Indian and Northern Affairs Canada

REMEDIAL ACTION PLAN
JOHNSON POINT STAGING AREA
JOHNSON POINT, NORTHWEST TERRITORIES

1740200

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EXECUTIVE SUMMARY

FOREWORD

Indian and Northern Affairs Canada (INAC) retained EBA Engineering Consultants Ltd. (EBA) to prepare a remedial action plan (RAP) for the Johnson Point Staging Area. The site was used extensively in the 1960s and 1970s for oil and gas exploration but recently has been used as a base by companies and agencies working in the area for refuelling. Remediation of the site is required to clean up contaminated soils and dispose of site infrastructure. It is currently comprised of an airstrip, Nodwells, derelict buildings, a tank farm, miscellaneous debris, and a trail network. The objective of the overall project is to review existing information, identify and address remaining information gaps, conduct additional studies, and develop a RAP for the site clean up. The present study is conducted as per the Standing Offer Agreement (SOA) #00-05-6003-8, Call-Up #8. This report comprises the RAP component.

This Remedial Action Plan is developed from studies conducted in the summer of 2006. The results of these studies are contained within EBA's Environmental Site Assessment report, Geophysical report, and Geotechnical report, in addition to a Human Health and Ecological Risk Assessment conducted by Jacques Whitford Ltd. (JWL).

FINDINGS AND CONCLUSIONS

Johnson Point requires remediation of hydrocarbon-contaminated soil, removal of hazardous and non-hazardous materials, and securing the five landfills identified. The primary focus areas of the site have been divided as follows:

- Apron Area
- Petroleum, Oil and Lubricants (POL) Area (main site)
- Landfills (five total)
- Materials/Buildings/Tanks

The environmental issues that require addressing at the site are as follows:

- Hydrocarbon impacts at the apron area are primarily volatile and semi-volatile F1 and F2 hydrocarbons. The volume of this soil is approximately 25,000 m^3 (exceeding CCME Parkland coarse-grained surface criteria of the Abandoned Military Site Protocol) and it is within 10 m of at least two waterbodies (pond and river) and possibly the Prince of Wales Strait. Impacts had attenuated considerably at the edge of the airstrip; however, no boreholes were placed in the airstrip for safety reasons. The protection of groundwater for aquatic life criteria, as indicated in Canadian Council of Ministers of the Environment (CCME) guidelines, would apply to soil within 10 m of the water's edge in this area. As a precaution, all soil within the apron area, including soil beyond 10 m distance from the water's edge, will have the protection of aquatic life exposure pathway. This area can best be remediated on the basis of economics, acceptability, and feasibility through alluing and/or landfarming. The technology can be

implemented with an excavator and a special mixing bucket and may require up to two field seasons to remediate this area.

- The POL area is impacted primarily by semi-volatile hydrocarbons in the F2 range, with some F1 and F3 hydrocarbons. It is approximately 500 m^3 in volume and in exceedance of the JWL site specific criteria of 4,570 ppm. This material can best be remediated through alluing and/or landfarming, along with the material from the apron area. If alluing is done rather than landfarming, consider providing a pre-treatment with a chemical oxidation product to quickly break down the semi-volatile components in soils at the POL area.
- The majority of the debris on-site is classified as hazardous (lead/PCB-based paint, and asbestos) or has lead paint concentrations higher than the territorial regulations. This material will need to be hauled off-site for disposal. The quantity of non-hazardous material is too small to warrant construction of a non-hazardous landfill as it will not be cost effective.
- Five existing landfills were identified on site. Landfills A, B, C and D will be covered with a layer of sand. Landfills A and C require a layer of erosion protection to be placed over the sand. The debris within the Apron Landfill (the fifth landfill) will be excavated along with hydrocarbon contaminated soil. The excavated debris will be shipped off-site.

SCHEDULE

Based on EBA's experience and understanding of site conditions and processes, the following project schedule is proposed:

Year 1

- Fall/Winter 2007/2008 - finalize RAP and other reports from input from community meetings, develop specification and design drawings, post on MERX noting contractor's site visit in early August, award contract and start applying for regulatory authorizations.

Year 2

- Spring 2008 - obtain water licence, land use permit.
- Summer/Fall 2008 - mobilize to site, stage for next year's work, perhaps upgrade airstrip and roads, camp set-up.

Year 3

- Excavate and treat hydrocarbon impacted soil.
- Remediate existing landfills.
- Remove hazardous materials from buildings and equipment by licensed contractors. Place materials in staging area at apron.
- Cut tanks and prepare for transport offsite.
- Prepare non-hazardous materials for transport off-site.

Year 4 (if needed) – The contractor may require an additional year of site work depending on the size and number of pieces of equipment brought to the site, size of the camp, etc.

- Continue treatment of hydrocarbon contaminated soil.
- Complete hazardous and non-hazardous material dismantling.
- Remove remaining hazardous and non-hazardous materials from site.
- Remove equipment from site.

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1.0 INTRODUCTION

1.1 GENERAL

Indian and Northern Affairs Canada (INAC), retained EBA Engineering Consultants Ltd. (EBA) to prepare a remediation action plan (RAP) for the Johnson Point Staging Area. The site was used extensively in the 1960s and 1970s for oil and gas exploration but recently has been used mainly as an emergency airstrip. Remediation of the site is required to clean up contaminated soils and dispose of abundant infrastructure. It is currently comprised of an airstrip, Nodwells, derelict buildings, a tank farm, miscellaneous debris, and a trail network. The objective of the overall project is to review existing information, identify and address remaining information gaps, conduct additional studies, and develop a RAP for the site clean up. The present study is conducted as per the Standing Offer Agreement (SOA) #00-05-6003-8, Call-Up #8. This report comprises the RAP component.

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1.2 SITE LOCATION

Johnson Point is situated on the east coast of Banks Island approximately 270 km northeast of Sachs Harbour, Northwest Territories (Figure 1) at 72°45'10" N, 118°30'00" W. The site size is approximately 2.5 km^2.

1.3 LAND TENURE

The land is currently within the Inuvialuit Settlement Region on Federal Crown Land. It has been traditionally used by the Inuvialuit people of Sachs Harbour and Ulukhaktok. The site is presently used by the Inuvialuit people for hunting and fishing.

2.0 SITE HISTORY

2.1 SITE HISTORY

Johnson Point was originally constructed as a staging area and base for oil and gas exploration for the north end of Banks Island. Oil and gas exploration activities began in 1971 and stopped in the 1980s. The site has been abandoned since exploration activities were completed, however, the airstrip has been used informally since that time and the site is likely visited by hunters.

The existing site infrastructure includes:

- An abandoned 1,500 m gravel airstrip, washouts limiting usable length to 1,100 m are present at the south end of the strip.
- An abandoned aircraft navigational aid building.

- An unlined, bermed tank farm containing 19 fuel tanks and two 127 mm pipelines connecting the tank farm to the airstrip.
- A Nodwell camp consisting of a Nodwell, two trailers and nine camp units.
- Various skid-mounted Petroleum, Oil and Lubricant (POL) tanks and barrels.
- Four (4) existing landfills, and one (1) suspected landfill.

The Johnson Point airstrip has been used as an alternate landing location (in case of poor weather conditions at the intended site) and the site has been used as a staging area for exploration further inland.

Environmental work previously completed at the site has included the following:

- 1992 INAC Site Inventory
- 2002 Parks Canada Investigation
- 2005 IEG Environmental Site Assessment
- 2006 EBA Site Supervision for Fuel Incineration (reported in 2007)
- 2006 EBA Environmental Site Assessment (reported in 2007)
- 2006 EBA Geotechnical Assessment (reported in 2007)
- 2006 EBA Geophysical Report (reported in 2007)
- 2007 JWL Human Health and Ecological Risk Assessment (HHERA) Report

In 1992, activities included the consolidation of drums, batteries, and other loose debris near the airstrip, incineration of combustible materials, inspection of fuel storage tanks for contents and estimated volume, and the completion of a detailed inventory of the site.

In 2002, Parks Canada visited the site in response to a report from the Sachs Harbour Hunters and Trappers Committee that stated the tanks were leaking. Parks Canada visually identified several areas of potential hydrocarbon impacts and classified the site as having a high likelihood for hydrocarbon contamination.

In 2005, IEG Environmental (IEG) completed a geophysical inspection of the site, a near surface soil sampling program, inspection of the tanks, and quantification and characterization of hydrocarbons remaining on-site. The geophysical investigation identified four significant anomalies that were suspected to be landfills. Collection of near surface soil samples identified petroleum hydrocarbon (PHC) contaminated soil to the northeast of the tank farm.

In 2006, EBA conducted a geophysical, geotechnical and environmental site assessment of the Johnson Point site. The results of these investigations are reported under separate cover. Arctic Environmental Services (AES) was contracted to incinerate residual fuel

remaining in the tanks in the POL area and barrels. The barrels were then crushed and placed on the airstrip apron.

3.0 REQUIREMENTS FOR THIS PROJECT

3.1 FIRST NATION PARTNERSHIP

Contaminants & Remediation Directorate (CARD) has been working closely with the Inuvialuit Regional Corporation (IRC) to identify groups or individuals within the Inuvialuit Settlement Region (ISR) that may be affected by the proposed activities at Johnson Point.

At the recommendation of IRC, CARD has consulted with the Sachs Harbour Hunters and Trappers Committee (HTC) and the Inuvialuit Game Council (IGC) and updated IRC prior to commencing consultation activities with the affected groups within the ISR. A summary of the community consultation conducted for this project is presented below:

- On December 2005, CARD attended the IGC quarterly meeting in Inuvik at the invitation of the IGC. CARD presented information on the Contaminated Sites Program, reviewed the assessment activities that had been completed at Johnson Point during 2005, and summarized the activities that are proposed for 2006.
- In April 2006, CARD initiated a Traditional Knowledge/Community survey in Sachs Harbour regarding Johnson Point and the surrounding area. The survey was contracted to the Sachs Harbour HTC and was conducted by Joey Carpenter, an elder from Sachs Harbour. CARD and the Sachs Harbour HTC prepared the survey to collect information about how Johnson Point is used by the community of Sachs Harbour (both past and present), how the site was used by industry, what animals are found at the site at different times in the year. The survey was completed in January 2007.
- In addition to the survey, CARD visited Sachs Harbour from April 24 to 27, 2006. CARD attended an HTC Special Members Meeting at the invitation of the Sachs Harbour HTC on April 25, 2006 to present an update on Johnson Point. During this presentation, information was provided about the process of evaluation and selection of sites for the Contaminated Sites Program, the tasks completed at Johnson Point in 2005 and a summary of the work proposed to be completed in 2006. Following the presentation, CARD held a question answer/period to gather information about community concerns. Fifteen Sachs Harbour HTC members were in attendance including three directors on the HTC Board.
- CARD also visited the Inualthuyak School in Sachs Harbour on April 26, 2006 and gave a short demonstration about how contaminants travel in the environment and why we need to be concerned about cleaning up sites and protecting the environment. The students participated in two short science experiments led by CARD.
- In August 2006, CARD conducted a site visit to Johnson Point with elders and some members of the Sachs Harbour HTC. Comments from elders and HTC members during the tour of the site as well as information gathered from the Traditional

Knowledge / Community Survey were used by CARD to direct further testing for contamination at Johnson Point and to determine if sites of cultural importance were present in the area.

- On April 17, 2007, CARD and PWGSC hosted a Remedial Options Evaluation Meeting in Sachs Harbour which was attended by delegates of the Sachs Harbour Community Corporation, Sachs Harbour HTC, and Sachs Harbour Elders Committee. Concerns and assessment results regarding each area of the site were discussed and the preferred option was selected. This meeting was followed by a Community Information Session in Sachs Harbour later that evening. A second Community Information Session in the hamlet of Ulukhaktok was hosted by the Olokhaktomiut Hunters and Trappers Committee on April 19, 2007.
- On July 31, 2007, CARD conducted a Community Site Tour of Johnson Point. This tour included community delegates from the Olokhaktomiut Hunters and Trappers Committee, Ulukhaktok Community Corporation, Ulukhaktok Elders Committee, and Ulukhaktok Youth Council. Representatives from the Department of Fisheries and Oceans and the Northwest Territories Water Board were also in attendance on this tour to provide technical feedback to assist with the regulatory application process. The Draft Remedial Action Plan was discussed as the tour visited each of the areas throughout the site. A Community Site Tour is planned for August 2007 with community representatives from Sachs Harbour.

Minutes from the Remedial Options Evaluation Meeting and each of the Community Information Sessions are included in Appendix C of this RAP.

In addition to involvement in the consultation process, the Inuvialuit people of Sachs Harbour provided personnel for the running of the camp for the waste fuel incineration and the 2006 site investigations.

3.2 REMEDIATION CRITERIA

3.2.1 INAC Abandoned Military Site Remediation Protocol

The applicable remediation criteria for the site are INAC's Abandoned Military Site Remediation Protocol, March 2005, which is based on the modified DEW Line Protocol. For metals and PCBs, the criteria are presented in Table 1.

TABLE 1: DEW LINE SOIL CLEANUP CRITERIA (DCC)[a]		
Substance	Criteria[b]	
Inorganic Elements	DCC-I[c]	DCC-II[d]
Arsenic		30
Cadmium		5.0
Chromium		250
Cobalt		50
Copper	-	100
Lead	200	500
Mercury	-	2.0
Nickel		100
Zinc		500
Polychlorinated biphenyls		
PCBs	1.0	5.0

a These criteria were adopted specifically for the cleanup of Arctic DEW Line Sites from the 1991 versions of the Quebec Soil Contamination Indicators and the Canadian Council of Ministers of the Environmental Interim Canadian Environmental Criteria for Contaminated Sites.

b Soil criteria are given in parts per million (ppm).

c Soils containing lead and/or PCBs at concentrations in excess of DCC I, but less than DCC II, may be landfilled.

d Soils containing one or more substrates in excess of DCC II must be containerized - i.e., removed in a manner which precludes contact with the Arctic ecosystem.

For hydrocarbons, the INAC protocol states that the following criteria apply:

TABLE 2: CCME RESIDENTIAL/PARKLAND TIER 1 LEVELS (MG/KG SOIL) FOR PHCs FOR COARSE-GRAINED SURFACE SOILS				
Exposure Pathways	F1 (C_6-C_{10})	F2 (>C_{10}-C_{16})	F3 (>C_{16}-C_{34})	F4 (>C_{34})
Soil ingestions (garages, hangars, etc.)	15,000	8,000	18,000	25,000
Protection of GW for aquatic life[1] (beach POLs)	230	150	NA[2]	NA[2]

1 Assumes surface water body at 10 m from HC source area

2 NA - not applicable

3.2.2 Human Health and Ecological Risk Based Criteria

As an alternative to generic criteria, risk based criteria can be proposed. INAC has provided EBA with risk based site specific criteria for hydrocarbons, based on a human health and ecological risk assessment (HHERA) conducted by JWL for the site.

The specific criteria proposed based on ecological risk to small animals which may permanently inhabit the site are as follows:

SPECIFIC CRITERIA PROPOSED BASED ON ECOLOGICAL RISK TO SMALL ANIMALS						
	Xylenes	F1	F2	F3	F4	Total
Value ppm	37,367	400	460	910	2,800	4,570

At the levels tested and from the exposure scenarios assumed, Jacques Whitford Limited determined that there is no risk to either human or ecological receptors on-site. Site Specific Target Levels (SSTLs) were generated for total petroleum hydrocarbons (TPH). TPH SSTL for ecological risk to receptors was determined to be 4,570 ppm. EBA was instructed by PWGSC/INAC to use this criterion for the POL area as this area is greater than 10 m from any waterbody. The more protective aquatic life criteria was selected for the apron area due to its proximity to water.

3.2.3 Criteria for Asbestos, Lead Paint, and PCB Paint

According to U.S. Department of Labour's Occupational Safety and Health Administration's (OSHA) Guideline (Part No. 1926, Standard Number 1926.1101, Title: Asbestos), "Asbestos-containing material (ACM) means any material containing more than one percent asbestos." EBA has used OSHA Guidelines for comparing asbestos results.

According to Government of Northwest Territories' (GNWT's) "Guideline for the Management of Waste Lead and Lead Paint", dated April 2004, lead-amended paint is defined as "structural coatings containing greater than 600 parts per million (ppm) (0.06% by weight) lead", which is 600 mg/kg. This guideline also states that products containing lead in excess of 600 ppm are considered hazardous waste. The Abandoned Military Site Remediation Protocol states that lead-based painted components, which are classified as hazardous materials, need to be collected and transported off-site appropriately to a licensed hazardous waste disposal facility. EBA has used this criterion for comparing lead-amended paint results. Transportation of lead-based paint should be as per Section 3.5 of GNWT's "Guideline for the Management of Waste Lead and Lead Paint", dated April 2004.

For evaluating PCBs in paint, EBA has referenced Environment Canada's, "The Technical Feasibility of Landfilling PCB-Amended Painted Materials" (Environment Canada, June 1999). Health Canada does have an advisory cautioning against burning wood and other materials that contain PCBs (Health Canada 2000-88). The potential for PCBs to be released from paints is considered low (Environment Canada, June 1999).

When transporting lead-amended painted materials, appropriate protocols and procedures should be followed as per Transportation of Dangerous Goods (TDG) Regulations. The

waste should be properly packaged, labelled, classified and manifested as required by the transport authority (air, road, rail, marine) as the case may be.

