Mackenzie Gas Project
NEB Hearing Order GH-1-2004

WRITTEN EVIDENCE OF ENVIRONMENT CANADA

Submitted to
the National Energy Board
June 1, 2005

INTRODUCTION

The Department of the Environment (Environment Canada) has reviewed information filed by the Applicants in support of their applications pursuant to the *National Energy Board Act* and the *Canadian Oil and Gas Operations Act* to construct and operate the Mackenzie Gas project (MGP). The proposed project will include three onshore gas fields in the Mackenzie Delta area, the Mackenzie Gathering System, the Mackenzie Valley Pipeline and related facilities.

This submission presents Environment Canada's outstanding issues based on information provided in the applications as well as the supplemental information provided in the information requests in the National Energy Board process and the Joint Review Panel process. If any new or corrected information relative to the issues before the National Energy Board is brought forward by the Applicants or otherwise becomes available before or during the hearings, the comments, conclusions and recommendations provided in this submission may be reconsidered and amended accordingly.

Environment Canada's submission focuses on the management of air emissions from the MGP and on ensuring that the construction, operation and decommissioning of that portion of the MGP located within the Kendall Island Bird Sanctuary is undertaken in a manner consistent with the ecological sensitivity of this federal protected area.

Following this Introduction, the submission is divided into 4 parts: Chapter 1 provides an overview of Environment Canada's mandate; Chapter 2 provides specific comments and recommendations relating to air emissions; Chapter 3 addresses issues of concern relating to the Kendall Island Bird Sanctuary; and Chapter 4 summarizes the recommendations extracted from the text of Chapters 2 and 3. A list of potential witnesses and references are attached as Appendices to this submission.

Submitted on Behalf of Environment Canada:

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1.0 ENVIRONMENT CANADA'S MANDATE

Department of the Environment Act

1.1 The mandate of Environment Canada is defined by the *Department of the Environment Act* (*DOE Act*). This Act establishes Environment Canada as a department of the Federal government and delegates responsibility to the Minister for:

- Preservation and enhancement of the quality of the natural environment, including water, air and soil quality;
- Renewable resources, including migratory birds and other non-domestic flora and fauna;
- Water;
- Meteorology;
- Coordination of federal policies and programs respecting preservation and enhancement of the quality of the natural environment;
- The enforcement of Regulations regarding the management of trans-boundary waters between Canada and the U.S. as they relate to the preservation and enhancement of the quality of the natural environment; and
- The coordination of Federal policies and programs respecting the preservation and enhancement of the quality of the natural environment.

1.2 The *DOE Act* also states that Environment Canada has the mandated responsibility to advise Federal departments, boards and agencies on matters pertaining to the preservation and enhancement of the quality of the natural environment.

The Canadian Environmental Protection Act

1.3 Proclaimed on March 31, 2000, the goal of the *Canadian Environmental Protection Act* (*CEPA*) is to contribute to sustainable development through pollution prevention and the protection of the environment, human life and health from the risks associated with toxic substances. *CEPA* shifts the focus from managing pollution after it has been created to preventing pollution. *CEPA* provides the Federal government with tools to protect the environment and human health, establishes strict deadlines for controlling certain toxic substances, and requires the virtual elimination of toxic substances which are bioaccumulative, persistent and result primarily from human activity.

1.4 Substances that are declared "toxic" under *CEPA* are added to the List of Toxic Substances in Schedule 1 of the Act. *CEPA* establishes authority for Canada to enact regulations or other control instruments to manage toxic substances to reduce or eliminate their release into the environment.

The Migratory Birds Convention Act

1.5 The *Migratory Birds Convention* (*MBC*), between Canada and the United States, provides for the cooperative management of shared migratory birds populations on a continental basis. The Parties agree to manage migratory bird populations in accord with the following conservation principles:

- to manage migratory birds internationally;
- to ensure a variety of sustainable uses;
- to sustain healthy migratory bird populations for harvesting needs;
- to provide for and protect habitat necessary for the conservation of migratory birds; and
- to restore depleted populations of migratory birds.

1.6 Within Canada, the *MBC* is implemented through the *Migratory Birds Convention Act* (*MBCA*) and its Regulations. The *MBCA* provides for the protection of migratory birds and nests and for the creation of protected areas for migratory birds and the control and management of those areas. The *Migratory Birds Regulations* address the harvest and possession of migratory birds. The *Migratory Birds Sanctuary Regulations* provide for the establishment and management of migratory bird sanctuaries and the authority for the Minister to grant permits, subject to conditions, which in the opinion of the Minister are necessary to protect migratory birds or eggs, nests or habitat within a migratory bird sanctuary.

