kg		
		RPD [P93796-01]	Benzene	2009/07/29	NC			%	50
Toluene	2009/07/29		NC			%	50		
Ethylbenzene	2009/07/29		NC			%	50		
Xylenes (Total)	2009/07/29		NC			%	50		
m & p-Xylene	2009/07/29		NC			%	50		
o-Xylene	2009/07/29		NC			%	50		
F1 (C6-C10) - BTEX	2009/07/29		NC			%	50		
(C6-C10)	2009/07/29		NC			%	50		
3306318 ST6	BLANK		Sieve - Pan	2009/07/28	<0.2		%		
			Sieve - #200 (>0.075mm)	2009/07/28	<0.2		%		
	RPD		Sieve - Pan	2009/07/28	1		%	35	
			Sieve - #200 (>0.075mm)	2009/07/28	2.0		%	35	
		3306462 JP6	BLANK	Moisture	2009/07/28	<0.3		%	
			RPD [P93796-01]	Moisture	2009/07/28	2.5		%	20
3306597 LD2	MATRIX SPIKE [P93797-01]	O-TERPHENYL (sur.)	2009/07/29		97	%	50 - 130		
		F2 (C10-C16 Hydrocarbons)	2009/07/29		106	%	50 - 130		
		F3 (C16-C34 Hydrocarbons)	2009/07/29		109	%	50 - 130		
		F4 (C34-C50 Hydrocarbons)	2009/07/29		106	%	50 - 130		
		O-TERPHENYL (sur.)	2009/07/29		84	%	50 - 130		
	SPIKE	F2 (C10-C16 Hydrocarbons)	2009/07/29		102	%	80 - 120		
		F3 (C16-C34 Hydrocarbons)	2009/07/29		106	%	80 - 120		



IEG CONSULTANTS  
 Attention:  
 Client Project #: A04012A01.02.01  
 P.O. #: 47001127 005 OD  
 Site Reference: CAMP FAREWELL, NT

Quality Assurance Report (Continued)  
 Maxxam Job Number: EA938607

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3306597 LD2	SPIKE	F4 (C34-C50 Hydrocarbons)	2009/07/29		102	%	80 - 120
	BLANK	O-TERPHENYL (sur.)	2009/07/29		115	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2009/07/29	<10		mg/kg	
		F3 (C16-C34 Hydrocarbons)	2009/07/29	<10		mg/kg	
		F4 (C34-C50 Hydrocarbons)	2009/07/29	<10		mg/kg	
	RPD [P93796-01]	F2 (C10-C16 Hydrocarbons)	2009/07/29	NC		%	50
		F3 (C16-C34 Hydrocarbons)	2009/07/29	NC		%	50
		F4 (C34-C50 Hydrocarbons)	2009/07/29	NC		%	50

NC = Non-calculable  
 RPD = Relative Percent Difference

Maxxam Analytics International Corporation o/a Maxxam Analytics Edmonton: 9331 - 48th Street T6B 2R4 Telephone(780)577-7100 FAX(780)450-4187

**Validation Signature Page**

**Maxxam Job #: A938607**

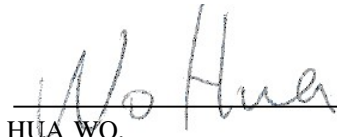
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The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



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DINA TLEUGABULOVA, Ph.D., Project Manager



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HUA WO,

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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. SCC and CALA have approved this reporting process and electronic report format.

257



Calgary: 2021 - 41st Ave. NE, T2E 6P2  
 Edmonton: 9619 - 42 Ave., T6E 5R2

Ph: (403) 291-3077 Fax: (403) 291-9468 Toll-free: (800) 386-7247  
 Ph: (780) 465-1212 Fax: (780) 450-1187 Ph: (977) 465-8889  
 www.maxxamanalytics.com

**ANALYTICAL REQUEST FORM**

Page: 1 of 2

Invoice To: Shell Canada Require Report? Yes  No

Report To: IEG Consultants Ltd.

Company Name: Shell Canada

Contact Name: Randall Warren

Address: 400th - 4th St SW

Calgary, AB PC: T2P2H5

Phone / Fax #: Ph: 403 Fax:

PO Box 3178

Wauvik, NT PC: XOEO TO

Ph: 8677778521 Fax: 8677772747

PO # / AFE #: \_\_\_\_\_  
 Quotation #: \_\_\_\_\_  
 Project #: A04012A01.02.01  
 Project Name: Camp Farewell  
 Location: Camp Farewell, NT  
 Sampler's Initials: AW

**REGULATORY REQUIREMENTS:**

- AT1 - Soil Contamination
- CCME
- CCME FWAL
- Regulatory Limits to appear on Final report
- PST
- CDWQG
- G50

**REPORT DISTRIBUTION:**

- Mail
- PDF
- Email: dwells@ieg.ca  
Sbird@kldw.com
- Fax
- Excel
- Other: \_\_\_\_\_

**SERVICE REQUESTED:**

- RUSH (Please ensure you contact the lab)
- Date Required: \_\_\_\_\_
- REGULAR Turnaround

**METALS: (WATERS):**

- Total
- Extractable
- Dissolved

**ANALYSIS REQUESTED**

Sample ID	Matrix	Date/Time	Sample Type	Hold > 60 Days	Sample Container #	CCME F1-F4	Other	Analysis 1	Analysis 2	Analysis 3	Analysis 4	Analysis 5	Analysis 6	Analysis 7	Analysis 8	Analysis 9	Analysis 10	Analysis 11	Analysis 12	
1	Soil	July 22	Comp		1	X														
2						X	X													
3						X														
4						X														
5						X														
6						X	X													
7						X														
8						X														
9						X	X													
10						X														
11						X														
12						X	X													

\*\*For water samples, please indicate if sample container has been preserved (P) and/or filtered (F).