4.0 CURRENT SITE CONDITIONS

4.1 REMAINING INFRASTRUCTURE ON-SITE

The primary infrastructure at the site which requires addressing includes 19 vertical POL tanks within an unlined soil berm, an abandoned aircraft NavAid station at the southern end of the airstrip, five suspected landfills, tanks on skids and crushed barrels, Nodwells, derelict buildings, and various debris. The POL tanks consist of 12 bolted tanks and seven welded tanks. Other major items at the site include five additional large bolted tanks, one large welded tank, 15 to 20 smaller welded tanks and Cat Loader. The remaining infrastructure and debris is listed in Appendix A.

Paint from various items was sampled for testing of lead and PCBs. Sample locations are shown on Figure 6 and the test results are presented in Table 3.

TABLE 3: JOHNSON POINT – DESCRIPTION AND LOCATION OF PAINT SAMPLES			
Sample #	Location	Detectable PCBs	Lead >600 mg/kg
1	Red paint on 10 sleds: 7 at apron area and 3 near tank farm	No	Yes
2	Orange paint on wooden shed at apron area	No	Yes
3	Yellow paint on bulldozer at apron area	Yes	Yes
4	White interior paint in trailers at apron area	Yes	Yes
5	White paint on wooden shed at apron area	No	Yes
6	Grey paint (11 large tanks, 3 small tanks and heating oil tank) at tank farm area	No	Yes
7	White paint on two tanks at tank farm	Yes	Yes
8	Orange paint on 22 utility oil tanks at tank farm	No	Yes
9	Green paint on wooden shed at tank farm area	No	Yes
10	Grey paint in wooden shed at tank farm	Yes	Yes
11	Red paint on metal shed at tank farm	Yes	No
12	Green paint on wooden sheds at main pad halfway between tank farm and trailers	No	Yes
13	White interior paint on white trailers	Yes	Yes
14	Grey metal paint in white trailers	Yes	No
15	Brown paint in mechanics room and crew quarters in white trailers	No	No
16	White paint in crew quarters in white trailers	Yes	No
17	Orange paint on Nodwells at upper base	Yes	Yes
18	Blue paint on Nodwells at upper base	Yes	Yes
19	White paint on Nodwells at upper base	Yes	Yes

Suspected asbestos containing materials such as fibrous materials, tiles and insulation were also sampled and tested. Results of testing are summarized in Table 4.

TABLE 4: JOHNSON POINT - ASBESTOS SAMPLES			
Sample #	Location	Asbestos (%)	Asbestos Type
1	Insulation in wood shed walls at apron area	ND	-
2	Table top in trailer at apron area	ND	-
3	Linoleum floors in trailers at apron area	70	Chrysotile
4	Insulation (white) in wood shed at apron area	ND	-
5	Ceiling material in white trailers	ND	-
6	Insulation in white trailers	ND	-
7	Yellow fibrous materials in Nodwells at upper base	ND	-
8	Blue foam material in walls of Nodwells at upper base	ND	-
ND – Not Detected			

Only one sample was found to contain asbestos. This was the linoleum floor material in the Nodwell camp trailers at the airstrip.

Based on EBA's previous experience with pre-manufactured trailers, the potential for asbestos-containing materials is high, depending on the construction dates of the trailers. Based on EBA's previous experience and available information concerning the manufacturing of these types of trailers, there is high likelihood that asbestos-containing flooring materials are present within all trailers at the site. Again, based on EBA's experience with similar buildings, a linoleum flooring material is typically used in the construction of these trailers.

4.2 SITE CONTAMINATION

4.2.1 IEG Report 2005

IEG conducted a Phase I and II in September/October, 2005. Work was conducted over a period of seven days. Work conducted included a geophysical survey, surface soil sampling, surface water sampling, site inspection, materials inventory (including paint and asbestos sampling), and tank fuel inventory.

An electromagnetic geophysical survey identified four potential landfill areas, labelled Areas A through D, respectively. These locations are shown on Figure 6. Limited surface sampling was conducted in this area. Tests were conducted for PCBs, metals and hydrocarbon parameters. Surface soil samples from 71 points were collected in the vicinity of the POL tanks. These soil samples were tested for various analytical parameters. Two dugouts and one pond sediment sample were also obtained and analyzed. Also analyzed

were three water samples from the dugouts and pond. A synopsis of results is included in the following two tables (Tables 5 and 6).

TABLE 5: PREVIOUS SOIL - ANALYTICAL RESULTS (IEG 2005)		
Parameter	Number of Soil Samples	Result
BTEX, Petroleum hydrocarbon fractions F1 to F4	32 surface samples submitted adjacent to Tank Farm, 10 samples from geophysical anomaly areas A, B, C, D	Fifteen soil samples from tank farm area exceeded criteria. F3 and F4 were as high as 24,000 ppm and 11,000 ppm, respectively. 2,100 m^3 of hydrocarbon impacted soil were estimated to be present within the tank farm area based on a screening criteria of 3,380 mg/kg TPH. The screening criteria was based on the sum of hydrocarbon fractions F1 through F4 of the CCME CWS Residential Parkland coarse-grained criteria. No hydrocarbon exceedances above screening criteria were found in geophysical anomaly areas
Polychlorinated Biphenyls (PCBs)	10 samples from geophysical anomaly areas	No exceedances of criteria
Trace metals	10 samples from geophysical anomaly areas	No exceedances of criteria.

TABLE 6: PREVIOUS SURFACE WATER QUALITY ANALYTICAL RESULTS (IEG 2005)		
Parameter	Number of Water Samples	Result
Hydrocarbons	Three samples	No exceedances
PCB	Three samples	No exceedances
Metals	Three samples	No exceedances

As the investigation was limited to surface sampling and groundwater could not be sampled (due to approaching winter conditions), the impacts found were not completely delineated, vertically or horizontally.

4.2.2 EBA Engineering Consultants Ltd., 2006

EBA was retained in 2006 to conduct an environmental site assessment, as a component of site activities in the summer of 2006. Detailed results are under separate cover (EBA Environmental Site Assessment, 2007).

Soil and sediment samples from geophysical anomalies, areas of concern (POL area and apron area), controls, and adjacent to key surface water bodies were obtained and analyzed for PCBs, metals and hydrocarbons. Water samples were obtained from two dugout areas

sampled previously by IEG (the river, the sea and the pond adjacent to the apron), as well as from groundwater monitoring wells. Water samples were analyzed for hydrocarbons and metals. Some detectable hydrocarbons were found in groundwater (MW 4, 6, 15, 26, 74, 79, 85, 89, 94, 107, 108, 109, 116, 120, and 140). No hydrocarbon exceedances above criteria were noted in groundwater outside source areas. Hydrocarbon results for soil and water are in Appendix B for reference. Soil, water and sediment sampling locations are shown in Figures 2 through 5. A synopsis of key soil results and volumes of impacted soil are presented in Table 7.

TABLE 7: SYNOPSIS OF RESULTS AND IMPACTED SOIL VOLUMES

Area	Soils Exceeding Abandoned Military Site Protocol for Hydrocarbons (Aquatic Life Criteria of the Parkland Coarse-grained Surface Soil Criteria)*	Soils Exceeding JWL SSTL[1] TPH[2] of 4,570 ppm	Metals or PCBs Exceeding DCC-1 from Military Site Protocol
Apron Area (including suspected landfill by river)	26 soil samples and one sediment sample exceed (~25,000 m^3) CCME Protection of Aquatic Life Criteria	N/A[3]	No samples exceeding criteria.
Main Site[4]	No samples exceeding criteria	One soil sample from BH-17 exceeds criteria. Limited volumes likely less than 500 m^3	No samples exceeding criteria.
Upper Base	No samples exceeding criteria	No samples exceeding criteria	No samples exceeding criteria.
Landfill A	No samples exceeding criteria	No samples exceeding criteria	A8 - lead exceeding likely less than 100 m^3 of soil
Landfill B	No samples exceeding criteria	No samples exceeding criteria.	No samples exceeding criteria.
Landfill C	No samples exceeding criteria	No samples exceeding criteria	CAN3 lead exceedance likely less than 100 m^3
Landfill D	No samples exceeding criteria	No samples exceeding criteria	No sample exceeding criteria.
TOTAL	**<25,000 m^3**	**<500 m^3**	**<200 m^3**

1 SSTL - Site Specific Target Level

2 Total Petroleum Hydrocarbons

3 N/A - Not Applicable

4 Relatively high hydrocarbon concentrations widespread throughout the area, but mainly within criteria

* Volume includes about 50% contingency factor

4.3 SUMMARY OF ENVIRONMENTAL CONCERNS AT JOHNSON POINT

The following are the main concerns at the Johnson Point site:

- Painted metal objects at the site contain lead paint, and in some instances, PCBs, which can flake off and locally impact soils. There is one instance of asbestos-containing materials in linoleum. There are batteries at the site which are in various states of deterioration and could pose a local concern to nearby soils from lead. The debris on-site is also an aesthetic concern.
- Volatile and semi-volatile hydrocarbons (Fraction F1 and F2) of about 25,000 m^3 of soil in the apron area are impacted above applicable criteria, based on CCME Protection of Groundwater for Aquatic Life (Parkland Coarse-grained Surface Soil Criteria of the Abandoned Military Site Protocol).
- Semi-volatile and non-volatile hydrocarbons, primarily in the F2 and F3 fraction range, impact the POL area. The volume of soil exceeding JWL's site-specific risk based criteria is approximately 500 m^3.
- PCB and metals in soil and water are not major concerns at the site. Analysis of one soil sample tested from Landfill A (lead concentration of 434 mg/kg) and another soil sample from Landfill C (lead concentration of 434 mg/kg) indicated lead exceeding DCC-I (criteria for lead is 200 mg/kg) but below DCC-II criteria, as per Abandoned Military Site Protocol. The volume of lead impacted soil in these landfills is anticipated to be minimal as other samples surrounding the impacted soils had lead concentration below criteria. Both soil samples that exceeded criteria were at about 1 m depth and impacts are not expected to be found deeper than 1.5 m.
- Existing landfills at the site need to be secured.

The areas impacted by hydrocarbons are shown on Figure 7.

5.0 CURRENT ENVIRONMENTAL CONDITIONS

5.1 LOCAL GEOLOGY AND SOILS

Banks Island has been subjected to a preglacial stage followed by multiple continental glaciations and interglaciations, due to climate change (Barendregt et al., 1998). During the non-glacial stage, different processes (colluvial, fluvial, and aeolian process) have modified the landscape at Banks Island. The successive continental glaciations and interglaciations also modified the surficial geology at Banks Island.

The surficial soils along both sides of the Prince of Wales Strait comprise primarily morainal material, of glacial origin (French and Egginton 1973). The terrain at Johnson Point is characterized by low rolling plains and is comprised of granular soils at surface and frost-shattered sedimentary rocks at depth. The ground ice is generally beneath a layer of unconsolidated material, giving rise to different thermokarst land forms. Several

thermokarst land forms, such as mud slumps, thaw lakes, and ice-wedge polygons, have been reported at or adjacent to Johnson Point (French and Egginton 1973).

Johnson Point is located within the zone of continuous permafrost. Ground temperatures have not been measured at the site in the past or during the current site investigation. The active layer thickness ranged from 0.6 m to 1.1 m during the current investigation.

Based on EBA's site investigation (EBA Geotechnical Study, 2006), soils were primarily uniformly graded sands with some finer-grained silts and very fine-grained sands. The sands were generally loose and the fine-grained material low to non-plastic and soft.

5.2 SURFACE AND GROUNDWATER

The groundwater at the site is typically found at less than 1 m depth, just above the active layer. There is a shallow pond, which is 1 m in depth or less. There is unlikely to be fish in this pond. There are also small dugouts on site, man-made, with no significant aquatic life. There are several drainage channels across the site. An unnamed river is approximately 100 m north of the tank farm. The river flows northeast into the Prince of Wales Strait. At the time of EBA's site visit, the river was approximately 20 m wide and was less than a metre deep. The river was oligotrophic, having low total dissolved solids and nutrients, and low algal biomass. The catchment area of this river is 210 km^2.

The Prince of Wales Strait is approximately 10 m southeast of the runway.

5.3 ECOLOGY OF THE SITE

The site is in the northern arctic ecozone. Wildlife in this zone consists of large sea mammals, such as beluga whales, polar bears and seals, large terrestrial mammals such as caribou, muskox, wolves and grizzly bears, small mammals, and large populations of birds such as tundra swans, loons, geese, ducks, snowy owls and various species of shorebirds. Smaller mammals include the collared lemming, arctic fox and ermine. Plant life is short, stunted and sparse. Plant life is confined to sheltered areas and more nutrient rich areas. Plants are generally mosses, sedges and lichens.

Observations at Johnson Point, however, have not found large populations of birds or other wildlife. The site is not highly vegetated and therefore offers limited habitat.

5.4 CLIMATE

Based on climate data from Environment Canada for Sachs Harbour, from 1971 to 2001, the mean average temperature is -13°C, with a mean monthly winter temperature (October to March) of -24°C and mean monthly summer temperature (April to September) of -3°C. The minimum winter temperature recorded was -52°C and the maximum summer temperature recorded was 24°C. Wind gusts for Johnson Point have been recorded up to 97 km/hour. Mean annual precipitation is 142 mm. From May to August, there is 24 hours of daylight.

6.0 REMEDIATION OPTIONS

6.1 REMEDIAL OPTIONS FOR HYDROCARBON IMPACTED SOILS

CARD and PWGSC hosted a remedial options evaluation meeting on April 17, 2007 with residents of Sachs Harbour. The preferred options were selected at this meeting. Information meetings were also held later that day in Sachs Harbour as well as in the Hamlet of Ulukhaktok on April 19, 2007.

6.1.1 General

There are four different strategies which could potentially be used at this site for remediation of hydrocarbons:

- Landfarming - This involves construction of a bermed area and excavation and hauling of contaminated soil to this area. Nutrients would be added and the soil tilled on a regular basis to introduce oxygen and promote biodegradation.
- Alluing soil - This could be successful for soils at the apron which are more volatile than soils at the POL area. This involves excavating soil and using a special mixing/aerating bucket attachment for a backhoe. The process volatilizes light-end hydrocarbon and adds oxygen to residual hydrocarbon to promote biodegradation. Nutrients could also be added during this process. The soil could be returned to the excavation after processing or it could be moved farther inland away from the water and the associated sensitive receptors. There is a small risk that the soil may not be completely remediated to the target level by this method, and if it happens, some of the residual impacted soil may be moved within the site away from the water body so that a higher criteria is justified.
- Chemical oxidation - A specialized product such as sodium permanganate, potassium permanganate or hydrogen peroxide would be added to the impacted soil and mixed. The chemical product would react with the hydrocarbons and destroy them. Hydrocarbons would be reduced to carbon dioxide (CO_2) and water (H_2O) as well as smaller hydrocarbon chains, which would be more amenable to biodegradation and volatilization. Sometimes chemical oxidants are mixed with a slow-release oxygen product (available commercially, such as Regenesis ORC®), which promotes biodegradation by maintaining an aerobic environment.
- Monitored Natural Attenuation - Hydrocarbon impacted soils are naturally biodegrading at the site. The majority of the hydrocarbons are being broken down through anaerobic processes, through sulfate and iron reducing bacteria. A smaller amount of hydrocarbon impacted soils, likely at the edges of the plume, are being broken down through aerobic processes. Anaerobic hydrocarbon biodegradation is approximately 10 times slower than aerobic breakdown and therefore, monitored natural attenuation is a very slow process, particularly in the Arctic with the short summer season. As natural attenuation of hydrocarbon contamination in soil occurs, CO_2 and organic acids are produced. These by-products alter the groundwater

chemistry, including increasing conductivity, lowering the pH, reducing sulphate levels, and increasing dissolved iron levels. Measurement of these parameters provides an indication to the rate of natural attenuation occurring at the site. EBA has measured these parameters that indicate that natural attenuation is occurring at this site (Phase III ESA report, 2007). To accurately determine the rate of natural attenuation occurring at the site, monitoring of the groundwater monitoring wells would be required for a minimum of four sampling events and up to eight sampling events over a period of four years. A consistent and statistically significant favourable change in the indicator parameters would prove the contaminant plume to be stable or shrinking, and would also be used to calculate the in-situ biodegradation rate. In any event, monitored natural attenuation would likely be at a minimum 10 times slower in destroying hydrocarbons than landfarming/alluing, as the biodegradation processes are anaerobic as opposed to the aerobic processes of a landfarming/alluing.

The above four processes are the most applicable and practical options for treating soil at the Johnson Point site. Each is described in more detail in the following sections.

6.2 LANDFARMING

6.2.1 Equipment Required

The following equipment would likely be necessary at the site for landfarming.

- Excavator for soil excavation.
- Trucks for hauling.
- A dozer or front end loader for constructing berms of landfarm and for spreading and turning soil in the landfarm.
- Packer.
- Liners.

6.2.2 Pros and Cons of Technology

The following are the advantages of this technology:

- Proven for Arctic conditions.
- No specialized equipment necessary.
- Crews in Arctic have experience in implementing this technology as it is widely used.
- Can achieve criteria in three to five years which is reasonable for Arctic sites.

The following are the disadvantages of the technology:

- Highly disruptive to the site, large area will be needed to accommodate landfarm. Large amount of borrow material will be needed to backfill impacted areas.
- Moderate to high cost.

6.3 ALLUING SOILS

6.3.1 Equipment Required

The following equipment would be required at the site.

- Excavator with allu mixing bucket.
- Contingency for other equipment to landfarm should target concentrations not being achieved.

6.3.2 Pros and Cons of Technology

The advantages of this technology are as follows:

- Proven for volatile hydrocarbon impacted soils, such as found at the apron area.
- Relatively inexpensive for an ex-situ treatment option.
- Less disruptive to site conditions as soils can be treated at impacted areas.