The Species at Risk Act

1.7 The *Species at Risk Act* (*SARA*) is intended to prevent endangered or threatened species or subspecies from becoming extinct or lost from the wild as a result of human activity and to help in the recovery of these species. It is also intended to manage species of special concern and to prevent them from becoming endangered or threatened. Most of *SARA* came into force in June 2003. The prohibitions came into force in June 2004.

1.8 With respect to species at risk, *SARA* provides for:

- assessment and legal listing;
- prohibitions relating to the collection or harassment;
- preparation of recovery strategies and action plans;
- protection of critical habitat;
- active management to prevent further endangerment

1.9 *SARA* includes general prohibitions against:

- the killing, harming, harassing of listed extirpated, threatened or endangered species or their residences; and
- the damage or destruction of the residences of individuals of a endangered or threatened species, or of an extirpated species where its reintroduction into the wild has been recommended; and
- the destruction of critical habitat of an extirpated, threatened or endangered species, as defined in a recovery strategy or action plan.

2.0 MANAGEMENT OF AIR EMISSIONS

2.1 The proposed Mackenzie Gas Project (MGP) will emit greenhouse gases such as carbon dioxide and methane from a mix of fugitive and combustion-related sources. These pollutants are important in the context of the issues of global warming and climate change.

2.2 Many of the same project components will also emit air contaminants such as nitrogen oxides (NO_x), fine particulate matter, carbon monoxide and volatile organic compounds (VOCs). These air contaminants can have direct impacts on human health, wildlife and vegetation. In addition NO_x and VOCs are precursors to the formation of secondary particulate matter and ozone. Finally, NO_x is also a contributor to acid rain.

2.3 Certain components of the MGP such as incineration and flaring may also lead to emission of toxic pollutants such as mercury and dioxins and furans. Depending on the composition of the produced gas, the project may also contribute to emissions of benzene.

2.4 Existing air quality in the project area is generally good. As such, Environment Canada's recommendations will focus on pollution prevention and the use of *Best Available Technology Economically Achievable* (BATEA) and *Best Management Practices* (BMPs) to minimize the degradation of air quality due to the new emissions sources associated with the MGP. The use of BATEA, BMPs and pollution prevention also applies to minimizing greenhouse gas emissions resulting from the project.

POLICIES AND COMMITMENTS RELEVANT TO THE MANAGEMENT OF AIR EMISSIONS FROM THE MGP

Federal Strategy on Pollution Prevention

2.5 The Federal government defines pollution prevention as:

> *The use of processes, practices, materials, products or energy that avoid or minimize the creation of pollutants and waste, and reduce overall risk to human health or the environment.*
>
> Pollution Prevention: A Federal Strategy for Action, 1995

2.6 Environment Canada's overall objective is to use this "anticipate and prevent" or "precautionary" approach to minimize the release of toxic substances and other pollutants. This, in turn, contributes to maintenance of biological diversity, allows conservation of ecological integrity over the

long term and thereby facilitates implementation of sustainable development.

2.7 Pollution prevention planning requires an organized, comprehensive and continuous improvement strategy to reduce the creation of pollutants and wastes. It includes improving process efficiency, substituting materials, improving housekeeping, conducting preventive maintenance, using "green management" practices and optimizing waste reduction, reuse and recycling.

2.8 Canada considers that pollution prevention should be a focus for the development and implementation of environmental policy. Preventive measures in many sectors of society have been demonstrated to be far more cost-effective than after-the-fact responses in mitigating adverse effects.

2.9 In applying pollution prevention to projects involving air emissions, Environment Canada advocates a holistic approach that recognises and addresses all environmental impacts at once (rather than focusing on one or two issues of concern). This offers the most effective means of protecting the environment and eliminating costly waste. Emissions can be reduced by four fundamental methods:

- Conservation -- the avoidance of energy use where possible;
- Efficiencies in energy production, and in the use of waste heat;
- Combustion and process modifications; or
- Back-end emission control.

2.10 The first three items relate directly to the principle of pollution prevention, while the fourth item represents mitigation of pollution that cannot otherwise be prevented. The pollution prevention concept is best served by maximising efforts on the first three items.

2.11 More details on pollution prevention measures applicable to minimizing greenhouse gas and air pollutant emissions from the MGP are provided in the section of this submission entitled *“Pollution Prevention Considerations in the Design and Operation of the MGP”*.

