INTRODUCTION

This section supports an application for land use activities and operations associated with the Inuvik area facility. It contains:

- an overview map showing the facility location
- an estimate of personnel requirements
- a summary of the operations
- a description of potential environmental and resource effects
- construction equipment estimates

The location of the Inuvik area facility is shown in a site photograph in Figure 7-1, and on the overview map in Figure 7-2. An artist's impression is shown in Figure 7-3.

PERSONNEL (PART 3)

The construction of the Inuvik area facility will involve three major steps. The first step is preparing the site and installing the site pad. This will require a crew size of about 150. The second step is the piling activity, which will require a crew size of about 50. The third step is installing the prefabricated processing facility modules followed by pre-commissioning activities. This step requires about 250 personnel, including camp staff.

Construction plans require the installation of a 250-person camp within the footprint of the Inuvik area facility for the construction period. A description of this activity is contained in Section 4.

After completion of construction, the facility will be commissioned for long-term operations. During commissioning, up to 20 personnel could be required on site for about three months. Staff will work rotating shifts and a small team will remain on site continuously. Additional maintenance workers and other personnel will travel daily to the site from Inuvik.

When facility operations have reached steady state, a few on-site personnel will provide surveillance, management and maintenance of automated plant operation. Routine operations and maintenance activities will likely require two to eight personnel on site, depending on the level of activity. Periodically, major maintenance or repair activities, or scheduled turnaround maintenance will be required. This type of activity might normally require about 20 to 40 personnel on site for a short period.

Staffing for the Inuvik area facility will be a combination of live-in and rotational personnel working on scheduled shifts. Live-in personnel will reside in Inuvik. Rotational personnel will be sourced from the nearest point where qualified personnel are available. In the long term, personnel will be encouraged to live in Inuvik.

Maintenance personnel at the Inuvik area facility might also support anchor field and pipeline operations, as required.

SUMMARY OF OPERATION (PART 5)

The land use activities and operations associated with this site include:

- developing and maintaining a 48 ha site
- developing and maintaining a 20 m wide, 16.3 km long all-weather access road from the Dempster Highway to the Inuvik area facility, of which 13.8 km will traverse Crown lands
- abandoning and reclaiming the site at the end of the operational life of the facility

Preconstruction Activities

Before facility development begins:

- a preconstruction survey will be conducted to finalize the location and site-specific layout
- geotechnical evaluations might be conducted, as required, to support engineering of the various aspects of the facility, as required

Development Activities

Construction of the Inuvik area facility site is scheduled to start in late 2006. The facilities are scheduled for start up in 2009. Construction activities will take place year-round and are scheduled to be complete in the summer of 2010.

Site Development

Terrain, soil type and the extent of permafrost will influence development at the Inuvik area facility site. Site preparation activities might include:

- fencing or flagging to define site boundaries and areas to be avoided
- clearing vegetation and storing merchantable timber

- grading and placing fill to provide a supporting surface for installing, operating and maintaining the facilities

- sloping the surface to direct runoff away from the facility site

The degree of grading will depend on the amount of permafrost at the site and on soil conditions. Continuous permafrost is expected to be encountered across the entire site.

Borrow material will be placed in varying thickness up to 1.5 m around the site. The thickness will depend on soil conditions, soil temperatures, and its intended use within the site.

Pad materials will be excavated from approved borrow site locations as close as deemed practical to the Inuvik area facility. These materials will be transported to the facility on the new 16.3 km all-weather access road. They might be hauled and placed while frozen, and allowed to thaw during the following summer season. This might require compacting at a later date.