The disadvantages of this technology are as follows:

- Significant volatilization can occur. Excavation operator may require respiratory protection.
- Pre-treatment with a chemical oxidation product would likely assist in rapid breakdown of semi-volatile components.
- Wind and dust issues.

6.4 CHEMICAL OXIDATION

6.4.1 Equipment Required

The following equipment and supplies would be required for this technology:

- Excavator and Allu bucket.
- Chemical oxidation products, as per suppliers' recommendations.
- Slow Release Oxygen Product (optional).

6.4.2 Pros and Cons of Technology

The advantages of this technology are as follows:

- Proven technology for destruction of hydrocarbons.
- Technology will work in cold climate but reactions are somewhat related to temperature, provided soil is not frozen. Note that no effective treatment can be obtained with frozen soils.

- Remediation will be nearly immediate with hydrogen peroxide or will take approximately one month with sodium or potassium permanganate. Any residual hydrocarbons will be more readily amenable to biodegradation or volatilization.

The disadvantages of this technology are as follows:

- Hydrogen peroxide is highly reactive and dangerous to handle and transport.
- Some of these products are costly.
- Little benefit to alluing and adding product to apron area soils, as these soils would likely be effectively treated using alluing alone.
- Likely impact to permafrost in area of treatment.

6.5 MONITORED NATURAL ATTENUATION

6.5.1 Equipment Required

Existing wells installed at the site are suitable for implementing this approach. Equipment required would include bailers, field testing equipment such as pH meters, dissolved oxygen meters and other similar equipment. Parameters that need to be tested include BTEX and F1 hydrocarbons, dissolved oxygen, dissolved and total iron sulfates, pH and electrical conductivity.

6.5.2 Pros and Cons of Technology

The advantages of this technology are as follows:

- No large equipment is necessary to be brought to the site.
- Costs are relatively low.
- Not disruptive to the site.

The disadvantages of this technology are as follows:

- Very long term remediation, likely greater than 20 years.
- Not suitable if a receptor is currently being impacted.
- Community concerns would not be addressed for 20 years.
- FCSAP funding may not be available throughout this process.

6.6 RECOMMENDATIONS FOR REMEDIATION OF HYDROCARBON IMPACTED AREAS

Based on review of pros and cons of various technologies and also based on input from a recent (April 2007) community consultation (minutes in Appendix C), EBA recommends the following:

- Apron Area - Allu 25,000 m^3 of impacted soil. There is a small risk that the soil may not be completely remediated to the target level by this method, and if it happens, some of

the residual impacted soil may be moved within the site away from the water body so that a higher criteria is justified.

- POL and other areas - Allu 500 m^3 of impacted soil. Consider pre-treatment with a chemical oxidation product to provide more rapid break-down of the semi-volatile components in the soil of the POL area.

6.7 REMEDIAL OPTIONS FOR SITE DEBRIS

6.7.1 Current Conditions

IEG Environmental Ltd. (December 2005) inventoried non-hazardous and hazardous materials on-site which was subsequently confirmed by EBA. Non-hazardous materials at the site are predominantly associated with building materials and debris including barrels, tanks, pipelines, wood, miscellaneous metals, and concrete waste. Hazardous materials on-site may include (but are not limited to) batteries, residual petroleum hydrocarbons, paint containing lead/PCBs, PCB containing equipment, pressurized gas, mercury containing fluorescent lights, and asbestos containing materials. Site inventory is summarized in Table 8.

TABLE 8: SITE INVENTORY

Area	Hazardous Waste Present Volume (Uncrushed) (m^3)	Non-Hazardous Waste Present Volume (Uncrushed) (m^3)
Apron*	220	133
Main Site*	975	243
Upper Camp Area*	294	63
Tanks/Barrels*	69 Tanks/Barrels (38**/52***)	-

* Details in Appendix A of this report

** This volume represents the volume of tanks if they were cut into equal sized panels that could be stacked with no air voids present. In practice, this volume could not be achieved.

*** This volume is based on 35% contingency factor to represent any additional volume from tank liners or interior support materials within the tanks or from inefficiencies of packing the demolished material.

All of the hazardous materials would therefore be removed from all site buildings etc., consolidated, and packaged according to TDG regulations. All buildings would then be demolished or salvaged at the discretion of the contractor. The tanks would be cut up and packaged for shipment.

6.7.2 Evaluation of Remediation Strategies for Site Debris

Two remediation strategies were considered for site debris. The results of the evaluation are summarized in Table 9.

TABLE 9: EVALUATION OF REMEDIATION OPTIONS FOR SITE DEBRIS

Remediation Option	Pros	Cons
Transport all site debris wastes (hazardous and non-hazardous) to licensed off-site disposal facilities.	• Cost effective • Reduced disturbance to local environment • Removal of known site contaminants	
Transport hazardous site debris waste to licensed off-site disposal facilities; and Construct on-site engineered non-hazardous waste landfill for non-hazardous wastes.	• Reduced disturbance to local environment • Reduced offsite shipment requirements	• Additional onsite earthworks for landfill construction • Imported landfill erosion protection required • Long term monitoring required

6.8 RECOMMENDATION FOR REMEDIATION OF SITE DEBRIS

The preferred remediation option involves the transport of hazardous and non-hazardous wastes to licensed, off-site facilities. This was also agreed upon at the Remedial Options Evaluation Meeting (see Appendix C of this report).

Non-hazardous waste may include structures, equipment and debris. Some materials, such as fuel tanks, will require decontamination or vapour freeing prior to cutting and hauling to the landfill.

Any hazardous materials encountered on-site will need to be transported and disposed of off-site at a licensed hazardous waste facility. This may include batteries, gear oil, etc., that have high toxicity and/or leachability of contaminants. The leachability of the lead paint could be evaluated to further determine the class of waste facility where the material can be disposed.

6.9 REMEDIATION OF EXISTING LANDFILLS

6.9.1 Current Conditions

The results of the IEG Environmental Geophysical survey (2005) identified four isolated anomalous areas indicating suspected landfill areas. A follow-up geophysical survey completed by EBA (2007) further delineated these areas and also identified an additional

landfill at the apron area. The landfill locations are shown on Figure 8, and are summarized in Table 10.

TABLE 10: EXISTING LANDFILL DESCRIPTIONS

	Landfill A	Landfill B	Landfill C	Landfill D	Landfill Adjacent to Apron
Location	300 m NW of the airstrip and southeast of the tank farm	400 m W of Main Pad and Tank Farm	NE of the Upper Camp Area	500 m SW of the Upper Camp Area	Adjacent to and north of the Nodwell camp at apron area
Aerial Extent	4,000 m^2	600 m^2	1,900 m^2	1,300 m^2	2,000 m^2
Estimated Quantity of Wastes*	2,000 m^3	300 m^3	950 m^3	650 m^3	1,000 m^3
Contents	Miscellaneous debris predominantly containing metal, plastic, electric wires and wood	Ferrous, wood and plastic debris	Miscellaneous debris containing metal, wood, tires/tubes, vehicle wheels	Not defined; metal found within one pit	Cans, plastics, hydrocarbon odours fuel bladder
Cover Material	Sand; some surface debris visible.	Sand; surface debris is visible	Sand; very little surface debris evident	Sand; no surface debris evident	Sand

* Assumed to represent about 50% of the volume of landfill; remainder being soil. Assumed a depth of 1 m.

Based on chemical analysis results from existing investigations, PCB and metals in soil are not major concerns at the landfills. Analysis of one soil sample tested from Landfill A and another soil sample from Landfill C indicated lead exceeding DCC-I but below DCC-II criteria, as per Abandoned Military Site Protocol. The volume of lead impacted soil in these landfills is anticipated to be minimal as other samples surrounding the impacted soils had lead concentration below criteria. Drilling and sampling programs can only test discreet samples, and the possibility remains that other contaminants may be present in the landfills. However, observations made of the area did not identify stressed vegetation, soil staining, or other indications that landfill leachate has affected the subsurface soils.

6.9.2 Remediation Strategies for Existing Landfills

Landfill A: Landfill A is located within the main pad site, south of the tank farms. Ten testpits were excavated within the boundaries of Landfill A. Miscellaneous debris containing metal, plastic, electric wires and wood was encountered in six of the testpits at

depths ranging from 0.2 m to 0.7 m. Debris was also scattered on surface at different locations within Landfill A. Hydrocarbon odour was noted in two of the testpits. There are several small erosion channels through the area.

Geophysics was used to delineate the landfill. The landfill lobe locations are shown in Figure 9. Lobe A corresponds to buried ferrous debris in five parallel trenches with an approximate area of 4,000 m^2. A buried pipe is represented by Lobe B. Lobe C is the result of a garage building with a fixed foundation, two out buildings, a metal container and surface metals such as sled frames, pumps, cables, and incinerator equipment. Scattered surface debris is indicated in Lobes D, E, and F. An RF antenna mast was found on the surface of Lobe E.

The intent is to remediate Lobe A, leave Lobe B (pipeline) in place, and remove the surface debris from Lobes C, D, E and F.

Lobe A should be covered to reduce the future risk of debris exposure. It is recommended to cover the area with a minimum of 0.7 m of sand, and redirect the drainage around and through the area where no debris is present. The area should be covered with a minimum of 0.4 m of cobbles and gravel. This material will have to be imported to the site. Calculating the volume estimates is part of detailed design and is beyond the present scope of work.

Landfill B: Landfill B is located adjacent to a small pond approximately 400 m west of the tank farms. The extent of the landfill is shown in Figure 10. Three test pits were excavated within this landfill. Miscellaneous debris containing wood, metal, and plastic was encountered in all the testpits at about 0.3 m below grade.

The area is approximately 600 m^2 in area and is comprised of buried ferrous debris and some visible wood debris. Some surface debris is visible. The buried debris at this location corresponds to a visible mound and is in the order of 1.5 m high. There are no signs of erosion in the area.

It is recommended to cover Landfill B with an additional layer of sand to minimize the future risk of debris exposure. The minimum thickness of sand should be 0.7 m thick, and the slopes of the area should be graded to a 4H: 1 V slope to blend in with the surrounding terrain. Calculating the volume estimates is part of detailed design and is beyond the present scope of work.

Landfill C: Landfill C is located at the end of the road leading to the upper camp area. Five testpits were excavated within this landfill. Miscellaneous debris containing metal, wood, tires/tubes, and vehicle wheels were encountered at depths ranging from 0.5 m to 1 m below grade. The area was delineated using geophysics. The geophysics anomaly was 1,900 m^2. The extent of the landfill is shown in Figure 10.

The buried material at this location is well covered with only a few metal objects protruding along the toe of the slope. The covering material is primarily composed of sand. No erosion was noted in the site investigation. Based on the topography and the shape of the

gradient anomalies, it would seem that the buried debris was placed in two pits towards the toe of the ridge and then covered using neighbouring material.

It is recommended to cover Landfill C with an additional layer of sand to minimize the future risk of debris exposure. The minimum thickness of sand should be 0.7 m thick. The lower half of the slope should be covered with a layer of imported cobbles and coarse gravel. Calculating the volume estimates is part of detailed design and is beyond the present scope of work.

Landfill D: Landfill D is located on the hill where the upper camp area is located at the end of the road leading to the upper pad area, as shown in Figure 11. Five testpits were excavated within this landfill. Metal was encountered in only one testpit at about 1 m below grade, just above the permafrost. Hydrocarbon odour was noted in two of the test pits at about 1 m below grade.

The area was delineated with geophysics. The geophysics anomaly is 1,300 m^2. No surface debris is evident at this location. Based on the gradient anomaly, all buried material is contained within one pit that was then covered with neighbouring material of mostly sand.

It is recommended to cover Landfill D with an additional layer of sand to minimize the future risk of debris exposure. The minimum thickness of sand should be 0.7 m thick. Calculating the volume estimates is part of detailed design and is beyond the present scope of work.

Landfill Adjacent to the Apron Area: This landfill is located adjacent to and north of the Nodwell camp at the apron area, as shown in Figure 8. This landfill was identified during the gap analysis and was delineated by EBA while conducting geophysical survey as part of the 2006 site investigation. Four testpits were excavated within this landfill. Debris comprising cans and plastic was encountered in one of the testpits. Hydrocarbon odours were noted in all four testpits. The remains of a fuel bladder (i.e., rubberized canvas pieces) were noted in this area in an erosion gully.

The area is included in the hydrocarbon contaminated area that will be remediated. EBA recommends to remove the debris from the area as the hydrocarbon contaminated soil is excavated. Debris will be removed to an off-site disposal facility.

7.0 SUMMARY

The subject site predominantly requires remediation of hydrocarbon-contaminated soil, removal of hazardous and non-hazardous materials, and securing the five landfills identified. The primary focus areas of the site have been divided as follows:

- Apron Area
- Petroleum, Oil and Lubricants (POL) Area (main site)
- Landfills (4 and one suspected)

- Materials/Buildings/Tanks

The environmental issues that require addressing at the site are as follows:

- Hydrocarbon impacts at the apron area are primarily volatile and semi-volatile F1 and F2 hydrocarbons. The volume of this soil is approximately 25,000 m^3 (exceeding CCME Parkland Coarse-grained Surface Soil Criteria of the Abandoned Military Site Protocol for Hydrocarbons) and it is within 10 m of at least two waterbodies (pond and river) and possibly the Prince of Wales Strait. Impacts had attenuated considerably at the edge of the airstrip; however, no boreholes were placed in the airstrip for safety reasons. The protection of groundwater for aquatic life criteria, as indicated in Canadian Council of Ministers of the Environment (CCME) guidelines, would apply to soil within 10 m of the water's edge within this area. As a precaution, all soil within the area, including soil beyond 10 m distance from the water's edge, will have the protection of aquatic life exposure pathway applied to it. This area can best be remediated on the basis of economics, acceptability, and feasibility through alluing and/or landfarming.
- The POL area is impacted primarily by semi-volatile hydrocarbons in the F2 range, with some F1 and F3 hydrocarbons. There is approximately 500 m^3 of soil in exceedance of the JWL site specific criteria of 4,570 ppm. This material can best be remediated through alluing and/or landfarming, along with the material from the apron area. If alluing is done rather than landfarming, consider providing a pre-treatment with a chemical oxidation product to quickly break down the semi-volatile components in soils at the POL area.
- The majority of the debris on-site is classified as hazardous (lead/PCB-based paint, and asbestos) or has lead paint concentrations higher than the territorial regulations. This material will need to be hauled off-site for disposal. The quantity of remaining non-hazardous material is too small to warrant construction of a non-hazardous landfill as it will not be cost effective.
- Five existing landfills were identified on site. Landfills A, B, C and D will be covered with a layer of sand. Landfills A and C require a layer of erosion protection to be placed over the sand. The debris within the Apron Landfill (the fifth landfill) will be excavated along with hydrocarbon contaminated soil. The excavated debris will be shipped off-site.

SCHEDULE

Year 1

- Fall/Winter 2007/2008 - finalize RAP and other reports from input from community meetings, develop specification and design drawings, post on MERX noting contractor's site visit in early August, award contract and start applying for regulatory authorizations.

Year 2

- Spring 2008 - obtain water licence, land use permit.

- Summer/Fall 2008 - mobilize to site, stage for next year's work, perhaps upgrade airstrip and roads, camp set-up.

Year 3

- Excavate and treat hydrocarbon impacted soil.
- Remediate existing landfills.
- Remove hazardous materials from buildings and equipment by licensed contractors. Place materials in staging area at apron.
- Cut tanks and prepare for transport offsite.
- Prepare non-hazardous materials for transport off-site.

Year 4 (if needed) – The contractor may require an additional year of site work depending on the size and number of pieces of equipment brought to the site, size of the camp, etc.

- Continue treatment of hydrocarbon contaminated soil.
- Complete hazardous and non-hazardous material dismantling.
- Remove remaining hazardous and non-hazardous materials from site.
- Remove equipment from site.

8.0 LIMITATIONS OF LIABILITY

Recommendations presented herein are based on an environmental assessment as described in Section 1.0. This report has been prepared for the exclusive use of PWGSC and INAC for the specific application described in Section 1.0 of this report. It has been prepared in accordance with generally accepted geo-environmental engineering practices. No other warranty is made, either expressed or implied. Engineering judgment has been applied in developing the recommendations of this report.

For further limitations, reference should be made to the attached General Conditions (Appendix D).

9.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned at your convenience.

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REFERENCES

Barendregt, Vincent, Irving and Baker. Magnetostratigraphy of Quaternary and Lake Tertiary Sediments on Banks Island, Canadian Arctic Archipelago. Canadian Journal of Earth Science. 1998. Volume 35.

Canadian Council of Ministers of the Environment. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. CEQG, CCME, Winnipeg, Manitoba.

Department of Indian and Northern Affairs and Northern Development. 1992. Northern Affairs Program. Inuvik District Office, Johnson Point AES Clean-up, August.

EBA Engineering Consultants Ltd. Phase III Environmental Site Assessment. Johnson Point, Northwest Territories. 2007.

EBA Engineering Consultants Ltd. Geophysical Investigation. Johnson Point, Northwest Territories. 2007.

EBA Engineering Consultants Ltd. Geotechnical Evaluation at Johnson Point Staging Facility, Banks Island, Northwest Territories. 2007.

Environment Canada: The Technical Feasibility of Landfilling PCB Amended Painted Materials. June 1998.

Environment Canada. Climate Data for Sachs Harbour, 1971 - 2000.

French and Egginton. Thermokarst Development Banks Island, Western Canada. Proceedings of 2nd International Conference on Permafrost, Yakutsk, USSR, NAS, Washington, DC. 1973.

Government of the Northwest Territories, 1998. Guidelines for the Management of Waste Asbestos.

Health Canada. Potential Health Hazard From Burning Wood And Other Materials Coated With Paint Containing PCBs. 2000-88.