The Kyoto Protocol and the Climate Change Plan for Canada

2.12 There is increasingly strong scientific evidence that anthropogenic emissions of greenhouse gases (GHGs) are influencing the global climate. For example, the Intergovernmental Panel on Climate Change concluded in 2001 that:

In the light of new evidence and taking into account the remaining uncertainties, most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations.

IPCC Third Assessment Report - Climate Change 2001: The Scientific Basis (Summary for Policy Makers, 2001)

2.13 In the same report, The Intergovernmental Panel on Climate Change also concluded that the projected rate of change in the next 100 years is substantially greater than the 0.6°C warming observed over the past century.

2.14 Recognizing the threat posed by climate change, governments from the majority of the world's nations negotiated the *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, an agreement to reduce the emissions of GHGs from developed countries. Canada ratified the *Kyoto Protocol* in December 2002. The agreement came into force in February 2005. Canada's target under the *Kyoto Protocol* is a 6% reduction in GHG emissions from 1990 levels by the commitment period 2008 - 2012.

2.15 On April 13th, 2005, Canada released the 2005 Climate Change Plan, entitled *"Moving Forward on Climate Change: A Plan for Honouring our Kyoto Commitment"*. This document provides details on how Canada intends to meet its Kyoto targets.

2.16 Under the 2005 Plan the MGP would be considered a "Large Final Emitter". Large Final Emitters (LFEs) of GHGs include companies in mining and manufacturing, oil and gas and thermal electricity sectors.

2.17 LFEs will be assigned targets for emission reductions. Targets for new facilities such as the MGP will be based on BATEA performance standards, an approach which will assist in promoting technological advances and innovation. In addition, firms that achieve emission reductions beyond their targets will be able to sell emission reduction credits. This will provide further incentive for companies to continuously improve their emissions performance.

2.18 More details on pollution prevention measures applicable to minimizing greenhouse gas emissions from the MGP are provided in the section of this submission entitled *"Pollution Prevention Considerations in the Design and Operation of the MGP"*.

Canada-wide Standards for Particulate Matter and Ozone

2.19 Particulate matter (PM) and ozone are major components of smog. PM can be emitted directly from a variety of sources, or it may be formed in the atmosphere from chemical reactions involving precursor pollutants such as sulphur dioxide (SO_2), ammonia (NH_3), NO_x and VOCs. Ozone forms in the atmosphere from reactions involving NO_x and VOCs. PM and ozone have both been linked to human health effects. Recent scientific evidence indicates that there is no apparent lower threshold for the effects of these two pollutants on human health.

2.20 Recognizing the hazard to human health posed by PM and ozone, the Canadian Council of Ministers of Environment (CCME) agreed, in June 2000, to the *Canada-wide Standards (CWS) for PM and Ozone*. The CWS represent a balance between the desire to achieve the best health and environmental protection possible in the relative near term, and the feasibility and costs of reducing the pollutant emissions that contribute to elevated levels of PM and ozone in ambient air.

2.21 The PM and Ozone CWS commit governments to meet specified ambient levels of $PM_{2.5}$ and ozone as follows:

- for $PM_{2.5}$ - 30 μ/m^3 averaged over 24 hours, to be achieved by 2010;
- for ozone - 65 ppb averaged over 8 hours, to be achieved by 2010.

2.22 In addition to the numeric standards, the CWS also contain provisions that commit CCME jurisdictions to undertake the implementation of Continuous Improvement, Pollution Prevention, and Keeping Clean Areas Clean programs in areas with ambient concentrations lower than the CWS levels in accordance with the guidance provided in Annex A of the CWS for PM and Ozone. Specifically, jurisdictions recognised that polluting “up to a limit” is not acceptable and that the best strategy to avoid future problems is keeping already-clean areas clean. Jurisdictions are expected to work with their stakeholders and the public to establish programs that apply pollution prevention and best management practices, by, for example:

- developing and implementing strategies consistent with the CCME commitment to pollution prevention;
- ensuring that new facilities and activities incorporate the best available economically feasible technologies to reduce PM and ozone levels;
- requiring that upgrades carried out in the course of normal capital stock turnover incorporate the best available economically feasible technologies to reduce PM and ozone levels; and
- reviewing new activities that could contribute to an increase in PM and ozone level with stakeholders and the public in terms of their

social, economic and environmental merits.

2.23 The CCME jurisdictions are currently developing a guidance document for implementing Continuous Improvement / Keeping Clean Areas Clean programs.