Relinquished By: David Wells  
 Signature: \_\_\_\_\_

Date/Time: July 23 / 8:40

Received  
24/07/09  
12:40h  
RT

Temperature  
16/12/15°C

COMMENTS/SPECIAL INSTRUCTIONS: \_\_\_\_\_

C of C # **116865**

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Calgary: 2021 - 41st Ave. NE, T2E 6P2  
Edmonton: 9619 - 42 Ave., T6E 5R2

Ph: (403) 291-3077 Fax: (403) 291-9468  
Ph: (780) 465-1212 Fax: (780) 450-4187  
www.maxxamanalytics.com

Toll-free: (800) 386-7247

### ANALYTICAL REQUEST FORM

Toll-free: (800) 386-7247  
AA 38607 RT / D Page: 2 of 2

Invoice To: Require Report? Yes  No

Report To:

Company Name: \_\_\_\_\_  
Contact Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
PC: \_\_\_\_\_  
Phone / Fax #: Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

PO # / AFE #: \_\_\_\_\_  
Quotation #: \_\_\_\_\_  
Project #: \_\_\_\_\_  
Project Name: \_\_\_\_\_  
Location: \_\_\_\_\_  
Sampler's Initials: \_\_\_\_\_

#### REGULATORY REQUIREMENTS:

- AT1 - Soil Contamination
- CCME
- CCME FWAL
- Regulatory Limits to appear on Final report
- PST
- CDWQG
- G50

#### REPORT DISTRIBUTION:

- Mail
- PDF
- Email: \_\_\_\_\_
- Fax
- Excel
- Other: \_\_\_\_\_

#### SERVICE REQUESTED:

- RUSH (Please ensure you contact the lab)  
Date Required: \_\_\_\_\_
- REGULAR Turnaround

#### METALS: (WATERS):

- Total
- Extractable
- Dissolved

#### ANALYSIS REQUESTED

	Sample Identification	Matrix	Date/Time Sampled	Sample Type Grab/Comp	Hold > 60 Days	Sample Container #	CCME FI-FY	Particle Size												
1	SS09-13	Soil	July 22	Comp		1	X													
2	-14						X	X												
3	-15						X													
4	-16						X													
5	-17						X	X												
6	SS09-18						X													
7																				
8																				
9																				
10																				
11																				
12																				

\*\*For water samples, please indicate if sample container has been preserved (P) and/or filtered (F).

Relinquished By: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Signature: \_\_\_\_\_

COMMENTS/SPECIAL INSTRUCTIONS: \_\_\_\_\_

Received  
24/07/09  
12:40h RT

Temperature  
16/12/15°C

C of C # 116864



Your Project #: A04012A01.02 CAMP FARE WELL  
 Site: MACKENZIE DELTA NWT  
 Your C.O.C. #: 81098, 81099, 81096, 81097

**Attention: S BIRD**  
 IEG CONSULTANTS  
 PO Box 3178  
 INUVIK, NT  
 CANADA X0E0T0

**Report Date: 2009/09/28**

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: A951752**  
**Received: 2009/09/19, 11:15**

Sample Matrix: Soil  
 # Samples Received: 16

Analyses	Quantity	Date		Laboratory Method	Analytical Method
		Extracted	Analyzed		
BTEX/F1 by HS GC/MS (MeOH extract)	8	2009/09/20	2009/09/23	EENVSOP-00005 EENVSOP-00002	EPA 8260C/CCME
Chloride (soluble)	2	2009/09/23	2009/09/23	EENVSOP-00055	SM 4110-B
Chloride (soluble)	3	2009/09/25	2009/09/25	EENVSOP-00055	SM 4110-B
Conductivity (Soluble)	5	2009/09/23	2009/09/23	EENVSOP-00052	SSMA 18.3
CCME Hydrocarbons (F2-F4 in soil)	8	2009/09/20	2009/09/21	EENVSOP-00007 EENVSOP-00006	CCME PHC-CWS
Ion Balance	5	N/A	2009/09/24	CAL WI-00053	SM 1030E
Sum of Cations, Anions	5	N/A	2009/09/24		
Moisture	16	N/A	2009/09/25	EENVSOP-00139	Carter SSMA 51.2
pH (1:2 Calcium Chloride Extract)	5	2009/09/22	2009/09/22	AB SOP-00006	SSMA 16.3
pH (1:1 extract, solid waste)	5	2009/09/21	2009/09/21	AB SOP-00006	SSMA 16.3
Sodium Adsorption Ratio	5	N/A	2009/09/24		
Ca,Mg,Na,K,SO4 (Soluble)	5	2009/09/23	2009/09/23	CAL SOP-00192	EPA SW846/6010B
Soluble Paste	5	2009/09/23	2009/09/23	CAL SOP-00029	MSA No9, Part2
Theoretical Gypsum Requirement	5	N/A	2009/09/24	CAL WI-00087	SSMA 18.4.4

**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

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. SCC and CALA have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1



**SOIL SALINITY 4 (SOIL)**

Maxxam ID		Q83653	Q83653		
Sampling Date		2009/09/16	2009/09/16		
COC Number		81097	81097		
	<b>Units</b>	<b>0916-SS09-WR1-1</b>	<b>0916-SS09-WR1-1</b>	<b>RDL</b>	<b>QC Batch</b>
			<b>Lab-Dup</b>		

<b>Calculated Parameters</b>					
Anion Sum	meq/L	13	N/A	N/A	3430465
Cation Sum	meq/L	94	N/A	N/A	3430465
Ion Balance	N/A	7.4	N/A	0.01	3430464
<b>Soluble Parameters</b>					
Soluble Chloride (Cl)	mg/L	19	N/A	5	3438510
Soluble Conductivity	dS/m	6.8	N/A	0.02	3437781
Soluble (CaCl <sub>2</sub> ) pH	N/A	8.27	8.44	N/A	3435122
Sodium Adsorption Ratio	N/A	70	N/A	0.1	3430466
Soluble Calcium (Ca)	mg/L	43	N/A	1.5	3439366
Soluble Magnesium (Mg)	mg/L	15	N/A	1.0	3439366
Soluble Sodium (Na)	mg/L	2100	N/A	2.5	3439366
Soluble Potassium (K)	mg/L	4.2	N/A	1.3	3439366
Saturation %	%	61.0	N/A	N/A	3437774
Soluble Sulphate (SO <sub>4</sub> )	mg/L	580	N/A	5.0	3439366
Theoretical Gypsum Requirement	tons/ac	98	N/A	0.1	3430467
N/A = Not Applicable RDL = Reportable Detection Limit					