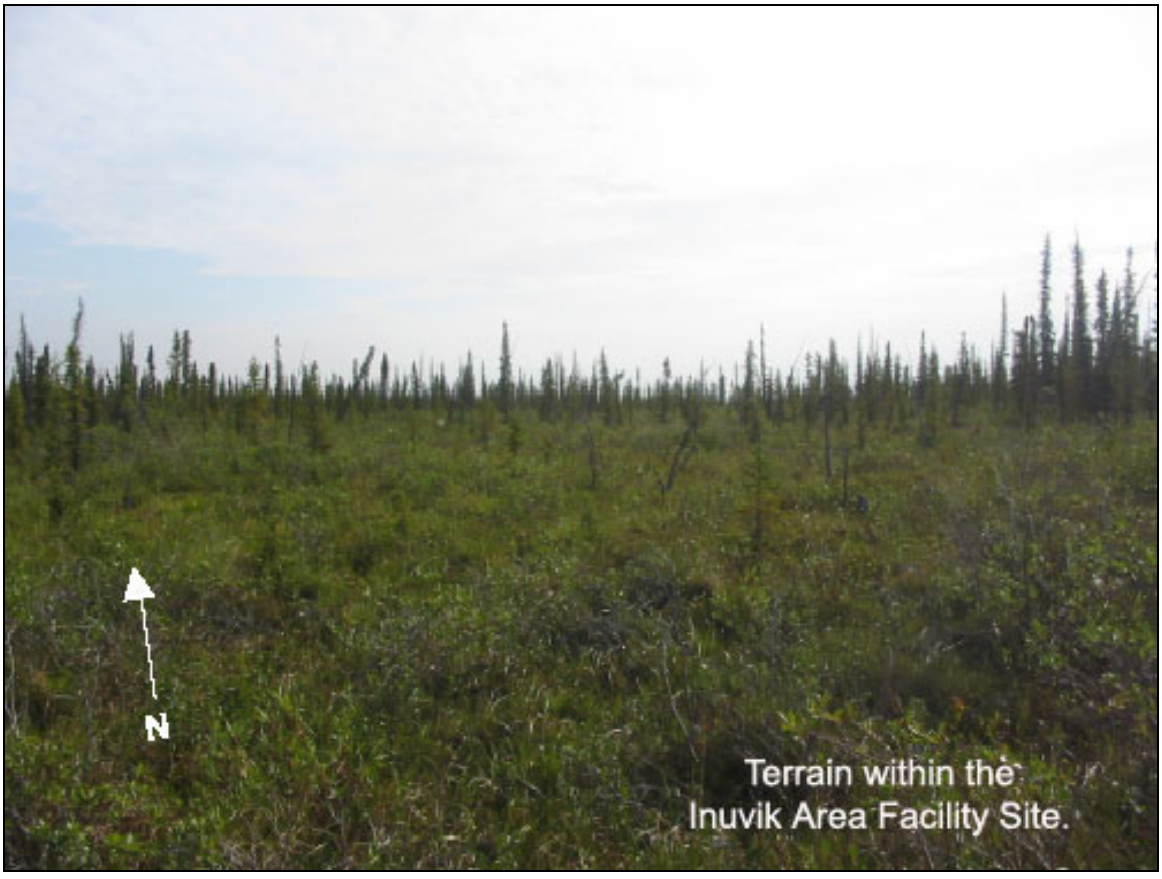

Figure 7-1: Site Photograph – Inuvik Area Facility

Figure 7.2 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.

Pile foundations will generally be used to support permanent buildings, modules, equipment supports, and pipe racks. Given the permafrost and soil conditions at the site, adfreeze type pilings will be drilled and frozen in place to support the Inuvik area facility components. Drilling rigs or truck-mounted drills will be used to drill the holes for the piling procedure. Tubular steel piles will be placed in the hole and the space between the pile and sides of the hole will be filled with a sand-and-water slurry mix. Once frozen, the pile will be solidly anchored in place.

Module Transportation

To reduce installation personnel requirements and length of time on site, most of the facility components will be fabricated into transportable modules in off-site shops. To the extent practical, pre-testing of the modules will be performed at these fabrication shops.

The modules will be transported by truck or rail to a staging area in Hay River where additional assembly and testing might be performed. The modules might be as large as 350 t for the Inuvik area facility.

Modules and other components will then be barged from Hay River to Inuvik. After unloading from the barge, modules will be staged in the nearby barge landing or equipment storage location and then transported to the Inuvik area facility, or potentially to the Campbell Lake infrastructure site for storage. Transport trailers will be used to transport modules.

Module Installation

When the modules are received at the site, they will either be initially stored at the infrastructure site or cranes will be used to set the modules onto previously installed pile foundations. Structural, piping, mechanical, electrical and instrumentation interconnections will be completed. Other facility components, such as yard piping and vessels, will be installed.

Equipment and Buildings

The equipment and buildings at the Inuvik area facility might be modular to facilitate construction. The gas processing facilities will include:

- liquids stabilization equipment
- liquids pumping equipment
- liquids storage units
- residue gas processing equipment
- gas compression equipment
- propane refrigeration equipment
- safety and control systems

- utility systems, including:
    - fuel gas conditioning and electrical power generation
    - flare system

Pipeline facilities and appurtenances will also be situated on the site, including:

- block valves
- pig receiver facility for the Storm Hills lateral
- pig launcher facilities for the NGL and gas pipelines
- slug catcher
- meter station for the NGL pipeline
- meter station for the gas pipeline

High-pressure sodium lights will be used for process buildings and external yard lighting. External lighting will be controlled to reduce light pollution, while providing enough light for safety and maintenance purposes. White lighting will be installed in the control and maintenance buildings.

Safety and Control Systems

The safety and control systems will include gas and smoke detection units, overpressure protection equipment, and an emergency shutdown system.

Site Testing and Commissioning

Commissioning and start up activities are scheduled to begin in early 2009 and be completed by year-end. Commissioning activities verify that equipment and systems are functioning according to the design and that the system is ready for operation. This includes energizing selected equipment and systems.

Testing will include pressure-testing facilities to ensure that they are free of leaks. Testing media being considered for the Inuvik area facility include heated water, water and freeze depressant mixture, air, and nitrogen.

Disturbed parts of the site that are not required during operations will be reclaimed.

Operations and Maintenance Activities

Operational control of the Inuvik area facility and gathering pipelines will be based in the Inuvik area facility. Personnel at the facility will include operations, maintenance, technical and administrative functions.

Every one to two years, major scheduled routine maintenance and repair activities will be required. This activity will cause a noticeable short-term increase in personnel, material and vehicular traffic.

Non-routine activities might also occur from time to time. This might involve the mobilization of crews and heavy equipment to the site, depending on the situation (see Section 3).

Access

An all-weather access road about 16.3 km long will be built to the site from the Dempster Highway about 18 km east of Inuvik. About 13.8 km of this access road will traverse Crown lands. Table 7-1 contains access road details. The access road will be constructed to accommodate the transportation of large facility modules, construction equipment and materials. See Section 3 for a cross-section of an all-weather access road. See the site-specific map in Figure 7-4 for access road alignment.

Table 7-1: Access Roads

Access Road Name	Kilometre Post (KP)	Land Use			Estimated Length (km)
		Municipal Length (km)	Private Length (km)	Crown Length (km)	
G-F-A – 0.0	0.0	-	2.5	13.8	16.3
Total Length of Facility Access Roads on GSA Crown Lands:				13.8	

ENVIRONMENT

The following topics provide specific biophysical and human environment setting effects and mitigation information for the Inuvik area facility. This information includes data gathered during the 2004 field studies.

Biophysical Environment

The Inuvik area facility will consist of a natural gas processing facility that will be installed in a 48 ha site, together with a 16.3 km access road in a 20 m wide road allowance running east from the Dempster Highway to the site.

Air Quality Setting

Air quality monitoring has been conducted near the Inuvik area facility. The climate was characterized based on available data from existing Meteorological Service of Canada (MSC) stations. Baseline air quality conditions in the area have been described in Section 8.

Air Quality Potential Effects and Mitigation

The primary source of project emissions in the GSA will be the continuous operation of emissions-producing equipment at the Inuvik area facility. Emissions

from the Inuvik area facility predicted during peak operations are summarized in Table 7-2.