IEG Environmental Phase I and II Environmental Site Assessment at Johnson Point, NT. December 2005.

Indian and Northern Affairs Canada, March 2005, Abandoned Military Site Remediation Protocol.

Jacques Whitford Human Health and Ecological Assessment Johnson Point Staging Facility, Johnson Point, Northwest Territories. January 2007.

FIGURES

PHOTOGRAPHS

Photo 1
Aerial oblique of tank farm area.

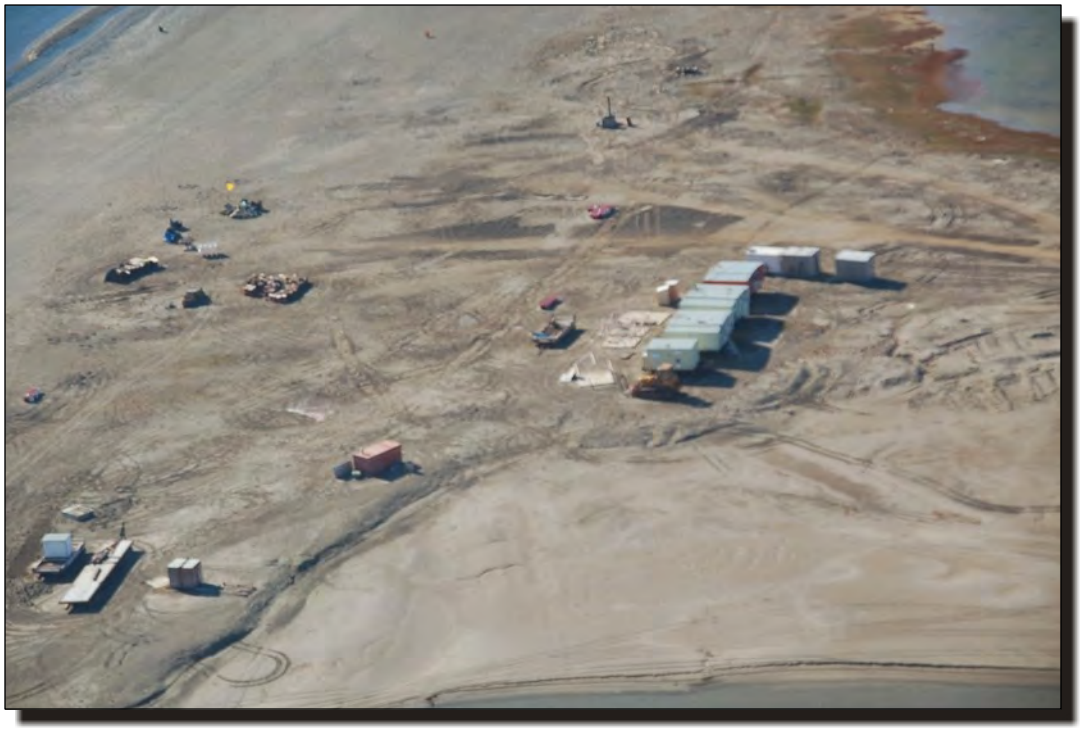

Photo 2
Aerial oblique of apron area.

Photo 3
Close up aerial oblique of apron area.

Photo 4
Camp area.

Photo 5
Trailer at upper base.

Photo 6
Equipment at upper base.

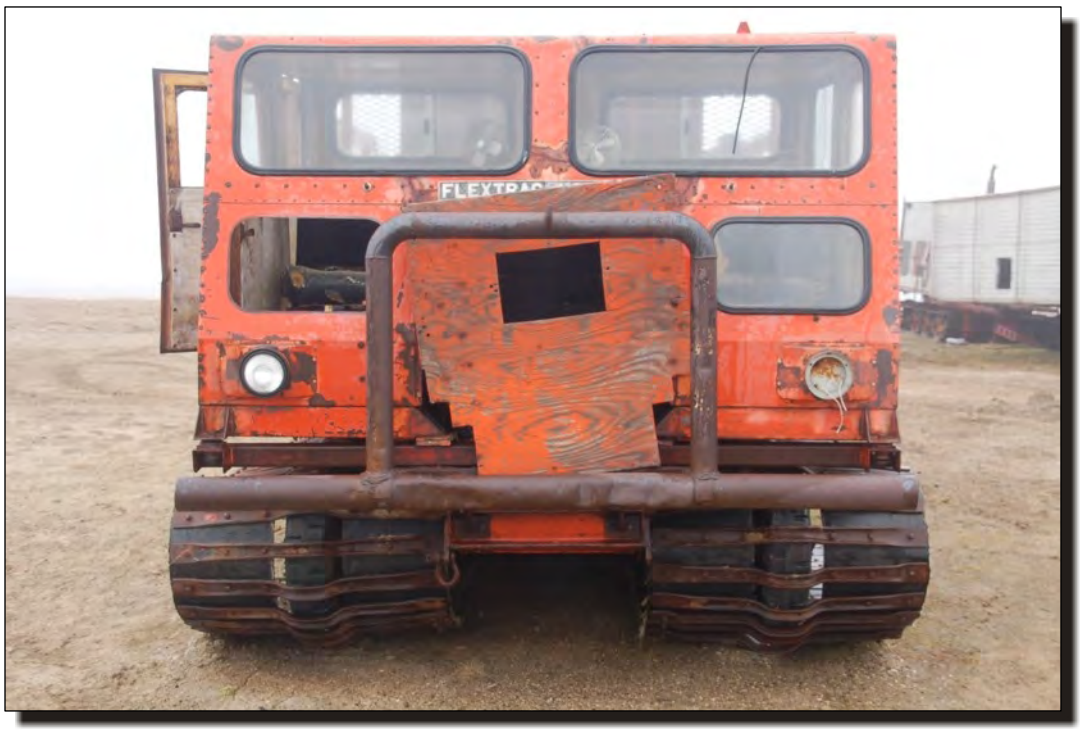

Photo 7
Nodwell at upper base.

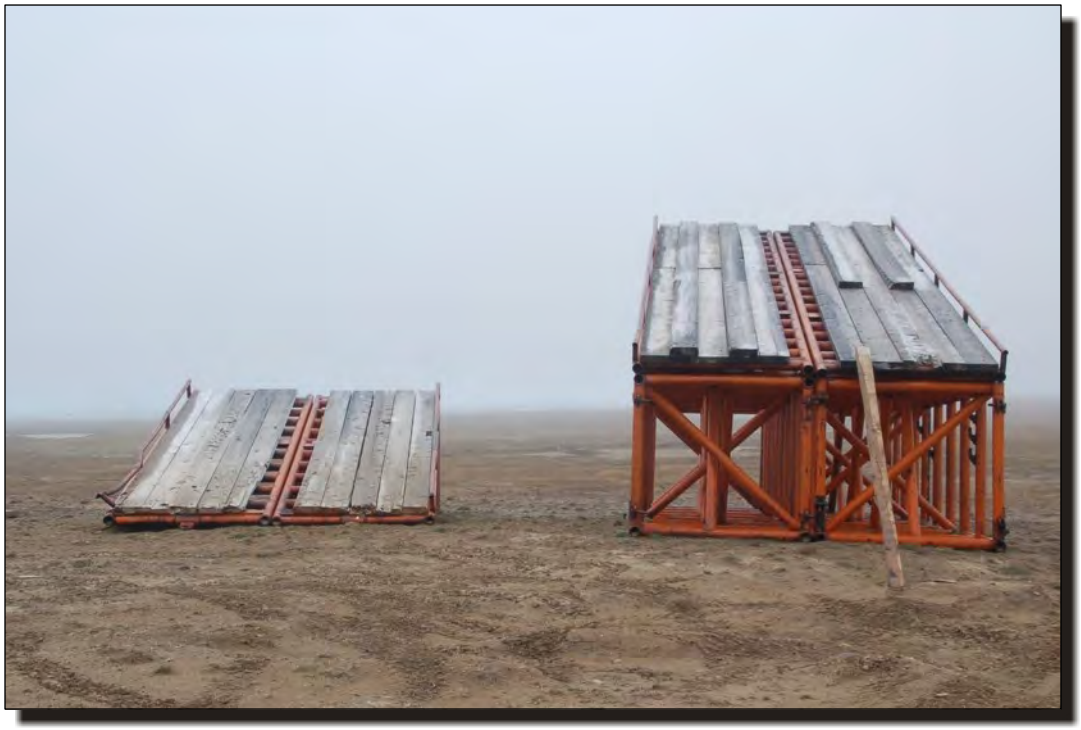

Photo 8
Loading racks at upper base.

Photo 9
Garage near tank farm.

Photo 10
Tank farm.

Photo 11
Utility tanks taken to tank farm.

Photo 12
Tank farm with camp in foreground.

Photo 13
Crushed barrels at apron.

Photo 14
Apron area as seen standing on runway.

Photo 15
Camp and tank farm as seen from apron area.

Photo 16
Front end loader at apron area.

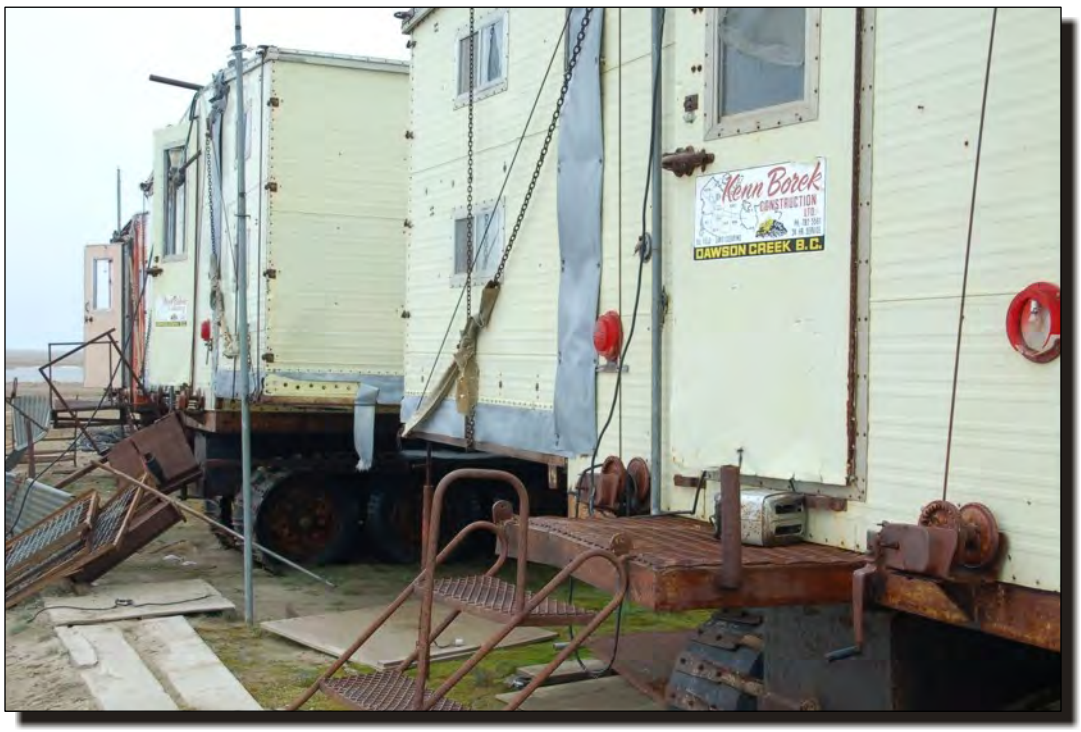

Photo 17
Close up of trailers at apron area.

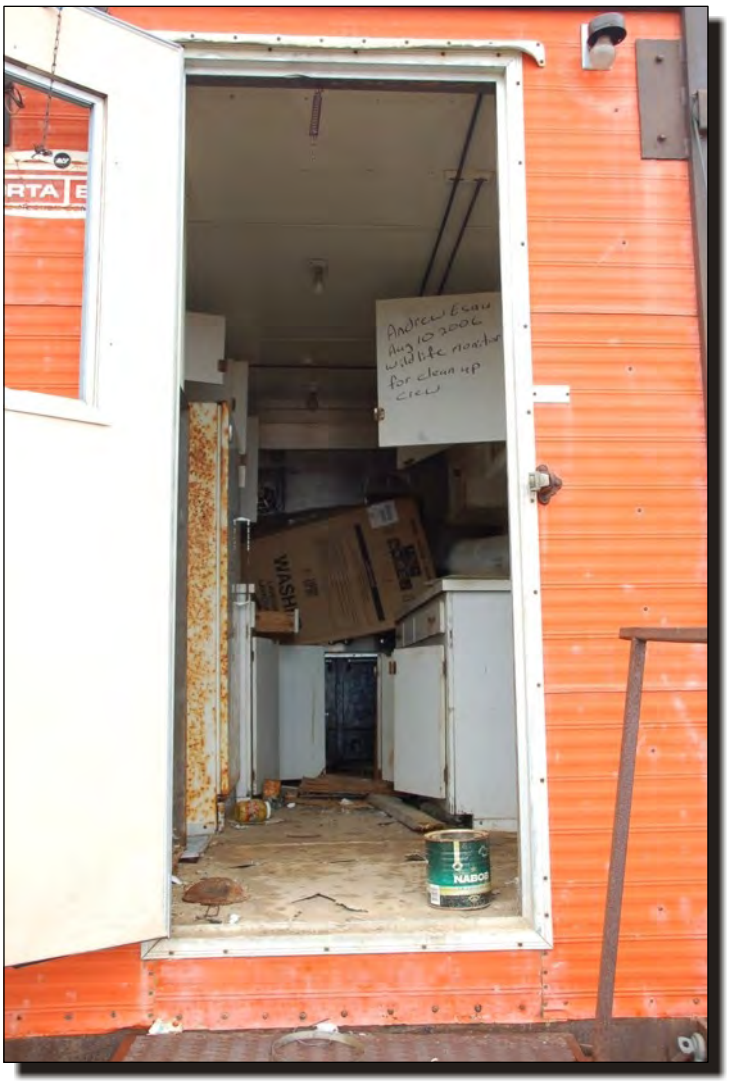

Photo 18
Interior of trailers at apron area.

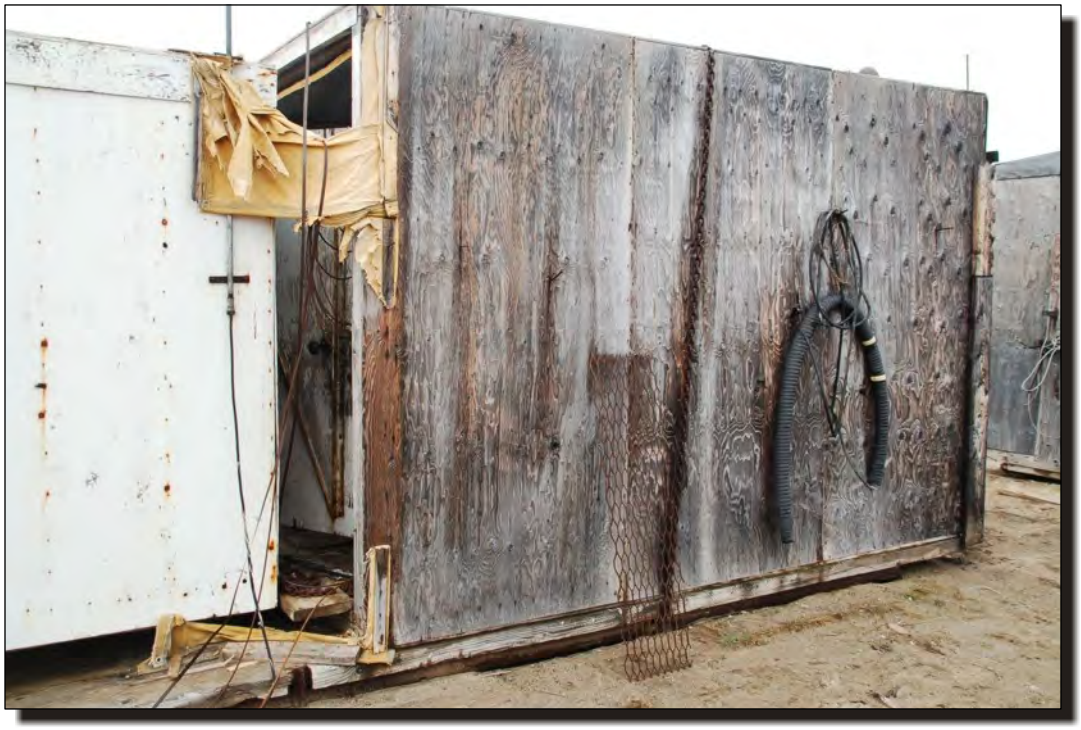

Photo 19
Shed at apron area.

Photo 20
Unnamed river near site.