**SOIL SALINITY 4 (SOIL)**

Maxxam ID		Q83655		Q83656		
Sampling Date		2009/09/16		2009/09/16		
COC Number		81097		81097		
	<b>Units</b>	<b>0916-SS09-WR1-3</b>	<b>QC Batch</b>	<b>0916-SS09-WR2-1</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Calculated Parameters</b>						
Anion Sum	meq/L	17	3430465	12	N/A	3430465
Cation Sum	meq/L	120	3430465	57	N/A	3430465
Ion Balance	N/A	7.0	3430464	4.7	0.01	3430464
<b>Soluble Parameters</b>						
Soluble Chloride (Cl)	mg/L	48	3446226	72	5	3438510
Soluble Conductivity	dS/m	8.7	3437781	3.7	0.02	3437781
Soluble (CaCl <sub>2</sub> ) pH	N/A	8.47	3435122	8.21	N/A	3435122
Sodium Adsorption Ratio	N/A	62	3430466	30	0.1	3430466
Soluble Calcium (Ca)	mg/L	93	3439366	79	1.5	3439366
Soluble Magnesium (Mg)	mg/L	26	3439366	22	1.0	3439366
Soluble Sodium (Na)	mg/L	2600	3439366	1200	2.5	3439366
Soluble Potassium (K)	mg/L	10	3439366	6.4	1.3	3439366
Saturation %	%	40.0	3437774	44.1	N/A	3437774
Soluble Sulphate (SO <sub>4</sub> )	mg/L	770	3439366	480	5.0	3439366
Theoretical Gypsum Requirement	tons/ac	99	3430467	14	0.1	3430467
RDL = Reportable Detection Limit						

**SOIL SALINITY 4 (SOIL)**

Maxxam ID		Q83658	Q83660		
Sampling Date		2009/09/16	2009/09/16		
COC Number		81097	81097		
	<b>Units</b>	<b>0916-SS09-WR3-1</b>	<b>0916-SS09-WR3-3</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Calculated Parameters</b>					
Anion Sum	meq/L	16	13	N/A	3430465
Cation Sum	meq/L	110	85	N/A	3430465
Ion Balance	N/A	6.9	6.6	0.01	3430464
<b>Soluble Parameters</b>					
Soluble Chloride (Cl)	mg/L	46	24	5	3446226
Soluble Conductivity	dS/m	7.5	5.9	0.02	3437781
Soluble (CaCl <sub>2</sub> ) pH	N/A	8.63	8.43	N/A	3435122
Sodium Adsorption Ratio	N/A	56	50	0.1	3430466
Soluble Calcium (Ca)	mg/L	89	65	1.5	3439366
Soluble Magnesium (Mg)	mg/L	26	23	1.0	3439366
Soluble Sodium (Na)	mg/L	2400	1800	2.5	3439366
Soluble Potassium (K)	mg/L	7.1	4.7	1.3	3439366
Saturation %	%	44.0	48.5	N/A	3437774
Soluble Sulphate (SO <sub>4</sub> )	mg/L	700	590	5.0	3439366
Theoretical Gypsum Requirement	tons/ac	86	57	0.1	3430467
RDL = Reportable Detection Limit					

### RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		Q83617	Q83617	Q83622	Q83623		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81098	81098	81098	81098		
	<b>Units</b>	<b>0916-SS09-05</b>	<b>0916-SS09-05 Lab-Dup</b>	<b>0916-SS09-10</b>	<b>0916-SS09-11</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>							
Moisture	%	8.3	8.1	7.6	8.3	0.3	3444662
RDL = Reportable Detection Limit							

Maxxam ID		Q83630	Q83637	Q83640	Q83645		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81099	81096	81096	81096		
	<b>Units</b>	<b>0916-SS09-18</b>	<b>0916-SS09-25</b>	<b>0916-SS09-28</b>	<b>0916-SS09-33</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Physical Properties</b>							
Moisture	%	9.0	9.2	8.3	7.8	0.3	3444662
RDL = Reportable Detection Limit							

Maxxam ID		Q83652	Q83653	Q83653	Q83654		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097	81097		
	<b>Units</b>	<b>0916-SS09-40</b>	<b>0916-SS09-WR1-1</b>	<b>0916-SS09-WR1-1 Lab-Dup</b>	<b>0916-SS09-WR1-2</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Soluble Parameters</b>							
Soluble (1:1) pH	N/A	N/A	9.78	9.96	N/A	N/A	3431895
<b>Physical Properties</b>							
Moisture	%	8.1	7.5	N/A	6.7	0.3	3444662

N/A = Not Applicable  
RDL = Reportable Detection Limit

**RESULTS OF CHEMICAL ANALYSES OF SOIL**

Maxxam ID		Q83655	Q83656	Q83657		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	<b>Units</b>	<b>0916-SS09-WR1-3</b>	<b>0916-SS09-WR2-1</b>	<b>0916-SS09-WR2-2</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Soluble Parameters</b>						
Soluble (1:1) pH	N/A	9.90	9.88	N/A	N/A	3431895
<b>Physical Properties</b>						
Moisture	%	7.6	9.5	10	0.3	3444662

N/A = Not Applicable  
 RDL = Reportable Detection Limit

Maxxam ID		Q83658	Q83659	Q83660		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	<b>Units</b>	<b>0916-SS09-WR3-1</b>	<b>0916-SS09-WR3-2</b>	<b>0916-SS09-WR3-3</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Soluble Parameters</b>						
Soluble (1:1) pH	N/A	9.97	N/A	9.85	N/A	3431895
<b>Physical Properties</b>						
Moisture	%	7.9	8.5	8.3	0.3	3444662