Table 7-2: Predicted Emissions from the Inuvik Area Facility

Activity	Emissions					
	SO_2[a] (t/d)[f]	NO_X[b] (t/d)	CO[c] (t/d)	$PM_{2.5}$[d] (t/d)	Benzene (t/d)[f]	BTEX[e] (t/d)[f]
Compression	0.01	0.88	0.81	0.07	0	0
Power generation	0	0.16	0.09	0.01	0	0
Process equipment	0	0.27	0.24	0.02	0	0
Total[g]	0.01	1.31	1.15	0.09	0	0

NOTES:
[a]SO_2 - sulphur dioxide
[b]NO_X - oxides of nitrogen
[c]CO - carbon monoxide
[d]$PM_{2.5}$ - fine particulate matter
[e]BTEX - benzene, toluene, ethyl benzene and xylene
[f]Zero signifies values that are below the t/d limit.
[g]Numbers in this table have been rounded for presentation purposes. The sum of the numbers might add up to values different than the totals.

The figures in Table 7-2 represent the likely emissions following the implementation of mitigation measures. During the life of the project, there might be brief periods when it will be necessary to release gas into the atmosphere as a result of plant upsets and routine maintenance. There is also the potential for small volumes of gases, known as fugitive emissions, to be released from valves and fittings during project operations. As such, fugitive emissions are usually restricted to older operations and are expected to be very small given the modern design and configuration of this project. Therefore, fugitive emissions were not quantified in the air assessment.

Sulphur Dioxide

The natural gas produced from the anchor fields, and used as fuel at the Inuvik area facility, is sweet gas that is effectively free of sulphur compounds. Therefore, project sulphur dioxide (SO_2) emissions will be effectively zero. The air quality assessment has included SO_2 as a parameter to ensure regulator and stakeholder concerns are addressed.

Table 7-3 summarizes ground-level SO_2 concentrations predicted by dispersion models in the area of the Inuvik area facility, following implementation of mitigation measures. The predicted one-hour, 24-hour and annual SO_2 concentrations were well below Northwest Territories ambient air standards.

Table 7-3: Sulphur Dioxide Predictions at the Inuvik Area Facility

Parameter	Averaging Period Predictions[a]		
	One-hour	24-hour	Annual
Maximum sulphur dioxide (SO_2) concentration (µg/m³)	5.5	1.7	0.2
Distance to maximum[b] (km)	0.1	0.1	0.1
Direction to maximum[b]	WNW[f]	WNW[f]	WNW[f]
Expected occurrences exceeding standard[c]	0	0	0
Area exceeding standard[d] (ha)	0	0	0
SO_2 standards[e] (µg/m³)	450	150	30

NOTES:
[a]The predictions in the table include the effects of combined emissions from project sources in the northern airshed.
[b]Distance and direction are relative to the Inuvik area facility.
[c]The expected occurrences exceeding standard is the number of hours, days or years with predicted concentrations exceeding the applicable standards. It is the average of five years of modelling data, so it might not be a whole number.
[d]The area exceeding standard is the total area over which the predicted one-hour, 24-hour or annual concentrations exceeded the applicable standards.
[e]*Northwest Territories Ambient Air Standards* (GNWT RWED 2002).
[f] WNW - west northwest

Nitrogen Dioxide and Oxides of Nitrogen

Nitrogen dioxide (NO_2) and nitric oxide (NO) will be the primary oxides of nitrogen (NO_X) emitted from the combustion sources at the Inuvik area facility. The NO emissions can undergo chemical reactions in the atmosphere to form additional NO_2. Nitrogen dioxide is addressed because it is the only oxide of nitrogen that is regulated in Canada. However, the assessment does present predicted total NO_X concentrations, as these are required to determine the NO_2 concentrations. There are no air quality guideline values or objectives for NO_X.

Table 7-4 summarizes the NO_X and NO_2 concentrations predicted by dispersion models in the area of the Inuvik area facility following implementation of mitigation measures. None of the maximum one-hour, 24-hour or annual NO_2 predictions exceeds federal ambient air quality objectives.

Table 7-4: Nitrogen Dioxide and Oxides of Nitrogen Air Quality Predictions from the Inuvik Area Facility

Parameter	Averaging Period Predictions[a]		
	One-hour	24-hour	Annual
Maximum oxides of nitrogen (NO_X) concentration (µg/m³)	686.8	159.6	17.7
Maximum nitrogen dioxide (NO_2) concentration (µg/m³)	227.2	38.9	2.5
Distance to maximum[b] (km)	5.2	1.6	0.1
Direction to maximum[b]	NW[g]	WNW[h]	WNW[h]
Expected occurrences exceeding objective[c]	0	0	0
Area exceeding objective[d] (ha)	0	0	0
NO_2 objectives[e, f] (µg/m³)	400	200	100

NOTES:
[a]The predictions in the table include the effects of combined emissions from project sources in the northern airshed.
[b]Distance and direction are relative to the Inuvik area facility.
[c]The expected occurrences exceeding objective is the number of hours, days or years with predicted concentrations exceeding the applicable objectives. It is the average of five years of modelling data, so it might not be a whole number.
[d]The area exceeding objective is the total area over which the predicted one-hour, 24-hour or annual concentrations exceeded the applicable objectives.
[e]Federal *Ambient Air Quality Objectives* from the *Clean Air Act* (Environment Canada 1981).
[f]There are no Northwest Territories standards for NO_2.
[g]NW - northwest
[h]WNW - west northwest

Carbon Monoxide

Carbon monoxide (CO) can result from the incomplete combustion of fuels used at the Inuvik area facility. It is also a regulated compound. Table 7-5 summarizes the ground-level CO concentrations predicted by dispersion models in the area of the Inuvik area facility following implementation of mitigation measures. None of the predicted one-hour and eight-hour CO concentrations exceeds the Federal ambient air quality objectives.