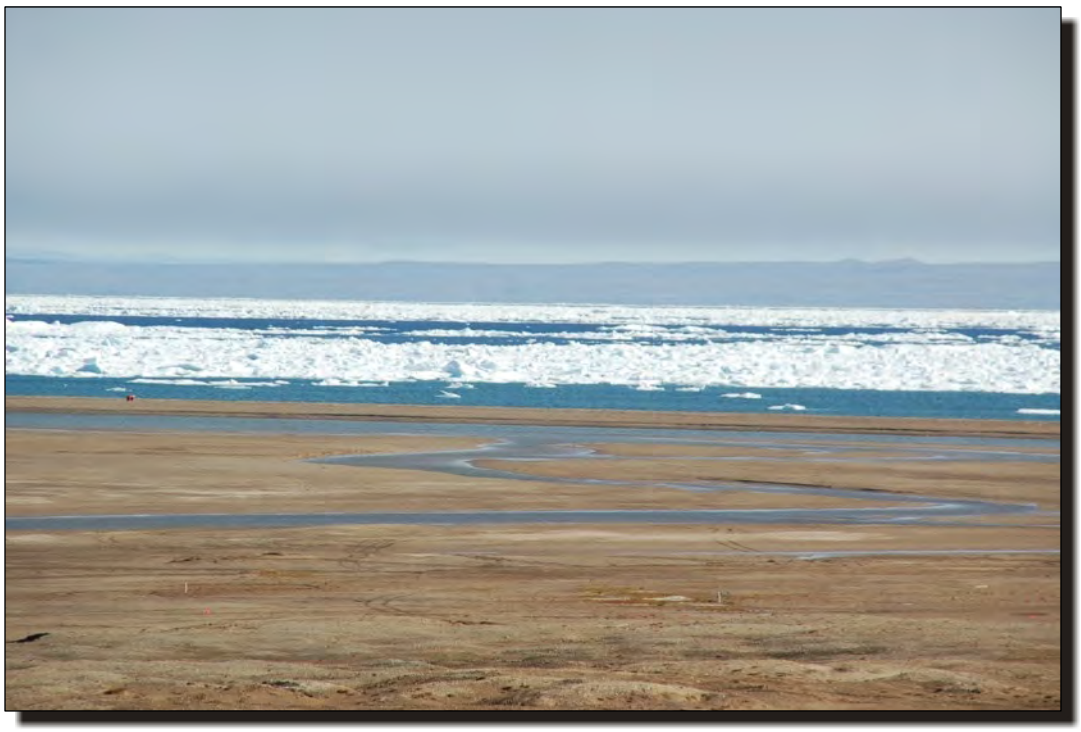

Photo 21
Unnamed river meandering near runway.

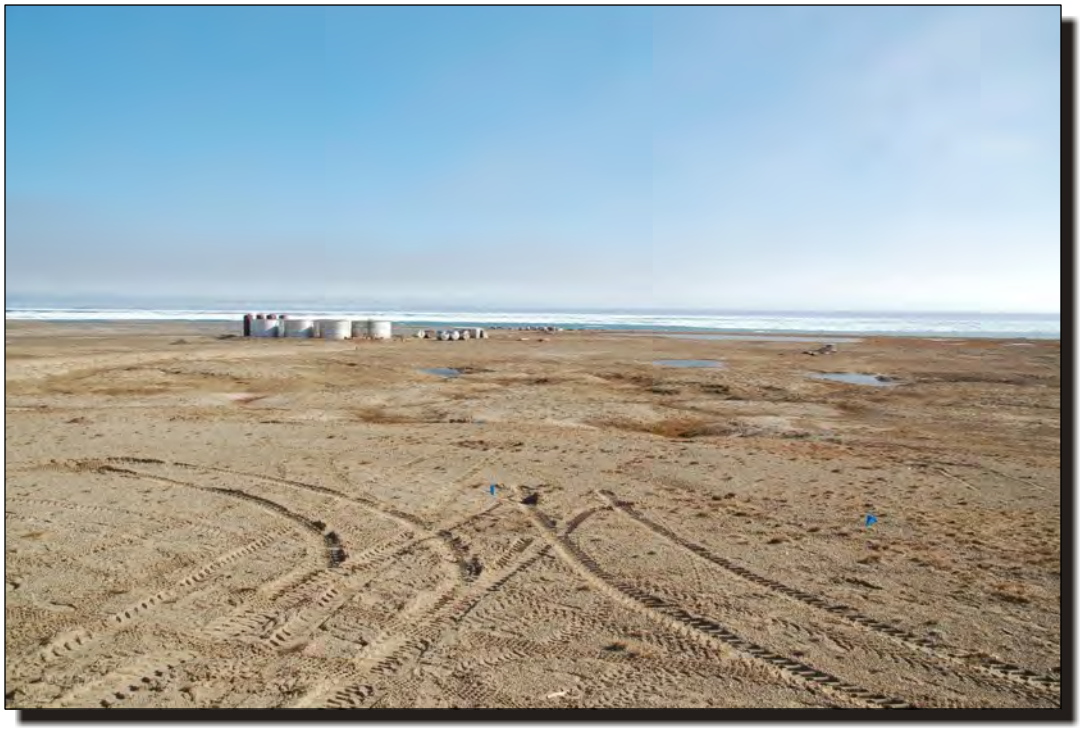

Photo 22
Tank farm as seen from upper base.

Photo 23
Site as seen from north end of runway.

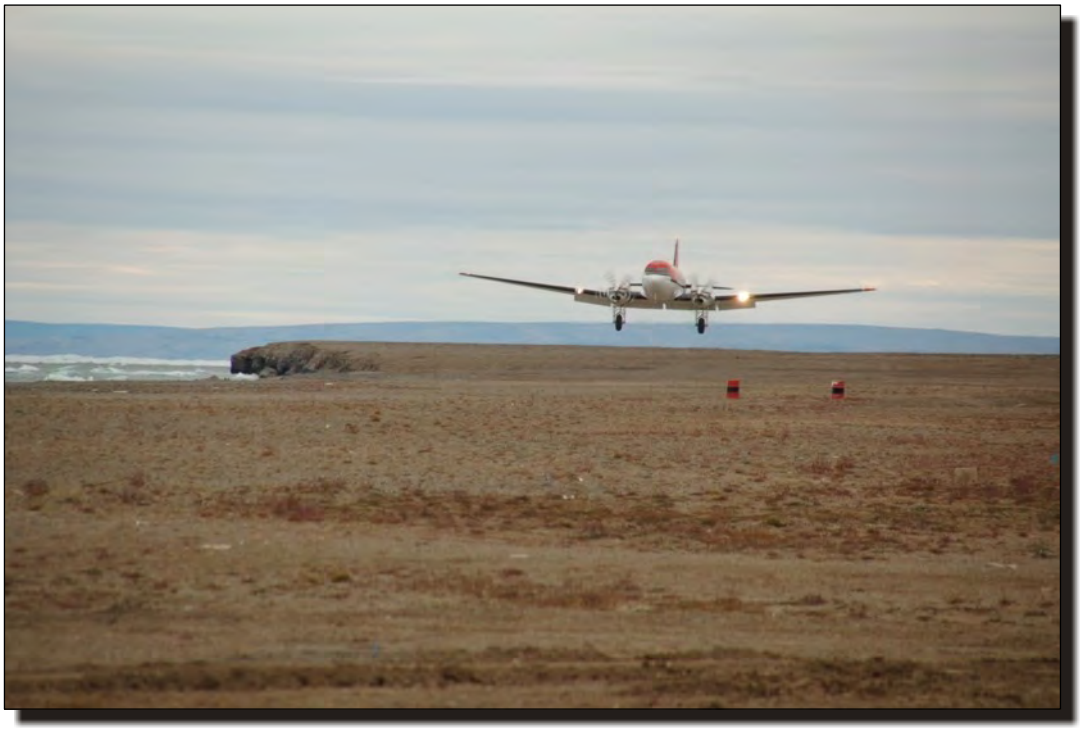

Photo 24
DC-3 landing at airstrip at Johnson Point.

APPENDIX

APPENDIX A SITE INVENTORY

Apron Area

TABLE A1: JOHNSON POINT - HAZARDOUS MATERIALS INVENTORY - APRON AREA						
Description	Materials	Hazardous Content	Dimensions (m)			Present Volume (m^3)
			Length	Width	Height	
Steel sleigh with bulldozer blade and bucket.	Steel/Wood	Paint	12.5	2.7	0.5	16.9
Wooden fuel sloop with small wooden shed. Hoses and valves in shed.	Steel/Wood	Paint	6.7	2.8	1.0	18.8
Wooden building, two rooms, particle board walls, furnace in inside room, various debris (e.g., cable, plywood).	Wood	Paint	4.6	2.1	1.9	18.4
997 L bulldozer with forks, and cable winch at rear. Not serviceable.	Steel	Paint Battery Fuel/Oil	4.4	2.2	2.8	27
Sleigh camp unit. Inside four bunks, range, tables, wall board. Asbestos containing material next to area where furnace was located. Outside of unit covered with aluminum sliding.	Steel/Wood	Asbestos Paint	4.6	2.1	1.9	18.4
Portabuilt units. Unit on Nodwell tracks. Three units in total (two pale yellow, one orange). Two sides of units fold out, wall board on inside, aluminum siding on outside. First unit is bunk house, second is washroom/shower; and third is kitchen.	Steel/Wood	Paint	5.9	2.1	2.4	29.7
Lead-acid battery from Item 10.	Lead	Battery	0.35	0.2	0.25	0.8
Furnace blowers (from Item 11).	Steel	Paint	1	0.5	0.5	0.3
Lead-acid batteries, less than 10 in total. Batteries contained in open 45 gallon drum.	Lead	Battery	2.0	2.0	0.2	0.8
100 lbs. pressurized gas containers, 26 in total, all were frozen in place, contents could not be confirmed. Suspected 10 partial to full tanks contained propane, two full tanks contain acetylene while 14 empty tanks (propane (9), acetylene (2), and oxygen (3)).	Steel/Gas	Chemicals	10.0	10.0	0.3	30.0
Navaid on wooden skid. Styrofoam covering.	Steel/Wood	Paint PCB (Ballast)	5.0 m diameter	-	3.0	58.9
					TOTAL	**220**

TABLE A2: JOHNSON POINT - NON-HAZARDOUS MATERIALS INVENTORY - APRON AREA					
Description	Materials	Dimensions (m)			Present Volume (m^3)
		Length	Width	Height	
Steel sleigh with metal debris (e.g., extra hitch, chains, "I" beams).	Steel/Wood	12.5	3.7	0.5	23.1
Wooden Storage shed (contains valves, metal debris, pipe).	Steel/Wood	1.9	2.4	2.0	9.1
Steel road drag.	Steel	3.8	2.0	0.3	2.3
Plywood shed on wooden skid, inside two bags of drilling sand, used electrical wire, two Nodwell tires, and one lead-acid battery.	Wood	3.7	2.5	2.6	24.0
Two plywood sheds joined together. Various debris including: electrical cables, fuel hoses, suction hoses, drill sand, fiberglass insulation.	Steel/Wood	8.2	2.5	2.6	53.3
Furnace.	Steel	0.8	0.8	1.0	0.6
Fuel sloop on skis.	Steel/Wood	6.7	2.8	1.0	18.8
5" steel pipe from pipeline.	Steel	75	0.125	0.125	1.2
				TOTAL	133

Main Site

TABLE A3: JOHNSON POINT - HAZARDOUS MATERIALS INVENTORY - MAIN SITE						
Description	Materials	Hazardous Content	Dimensions (m)			Present Volume (m^3)
			Length	Width	Height	
Former generator shack, constructed of steel on skids. One lead-acid battery.	Steel	Paint Battery	2.5	3.0	2.2	16.5
Wooden fuel sloop on skis.	Steel / Wood	Paint	6.7	2.7	1.0	18.1
Plywood shed on metal side/skis; furnace inside, benches, electric wires, steel container with kamlok fittings, metal box, can be seen in photo.	Steel / Wood	Paint	3	6	3	54.0
Shelf units from Item 37.	Wood	Paint	1	3	0.75	2.3
Fuel sloop on skis with wooden shed. Two bags of oil water solvent in shed as well as steel survey markers.	Steel / Wood	Paint	6.7	2.7	1	18.1
Fuel sloop on skis.	Steel / Wood	Paint	6.4	2.7	1	17.3
"Atco" type trailer, with aluminum siding, 3 room bunkhouse, 4 beds per room. Wall board on interior walls. Metal ski "bunks" are next to unit.	Steel / Wood	Paint Asbestos	11	3	2.4	79.2
"Atco" type trailer, on metal skids with aluminum siding: three rooms, washroom/shower room, office (with one bed) and bunk room (with four beds). Wall board on interior walls. PVC/stainless steel piping in washroom, washer/dryer unit in washroom.	Steel / Wood	Paint Asbestos	11	3	2.4	79.2
"Atco" type trailer on metal skids with aluminum siding. Generator unit. Two rooms are present, 1 small storage room, and 1 large room where gen set was located. Hydrocarbon staining on floor. Breaker and fuse boxes present. Internal walls covered with wall board.	Steel / Wood	Paint Asbestos	11	3	2.4	79.2

TABLE A3: JOHNSON POINT - HAZARDOUS MATERIALS INVENTORY - MAIN SITE						
Description	Materials	Hazardous Content	Dimensions (m)			Present Volume (m^3)
			Length	Width	Height	
"Atco" type trailer on metal skids with aluminum siding. Unit is very similar to item 66. Two rooms are located within the unit. Appears to be a workshop in large room. 1 - 100 lbs. propane tank. Small room is storage room, deep freezer present.	Steel / Wood	Paint Asbestos	11	3	2.4	79.2
"Atco" type trailer, not on skids. Two rooms, 1 large "TV" room, two furnaces, the small room has one bunk bed, wall board on interior walls. Paint sample collected from ceiling. Aluminum siding on outside.	Steel / Wood	Paint Asbestos	11	3	2.4	79.2
"Atco" type trailer on skis with aluminum siding. Three room bunkhouse, four beds per each room. Wall board on interior walls.	Steel/ Wood	Paint Asbestos	11	3	2.4	79.2
"Atco" type trailer on skis with aluminum siding. Kitchen unit, range and fridge present. Fridge bolted to wall, cannot tell type of refrigerant.	Steel / Wood	Paint Asbestos Refrigerant	11	3	2.4	79.2
Maintenance shed, constructed out of plywood, wooden planks are laid on ground, electrical wires, "Herman Nelson" heater, steel bolts, and two CO_2 fire extinguishers. Some hydrocarbon staining on floor of building, 1 door is missing, 25% of roof is missing.	Steel/Wood	Paint	13.4	6.1	3.6	294.3
					TOTAL	**975**

TABLE A4: JOHNSON POINT - NON-HAZARDOUS MATERIALS INVENTORY – MAIN SITE					
Description	Materials	Dimensions (m)			Present Volume (m^3)
		Length	Width	Height	
Small breached soil berm.	Wood	5.0	5.0	0.8	20.0
2 valves from pipeline. One is a 5" line reduced to 2", the other is a 4" line reduced to 3".	Steel	0.1	0.1	0.1	0.1
Plywood building, debris inside (cardboard banned into sheets).	Wood	2.5	2.0	2.0	10.0
Plywood building with steel edges. Kamlok fittings and hose inside.	Steel / Wood	3.7	2.5	2.5	23.1
Plywood debris.	Steel / Wood	2	0.75	0.2	0.3
Five Wooden poles approximately 7 to 9 metres tall, though to be used for communication system - poles are not treated. Cut down by AES for use in camp.	Wood	8	0.5	2.0	8.0
Metal skid Nodwell tracks (5) stored on it.	Steel	9.1	2.7	1	24.6
Wooden deck on metal skid.	Steel / Wood	7.6	3	1	22.8
Metal skid on rack. Pipe debris on ground.	Steel	9.1	2.7	0.5	12.3
Metal skid on pipe rack, wooden timbers.	Steel / Wood	9.1	2.7	0.5	12.3
Metal/plywood skid.	Steel / Wood	4	2.4	0.5	4.8
4 - 8'x8'x8' plywood sheds, with steel tower on top. Second shed has hoses, and cables. Fourth shed has hoses, bed frames, and other debris.	Steel / Wood / Fuel	2.4	2.4	2.4	13.8
Assorted debris on ground surface, mostly wood and steel.	Steel / Wood	1.5	1.5	0.5	1.1
Lay down timbers (10" x 10") untreated, approximately 30 in total.	Wood	3.5	0.25	0.25	0.2
Metal skid with timbers, pallets, fence posts.	Steel / Wood	9.1	2.7	1	24.6
Metal frame made from 4" pipe	Steel	3	0.1	2	0.6
3 pieces of 10'x4" pipe on timbers (10"x10").	Steel / Wood	3.5	0.25	0.25	0.2

TABLE A4: JOHNSON POINT - NON-HAZARDOUS MATERIALS INVENTORY – MAIN SITE					
Description	Materials	Dimensions (m)			Present Volume (m^3)
		Length	Width	Height	
5 large posts (communication posts) untreated.	Steel / Wood	9.1	0.2	1	1.8
Pallet line of various metal debris (mostly pipe and some lower sections) supported on timbers (10"x10").	Steel / Wood	3	1	1	3.0
Metal skid. Four wooden pallets, metal debris and plywood on skid.	Steel / Wood	9.1	2.7	0.25	6.1
Metal skid with wooden deck.	Steel / Wood	9.1	2.7	1	24.6
Metal skid with metal tractor tracks.	Steel	9.1	2.7	0.5	12.3
Metal skid on skids, metal debris (skis), wood, and two nodwell tracks.	Steel / Wood	11	3	0.5	16.5
Metal debris (pipe).	Steel				
				TOTAL	**243**

Upper Camp Area

TABLE A5: JOHNSON POINT - HAZARDOUS MATERIALS INVENTORY - UPPER CAMP AREA						
Description	Materials	Hazardous Content	Dimensions (m)			Present Volume (m^3)
			Length	Width	Height	
Steel and wood rams, separated into two pieces.	Steel / Wood	Paint	13.3	3.7	3	73.8
Steel bolting timbers together.	Steel	Paint	0.9	0.6	1.6	1.0
Nodwell trailer, contains tires, 2 - 5 gallon pails with frozen material, plywood box containing drilling pieces, and debris (wood and metal).	Steel / Wood	Paint	5.9	2.1	1.5	18.6
Nodwell. Lead-acid "Cat" battery, engine present. Rear storage area contains rope, cable, chain, hoses and plywood.	Steel	Paint Battery Fuel/Oil	5.9	2.1	1.8	22.3
Nodwell camp generator unit. Cables, plugs and aluminum siding on outside. Two lead-acid batteries present. Air compressor and other	Steel / Wood	Paint Asbestos Battery	5.9	2.1	2.4	29.7