N/A = Not Applicable  
 RDL = Reportable Detection Limit

**PETROLEUM HYDROCARBONS (CCME)**

Maxxam ID		Q83653	Q83653	Q83654		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	<b>Units</b>	<b>0916-SS09-WR1-1</b>	<b>0916-SS09-WR1-1 Lab-Dup</b>	<b>0916-SS09-WR1-2</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Ext. Pet. Hydrocarbon</b>						
F2 (C10-C16 Hydrocarbons)	mg/kg	450	520	530	10	3431075
F3 (C16-C34 Hydrocarbons)	mg/kg	600	730	630	10	3431075
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	10	3431075
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3431075
<b>Surrogate Recovery (%)</b>						
O-TERPHENYL (sur.)	%	95	102	98	N/A	3431075

N/A = Not Applicable  
RDL = Reportable Detection Limit

Maxxam ID		Q83655	Q83656	Q83657		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	<b>Units</b>	<b>0916-SS09-WR1-3</b>	<b>0916-SS09-WR2-1</b>	<b>0916-SS09-WR2-2</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Ext. Pet. Hydrocarbon</b>						
F2 (C10-C16 Hydrocarbons)	mg/kg	590	160	76	10	3431075
F3 (C16-C34 Hydrocarbons)	mg/kg	780	190	110	10	3431075
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	10	3431075
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3431075
<b>Surrogate Recovery (%)</b>						
O-TERPHENYL (sur.)	%	111	88	83	N/A	3431075

N/A = Not Applicable  
RDL = Reportable Detection Limit

**PETROLEUM HYDROCARBONS (CCME)**

Maxxam ID		Q83658	Q83659	Q83660		
Sampling Date		2009/09/16	2009/09/16	2009/09/16		
COC Number		81097	81097	81097		
	<b>Units</b>	<b>0916-SS09-WR3-1</b>	<b>0916-SS09-WR3-2</b>	<b>0916-SS09-WR3-3</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Ext. Pet. Hydrocarbon</b>						
F2 (C10-C16 Hydrocarbons)	mg/kg	55	27	110	10	3431075
F3 (C16-C34 Hydrocarbons)	mg/kg	49	27	160	10	3431075
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	10	3431075
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	N/A	3431075
<b>Surrogate Recovery (%)</b>						
O-TERPHENYL (sur.)	%	84	86	88	N/A	3431075

N/A = Not Applicable  
 RDL = Reportable Detection Limit

**VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		Q83617	Q83617	Q83622	Q83623		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81098	81098	81098	81098		
	<b>Units</b>	<b>0916-SS09-05</b>	<b>0916-SS09-05 Lab-Dup</b>	<b>0916-SS09-10</b>	<b>0916-SS09-11</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Volatiles</b>							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3434716
Toluene	mg/kg	0.043	0.039	<0.020	0.050	0.020	3434716
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3434716
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	0.17	0.040	3434716
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	0.17	0.040	3434716
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3434716
F1 (C6-C10) - BTEX	mg/kg	<12	13	26	40	12	3434716
(C6-C10)	mg/kg	<12	13	26	40	12	3434716
<b>Surrogate Recovery (%)</b>							
4-BROMOFLUOROBENZENE (sur.)	%	98	106	103	114	N/A	3434716
D10-ETHYLBENZENE (sur.)	%	104	115	110	108	N/A	3434716
D4-1,2-DICHLOROETHANE (sur.)	%	82	82	80	79	N/A	3434716
D8-TOLUENE (sur.)	%	103	106	105	103	N/A	3434716

N/A = Not Applicable  
RDL = Reportable Detection Limit



**VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		Q83630	Q83637	Q83640	Q83645		
Sampling Date		2009/09/16	2009/09/16	2009/09/16	2009/09/16		
COC Number		81099	81096	81096	81096		
	<b>Units</b>	<b>0916-SS09-18</b>	<b>0916-SS09-25</b>	<b>0916-SS09-28</b>	<b>0916-SS09-33</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Volatiles</b>							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	3434716
Toluene	mg/kg	0.044	<0.020	0.043	0.032	0.020	3434716
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	3434716
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3434716
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	3434716
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	3434716
F1 (C6-C10) - BTEX	mg/kg	50	20	12	<12	12	3434716
(C6-C10)	mg/kg	50	20	12	<12	12	3434716
<b>Surrogate Recovery (%)</b>							
4-BROMOFLUOROBENZENE (sur.)	%	120	94	94	94	N/A	3434716
D10-ETHYLBENZENE (sur.)	%	110	110	106	106	N/A	3434716
D4-1,2-DICHLOROETHANE (sur.)	%	77	78	77	77	N/A	3434716
D8-TOLUENE (sur.)	%	105	104	104	104	N/A	3434716

N/A = Not Applicable  
 RDL = Reportable Detection Limit

**VOLATILE ORGANICS BY GC-MS (SOIL)**

Maxxam ID		Q83652		
Sampling Date		2009/09/16		
COC Number		81097		
	<b>Units</b>	<b>0916-SS09-40</b>	<b>RDL</b>	<b>QC Batch</b>

<b>Volatiles</b>				
Benzene	mg/kg	<0.0050	0.0050	3434716
Toluene	mg/kg	0.031	0.020	3434716
Ethylbenzene	mg/kg	<0.010	0.010	3434716
Xylenes (Total)	mg/kg	<0.040	0.040	3434716
m & p-Xylene	mg/kg	<0.040	0.040	3434716
o-Xylene	mg/kg	<0.020	0.020	3434716
F1 (C6-C10) - BTEX	mg/kg	<12	12	3434716
(C6-C10)	mg/kg	<12	12	3434716
<b>Surrogate Recovery (%)</b>				
4-BROMOFLUOROBENZENE (sur.)	%	94	N/A	3434716
D10-ETHYLBENZENE (sur.)	%	102	N/A	3434716
D4-1,2-DICHLOROETHANE (sur.)	%	78	N/A	3434716
D8-TOLUENE (sur.)	%	102	N/A	3434716

N/A = Not Applicable  
 RDL = Reportable Detection Limit

Package 1	6.3°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

**General Comments**

Sample Q83653-01: Ionic imbalance; some analysis performed in duplicate; possible matrix impact.