Table 7-5: Carbon Monoxide Air Quality Predictions from the Inuvik Area Facility

Parameter	Averaging Period Predictions[a]	
	One-hour	Eight-hour
Maximum carbon monoxide (CO) concentration (µg/m³)	705.9	269.7
Distance to maximum[b] (km)	0.1	0.1
Direction to maximum[b]	WNW[g]	WNW[g]
Expected occurrences exceeding objective[c]	0	0
Area exceeding objective[d] (ha)	0	0
CO objectives[e, f] (µg/m³)	15,000	6,000

NOTES:
[a]The predictions in the table include the effects of combined emissions from project sources in the northern airshed.
[b]Distance and direction are relative to the Inuvik area facility.
[c]The expected occurrences exceeding the objective is the number of one-hour or eight-hour periods with predicted concentrations exceeding the applicable objectives. It is the average of five years of modelling data, so it might not be a whole number.
[d]The area exceeding objective is the total area over which the predicted one-hour or eight-hour concentrations exceeded the applicable objectives.
[e]Federal *Ambient Air Quality Objectives* from the *Clean Air Act* (Environment Canada 1981).
[f]There are no Northwest Territories standards for CO.
[g]WNW - west northwest

Fine Particulate Matter

Most airborne particles emitted from the Inuvik area facility during peak operations will be in the smallest size ranges. Therefore, they will be assessed using $PM_{2.5}$ as an indicator.

Table 7-6 shows maximum ground-level $PM_{2.5}$ concentrations predicted by dispersion models in the area of the Inuvik area facility following implementation of mitigation measures. All values are below the Northwest Territories ambient air standards.

Table 7-6: Fine Particulate Matter Air Quality Predictions from the Inuvik Area Facility

Parameter	Averaging Period Predictions[a]	
	24-hour	Annual
Maximum fine particulate matter ($PM_{2.5}$) concentration (µg/m³)	12.3	2.0
Distance to maximum[b] (km)	0.1	0.1
Direction to maximum[b]	WNW[f]	WNW[f]
Expected occurrences exceeding standard[c]	0	-
Area exceeding standard[d] (ha)	0	-
$PM_{2.5}$ standards[e] (µg/m³)	30	-

NOTES:
[a]The predictions in the table include the effects of combined emissions from project sources in the northern airshed.
[b]Distance and direction are relative to the Inuvik area facility.
[c]The expected occurrences exceeding standard is the number of days or years with predicted concentrations exceeding the applicable standards. It is the average of five years of modelling data, so it might not be a whole number.
[d]The area exceeding standard is the total area over which the predicted 24-hour or annual concentrations exceeded the applicable standards.
[e]*Northwest Territories Ambient Air Standards* (GNWT RWED 2002).
[f]WNW - west northwest

Benzene and BTEX Compounds

Volatile organic compounds (VOCs) can be released in small quantities from the incomplete combustion of fuel at facilities. Of the VOCs that could be released, this assessment focused specifically on benzene and BTEX, that is, the combination of benzene, toluene, ethylbenzene and xylene. Benzene and BTEX concentrations were included because of the perceived association between oil and gas operations and benzene and BTEX levels in the air.

Table 7-7 shows ground-level concentrations of benzene and total BTEX concentrations predicted by dispersion models in the area of the Inuvik area facility following implementation of mitigation measures. None of the predicted benzene or BTEX concentrations exceed the defined criteria.

Since ground-level concentrations of SO_2, NO_2, NO_x, CO, $PM_{2.5}$ benzene and BTEX are below applicable federal and territorial guideline levels in the GSA (as referenced previously in the tables), no detectable air quality effects are expected.

Table 7-7: Benzene and Total BTEX Air Quality Predictions at the Inuvik Area Facility

Parameter	Predicted Maximum Concentrations[a]	
	Benzene	BTEX
Maximum one-hour concentration (µg/m³)	0.1	1.2
Distance to maximum[d] (km)	0.1	0.1
Direction to maximum[d]	WSW[h]	WSW[h]
Expected occurrences exceeding criteria[e]	0	0
Area exceeding criteria[f] (ha)	0	0
Available criteria[g] (µg/m³)	30[b]	30[c]

NOTES:
[a]The predictions in the table include the effects of combined emissions from project sources in the northern airshed.
[b]*Alberta Ambient Air Quality Guidelines* (AE 2000).
[c]The *Alberta Ambient Air Quality Guidelines* (AE 2000) value for benzene was used for BTEX, as it is the most stringent of the available criteria for benzene, toluene, ethylbenzene and xylene.
[d]Distance and direction are relative to the Inuvik area facility.
[e]The expected occurrences exceeding criteria is the number of hours with predicted concentrations exceeding the applicable criteria. It is the average of five years of modelling data, so it might not be a whole number.
[f]The area exceeding criteria is the total area over which the predicted one-hour concentrations exceeded the applicable criteria.
[g]There are no Northwest Territories standards for benzene or total BTEX.
[h]WSW - west southwest

Increased Acid Input

Emissions of SO_2 and NO_X from Inuvik area facility operations have the potential to react in the atmosphere to form acid compounds that could affect the environment when deposited on soils, vegetation or into waterbodies. Potential increase in acid deposition because of the project has been evaluated by determining the expected sulphate and nitrate deposition, and from that, area potential acid input (PAI).

Table 7-8 summarizes predicted PAI values associated with Inuvik area facility emissions. Since the PAI levels predicted over the study areas are below the threshold for the most sensitive ecosystems, no detectable effects are expected because of PAI.

Table 7-8: Potential Acid Input Predictions at the Inuvik Area Facility

Parameter	Results[a]
Maximum potential acid input (PAI) (keq/ha/a)	0.1
Area PAI (keq/ha/a)[d]	0.004
Maximum sulphate deposition (kg/ha/a)	0.08
Maximum nitrate deposition (kg/ha/a)	6.06
Area with PAI >0.17 keq/ha/a (ha)[b]	0
Area with PAI >0.25 keq/ha/a (ha)[c]	0

NOTES:
[a]The predictions in the table include the effects of combined emissions from project sources in the northern airshed.
[b]0.17 keq/ha/a represents the monitoring load value for sensitive ecosystems as defined by CASA
[c]0.25 keq/ha/a represents the critical load value for sensitive ecosystems
[d]Area PAI represents integrated PAI levels over the entire 40,000 ha study area.