TABLE A5: JOHNSON POINT - HAZARDOUS MATERIALS INVENTORY - UPPER CAMP AREA						
Description	Materials	Hazardous Content	Dimensions (m)			Present Volume (m^3)
			Length	Width	Height	
assorted debris (ladder, fuel hoses, bolts, wood shelves) located within unit.						
Nodwell portabuilt camp unit. Bunk/sleeper unit. Two rooms in fold-out portion, six fold-up bunk beds per room. One furnace. Centre room has separate door (opposite end of unit). Room was used as storage/tool crib. All internal walls covered with plywood.	Steel / Wood	Paint	5.9	2.1	2.4	29.7
Nodwell portabuilt camp unit. Kitchen unit, contains fridge, deep freeze, range/oven, water tank. Kitchen is located in centre of unit, one wing of unit has six fold up beds, opposite wing is dining area. Paint peeling from ceiling.	Steel / Wood	Paint Refrigerant	5.9	2.1	2.4	29.7
Nodwell portabuilt camp unit. Bunk/office unit. Six beds per room, located in the two wings. Office located in centre of unit. Plywood on internal walls, carpet on floor. Paint peeling from ceiling. One furnace located in the unit.	Steel / Wood	Paint	5.9	2.1	2.4	29.7
Nodwell portabuilt camp unit. Bunk/office unit. Six beds per room, rooms located in two wings. Centre of unit is storage/office, contains fuel filters, and maintenance equipment. Dates shown in office - 1980. Interior walls covered with plywood.	Steel / Wood	Paint	5.9	2.1	2.4	29.7
Nodwell portabuilt camp unit. Washroom/bunk unit. Washroom is located in centre of unit, contains washer, toilet, shower, sink. Two bunkbeds in each of the rooms located in the two wings.	Steel / Wood	Paint	5.9	2.1	2.4	29.7
					TOTAL	**294**

TABLE A6: JOHNSON POINT - NON-HAZARDOUS MATERIALS INVENTORY - UPPER CAMP AREA					
Description	Materials	Dimensions (m)			Present Volume (m^3)
		Length	Width	Height	
Debris pile (plywood and steel).	Steel / Wood	1	1	0.2	0.2
Timbers bolted together with steel (steel listed separately).	Wood	9/4.5	0.6/1.2	0.9/1.2	11.4
Debris (wood and cable).	Steel / Wood	5	2	1	10.0
Solid waste incinerator on skid, debris (Nodwell tire, cable, wood, ladder).	Steel	2.1	1.4	1.4	4.1
Nodwell track (three on ground)	Steel / Rubber	1.5	1	0.5	0.8
Small plywood shed, contains hoses and fittings.	Steel / Wood	2.4	2.4	1.8	10.4
Metal skid with Nodwell tracks, Nodwell tires, and various metal debris.	Steel	4.9	1.2	0.5	2.9
Solid waste incinerator, fuel tank empty.	Steel	2.5	1.2	1.4	4.2
Nodwell tracked unit. Suction hoses and other debris (metal and wood) located on top of tank	Steel	5.9	2.1	1.5	18.6
				TOTAL	**63**

TABLE A7: TANK INVENTORY - JOHNSON POINT								
Tank ID	Location	Tank Walls	Tank Orientation	Opening Type	Tank Volume (L)	Height (cm)	Length (cm)	Diameter (cm)
Tank 1	Area 3	Bolted; 3 mm	Vertical	4"	313634	493	NA	900
Tank 2	Area 3	Bolted; 3 mm	Vertical	-	314906	495	NA	900
Tank 3	Area 3	Bolted; 3 mm	Vertical	4"	479337	737	NA	910
Tank 4	Area 3	Bolted; 3 mm	Vertical	4"	479337	737	NA	910
Tank 5	Area 3	Bolted; 3 mm	Vertical	4"	313634	493	NA	900
Tank 6	Area 3	Bolted; 3 mm	Vertical	4"	312998	492	NA	900
Tank 7	Area 3	Welded; 4 mm	Vertical	3"	91934	955	NA	350.1
Tank 8	Area 3	Welded; 4 mm	Vertical	3"	91934	955	NA	350.1
Tank 9	Area 3	Welded; 4 mm	Vertical	3"	91934	955	NA	350.1
Tank 10	Area 3	Welded; 4 mm	Vertical	3"	91934	955	NA	350.1
Tank 11	Area 3	Welded; 4 mm	Vertical		91934	955	NA	350.1
Tank 12	Area 3	Welded; 4 mm	Vertical	3"	91934	955	NA	350.1
Tank 13	Area 3	Welded; 4 mm	Vertical	3"	91934	955	NA	350.1
Tank 14	Area 3	Bolted; 4 mm	Vertical	4"	1653224	737	NA	1690
Tank 15	Area 3	Bolted; 4 mm	Vertical	4"	1650981	736	NA	1690
Tank 16	Area 3	Bolted; 4 mm	Vertical	-	1662120	734	NA	1698
Tank 17	Area 3	Bolted; 4 mm	Vertical	4"	801602	733	NA	1180
Tank 18	Area 3	Bolted; 4 mm	Vertical	4"	800509	732	NA	1180
Tank 19	Area 3	Bolted; 4 mm	Vertical	4"	801602	733	NA	1180
Tank 20	SE of Tank Farm	Hot Rivet Wall; 4 mm	Horizontal	2"	59459	NA	618	350
Tank 21	SE of Tank Farm	Welded; 4 mm	Horizontal		57073	NA	607	346
Tank 22	SE of Tank Farm	Welded; 4 mm	Horizontal		57073	NA	607	346
Tank 23	SE of Tank Farm	Hot Rivet Wall; 4 mm	Horizontal	3"	59266	NA	616	350
Tank 24	SE of Tank Farm	Hot Rivet Wall; 4 mm	Horizontal	2", 3"	59074	NA	614	350

TABLE A7: TANK INVENTORY - JOHNSON POINT

Tank ID	Location	Tank Walls	Tank Orientation	Opening Type	Tank Volume (L)	Height (cm)	Length (cm)	Diameter (cm)
Tank 25	W of Garage	Welded; 3 mm	Horizontal	1 ½", 3"	22192	NA	617	214
Tank 26	E of Garage	Welded; 3 mm	Horizontal	2", 3"	2325	NA	220	116
Tank 27	E of Garage	Welded; 3 mm	Horizontal	3/4"	2254	NA	217	115
Tank 28	S of Garage	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	214	116
Tank 29	S of Garage	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	214	116
Tank 30	S of Garage	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	214	116
Tank 31	S of Garage	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	214	116
Tank 32	S of Garage	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	215	117
Tank 33	S of Garage	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	215	117
Tank 34	S of Garage	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	215	117
Tank 35	S of Garage	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	215	117
Tank 36	S of Garage	Welded; 3 mm	Horizontal	60 mm ID	2312	NA	215	117
Tank 37	Area 5, beside sheds	Welded; 3 mm	Horizontal	3"	2264	NA	218	115
Tank 38	Area 5, In shed row	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 39	Area 5, In shed row	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 40	Area 5, In shed row	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 41	Area 5, In shed row	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 42	Area 5, In shed row	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 43	Area 5, In shed row	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 44	Area 5, W of sheds	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 45	Area 5, W of sheds	Welded Equipment Tank	Dimensional	-	205	NA	NA	NA
Tank 46	Area 7, E of Trailers	Welded; 3 mm	Horizontal	1 ¼"	3860	NA	185	163
Tank 47	Area 7, E of Trailers	Welded; 3 mm	Horizontal	-	3860	NA	185	163
Tank 48	Area 7, E of Trailers	Welded; 3 mm	Horizontal	-	3860	NA	185	163

TABLE A7: TANK INVENTORY - JOHNSON POINT								
Tank ID	Location	Tank Walls	Tank Orientation	Opening Type	Tank Volume (L)	Height (cm)	Length (cm)	Diameter (cm)
Tank 49	Area 7, E of Trailers	Welded; 3 mm	Horizontal	-	3860	NA	185	163
Tank 50	Area 7, E of Trailers	Welded; 3 mm	Horizontal	1 ¼"	2304	NA	218	116
Tank 51	Area 7, E of Trailers	Welded; 3 mm	Horizontal	-	2304	NA	218	116
Tank 52	Area 8, Nodwell Trailer	Welded; 4 mm	Dimensional	2"		NA	NA	NA
Tank 53	Area 8, Deck Tank	Welded; 4 mm	Dimensional	60 mm ID		NA	NA	NA
Tank 54	Area 8,Nodwell Fuel tank x2	Welded; 2 mm	Dimensional	3/8"		NA	NA	NA
Tank 55	Area 8,Nodwell Gen Shack	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 56	Area 8,Nodwell Gen Shack	Welded Equipment Tank	Dimensional	-		NA	NA	NA
Tank 57	S of Area 8	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 58	S of Area 8	205-L Drum	Vertical	-	205	NA	NA	NA
Tank 59	Area 2; E of Camp	Welded; 3 mm	Horizontal	1"	2262	NA	214	116
Tank 60	Area 2; E of Camp	Welded; 3 mm	Horizontal	1"	2262	NA	214	116
Tank 61	Area 2; E of Camp	Welded; 3 mm	Horizontal	1"	2262	NA	214	116
Tank 62	Area 2; E of Camp	Welded; 3 mm	Horizontal	1"	2262	NA	214	116
Tank 63	Area 2; E of Camp	Welded; 3 mm	Horizontal	1"	2262	NA	214	116
Tank 64	Area 2; W of Camp	Welded; 3 mm	Horizontal	1"	2304	NA	218	116
Tank 65	Area 2, Loader fuel tank	Welded; 3 mm	Dimensional	3/8"		NA	NA	NA
Tank 66	Area 2; N of Camp	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	214	116
Tank 67	Area 2; N of Camp	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	214	116
Tank 68	Area 2; N of Camp	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	214	116
Tank 69	Area 2; N of Camp	Welded; 3 mm	Horizontal	60 mm ID	2262	NA	214	116

APPENDIX

APPENDIX B HYDROCARBON ANALYTICAL RESULTS

TABLE B1: PETROLEUM HYDROCARBONS IN SOIL - LANDFILLS										
Borehole Number		BTEX (ppm)				Hydrocarbon Fractions (ppm)				
		Benzene	Toluene	Ethyl-benzene	Xylenes	F1 (C6-C10) – BTEX	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	TPH
Abandoned Military Site Protocol (coarse-grained surface)	**Soil Ingestion**	**-**	**-**	**-**	**-**	**15000**	**8000**	**18000**	**25000**	**NA**
	Protection of Aquatic Life	**-**	**-**	**-**	**-**	**230**	**150**	**NA**	**NA**	**NA**
AAN1		<0.0050	<0.020	<0.010	<0.020	<10	<10	21	31	72
AAN3		<0.0050	<0.020	<0.010	<0.020	<10	<10	36	36	92
AAN4		<0.0050	<0.020	<0.010	<0.020	<10	<10	44	44	108
AAN6		<0.0050	<0.020	<0.010	<0.020	<10	<10	41	44	105
AAN7		0.023	<0.020	<0.010	<0.020	<10	<10	51	49	120
AAN9		<0.0050	<0.020	0.29	1.9	604	3040	775	158	4577
AAN10		<0.0050	<0.020	<0.010	<0.020	<10	199	82	39	330
BAN2		<0.0050	<0.020	<0.010	<0.020	<10	17	95	35	157
BAN4		<0.0050	<0.020	<0.010	<0.020	<10	14	41	14	79
BAN6		<0.0050	<0.020	<0.010	<0.020	<10	<10	129	27	176
CAN2		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	12	42
CAN3		<0.0050	<0.020	<0.010	<0.020	<10	<10	12	46	78
CAN4		<0.0050	<0.020	<0.010	<0.020	<10	<10	10	19	49
CAN7		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	14	44
D4		<0.0050	0.098	0.26	2.6	102	1610	1560	239	3511
D5		<0.0050	<0.020	<0.010	0.21	<10	<10	<10	<10	40
DAN1		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	<10	40
DAN3		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	<10	40
DAN7		<0.0050	<0.020	<0.010	<0.020	<10	<10	11	<10	41

TABLE B2: PETROLEUM HYDROCARBONS IN SOIL - UPPER BASE

Borehole Number		BTEX (ppm)				Hydrocarbon Fractions (ppm)				
		Benzene	Toluene	Ethyl-benzene	Xylenes	F1 (C6-C10) – BTEX	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	TPH
Abandoned Military Site Protocol (coarse-grained surface)	**Soil Ingestion**	**-**	**-**	**-**	**-**	**15000**	**8000**	**18000**	**25000**	**NA**
	Protection of Aquatic Life	**-**	**-**	**-**	**-**	**230**	**150**	**NA**	**NA**	**NA**
BH-60							30	77	28	135
BH-63							<10	<10	<10	30
BH-64							12	57	34	103
BH-65		<0.0050	<0.020	<0.010	<0.020	<10	<10	20	14	54
BH-124							<10	<10	<10	30
BH-125		<0.0050	0.022	0.016	0.088	11	3360	400	<10	3781
BH-126							13	<10	<10	33
BH-128		<0.0050	<0.020	<0.010	0.048	<10	17	125	<10	162
BH-129							16	20	<10	46
BH-130							<10	61	<10	81
BH-131							<10	<10	<10	30
BH-132							<10	<10	<10	30
BH-133		<0.0050	<0.020	<0.010	<0.020	<10	<10	13	<10	43
BH-134							<10	15	<10	35
BH-135							<10	<10	<10	30
BH-136							<10	15	<10	35
BH-137							<10	16	<10	36
BH-138							<10	<10	<10	30
BH-139							<10	<10	<10	30

TABLE B3: PETROLEUM HYDROCARBONS IN SOIL - APRON AREA

Borehole Number		BTEX (ppm)				Hydrocarbon Fractions (ppm)				
		Benzene	Toluene	Ethyl-benzene	Xylenes	F1 (C6-C10) – BTEX	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	TPH
Abandoned Military Site Protocol (coarse-grained surface)	**Soil Ingestion**	**-**	**-**	**-**	**-**	**15000**	**8000**	**18000**	**25000**	**NA**
	Protection of Aquatic Life	**-**	**-**	**-**	**-**	**230**	**150**	**NA**	**NA**	**NA**
BH-35							17	26	<10	53
BH-36							2150	911	48	3109
BH-37		<0.0050	<0.020	<0.010	<0.020	<10	63	63	<10	146
BH-38							13	50	13	76
BH-39							14	57	17	88
BH-70		<0.0050	<0.020	0.049	0.18	<10	32	17	<10	69
BH-71							17	18	<10	35
BH-72						<10	52	165	23	250
BH-73							24	62	29	105
BH-74							736	103	<10	849
BH-75							182	40	<10	232
BH-76		<0.0050	0.031	<0.010	0.10	<10	14	17	<10	51
BH-77							12	11	<10	33
BH-78		0.59	27	17	90	1170	1710	229	11	3120
BH-79		0.068	27	13	69	983	638	112	<10	1743
BH-80							48	73	34	155
BH-81		<0.0050	<0.020	<0.010	<0.020	<10	216	188	<10	424
BH-82							24	30	<10	64
BH-83							<10	<10	<10	30
BH-84							11	<10	<10	31
BH-85							525	102	<10	617
BH-86							75	32	<10	117
BH-87							12	18	<10	40
BH-88							11	17	<10	38
BH-89		0.017	0.40	0.34	14	604	625	95	<10	1334
BH-90							21	17	<10	48
BH-91							12	16	<10	38
BH-92							643	95	<10	748
BH-93							695	92	<10	807
BH-94							740	116	<10	866
BH-95		<0.0050	0.15	1.6	56	1420	125	124	15	1684
BH-96							41	39	<10	90
BH-97		<0.0050	0.021	<0.010	0.031	16	473	226	11	726
BH-98							31	230	37	297
BH-99		0.35	17	9.1	85	1740	3000	241	<10	4991
BH-100		0.18	7.9	3.1	23	499	299	42	<10	840
BH-101							1090	105	<10	1205

TABLE B3: PETROLEUM HYDROCARBONS IN SOIL - APRON AREA										
Borehole Number		BTEX (ppm)				Hydrocarbon Fractions (ppm)				
		Benzene	Toluene	Ethyl-benzene	Xylenes	F1 (C6-C10) – BTEX	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	TPH
Abandoned Military Site Protocol (coarse-grained surface)	**Soil Ingestion**	**-**	**-**	**-**	**-**	**15000**	**8000**	**18000**	**25000**	**NA**
	Protection of Aquatic Life	**-**	**-**	**-**	**-**	**230**	**150**	**NA**	**NA**	**NA**
BH-102							957	115	<10	1082
BH-103							36	<10	<10	56
BH-104							470	46	<10	526
BH-105							83	<10	<10	103
BH-106							296	<10	<10	316
BH-107							272	<10	<10	292
BH-108		0.020	0.092	0.090	2.2	385	110	<10	<10	130
BH-109							62	119	62	247
BH-110		<0.0050	0.049	<0.010	0.67	551	353	150	57	460
BH-111							40	105	54	199
BH-112		<0.0050	0.021	<0.010	0.068	<10	20	118	55	193
BH-113							18	106	53	177
BH-114		<0.0050	<0.020	<0.010	<0.020	<10	19	119	54	192
BH-115							1330	462	98	1890
BH-116		10	63	29	140	2640	1780	413	76	4909
BH-117							250	165	60	475
BH-118							11	98	53	162
BH-119		<0.0050	<0.020	<0.010	0.097	<10	50	150	76	286
BH-120						<10	395	124	62	591
BH-121		<0.0050	0.030	0.067	1.2	367	1780	181	67	2395
BH-122							10	10	<10	30
BH-123							17	28	<10	55
BH-142		<0.0050	<0.020	<0.010	<0.020	<10	11	56	14	81
BH-143		<0.0050	<0.020	<0.010	<0.020	<10	11	19	<10	40
BH-144		<0.0050	<0.020	<0.010	<0.020	<10	17	33	<10	50
BH-148		<0.0050	<0.020	<0.010	<0.020	<10	<10	47	<10	67
BH-150							<10	34	<10	54