Sample Q83655-01: Ionic imbalance; some analysis performed in duplicate; possible matrix impact.

Sample Q83658-01: Ionic imbalance; some analysis performed in duplicate; possible matrix impact.

Sample Q83660-01: Ionic imbalance; some analysis performed in duplicate; possible matrix impact.

**Results relate only to the items tested.**

Quality Assurance Report  
 Maxxam Job Number: EA951752

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits		
3431075 AN4	Matrix Spike [Q83654-01]	O-TERPHENYL (sur.)	2009/09/21		110	%	50 - 130		
		F2 (C10-C16 Hydrocarbons)	2009/09/21		NC	%	50 - 130		
		F3 (C16-C34 Hydrocarbons)	2009/09/21		NC	%	50 - 130		
		F4 (C34-C50 Hydrocarbons)	2009/09/21		106	%	50 - 130		
	Spiked Blank	O-TERPHENYL (sur.)	2009/09/21			76	%	50 - 130	
		F2 (C10-C16 Hydrocarbons)	2009/09/21			116	%	80 - 120	
		F3 (C16-C34 Hydrocarbons)	2009/09/21			99	%	80 - 120	
		F4 (C34-C50 Hydrocarbons)	2009/09/21			107	%	80 - 120	
	Method Blank	O-TERPHENYL (sur.)	2009/09/21			81	%	50 - 130	
		F2 (C10-C16 Hydrocarbons)	2009/09/21		<10		mg/kg		
		F3 (C16-C34 Hydrocarbons)	2009/09/21		<10		mg/kg		
		F4 (C34-C50 Hydrocarbons)	2009/09/21		<10		mg/kg		
	RPD [Q83653-01]	F2 (C10-C16 Hydrocarbons)	2009/09/21		13.6		%	50	
		F3 (C16-C34 Hydrocarbons)	2009/09/21		19.4		%	50	
F4 (C34-C50 Hydrocarbons)		2009/09/21		NC		%	50		
3431895 DS9	Calibration Check RPD [Q83653-01]	Soluble (1:1) pH	2009/09/21		100	%	99 - 101		
		Soluble (1:1) pH	2009/09/21	1.8		%	5		
3434716 CD1	Matrix Spike [Q83622-01]	4-BROMOFLUOROBENZENE (sur.)	2009/09/22		93	%	60 - 140		
		D10-ETHYLBENZENE (sur.)	2009/09/22		104	%	30 - 130		
		D4-1,2-DICHLOROETHANE (sur.)	2009/09/22		79	%	60 - 140		
		D8-TOLUENE (sur.)	2009/09/22		103	%	60 - 140		
		Benzene	2009/09/22		108	%	60 - 140		
		Toluene	2009/09/22		103	%	60 - 140		
		Ethylbenzene	2009/09/22		104	%	60 - 140		
		m & p-Xylene	2009/09/22		102	%	60 - 140		
		o-Xylene	2009/09/22		101	%	60 - 140		
		(C6-C10)	2009/09/22		88	%	60 - 140		
		Spiked Blank	4-BROMOFLUOROBENZENE (sur.)	2009/09/22			115	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2009/09/22			113	%	30 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2009/09/22			81	%	60 - 140
			D8-TOLUENE (sur.)	2009/09/22			100	%	60 - 140
	Benzene		2009/09/22			109	%	60 - 140	
	Toluene		2009/09/22			101	%	60 - 140	
	Ethylbenzene		2009/09/22			101	%	60 - 140	
	m & p-Xylene		2009/09/22			100	%	60 - 140	
	o-Xylene		2009/09/22			99	%	60 - 140	
	(C6-C10)		2009/09/22			115	%	80 - 120	
	Method Blank	4-BROMOFLUOROBENZENE (sur.)	2009/09/24			93	%	60 - 140	
		D10-ETHYLBENZENE (sur.)	2009/09/24			103	%	30 - 130	
		D4-1,2-DICHLOROETHANE (sur.)	2009/09/24			79	%	60 - 140	
		D8-TOLUENE (sur.)	2009/09/24			105	%	60 - 140	
		Benzene	2009/09/24		<0.0050		mg/kg		
		Toluene	2009/09/24		<0.020		mg/kg		
		Ethylbenzene	2009/09/24		<0.010		mg/kg		
		Xylenes (Total)	2009/09/24		<0.040		mg/kg		
		m & p-Xylene	2009/09/24		<0.040		mg/kg		
		o-Xylene	2009/09/24		<0.020		mg/kg		
	RPD [Q83617-01]	F1 (C6-C10) - BTEX	2009/09/24		<12		mg/kg		
		(C6-C10)	2009/09/24		<12		mg/kg		
		Benzene	2009/09/23		NC		%	50	
		Toluene	2009/09/23		NC		%	50	
		Ethylbenzene	2009/09/23		NC		%	50	
		Xylenes (Total)	2009/09/23		NC		%	50	