Increased Dust Deposition

Increased dust deposition will be caused by:

- facilities and rights-of-way construction
- extraction of borrow materials during construction
- vehicle movement along unpaved roadways

Dust deposition would be a localized effect, as most of the dust particles will be deposited quickly and near their sources.

Increased Greenhouse Gas Emissions

Greenhouse gas (GHG) emissions are mostly CO_2, CH_4 and N_2O, which can all be expressed as ECO_2, that is, equivalent carbon dioxide values. Facility operations, project infrastructure and associated traffic will all contribute to GHG emissions, but the contribution of the Inuvik area facility to GHG emissions is expected to be small and short-term.

Table 7-9 shows annual predicted GHG emissions from the Inuvik area facility.

Although the operation of the Inuvik area facility will result in noticeably increased GHG emissions in the NWT (about 35% based on year 2000 GHG levels), the increase in GHG emissions on a national level will be very low (about 0.07% based on year 2000 GHG levels).

Table 7-9: Annual Predicted Greenhouse Gas Emissions for the Inuvik Area Facility

Activity	Emissions			
	CO_2 (kt/a)	CH_4 (kt/a)[c]	N_2O (kt/a)[c]	ECO_2[a,b] (kt/a)
Compression	379.92	0.03	0.02	385.67
Power generation	43.96	0	0	44.62
Process equipment	118.55	0	0	119.67
Total[d]	542.43	0.04	0.02	549.96

NOTES:
[a] ECO_2 - equivalent carbon dioxide
[b] ECO_2 emissions were calculated using greenhouse potentials of one for CO_2, 21 for CH_4 and 310 for N_2O (Environment Canada 2002).
[c] Zero signifies values that are below the kt/a limit.
[d] Numbers in this table have been rounded for presentation purposes. Therefore, the sum of the presented numbers might add up to values different than the totals.

Noise Setting

Noise modelling has been conducted for the Inuvik area facility. Baseline conditions in the area have been described in Section 8.

Noise Potential Effects and Mitigation

Noise effects caused by normal operations at the Inuvik area facility are predicted to be about 40 dBA at 1.5 km, which meets regulatory guidelines (RWED 2002 and EUB 1999). Several process sources have been identified as noise contributing sources including compressors, pumps and generators, and piping and cooling units. Mitigating these operational noise effects will involve the use of sound reducing technology such as silencers, pipe insulation and upgraded building shells.

Soils, Landforms and Permafrost Setting

The Inuvik area facility lies within an extensive moraine plain between areas of rolling moraine to the west and organic veneers over moraine to the east. The region has a very gentle slope and locally has a weakly developed blanket slope drainage pattern. The site lies in a region of continuous permafrost and is characterized by soils of the Cryosolic Order.

A single soil test pit was excavated at the facility site. Orthic Eutric Turbic Cryosols were developed over the surficial parent material. The ground surface was level and was moderately well drained. The soil lacked mottling indicating that it is not water-saturated. The permafrost table was found at a depth of 60 cm in July 2004. The frozen layer contained up to 30% visible ice crystals.

The all-weather access road will be constructed over the moraine plain and link the facility with the Dempster Highway to the south. Moraine plains are imperfectly to poorly drained and have estimated frozen moisture contents of 80 to 100% by weight. The moraine plain lacks thermokarst lakes, although thermokarst is associated with organic covered areas to the east. The moraine plain does not display evidence of pre-existing thermokarst and an aerial survey of the route did not find evidence of patterned ground.

Soils, Landforms and Permafrost Potential Effects and Mitigation

The land surface near the facility is level and the soil is moderately well drained. As a result, the facility is unlikely to be sensitive to erosion or thaw settlement, but the construction of granular pads for the facility site will result in soil loss. The operation of the facility is not expected to change soil quality by altering the physical or chemical properties of the soil because of emissions. Effects on uncommon landforms are not expected for the all-weather access road crossing the gently sloping moraine plain.

A discussion of general project effects on soils, landforms and permafrost, some of which might occur at the Inuvik area facility or along the access road, as well as general mitigation strategies to offset these potential effects are outlined in Section 8.

Vegetation Setting

The facility site is located at the northern edge of the Transition Forest ecological zone. The vegetation at this site is predominantly black spruce/ground birch forest with some areas of black spruce/northern Labrador tea/lichen bog. Proposed access to the Inuvik area facility will cross areas of black spruce/ground birch, upland black spruce/lichen and black spruce/tamarack, and some areas of upland Alaska birch/spruce and riparian willow.

A rare plant survey (in black spruce/northern Labrador tea/lichen bog vegetation) and ecological land classification survey (in black spruce/ground birch vegetation) were completed at this site in 2004. Forested areas are characterized by scattered, short white and black spruce which forms an open tree canopy. Tall shrubs including ground birch, black spruce and shrubby and blue-green willow are a dominant component of the vegetation of this borrow site. Other commonly occurring understory species include red bearberry, sheathed sedge and dwarf scouring rush. Lowland areas are characterized by stunted black spruce and abundant shrub, bryophyte and lichen cover. Bog bilberry, northern Labrador tea and ground birch are common. No rare vascular plants were found in the survey.

Vegetation Potential Effects and Mitigation

The development of the Inuvik area facility and its associated access road will affect vegetation through clearing and mechanical damage of trees and shrubs,

burial of vegetation on the site by gravel, permanent changes in substrate with construction of pads, and potential changes in drainage around the site. Alteration of vegetation health through effects of dust will occur during construction, to a limited localized extent, primarily along the all-weather access road to the facility. Effects on vegetation resulting from facility construction activities will persist for the operations phase and are likely to extend into the far future (effect extends beyond 30 years past decommissioning and abandonment) given the slow rates of vegetation growth in the North. Vegetation growing in association with gravel pads will likely develop into plant communities differing from those existing before development. In addition, introductions of reclamation species and potential accidental introductions of invasive non-native plant species might occur.