TABLE B4: PETROLEUM HYDROCARBON IN SOIL - MAIN SITE (POL AREA)										
Borehole Number		BTEX (ppm)				Hydrocarbon Fractions (ppm)				
		Benzene	Toluene	Ethyl-benzene	Xylenes	F1 (C6-C10) – BTEX	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	TPH
Abandoned Military Site Protocol (coarse-grained surface)	**Soil Ingestion**	**-**	**-**	**-**	**-**	**15000**	**8000**	**18000**	**25000**	**NA**
	Protection of Aquatic Life	**-**	**-**	**-**	**-**	**230**	**150**	**NA**	**NA**	**NA**
BH-1		0.0093	1.6	1.6	21	296	148	<10	17	471
BH-2							984	42	21	1047
BH-3							1550	150	12	1712
BH-4		<0.0050	0.040	0.043	5.0	160	1730	208	12	2110
BH-5							2790	166	17	2973
BH-6		<0.0050	2.4	2.2	45	754	941	80	16	1791
BH-7							1020	93	14	1127
BH-8							27	<10	<10	47
BH-9							997	139	<10	1146
BH-10		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	10	40
BH-11							<10	<10	<10	30
BH-12							<10	<10	<10	30
BH-13		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	<10	40
BH-14		<0.0050	<0.020	<0.010	<0.020	<10	116	47	<10	183
BH-15							1900	376	<10	2286
BH-16							56	17	<10	83
BH-17		<0.050	.35	3.8	42	1960	5140	655	<10	7765
BH-18		<0.0050	<0.020	0.057	0.33	10	43	10	<10	73
BH-19							1180	199	<10	1389
BH-20							313	37	<10	360
BH-21							10	16	<10	36
BH-22							15	12	<10	37
BH-23							<10	15	<10	35
BH-24							148	16	17	181
BH-25		0.036	0.18	0.017	0.22	<10	12	12	<10	44
BH-26							952	65	<10	1027
BH-27		<0.050	<0.20	1.5	19	830	1220	99	<10	2154
BH-28		<0.0050	<0.020	<0.010	<0.020	<10	81	79	<10	180
BH-29							13	25	<10	48
BH-30							31	67	<10	118
BH-31		<0.0050	<0.020	<0.010	0.053	<10	11	31	<10	72
BH-32							15	44	<10	69
BH-33		<0.0050	<0.020	<0.010	<0.020	<10	11	23	<10	63
BH-34							23	155	27	195
BH-35							17	26	<10	57

TABLE B4: PETROLEUM HYDROCARBON IN SOIL - MAIN SITE (POL AREA)										
Borehole Number		BTEX (ppm)				Hydrocarbon Fractions (ppm)				
		Benzene	Toluene	Ethyl-benzene	Xylenes	F1 (C6-C10) – BTEX	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	TPH
Abandoned Military Site Protocol (coarse-grained surface)	**Soil Ingestion**	**-**	**-**	**-**	**-**	**15000**	**8000**	**18000**	**25000**	**NA**
	Protection of Aquatic Life	**-**	**-**	**-**	**-**	**230**	**150**	**NA**	**NA**	**NA**
BH-40		<0.0050	<0.020	<0.010	0.021	<10	14	18	<10	52
BH-41							756	128	22	906
BH-42							442	84	<10	536
BH-43		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	<10	40
BH-44							428	82	<10	520
BH-45							<10	<10	10	30
BH-46		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	<10	40
BH-47							55	40	<10	105
BH-48							14	42	20	76
BH-49							16	42	20	78
BH-50							371	141	18	530
BH-51							14	39	18	71
BH-52							21	34	18	73
BH-53		<0.0050	<0.020	<0.010	<0.020	<10	14	41	18	83
BH-54							15	47	21	83
BH-55		<0.0050	<0.020	<0.010	<0.020	<10	16	43	21	90
BH-56							13	37	19	69
BH-57							14	35	17	66
BH-58							13	55	23	91
BH-59							19	81	54	154
BH-60							30	77	28	135
BH-61		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	<10	40
BH-62							<10	<10	<10	30
BH-63							<10	<10	<10	30
BH-64							12	57	34	103
BH-65		<0.0050	<0.020	<0.010	<0.020	<10	<10	20	14	54
BH-66							<10	14	<10	34
BH-67							<10	13	<10	33
BH-68							18	778	150	946
BH-69		<0.0050	<0.020	<0.010	0.13	235	3590	701	15	4541
BH-140		<0.0050	<0.020	<0.010	<0.020	<10	22	13	<10	55
BH-141		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	<10	40
BH-142		<0.0050	<0.020	<0.010	<0.020	<10	11	56	14	91
BH-143		<0.0050	<0.020	<0.010	<0.020	<10	11	19	<10	50
BH-144		<0.0050	<0.020	<0.010	<0.020	<10	17	33	<10	60
BH-145		<0.0050	<0.020	<0.010	<0.020	<10	30	348	55	443

TABLE B4: PETROLEUM HYDROCARBON IN SOIL - MAIN SITE (POL AREA)										
Borehole Number		BTEX (ppm)				Hydrocarbon Fractions (ppm)				
		Benzene	Toluene	Ethyl-benzene	Xylenes	F1 (C6-C10) – BTEX	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	TPH
Abandoned Military Site Protocol (coarse-grained surface)	**Soil Ingestion**	**-**	**-**	**-**	**-**	**15000**	**8000**	**18000**	**25000**	**NA**
	Protection of Aquatic Life	**-**	**-**	**-**	**-**	**230**	**150**	**NA**	**NA**	**NA**
BH-146		<0.0050	<0.020	<0.010	<0.020	<10	12	28	<10	60
BH-147							<10	<10	<10	30
BH-148		<0.0050	<0.020	<0.010	<0.020	<10	<10	47	<10	77
BH-149		<0.0050	<0.020	<0.010	<0.020	<10	<10	26	<10	56
BH-150							<10	34	<10	54

TABLE B5: HYDROCARBON RESULTS IN SOIL - SEDIMENT AND BACKGROUND SAMPLES

Borehole Number		BTEX (ppm)				Hydrocarbon Fractions (ppm)				
		Benzene	Toluene	Ethyl-benzene	Xylenes	F1 (C6-C10) – BTEX	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	TPH
Abandoned Military Site Protocol (coarse-grained surface)	**Soil Ingestion**	**-**	**-**	**-**	**-**	**15000**	**8000**	**18000**	**25000**	**NA**
	Protection of Aquatic Life	**-**	**-**	**-**	**-**	**230**	**150**	**NA**	**NA**	**NA**
Sediment #1		<0.0050	<0.020	0.10	0.29	421	1410	363	22	2206
Sediment #2		<0.0050	<0.020	<0.010	0.038	<10	<10	<10	<10	40
Sediment #3							<10	19	<10	39
Sediment #4							<10	<10	<10	30
Sediment #5		<0.0050	<0.020	<0.010	<0.020	<10	<10	<10	<10	30
Sediment #6		<0.0050	<0.020	<0.010	<0.020	<10	14	46	<10	80
Sediment #7		<0.0050	<0.020	<0.010	<0.020	<10	<10	56	<10	86
Sediment #8		<0.0050	<0.020	<0.010	<0.020	<10	<10	22	<10	42
Background 5		<0.0050	<0.020	<0.010	<0.020	<10	23	112	78	230
Background 5							24	258	98	380
BH25S							<10	<10	<10	30

[1] = Eco Soil Contact
[a] = For protection against contaminated groundwater discharge to an adjacent surface waterbody

TABLE B6: JOHNSON POINT - WATER ANALYTICAL RESULTS (HYDROCARBON)					
Monitoring Well	BTEX (ppb)			Hydrocarbon Fractions (ppb)	
	Benzene	Toluene	Ethyl-benzene	Xylenes	F1 (C6-C10) – BTEX
4	<5	7	<5	284	5350
6	<5	3130*	22	5420	3430
13	<0.5	<0.5	<0.5	<1	<100
14	<0.5	<0.5	<0.5	<1	<100
15	<5	<5	13	763	4760
16	<0.5	<0.5	<0.5	9	185
18	<0.5	<0.5	<0.5	<1	<100
26	<0.5	<0.5	<0.5	31	254
28	<0.5	<0.5	<0.5	<1	<100
72	<0.5	<0.5	<0.5	<1	<100
74	303*	16000*	2730*	16800	7330
79	<50	1350*	<50	606	23700
85	31.1	5.2	6.3	133	1840
89	125*	1260*	129*	7140	5480
94	477*	12000*	952*	8770	12300
107	664*	16900*	2950*	28800	1640
108	<0.5	4.3	<0.5	229	3050
109	0.8	4.0	<0.5	4110	16400
114	<0.5	<0.5	<0.5	<1	<100
116	<0.5	<0.5	<0.5	2	6410
120	2.1	<0.5	<0.5	72	728
140	<0.5	<0.5	<0.5	6	<100
142	<0.5	<0.5	<0.5	<1	<100
143	<0.5	<0.5	<0.5	<1	<100
145	<0.5	<0.5	<0.5	<1	<100
Surface Water # 1	<0.5	<0.5	<0.5	<1	<100
Surface Water # 2	<0.5	1.2	<0.5	4	<100
Surface Water # 3	<0.5	<0.5	<0.5	<1	<100
Surface Water # 4	<0.5	<0.5	<0.5	<1	<100
Surface Water # 5	<0.5	<0.5	<0.5	<1	<100
Surface Water # 6	<0.5	<0.5	<0.5	<1	<100
Surface Water # 7	<0.5	<0.5	<0.5	<1	<100
Surface Water # 8	<0.5	<0.5	<0.5	<1	<100
Freshwater Aquatic Criteria	370	2	90	-	-
Marine Aquatic Criteria	110	215	25	-	-

Exceeds Freshwater Aquatic Criteria

* Exceeds Marine Aquatic Criteria

APPENDIX

APPENDIX C COMMUNITY MEETING MINUTES

Johnson Point Community Information Session

April 17, 2007 – Sachs Harbour Hamlet Office; 6:00 pm- 7:30 pm (dinner provided)

Attendees:

Martha & Frank Kudlak
Bridgette Wolki
Betty Haogak
Bonnie Haogak
Joey Carpenter
Terence Lennie
Ellsworth Stanley
Donna Keogak
Pat Dunn, ParksCanada
Emma Pike, INAC
Joel Gowman, INAC
Brad Thompson, PWGSC

Recorder: Donna Keogak, Sachs Harbour Community Corporation

1. Introductions
2. Summary of the Contaminated Sites Program, highlighting what projects are being worked on in the ISR
3. Johnson Point overview and summary of work completed to date
4. Review of environmental site assessment, geophysical and geotechnical studies' results
5. Summary of proposed Remedial Action Plan
6. Inuvialuit benefits and contracting process

Summary of Summary of Community Information Session Discussion

The Johnson Point project was introduced and the results of the various work completed to date were summarized.

Community concerns/questions are summarized as follows:

- ***Community benefits***
  - There were a number of questions regarding ensuring benefits to the community of Sachs Harbour during the contracting process, as the community was not satisfied with the benefits received from the Johnson Point incineration contract. The details of the revised Inuvialuit Benefits Package were described in detail, including the requirement for companies to pass this component in the proposal stage before even being considered a compliant bid. Once described, there was support for the process.
- ***Contaminated soil.***
  - Some community members were at the site last year and they could smell the hydrocarbons in the soils. There was concern that this could affect people's health and the environment. The risk assessment results were highlighted indicating negligible risk to people and wildlife. Also, fuel is

very volatile and therefore only a small amount can create that odour. It does not necessarily mean that the levels are of concern.

- ***Future land use.***
  - There were questions as to whether this site might be used by the Canadian military in the future in support of ensuring sovereignty of the North. INAC indicated they knew of no such plans, but the airstrip would be left in place in an abandoned condition so it could be used by anyone at their own risk.
- ***Airstrip upgrades***
  - There was some discussion regarding INAC's role in promoting development and whether the airstrip should be upgraded to a higher standard. INAC indicated that they are not in the business of developing and maintaining airstrips, but would also not remove them at the end of a project. If private industry then wanted to use it, it would be up to them to upgrade and maintain it.

Question and Answer Sessions Records

INAC would like to introduce the results from the studies and clean up activities done at Johnson Point to date. They would also like to inform the public the results from the meeting that was held this morning with the HTC, Community Corporation and Elders. The presentation was made to the Community members present by way of Power Point. The following are the questions that the members presented to INAC.

Q. Did INAC ever find out why the Elders from the community did not have much traditional knowledge of the area?
A. No, but this presentation will be brought to Ulukhaktok and maybe they will be able to find more information from them.

Q. Are the tenders for the work that has to be done out yet?
A. No, currently INAC is just presenting the options that are available to the community regarding the clean up.

Q. Did they do soil sampling around the garage? (Oil was used around there)
A. Yes. There was extensive sampling around the entire site.

Q. Is the contractor going to be responsible to upgrade the roads?
A. Yes, the amount required to upgrade these roads will be included in their bid price.

Q. Why don't they fix up the airstrip to standards?
A. The contractor will upgrade the airstrip to meet his needs and then when the project is completed the airstrip will be considered abandoned.

Q. Were they ever able to find the garbage dump?
A. A number of landfills were located and with the contents that were found at each site it was decided that each of these landfills was used for waste.

Q. Will there still be a residue left after they spread out the hydrocarbon?
A. No, because it is such a small amount in each area it will evaporate like gas rather than turning the soil black like oil.

Q. Will some of these sites be used for military purposes?
A. We are not aware of any such plans.

Q. In regards to the contracts can Sachs Harbour be considered first?
A. The bidders have to follow the IFA but all bids have to be considered equally on a rating system.

Q. A member of the public gave the example from Tuktoyaktuk where they give them the first consideration.
A. That is the private businesses and they have a choice on how they prioritize on who their contracts are given to. As the Federal Government is bound by the IFA and they are required to follow the rules set before them. It has to be a fair, open, and transparent process but the Inuvialuit Benefits Package does give an advantage to Inuvialuit beneficiaries.

Meeting completed at 8pm.

Johnson Point Community Consultation –
Remedial Options Evaluation Meeting Minutes

April 17, 2007 – Sachs Harbour Hamlet Office; 9:00 am – 12:00 then 1:30-3:00pm

Attendees:

Earl Esau – HTC
Martha Kudlak – Elders Committee
Lawrence Amos - HTC
Darren Nasogaluak - HTC
Tony Lucas – Community Corporation
Terence Lennie - Community Corporation
Manny Kudlak - Community Corporation
David Haogak – Parks Canada
Emma Pike, INAC
Joel Gowman, INAC
Brad Thompson, PWGSC

Recorder: Donna Keogak, Community Corporation

Agenda:

1. Introductions - roundtable
2. Summary of the Contaminated Sites Program, highlighting what projects are being worked on in the ISR
3. Johnson Point overview and summary of work completed to date
4. Review of environmental site assessment, geophysical and geotechnical studies' results
5. Summary of human health and ecological risk assessment and development of site-specific target levels/ remediation criteria
6. General comments/concerns from the community
7. Evaluation criteria for evaluating remedial options
8. Remedial options evaluation & discussion
9. Inuvialuit benefits and contracting process

Summary of Remedial Options Evaluation Meeting Discussion

Agenda items up to # 5 were general summaries of the program and reports produced for the Johnson Point project. Details of which are not presented here.

6. General comments/concerns from the community:

- There were numerous concerns noted about the contracting of the Johnson Point incineration project. AES hired only a few people from Sachs Harbour and their Inuvialuit content was not accurate as many people working there were Gwich'in
- The community wanted to ensure that benefits from the project go directly to the community of Sachs harbour as there is little development in this area. They also were the ones who identified and pushed to get the project going
- There were some concerns regarding the airstrip condition and that it is hard to land if there is low cloud

- Community members identified that there were likely some pieces of equipment in the lake at the south end of the site. INAC should ensure we look at this when we collect waste around the site.

Action: During work at the site, the lake at the south end of the airstrip should be looked at in terms of waste/equipment in and around the lake.

Action: It was noted that the Amundsen ice-breaker is in and around Banks Island area and they could be used to help determine barge access to the site. Follow-up with Andrew Applejohn with ARI.

- There were a lot of concerns regarding the sumps associated with oil and gas exploration on Banks Island. Sumps are being surveyed and looked at around the delta region and they are getting a lot of money, but nothing is happening on Banks Island and there are sumps here too that people are concerned about. Even if the sumps are owned by an oil and gas company, nobody here knows who and therefore doesn't know who to follow up with. So even if INAC does not do the survey work itself, the community would like to see INAC take a leadership role to ensure the sumps are assessed by the oil companies or others to ensure contaminants are leaking out. Complete some kind of survey like the ones in the Delta.

Action: Communicate concerns regarding sumps on Banks Island to the appropriate INAC representative in Yellowknife.

- There were also some questions regarding the high arctic weather stations such as Mould Bay. INAC indicated that these sites are owned and managed by Environment Canada and therefore the community would need to contact them on this issue.