Quality Assurance Report (Continued)  
 Maxxam Job Number: EA951752

QA/QC Batch	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3434716 CD1	RPD [Q83617-01]	m & p-Xylene	2009/09/23	NC		%	50
		o-Xylene	2009/09/23	NC		%	50
		F1 (C6-C10) - BTEX	2009/09/23	NC		%	50
		(C6-C10)	2009/09/23	NC		%	50
3435122 SB8	Calibration Check	Soluble (CaCl2) pH	2009/09/22		100	%	97 - 103
	QC Standard	Soluble (CaCl2) pH	2009/09/22		98	%	97 - 103
3437774 JM9	RPD [Q83653-01]	Soluble (CaCl2) pH	2009/09/22	2.1		%	5
	QC Standard	Saturation %	2009/09/23		102	%	81 - 119
	Method Blank	Saturation %	2009/09/23	0.00		%	
3437781 AD3	RPD	Saturation %	2009/09/23	0.9		%	12
	Calibration Check	Soluble Conductivity	2009/09/23		98	%	95 - 105
	QC Standard	Soluble Conductivity	2009/09/23		92	%	80 - 120
3438510 SY1	Method Blank	Soluble Conductivity	2009/09/23	<0.02		dS/m	
	RPD	Soluble Conductivity	2009/09/23	1.8		%	35
	Calibration Check	Soluble Chloride (Cl)	2009/09/23		99	%	80 - 120
	Matrix Spike	Soluble Chloride (Cl)	2009/09/23		101	%	75 - 125
3439366 SG8	QC Standard	Soluble Chloride (Cl)	2009/09/23		91	%	75 - 125
	Method Blank	Soluble Chloride (Cl)	2009/09/23	<5		mg/L	
	RPD	Soluble Chloride (Cl)	2009/09/23	NC		%	35
	Calibration Check	Soluble Calcium (Ca)	2009/09/23		103	%	80 - 120
		Soluble Magnesium (Mg)	2009/09/23		102	%	80 - 120
		Soluble Sodium (Na)	2009/09/23		102	%	80 - 120
3444662 SR7	QC Standard	Soluble Potassium (K)	2009/09/23		103	%	80 - 120
		Soluble Calcium (Ca)	2009/09/23		87	%	75 - 125
		Soluble Magnesium (Mg)	2009/09/23		81	%	75 - 125
		Soluble Sodium (Na)	2009/09/23		83	%	75 - 125
		Soluble Potassium (K)	2009/09/23		89	%	75 - 125
		Soluble Sulphate (SO4)	2009/09/23		83	%	75 - 125
	Method Blank	Soluble Calcium (Ca)	2009/09/23	<1.5		mg/L	
		Soluble Magnesium (Mg)	2009/09/23	<1.0		mg/L	
		Soluble Sodium (Na)	2009/09/23	<2.5		mg/L	
		Soluble Potassium (K)	2009/09/23	<1.3		mg/L	
		Soluble Sulphate (SO4)	2009/09/23	<5.0		mg/L	
	RPD	Soluble Calcium (Ca)	2009/09/23	20.3		%	35
	Soluble Magnesium (Mg)	2009/09/23	NC		%	35	
	Soluble Sodium (Na)	2009/09/23	NC		%	35	
	Soluble Potassium (K)	2009/09/23	NC		%	35	
	Soluble Sulphate (SO4)	2009/09/23	NC		%	35	
3444662 SR7	Method Blank	Moisture	2009/09/25	<0.3		%	
	RPD [Q83617-01]	Moisture	2009/09/25	2.4		%	20

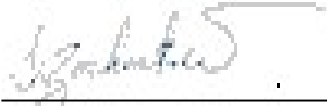
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.  
 Calibration Check: A calibration standard analyzed at different times to evaluate on-going calibration accuracy.  
 Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.  
 QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.  
 Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.  
 Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.  
 Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.  
 NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.  
 NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

**Validation Signature Page**

**Maxxam Job #: A951752**

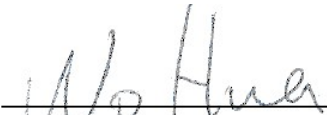
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The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



---

DIANE ZACHARKIW, Scientific Specialist



---

HUA WO, Organics Supervisor



---

LISA CUMMINGS, Extractables Supervisor

=====

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. SCC and CALA have approved this reporting process and electronic report format.

**Invoice To:** Require Report? Yes  No

**Company Name:** Shell Canada Energy

**Contact Name:** Randall Warren

**Address:** 400-4 Ave SW Calgary

**Prov:** Alta **PC:** \_\_\_\_\_

**Contact #s:** Ph: 403-691-2521 Fax: \_\_\_\_\_

**Report To:** Sam Bird

IEG Consultants,

500-2618 Hopewell Place NE Cal.

**Prov:** Alta **PC:** T14-7J7

**Ph:** 403-990-1382 **Fax:** \_\_\_\_\_

PO # / AFE #:

Quotation #:

Project #: A04012A01.02

Project Name: Camp Farewell

Location: Mackenzie Delta NWT

Sampler's Initials: JSB

**DETECTION LIMIT REQUIREMENTS:**  
 Check the applicable criterion and indicate land use

AT1

CCME

OTHER

**REPORT DISTRIBUTION:**  
**EMAIL ADDRESS(S):**  
sbird@ieg.ca  
nimmela@klohn.com

**SERVICE REQUESTED:**

RUSH (Please ensure you contact the lab to reserve)  
**Date Required:** \_\_\_\_\_

REGULAR Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)					WATERS (footnotes defined on back)					OTHER TEST(S)				*HOLD for 60 Days # of Containers Submitted	
			BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1) <sup>1</sup>	Assessment ICP Metals <sup>2</sup>	Paint Filter <input type="checkbox"/> Flashpoint <input type="checkbox"/> pH (1:1)	TCLP <input type="checkbox"/> BTEX <input type="checkbox"/> Metals	BTEX F1 <input type="checkbox"/> VOCs	BTEX F1-F2 <input type="checkbox"/> BTEX F1-F4	Routine Water Package <input type="checkbox"/> Turb <input type="checkbox"/> F	Total <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Dissolved <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Filtered <input type="checkbox"/> Not Filtered	Mercury <input type="checkbox"/> Total <input type="checkbox"/> Dissolved		Ammonia <input type="checkbox"/> TKN <input type="checkbox"/> COD
1 0916-5509-01	S	2009/09/16																1
2 02																		1
3 03																		1
4 04																		1
5 05										X								1
6 06																		1
7 07																		1
8 08																		1
9 09																		1
10 10										X								1
11 11										X								1
12 12																		1

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD Date/Time: Sept. 18, 2009 11:00 AM

Sign and Print: Sam Bird

COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED	Received By		Temperature		Ice
	<u>19/09/09 D.W.</u>		<u>6 6 7</u>		
	CUSTODY SEAL		YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>		

**Invoice To:** Require Report? Yes  No

Company Name: \_\_\_\_\_  
 Contact Name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Prov: \_\_\_\_\_ PC: \_\_\_\_\_  
 Contact #s: Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

**Report To:**  
 SAM BIRD  
 IEG Consultants  
 Prov: \_\_\_\_\_ PC: \_\_\_\_\_  
 Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