Implementation of primary mitigation measures, as described in Section 8, will help reduce the magnitude of effects on vegetation at the Inuvik area facility and along the access road.

Wildlife Setting

Wildlife habitat at the Inuvik area facility is composed of young, open black spruce forest and shrub-dominated wetland. These habitat types are considered common in the study area. The dense shrub layer is composed primarily of ground birch while the ground layer is dominated by heath. Some standing water occurs on the site. No noteworthy wildlife habitat features were identified.

The access road to the Inuvik area facility crosses a mix of habitat types, including young and mature open black spruce forest (both upland and lowland slope positions), shrub-dominated wetland and riparian willow habitat. The black spruce and shrub wetlands are common in the study area, whereas the riparian willow habitat is uncommon. The mix of habitat types likely supports a number of wildlife species.

Moose was the only key wildlife species observed near the facility site during field surveys. Key species were species selected because of their importance in the subsistence economy or because they are listed as species of conservation concern or as species of particular ecological relevance. The facility site provides high quality foraging habitat for moose, grizzly bear and marten. No grizzly bear denning habitat was observed at the facility site.

Overall habitat quality for wildlife at the Inuvik area facility, based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, was considered moderate for both birds and mammals. The habitat types at this site are well represented in the study area.

The all-weather access road provides high quality habitat for barren-ground and woodland caribou, grizzly bear, beaver, scaup and lesser yellowlegs. Such habitat is widespread in the area. Habitat quality for key wildlife species, as determined

by the presence of key habitat features, such as percent cover of forage species, was rated higher along the access road than at the facility site (Table 7-10). No grizzly bear denning habitat was observed along the proposed access.

Overall habitat quality for wildlife along the access road based on habitat complexity and diversity, habitat rarity, proximity to disturbance, and wildlife species occurrence, was rated as moderate for both birds and mammals.

Table 7-10: Habitat Quality for Key Wildlife Species at the Inuvik Area Facility and the Associated Access Road

Group	Species	Habitat Use	Habitat Quality[a]	
			Inuvik Area Facility	Permanent Access Road
Mammals	Barren-ground caribou	Winter foraging	Moderate	High
	Woodland caribou	Winter foraging	Moderate	High
	Moose	Winter foraging	High	Moderate to high
	Grizzly bear	Fall foraging	High	High
		Spring foraging	High	High
		Denning	Low	Low
	Marten	Winter foraging	Moderate	Low
	Lynx	Winter foraging	Moderate	Low
	Beaver	Cover	Low	Low to high
		Foraging	Low	Low to moderate
Birds	Scaup	Nesting	Low	Low to high
	Peregrine falcon	Nesting	Low	Low
	Arctic tern	Nesting	Low	Low
	Lesser yellowlegs	Nesting	Moderate	Low to high
	Boreal chickadee	Nesting	Moderate	Low

NOTE:
[a]Habitat quality was determined by comparing the vegetation and terrain characteristics at each site to each species' habitat requirements (such as, shrub availability for moose).

Some species-at-risk, such as sensitive or threatened species might occur at the Inuvik area facility site or along the access. Species-at-risk that might occur based on habitat availability are summarized in Table 7-11.

Species with regulatory status designation are those that either COSEWIC or the Government of the Northwest Territories ranks as being sensitive to disturbance. They also include species listed under SARA and the IUCN – *Red List of Threatened Species.*

Table 7-11: Species-at-Risk that were Observed or that might Occur at the Inuvik Area Facility and All-Weather Access Road

Species	Status[b]			
	RWED[c]	COSEWIC[d]	SARA[e]	IUCN[f]
Grizzly bear (northwestern population)	Sensitive	Special concern	Schedule 3 – special concern[a]	Lower risk – least concern
River Otter	Sensitive	-	-	Lower risk – least concern
Wolverine	Secure	Special concern	Schedule 3 – special concern[a]	Vulnerable
Woodland caribou	Sensitive	Threatened	Schedule 1 – threatened	Lower risk – least concern
Northern pintail	Sensitive	-	-	-
Lesser scaup	Sensitive	-	-	-
Surf scoter	Sensitive	-	-	-
White-winged scoter	Sensitive	-	-	-
Golden eagle	Sensitive	-	-	-
Lesser yellowlegs	Sensitive	-	-	-
Boreal chickadee	Sensitive	-	-	-
Blackpoll warbler	Sensitive	-	-	-
American tree sparrow	Sensitive	-	-	-
White-throated sparrow	Sensitive	-	-	-
Harris' sparrow	Sensitive	-	-	-
Rusty blackbird	Sensitive	-	-	-

NOTES:
[a]Status is to be reassigned (i.e., potentially added to Schedule 1) pending results of public consultation, stakeholder consultation, and final ministerial approval.
[b]A hyphen indicates that no status has been assigned for this species.
[c]RWED – Resources, Wildlife and Economic Development
[d]COSEWIC – Committee on the Status of Endangered Wildlife in Canada
[e]SARA – *Species At Risk Act*
[f]IUCN – IUCN–The World Conservation Union

Wildlife Potential Effects and Mitigation

Mammals

The Inuvik area facility provides important habitat for a number of mammal species. This habitat is well represented in the study region. Although vegetation clearing will result in the loss of a small amount of habitat for key wildlife species, the willow riparian habitat is not common in the study area.

Sensory disturbance resulting from construction and facility operations will occur throughout the year and extend through the life of the project. Key wildlife species might be affected by this disturbance, resulting in displacement of some individuals. These effects will be localized, resulting in little or no effect on wildlife populations.