7. Evaluation criteria for evaluating remedial options

A discussion was had regarding what to consider while reviewing and selecting remedial options for the site. The goals and objectives of the Contaminated Sites Program were presented and discussed as well as other considerations such as what our vision for the site is and what future land use we might expect for this area. We highlighted that there are legal requirements we must meet, environmental and technical considerations as well as Inuvialuit objectives to consider. These included developing a walk-away solution, providing socio-economic opportunities for local/regional businesses as well as training opportunities. Finally cost needs to be considered, including capital costs, operating costs and costs associated with long-term monitoring if required.

8. Remedial options evaluation & discussion

For each waste stream, a summary of the results were presented along with any special considerations that should be considered in selecting a remedial option. The technically

viable options were presented along with a short description of each and associated pros and cons. The technically-recommended option was then highlighted leading into a group discussion and question/answer period. This was repeated for each waste stream/ site component.

Hydrocarbon-contaminated soil:
There was a lot of discussion regarding the potential options for hydrocarbon-contaminated soil. Three main options were presented and considered: landfarming, leaving in place or mechanical agitation (excavating and aerating soils).

- Landfarm: There were concerns associated with the landfarming option as there was a landfarm constructed in the hamlet of Sachs Harbour by Biogenie that the community feels was not constructed properly and is not working well. There is a lot of permafrost degradation from the exposed excavation and they are not happy with the situation.
- Leave in place: There was no support for the leave in-place option as this is not considered remediation.
- Mechanical agitation: This option consisted of excavating soil and transferring it to staging area, aerating the soil, collecting confirmatory samples and then regarding to match the natural topography. The volatilization process was also described in detail.

After a group discussion, this option was selected as preferred for these main reasons:

- Due to the lighter hydrocarbon fractions and sandy soil conditions, the soil should remediate very quickly
- Risk of permafrost degradation will be minimized as the area of open excavation would be minimized during site work by backfilling with clean fill
- No construction of new site feature (landfarm treatment area).
- Soil will be re-graded to match natural topography

Hazardous Waste:
Only two options were considered for the hazardous waste at the site:

- On-site disposal in an engineered Type II landfill, and
- Off-site disposal to a licensed disposal facility.

The latter option was preferred for the following reasons:

- There is not a large volume to hazardous materials (~ 500m3), making the design and construction of a hazardous waste landfill expensive per cubic meter
- Lack of proper on-site granular borrow to construct such a facility. Material would have to be brought in to ensure long-term stability of the structure.
- Risk of erosion, namely due to the lack of gravel/cobble/armour type material that is required to cover the landfill
- Requirement for long-term monitoring

- Traditional land use and risk perception. If the community members know there is a hazardous waste landfill at the site, there will always be concerns regarding the use of the area.

Non-hazardous Waste:
The two same options were considered for the non-hazardous waste at the site as was considered for the hazardous waste:

- On-site disposal in an engineered landfill, and
- Off-site disposal to a licensed landfill for disposal.

The latter option was preferred for the following reasons:

- There is not a large volume to non-hazardous materials (~ 220m3), making the design and construction of a landfill expensive per cubic meter
- Lack of proper on-site granular borrow to construct such a facility. Material would have to be brought in to ensure long-term stability of the structure.
- Risk of erosion, namely due to the lack of gravel/cobble/armour type material that is required to cover the landfill
- Requirement for long-term monitoring
- Traditional land use and risk perception. If the community members know there is a hazardous waste landfill at the site, there will always be concerns regarding the use of the area.

There was some follow-up discussion that perhaps this non-hazardous material could be disposed of in the Sachs Harbour landfill rather than shipping it all the way to Inuvik or further south. The community would need to consider this further and determine if they would be willing to accept this waste and if so, at what price.

Existing Landfills:
Two main options were considered of the existing landfills:

- Excavate the existing landfills and dispose of in a new engineered on-site landfill or ship south for disposal, or
- Upgrade the existing landfills by placing additional erosion-resistant fill over the existing landfills and redirecting drainage around them, as necessary.

Discussions regarding the landfills centred around how to not create a larger impact and therefore the option of excavating existing landfills was considered not acceptable.

The latter option of upgrading existing landfills was selected for the following reasons:

- The site does not have appropriate resources to construct an engineered landfill.
- Excavation of existing landfills could result in permafrost degradation and create a new problem.
- Most of the existing landfills are already performing well (high and dry, no leachate, minimal exposed debris).
- Minimal risk associated with metal and hydrocarbon contamination left in place at depth.

There was some follow-up discussion regarding the additional erosion-resistant material required for the landfill stabilization. The preferred option from the community perspective is to bring in imported gravel/armour rock from elsewhere. There is the potential to use material from around Sachs Harbour, creating more opportunities in the community. The gravel/rock option was preferred over a more engineered approach as it would look more natural and eventually it could revegetate. The other option of using a geogrid and concrete slurry or combination of geogrid and sand/gravel was considered to be acceptable but definitely not preferred. Only if there was a major cost savings would they consider this option acceptable. Another scenario discussed was making concrete on site then breaking it up to use as armour material. Again, this would be considered acceptable only if there was significant cost savings. The very much preferred option is to bring in imported gravel/rock.

Summary of proposed Remedial Action Plan

Therefore the proposed remedial action plan, which is consistent with Abandoned Military Sites Remediation Protocol, would consist of the following tasks:

- Upgrade infrastructure as required
- Hazardous wastes containerized and shipped south for disposal
- Non-hazardous wastes shipped south for disposal
- Additional fill placed over existing landfills and redirect drainage
- Treat hydrocarbon contaminated soils on site
- Regrade and re-establish natural drainage
- Airstrip left in abandoned condition.

9. Inuvialuit benefits and contracting process

One of the biggest concerns from the community is how they can benefit from this project. INAC and PWGSC have been working to improve the procurement process for this and other projects in the area to ensure Inuvialuit benefits are maximized. The following points were highlighted:

- All work is conducted through an open transparent competitive bidding process through PWGSC
- Contracts in ISR would be subject to the IFA. Note that the IFA only states that the work must benefit Inuvialuit beneficiaries, it does not mention specific communities. Because of this, we also cannot name communities within the contract documents as it would be seen as preferential contracting.
- Contractors submit proposals which are evaluated based on the following criteria:
    i. Technical Merit
    ii. Company and Project Team
    iii. Inuvialuit Benefits Plan
    iv. Cost
- Companies to be considered for contract award would need to pass each of the first three criteria before cost would even be looked at.

- INAC is willing to pay up to a 15% premium for a good proposal including an experienced team, companies who know how to work in the North, and those who maximize Inuvialuit benefits. This is reflected in the scores of the first three criteria
- Inuvialuit Benefits Plan – process by which Inuvialuit labour & sub-contracting, and training is maximized.
- The proposed contracting process (including the Inuvialuit Benefits Plan) has been reviewed and approved by the IRC.

Once the contracting process was explained in detail, including the procurement restrictions and rules that the government has to meet, there was support for the approach. There was acknowledgement that the process seemed open and fair while still meeting the spirit and intent of the Inuvialuit Final Agreement.

Question and Answer Sessions Records

Q. Where did they discharge the washwater and oily water from the clean up?
A. The wash water and oily water went through a treatment process so they were able to discharge it right onto the land.

Q. Is there no more fuel to burn off?
A. All the waste fuel was burned off this past summer.

Q. What was done with the contaminated soil?
A. The first goal was to eliminate the source of the contamination which was the leaking fuel and now we will be looking at cleaning up the soil during the major remediation work. Soil samples were also taken during the burning off of the fuel to ensure that the incineration didn't create new contaminated soil.

Q. Are the contracts open to everyone across Canada or will Sachs have the first option?
A. The contracts are open for everyone across Canada but have to meet the IFA before being considered. There is an Inuvialuit Benefits Package (IBP) as part of the evaluation of contract proposals.

Q. Sole Sourcing from Sachs should be a priority. (There were some concerns in regards to the hiring process.) Is this possible?
A. PWGSC will have to follow the guidelines under the Government. Should Sachs put in a bid they may have a better chance since the workforce is here in the Community. There will be a pre-bidders meeting where the Development Corporation or anyone who wants to bid on the contracts can meet with other prospective contractors. We would encourage you to look at partnering with contractors who have equipment or skills etc that may not be available in the community.

Q. When the sampling is being done, how soon can we get the results?

A. It all depends on the area and what level of contamination there is. There are field analyses that can be done but confirmatory sampling requires samples to be sent to a certified laboratory for analysis

Q. How deep are the contaminated areas?
A. 1 ½ - 2 meters around the tank farm and apron.

Q. Are there any other contaminants found?
A. There has been some metal contamination found around the landfills but not much.

Q. Was there any known ocean dumping done?
A. This is not known.

Q. In regards to the lake that is adjacent to the airport, will checks be done to see if there was any dumping of large vehicles in it?
A. The lake will be checked.

Q. When you looked at possible landfill sites did you take into consideration climate change?
A. Yes, climate change has been factored into the landfill area selection and design. However, no new landfills are currently proposed for this site.

Q. Is land filling the only option?
A. No, it is only one of the options.

Q. Are there any plans to tie in the Musk-ox Mine clean-up with Johnson Point?
A. Both projects are being treated as separate as they are far apart.

Q. What can INAC do about all the sumps that are on the Island?
A. CARD is focusing on Johnson Point. However, concerns regarding sumps will be forwarded to the appropriate INAC people

Q. Is there a set standard for contaminated hydrocarbons?
A. Yes, for each site there is a standard. There are several standards depending on site conditions such as soil grain size and the type of hydrocarbon. We also look at risk to determine protective criteria.

Q. What will happen to the land since the permafrost will be left?
A. Excavations will be backfilled as soon as possible to provided protection for the permafrost.

Q. What about the wind?
A. The method chosen for the remediation would have to take wind into consideration.

Q. What time are you looking at for the clean up?
A. We would remediate immediately after all the stages required are completed. This would likely mean contracting this year with anticipated mobilization in 2008 and work completed in 2009.

After discussion on the 1st options the members stated that Mechanical Agitation will be the best option.

Q. Is any of the items at Johnson Point salvageable?
A. There may be a few items that can be salvaged. (e.g. steel piping) This would be up to the contractor.

After reviewing the possibilities for the 2nd set of options the members agreed to Off-Site disposal in a licensed land fill for Hazardous and Non-Hazardous waste.

Q. Are they still required to do Transportation of Dangerous goods for Non-Hazardous waste?
A. No, this is not required.

Existing Landfills:

Q. How did the geo-grid work in the North?
A. It was used in Gjoa Haven. The grid may show after a few years.

Q. What about revegetation over the land fill sites?
A. Revegetation may be a good idea but it may or may not work so it should not be critical to the design.

After discussion the members stated that the imported gravel would be the best option. Excavating is not to be considered as a option. The members stated that they should do a cost comparison on concrete blocks vs. imported gravel since this may be a possibility.

Q. How do they rate the Company& Project team?
A. It is based on past experience and how well they performed.
The ratings for the bidders are based on the following:
- Technical Merit
- Company & Project team
- Inuvialuit Benefits Plan

These rate 60% of the mark.
- Cost

This rates 40% of the mark.

Q. Would INAC help out by bring the representatives from Sachs Harbour to the bidders meeting?
A. They can look into the possibility.

Q. What about a Community Liaison person? How many communities have this in place?

A. A Community Liaison was hired in Tuk for the Atkinson clean up for approximately $1500.00 per month. They can look into placing one here in the community.

Following the day's discussions, a Community Information Session was held to summarize the results of the day and to hear any additional concerns people may have. Please refer to the attached notes from that meeting.

Ulukhaktok Community Information Meeting
April 19, 2007
Ulukhaktok Community Hall

Meeting Minutes

Recorders: Joel Gowman and Emma Pike

Opening Prayer – lead by Robert (community elder) at 5:30pm (approximately 25 persons plus several children)

Meeting followed supper coordinated by the Olokhaktomiut Hunters and Trappers Committee (thanks to Lillian for her help) and catered by local community members.

Questions and Answers Session

Q – Was the waste fuel not suitable to be used for anything?
A – Yes, as the fuel was significantly aged and contaminated with water and rust, it was not suitable to be used for any purposes.

Q – Is older fuel different?
A – Yes, the flash point is different and older fuel is often contaminated with water and rust.

Q – How many types of fuel were present at the site?
A – The storage tanks at the site contained mainly diesel. Several of the barrels also contained gasoline and glycol.

Q – What were the results of the geotechnical investigation?
A – Details of the geotechnical investigation will be reviewed a little later in the presentation.

Q – Will the site be cleaned up back to normal?
A – Yes, the goal is to clean up the site to ensure that it doesn't present a risk to human health and the environment.

Q – What is going to happen at BAR-C?
A – INAC is currently in negotiations with ILA to determine how best to address that site.

Q – What is happening at the runway at Johnson Point?
A – The contractor who will be conducting the work will determine whether or not they require upgrades of the airstrip to conduct the remediation work. While it may be temporarily upgraded to complete the remediation work at the site, it will be abandoned following the remediation work and will not be maintained by INAC.

Environmental Site Investigation (ESA) Presentation

Q – How did you know the landfills were there?
A – Typically a site of this size would have a significant amount of waste material associated with it. To make sure that we know how much material we are dealing with, CARD had a consultant conduct a geophysical survey of the site with an EM61 which is basically sensitive metal detector connected to a GPS. The equipment was used to map the aerial extent and then test pits were completed to determine the nature of the buried debris.

Q – Is CARD cleaning up the existing landfills?
A – As digging up the landfills could cause more environmental damage (in the form of permafrost degradation), we will not be cleaning up the existing landfills. The landfills appear to be stable but the remediation plan will include some measures to protect against erosion in the future.

Community Comment

- Permafrost is melting more and more every year.

Q – Did CARD find anything in the river?
A – No, the river water was sampled and it was clean. Also, no debris was observed in the river.

Q – Was there any sign of wildlife dying around there?
A – When we were at Johnson Point, we did not see any dying wildlife. We also conducted a Community and Traditional Knowledge Survey through the Sachs Harbour Hunters and Trappers Committee and nothing of this nature was noted. There is a lot of history associated with this site but not a lot of recorded information regarding traditional use or regarding more recent use by industry.

Q – What level is considered contaminated at this site?
A – Various factors are considers when selecting criteria for a site. During the assessment phase of the work at this site, CARD had a Human Health and Ecological Risk Assessment (HHERA) completed and a Site Specific Target Level (SSTL) for hydrocarbons was developed. The HHERA indicated that there was no human health or ecological risk present at the site. For this site, the SSTL will be applied to hydrocarbon contaminated soils in the upper portions of the site but the more protective CCME Protection of Freshwater Aquatic Life criteria will be applied to the airstrip apron area which is immediately adjacent to more sensitive habitat (i.e. – the small tundra pond to the south, the un-named river to the north, and the Prince of Wales Strait to the east).

Q – Were any people from Ulukhaktok invited on the community site tours of the site?
A – We have had some discussion with the local HTC; however, IRC has directed us that to work most closely with community of Sachs Harbour.

Note – Since the completion of this community meeting, CARD has also completed a community site tour for representatives from Ulukhaktok. This tour was attended by 9 delegates in total providing representation from the Olokhaktomiut Hunters and Trappers Committee, the Ulukhaktok Community Corporation, the Elders Committee, and the Youth Council.

Community Comments

- It is good you are here. We had heard that some people were working at this site.
- It is surprising that INAC doesn't know who created the mess at the site and get them to pay.

Q – How long is the process for soil treatment expected to take?
A – The time required is dependent on the size of equipment and the methodology proposed by the successful contractor. It is anticipated that the soil treatment could be completed within 1-2 years.

Q – Were the tanks barged in?
A – Maybe. Some of the equipment and materials may also been airlifted in to the site with C130's or other large aircraft.

Q – What are mercury switches?
A – Mercury switches are used for thermostats and some other electronic equipment.

Q – Where will the Hazardous Materials be sent?
A – All Hazardous Materials will need to be sent to a licensed disposal facility to be determined by the contractor. PCB-amended materials would most likely be sent to Swan Hills in Alberta.

Q – Will CARD monitor the site and the landfills?
A – Yes, CARD would develop a monitoring plan that will likely include more frequent visits in the years immediately following the remediation with less frequent trips in subsequent years once stability of the site has been documented.

Q – Was there any heavy equipment left on the land?
A – No heavy equipment, with the exception of one CAT loader and a nodwell, have been noted at this site.

Q – Will local people be hired to complete the work?
A – Staffing for the project is the responsibility of the contractor awarded the work. Contractor proposals must include an Inuvialuit Benefits Package (IBP) in which they specify the level of Inuvialuit employment and contracting that they will maintain for the project. This system provides CARD with some tools to ensure that Inuvialuit receive training and economic benefits from our work in the region.

Q – Are there signs of bears in the buildings?
A – Yes but the risks to the animals entering the buildings is low and wildlife monitors will be on-site during the remediation work to ensure that both people and animals are kept safe.

Community Comment

– It is good that the site is getting cleaned up.

APPENDIX

APPENDIX D ENVIRONMENTAL REPORT - GENERAL CONDITIONS

ENVIRONMENTAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed on site at the time of EBA's investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

2.1 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of this report, EBA may have relied on information provided by persons other than the client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

3.0 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

1. With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort;
2. With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

4.0 JOB SITE SAFETY

EBA is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of EBA personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

5.0 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

6.0 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

7.0 EMERGENCY PROCEDURES

The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect EBA employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay EBA for any expenses incurred as a result of such discoveries and to compensate EBA through payment of additional fees and expenses for time spent by EBA to deal with the consequences of such discoveries.

8.0 NOTIFICATION OF AUTHORITIES

The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

9.0 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.

10.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.