PO # / AFE #: \_\_\_\_\_  
 Quotation #: \_\_\_\_\_  
 Project #: \_\_\_\_\_  
 Project Name: \_\_\_\_\_  
 Location: \_\_\_\_\_  
 Sampler's Initials: \_\_\_\_\_

**DETECTION LIMIT REQUIREMENTS:**  
 Check the applicable criterion and indicate land use  
 AT1  
 CCME  
 OTHER

**REPORT DISTRIBUTION:**  
 EMAIL ADDRESS(S):  
 sbird@ieg.ca

**SERVICE REQUESTED:**  
 RUSH (Please ensure you contact the lab to reserve)  
 Date Required: \_\_\_\_\_  
 REGULAR Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)						WATERS (footnotes defined on back)						OTHER TEST(S)					
			BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1) <sup>1</sup>	Assessment ICP Metals <sup>2</sup>	<input type="checkbox"/> Paint Filter <input type="checkbox"/> Flashpoint <input type="checkbox"/> pH (1:1)	TCLP <input type="checkbox"/> BTEX <input type="checkbox"/> Metals	BTEX F1 <input type="checkbox"/> VOCs	BTEX F1-F2 <input type="checkbox"/> BTEX F1-F4	Routine Water Package <input type="checkbox"/> Turb <input type="checkbox"/> F	Total <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Dissolved <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Filtered <input type="checkbox"/> Not Filtered	Mercury <input type="checkbox"/> Total <input type="checkbox"/> Dissolved	Ammonia <input type="checkbox"/> TKN <input type="checkbox"/> COD	TOC <input type="checkbox"/> DOC	*HOLD for 60 Days	# of Containers Submitted
1 0916-5509-13	S	2009/09/16																		1
2 14																				1
3 15																				1
4 16																				1
5 17																				1
6 18																				1
7 19																				1
8 20																				1
9 21																				1
10 22																				1
11 23																				1
12 24																				1

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #: \_\_\_\_\_

Relinquished By: SAM BIRD Date/Time: Sept. 18, 2009 11am  
 Sign and Print: [Signature]

# JARS USED & NOT SUBMITTED	Received By: <u>19/09/09 11:15</u>	Temperature		Ice
	<u>D.W</u>	6	6	
CUSTODY SEAL YES / NO				



**Invoice To:** Require Report? Yes  No

Company Name: \_\_\_\_\_  
 Contact Name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 Prov: \_\_\_\_\_ PC: \_\_\_\_\_  
 Contact #s: Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

**Report To:**  
 SAM BIRD

Prov: \_\_\_\_\_ PC: \_\_\_\_\_  
 Ph: 403 9901382 Fax: \_\_\_\_\_

PO # / AFE #:  
 Quotation #:  
 Project #:  
 Project Name:  
 Location:  
 Sampler's Initials:

**DETECTION LIMIT REQUIREMENTS:**  
 Check the applicable criterion and indicate land use

AT1 \_\_\_\_\_  
 CCME \_\_\_\_\_  
 OTHER \_\_\_\_\_

**REPORT DISTRIBUTION:**  
 EMAIL ADDRESS(S):  
 sbird@icg.ca

**SERVICE REQUESTED:**

RUSH (Please ensure you contact the lab to reserve)  
 Date Required: \_\_\_\_\_  
 REGULAR Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)							WATERS (footnotes defined on back)							OTHER TEST(S)			*HOLD for 60 Days # of Containers Submitted			
			BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1)	Assessment ICP Metals <sup>2</sup>	<input type="checkbox"/> Paint Filter <input type="checkbox"/> Flashpoint <input type="checkbox"/> pH (1:1)	TCLP <input type="checkbox"/> BTEX <input type="checkbox"/> Metals	BTEX F1	VOCs	BTEX F1-F2	BTEX F1-F4	Routine Water Package <input type="checkbox"/> Turb <input type="checkbox"/> F	Total <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Dissolved <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Filtered <input type="checkbox"/> Not Filtered	Mercury <input type="checkbox"/> Total <input type="checkbox"/> Dissolved	Ammonia <input type="checkbox"/> TKN <input type="checkbox"/> COD		TOC <input type="checkbox"/> DOC		
1 0916-SS09-25	S	2009/09/16																				1	
2 ↓ 26	↓	↓																					1
3 ↓ 27	↓	↓																					1
4 ↓ 28	↓	↓									X												1
5 ↓ 29	↓	↓																					1
6 ↓ 30	↓	↓																					1
7 ↓ 31	↓	↓																					1
8 ↓ 32	↓	↓																					1
9 ↓ 33	↓	↓										X											1
10 ↓ 34	↓	↓																					1
11 ↓ 35	↓	↓																					1
12 ↓ 36	↓	↓																					1

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #:

Relinquished By: SAM BIRD  
 Sign and Print: *Sam Bird*  
 COMMENTS/SPECIAL INSTRUCTIONS:

Date/Time: Sept. 18, 2009 11 AM

# JARS USED & NOT SUBMITTED	Received By		Temperature		Ice
	19/09/09 11:15 D.W		6 6 7		
CUSTODY SEAL			(YES) / NO		

**Invoice To:** Require Report? Yes  No

Company Name: \_\_\_\_\_  
Contact Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
Prov: \_\_\_\_\_ PC: \_\_\_\_\_  
Contact #s: Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

**Report To:** SAM BIRD  
IEG Consultants.

Prov: \_\_\_\_\_ PC: \_\_\_\_\_  
Ph: \_\_\_\_\_ Fax: \_\_\_\_\_

PO # / AFE #: \_\_\_\_\_  
Quotation #: \_\_\_\_\_  
Project #: \_\_\_\_\_  
Project Name: \_\_\_\_\_  
Location: \_\_\_\_\_  
Sampler's Initials: \_\_\_\_\_

**DETECTION LIMIT REQUIREMENTS:**

Check the applicable criterion and indicate land use  
 AT1 \_\_\_\_\_  
 CCME \_\_\_\_\_  
 OTHER \_\_\_\_\_