The Inuvik area facility provides low quality denning habitat for grizzly bear. As a result, it is unlikely that bears would den at the site, resulting in little risk of bear mortality during site clearing. However, bear mortality can result from attraction to human and industrial smells. Attraction of bears to the facility site will be reduced by enforcing strict waste and food management policies and preventing harassment or feeding of wildlife. These methods have been shown to reduce bear mortality at work sites.

The access road provides low quality denning habitat for grizzly bears. As a result, it is unlikely that bears would den along the access road, resulting in little risk of bear mortality during site clearing. Access road development could result in increased trapping of marten, lynx and beaver, and increased hunting and predation of caribou and moose. Year-round access could also facilitate hunting of grizzly bear during their active period. In addition, animals could be killed or injured in collisions with vehicles. Prohibiting recreational use of the access road by project staff while on the job site, and enforcing speed limits, will reduce potential wildlife mortality. Reclamation of the road following decommissioning of the facility site, if agreed upon through community consultation and development agreements, will reduce potential long-term mortality of wildlife.

Implementation of general mitigation measures, outlined in Section 8, will reduce effects on mammals during facility site and access road development and operations.

Birds

The Inuvik area facility provides moderate to high quality habitat for scaup, lesser yellowlegs and boreal chickadee. Clearing will result in the loss of 48 ha of habitat at the facility site. The amount of habitat loss is considered small compared to regional habitat availability for migratory birds in the immediate vicinity and in the GSA.

The all-weather access road provides moderate to high quality habitat for scaup, lesser yellowlegs and boreal chickadee. Clearing will result in the loss of 37 ha of habitat along the all-weather access road, including a small amount of riparian habitat. The habitat loss is small compared to regional habitat availability for migratory birds in the GSA. Clearing activities at the facility site and along the access road will primarily occur during the winter non-breeding season and, as such, will not destroy active bird nests. However, disturbances during spring and summer construction and because of operational activities, especially those not associated with normal day-to-day activities (which birds might habituate to),

might cause some birds to abandon nearby nests, resulting in egg mortality through predation or exposure. These disturbances are expected to occur infrequently and in localized areas, resulting in the loss of few, if any, nests during construction and operations. No federally-listed species-at-risk are known to nest near the facility site or its access road.

Summer construction or excavation at this site will have a greater effect on migratory birds than winter clearing, through both sensory disturbance and the removal of vegetation. Mitigation will reduce potential disturbance and destruction of any nest sites, particularly in May through July, and into August for waterfowl. Vegetation clearing should occur primarily before May to avoid critical bird nesting habitat. Where practical, a vegetated buffer on vegetation clearing around raptor nests, depending on the species, will be considered.

Sensory disturbance resulting from operation of the facility will occur throughout the year and extend through the life of the project. As a result, both migratory and resident bird species will be affected by noise and visual disturbances. These effects might result in the displacement of some birds from the immediate vicinity of work areas through the life of the project, resulting in limited long-term but local changes in habitat availability. However, only a small number of birds will be effected.

All-weather access road development could result in increased hunting of waterfowl and upland game birds near the road. However, the area does not support important staging areas for migrating waterfowl and therefore, effects will likely be minimal. Spruce grouse mortality might increase through vehicle collisions or roadside hunting, but the associated effects will not likely affect regional populations.

Implementation of general mitigation measures, outlined in Section 8, will reduce effects on birds during facility site and access road development and operations.

Hydrology Setting

The Inuvik area facility site and its access road are located within a 60 km^2 drainage area of an unnamed watercourse located about 100 m east of the Inuvik area facility.

Hydrology Potential Effects and Mitigation

Changes in runoff coefficients might occur because of the development of the Inuvik area facility. Runoff discharge and velocity will be greater in areas where vegetation has been removed and the land surface graded. The increased runoff coefficient resulting from operations at the Inuvik area facility is not expected to appreciably increase water levels in local waterbodies.

If all runoff from the facility is directed toward the unnamed watercourse to the east, the sediment concentrations in that watercourse could be increased. The increases in sediment concentration could be over 25 mg/L in mean annual concentrates or over 100 mg/L in short-term increases.

However, when assessed from the larger drainage basin that draws into Campbell Lake, the possible sediment increases are lower, in the range of 10 mg/L to 25 mg/L for mean annual concentrates or 50 mg/L to 100 mg/L for short-term increases.

Mitigation, such as the use of silt fences, sediment traps, and the directing of runoff through well-vegetated areas, will greatly reduce the amount of sedimentation entering into the watercourse and drainage basin. Following construction, the level of sedimentation will be substantially reduced, as surface disturbance will no longer be taking place.

Groundwater Setting

The facility site is located within the zone of continuous permafrost. The extent and depth of permafrost affects the distribution of groundwater. In areas of continuous permafrost, groundwater flow is seasonal and restricted to the active layer. Groundwater beneath the permafrost has little interaction with surface water or shallow groundwater.

Groundwater Potential Effects and Mitigation

Local alterations of surface water drainage patterns, because of the presence of surface facilities, might result in minor changes to groundwater flow patterns. The 16.3 km all-weather road might affect shallow groundwater flow in areas of low relief and poor drainage. These effects can be effectively managed by the implementation of the following mitigation measures:

- installing drainage culverts, as required
- re-establishing drainage where ponding occurs, when conditions are appropriate

Water Quality Setting

Water quality data for this site is expected to be similar to regional data for the GSA described in Section 8.

Water Quality Potential Effects and Mitigation

The Inuvik area facility might affect water quality through acid deposition, the release of treated domestic wastewater from the camp, leaks and spills, sediment releases from disturbed land, and changes in surface water flow and level

resulting from water withdrawals. There will be no untreated process water released to surface waters from the facility.

Modelled acid deposition rates resulting from Inuvik area facility emissions were negligible. Therefore, based on available information, no effects on lake water quality because of acid deposition are predicted.

Effects of the releases of domestic wastewater will be managed using water treatment and disposal techniques that will meet regulatory requirements.

Effects of small-scale leaks will be reduced through management practices, mitigation, contingency and emergency response plans. Therefore, effects are not expected from leaks.