**REPORT DISTRIBUTION:**

EMAIL ADDRESS(S): sbird@ieg.ca

**SERVICE REQUESTED:**

RUSH (Please ensure you contact the lab to reserve)  
Date Required: \_\_\_\_\_  
 REGULAR Turnaround (5 to 7 Days)

Sample Identification	Matrix S/W	Date & Time Sampled Year/Month/Day	SOILS (footnotes defined on back)				WATERS (footnotes defined on back)				OTHER TEST(S)				*HOLD for 60 Days	# of Containers Submitted	
			BTEX F1-F4	Sieve (75 micron)	Salinity 4	Regulated Metals (CCME / AT1) <sup>1</sup>	Assessment ICP Metals <sup>2</sup>	Paint Filter <input type="checkbox"/> Flashpoint <input checked="" type="checkbox"/> pH (1:1)	TCLP <input type="checkbox"/> BTEX <input type="checkbox"/> Metals	BTEX F1 <input type="checkbox"/> VOCs	BTEX F1-F2 <input type="checkbox"/> BTEX F1-F4	Routine Water Package <input type="checkbox"/> Turb <input type="checkbox"/> F	Total <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved	Dissolved <input type="checkbox"/> Preserved <input type="checkbox"/> Not Preserved			Filtered <input type="checkbox"/> Not Filtered
1 0916-SS09-37	S	2009/09/16															1
2 38																	1
3 39																	1
4 40																	1
5 WR1-1				X	X												2
6 WR1-2				X	X												2
7 WR2-3				X	X												2
8 WR2-1				X	X												2
9 WR2-2				X	X												2
10 WR3-1				X	X												2
11 WR3-2				X	X												2
12 WR3-3				X	X												2

\*All samples are held for 60 calendar days after sample receipt. For long term storage please contact your project manager.

Maxxam Job #: \_\_\_\_\_

Relinquished By: SAM BIRD Date/Time: Sept. 18 2009 11 AM

Sign and Print: *Sam Bird*

COMMENTS/SPECIAL INSTRUCTIONS:

# JARS USED & NOT SUBMITTED

Received By

19/09/09 11:15

D.W

CUSTODY SEAL YES / NO

Temperature

6 6 7 y

Ice

# APPENDIX IX

## WorleyParsons Polyurethane Foam Assessment

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## APPENDIX 4: POTENTIAL BY-PRODUCTS OF INSULATION DEGRADATION

### Introduction

A meeting was held on April 30<sup>th</sup>, 2009 to discuss the Interim Abandonment and Reclamation Plan for Camp Farewell (WorleyParsons 2006) and specifically the dismantling and remediation activities that were planned for 2009. As a result of that meeting a commitment was made to include degradation products of the foam insulation in future groundwater monitoring programs. Given that there are no historical environmental issues associated with the degradation of foam insulation, monitoring of groundwater is considered an appropriate safeguard for this possibility.

The underlying text identifies the potential by-products of the degradation of the foam insulation.

### Foam Insulation Degradation Products

#### Assessment

Polyurethanes (PU) are typically produced by reacting diisocyanates with polyols. The two diisocyanates predominantly used in the manufacture of polyurethanes are methylenediphenyl diisocyanate (MDI) and toluene diisocyanate (TDI) (Allport 2003).

Degradation of PU foam under buried conditions is very slow and short term studies have found no change in PU foams tested at a disposal site and evaluated after 3 and 5 years, with no detectable alteration in leachate water composition. The rate at which degradation occurs is to a large extent dependent on the chemical base of the foam in question. Studies designed to evaluate the degradation of soft PU foams with a polyester versus polyether base have shown that polyurethane-ester foams are susceptible to chemical or microbial degradation, whereas polyurethane-ether foams are more resistant (IPCS 1987).

Filip (1978) observed that the microbial decomposition of polyurethane followed the following sequence: degradation of free isocyanate groups -> splitting of the urea and amide groups -> breaking off the urethane groups -> cleavage of the rings of the isocyanuric acid units.

Possible products of PU foam degradation in a buried state may include aromatic amines, produced when isocyanates are released from the PU foam. There is evidence that isocyanates used in the production of polyurethane foam can be released into the media (Filip 1979). Isocyanates are highly reactive in water and undergo rapid hydrolysis; toluene diisocyanate has a half life of 0.5 seconds to 3 days dependent on pH and turbidity (IPCS). Hydrolysis of diisocyanates forms amines; these amines then react further with excess isocyanate to create solid, insoluble polyurea (WHO 2000). Both these reactions are rapid.

A 700 day simulated landfill study assaying for aromatic amines using a variety of PU foams (including TDI-based flexible foams and MDI-based rigid foams) did not see the expected aromatic amines released into leachate. It was unclear as to whether the aromatic amines were becoming bound to the substrate, or metabolized (Brown cited by DeGaspari 1999).



According to the work of Filip (1978), cleavage of isocyanuric acid rings is the final stage in the microbial decomposition. Isocyanuric acid (also known as cyanuric acid) is stable in water and not readily biodegradable (OECD 1999). Once dissolved into water, cyanuric acid is not likely to volatilize or to be adsorbed by soil particles (OECD 1999). It is possible to detect and measure isocyanuric acid in water samples using a melamine solution and turbidity test.

## Proposed Monitoring

Based on the above, it is evident that polyurethane foam is not susceptible to degradation and that potential degradation products are not particularly soluble. That said, potential degradation products contain significant proportions of nitrogen. Accordingly, it is proposed to include total nitrogen (as well as nitrate and nitrite) in the routine groundwater monitoring program for the site. If anomalous nitrogen concentrations are noted, then target analysis for cyanuric acid would be completed. It is also recommended that at least one round of groundwater testing include specific analysis of cyanuric acid.

## References

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<http://www.springerlink.com/content/j6r6h7m3g36n46w5/fulltext.pdf>
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- WorleyParsons Komex, 2006. 2006 Environmental Site Assessment, Camp Farewell, NT. Unpublished report prepared for Shell Canada Limited, December 2006. C52360300.