The facility will disturb less than 1.0% of the drainage area of the unnamed watercourse to the east. Because of the small area of disturbance and the limited effects predicted on hydrology, no effects are expected on water quality from suspended sediment inputs or changes in surface water flow and level.

Fish and Fish Habitat Setting

There are no watercourses or waterbodies within 500 m of the Inuvik area facility that have potential for fish and fish habitat.

Fish and Fish Habitat Potential Effects and Mitigation

Potential effects of the construction and operation of the Inuvik area facility on fish and fish habitat would be related primarily to direct disturbance of fish habitat by activities associated with the development of the site and indirect effects resulting from sediment in runoff during construction and operation. However, the facility is more than 500 m from any waterbody with potential for fish and fish habitat. At this distance, no direct adverse effects on fish or fish habitat are expected to occur.

The topography of the site, maintaining a vegetated buffer zone between the site and local waterbodies, if required, and implementation of site-specific erosion and sediment control plans will inhibit sediment from the site from reaching surface waters.

Human Environment Setting

This topic provides information on protected areas and heritage resource settings at the Inuvik area facility. Regional information on the human environment setting, effects and mitigation is provided in Section 8.

Protected Areas Setting

The Inuvik area facility is located within the Campbell Creek Special Management Zone.

Protected Areas Potential Effects and Mitigation

The development of the Inuvik area facility site and its access road in the special management zone will result in a decrease in the land base available for other land uses within this area. The presence of a development within the zone will be a permanent change to the landscape.

Heritage Resources Setting

The Inuvik area facility site was inspected as part of the 2004 field reconnaissance program. No new heritage sites were recorded during the surface reconnaissance and no existing sites have been recorded in the immediate area. This location was considered to have low potential for the discovery of heritage resources.

Heritage Resources Potential Effects and Mitigation

Before development of this site, and if required, a Heritage Resource Impact Assessment will be conducted and provided to the Prince of Wales Northern Heritage Centre. If it is determined that the development will affect any heritage resources, mitigation plans will be prepared.

PUBLIC INVOLVEMENT

No concerns regarding the Inuvik area facility have been expressed by the local GSA communities in meetings or discussions with Imperial. The public involvement activities are documented in Section 10.

EQUIPMENT (PART 10)

The following tables show an estimate of the equipment that might be required at the Inuvik area facility. The exact list and numbers will not be known until immediately before construction. Table 7-12 lists site construction equipment. Table 7-13 lists the site operations equipment.

Table 7-12: Estimated Site Construction Equipment

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Trucks – 8	4x4 Pick-up and Crew cab	Personnel transport
Trucks – 2	4x4 Mechanic rig	Field mechanic
Ambulance – 1	4x4 and 4x2	First aid, med-evac
Trucks – 2	Fuel and Service S/A and T/A	Equipment fuelling
Truck – 1	Tandem water	Water hauling
Cranes – 4	Mobile 65 ton	Lifting and loading
Cranes – 2	Mobile 150 ton	Lifting and loading
Trucks – 20	Tandem dump – 18 m^3	Hauling earth
Trailers – 4	Warehouse van	Parts and supplies
Trailers – 4	Office skid	Administration
Trailers – 2	Mechanics/welders setup	Pipe welding and equipment repair
Buses – 6	36, 24 and 12 Pass. 4x2 and mini-bus	Personnel transport
Bulldozers – 2	Large sized bulldozer (405hp)	Earth moving
Mechanical ditchers – 1	Medium sized excavator	Excavation
Shelters – 4	Mechanized welders	Shelter welders
Loaders, FE – 2	Large sized loader (5.5 m^3 bucket loader)	Loading and excavation
Loaders, FE – 3	Large sized loader (5.5 m^3 bucket loader)	Loading and excavation
Grader – 1	Large sized grader (4.3 m blade)	Road and pad grading
Pumps – 4	Ditch, 3”	Ditch dewatering
Pumps – 4	Ditch, 2”	Ditch dewatering
Compressors – 10	150, 185, 350, 1,600 cfm	Pipe work, dewatering and testing
Radio – 1	Base	Communications
Radios – 45	Mobile	Communications
Propane tanks – 6	500 gallon	Propane storage
Light towers – 10	As required	Work area lighting

Table 7-12: Estimated Site Construction Equipment (cont'd)

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Generators – 8	6 kV	Power for hand tools and pumps
Tool cribs – 6	25-person	Tool storage
Welders – 6	300 amp portable diesel	Welding
Welders – 4	8 pack	Welding
Vibratory roller/packers – 2	As required	Compaction
Portable shelters – 4	20' by 20'	Shelter workers

Table 7-13: Estimated Site Operations Equipment

Type and Approximate Number per Site	Size, Model or Equivalent	Proposed Use
Truck – 1	4x4 Utility Vehicle	Personnel transport and hauling
Loader – 1	Large sized loader (5.5 m^3 bucket loader)	Loading and excavation
Crane – 1	As required	Lifting and loading
Truck – 1	Utility welder	Maintenance and repair
Mechanical ditcher – 1	Medium sized backhoe and loader	Loading and excavation

PERIOD OF OPERATION (PART 14)

Construction activities will take place year-round, at varying levels of activity, from 2006 to 2010 (see Section 3). The Inuvik area facility is expected to be in operation for 25 years or more.

LOCATION OF ACTIVITIES BY MAP COORDINATES (PART 16)

Map coordinates of the northwest corner of the facility site are given in Table 7-14. A map showing the location of the site is in Figure 7-4.

Table 7-14: Location of Activities by Map Coordinates

Latitude (DD)	Longitude (DD)	UTM Easting (m)	UTM Northing (m)	UTM Zone
68.4132	-133.3238	568818	7589867	8

FEES (PART 18)

The total land area required for activities contained in this section is 75.6 ha.

The land requirements are shown in Appendix A.

Figure 7.3 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.

Figure 7.4 has been moved to reduce file size. To view it, click on the link to the figure in the web page List of Figures for this document.