2.24 Although numeric achievement of the PM and Ozone CWS is only required in urban areas of over 100,000 inhabitants, several jurisdictions, including the Northwest Territories, have adopted the CWS numerical standards as ambient air quality guidelines that define the minimum level of air quality to be met in all areas of the jurisdiction. The pollution prevention, Continuous Improvement, and Keeping Clean Areas Clean provisions are intended to apply throughout the jurisdictions, not just in urban areas with populations over 100,000.

2.25 To meet the intent of the CWS for PM and Ozone, Environment Canada recommends that the MGP should be designed and operated using pollution prevention principles and best available economically feasible technologies to appropriately manage the emissions of PM and of precursors to PM and ozone.

Canada-wide Acid Rain Strategy for Post-2000

2.26 Acid deposition is the end product of reactions between sulphur dioxide (SO_2), nitrogen oxides (NO_x) and water in the atmosphere. Atmospheric acid may reach the Earth's surface in precipitation (acid rain) or in particles or gas (dry deposition). Acid deposition reduces the biodiversity of aquatic ecosystems and has the potential to alter the composition of species in terrestrial ecosystems. Anthropogenic emissions of SO_2 and NO_x from sources such as base metal smelting, thermal electric power generation, upstream oil and gas, and transportation are the primary contributors to acid deposition.

2.27 In October 1998, CCME ministers signed the *Canada-wide Acid Rain Strategy for Post-2000*. The primary long-term goal of the Strategy is "to meet the environmental threshold of critical loads for acid deposition across Canada".

2.28 As steps towards the achievement of this goal, the Strategy calls for a number of actions, including:

- pursuing further emission reduction commitments from the United States;
- establishing new sulphur dioxide (SO_2) emission reduction targets in eastern Canada;

- preventing pollution, and keeping “clean” areas clean;
- ensuring the adequacy of acid rain science and monitoring programs; and
- annually reporting on SO_2 and nitrogen oxide (NO_x) emissions and forecasts, on compliance with international commitments, and on progress in implementing the Strategy.

2.29 To meet the intent of the *Canada-wide Acid Rain Strategy*, Environment Canada recommends that the MGP should be designed and operated using BATEA and BMPs to appropriately manage the emissions of SO_2 and NO_x.

Canada-wide Standards for Mercury Emissions

2.30 Mercury is a naturally occurring substance, which is transformed through biological processes to methyl mercury, a persistent substance which bioaccumulates in the food chain and is particularly toxic to humans and wildlife. Mercury levels originate from a combination of naturally-occurring mercury and anthropogenically emitted mercury. Levels in any one region reflect variable combinations of local, regional and even global sources. Approximately sixty percent of the mercury entering the ecosystem is from anthropogenic sources.

2.31 Recognizing the hazard posed by anthropogenically emitted mercury entering the food chain, the CCME ministers agreed in June 2000 to the *Canada-wide Standards (CWS) for Mercury Emissions*. The CWS set limits for mercury emissions from several sectors, including incinerators.

2.32 Incinerators operating at construction work camps and other facilities in the MGP have the potential to emit mercury. Environment Canada recommends that any incinerators used in the MGP should be required to meet the emission limits in the Mercury CWS.

Canada-wide Standards for Dioxins and Furans

2.33 Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), commonly known as dioxins and furans, are toxic, persistent, bioaccumulative, and result predominantly from human activity. Due to their extraordinary environmental persistence and capacity to accumulate in biological tissues, dioxins and furans are slated for virtual elimination under *CEPA*, the federal *Toxic Substances Management Policy (TSMP)* and the CCME *Policy for the Management of Toxic Substances*.

2.34 Recognizing the hazard posed by dioxins and furans entering the environment, the CCME ministers agreed, in May 2001, to the *Canada-wide Standards (CWS) for Dioxins and Furans*. These standards set limits for dioxin and furan emissions from several sectors including incinerators.

2.35 Incinerators operating at construction work camps and other facilities in the MGP have the potential to emit dioxins and furans. Environment Canada recommends that any incinerators used in the MGP should be required to meet the emission limits in the CWS for Dioxins and Furans.

Canada-wide Standards for Benzene

2.36 Benzene is a non-threshold toxicant – a substance for which there is considered to be some probability of harmful effects at any level of exposure. On the basis of available data, benzene is carcinogenic to humans.

2.37 Recognizing the benefits of reducing ambient levels of benzene, the CCME ministers agreed in, June 2000, to the *Canada-wide Standards (CWS) for Benzene*. In September 2001, the CCME ministers further agreed to Phase 2 of the CWS for Benzene. The Companion Document to the CWS for Benzene contained commitments to reduce emissions of benzene from several sectors.

2.38 Glycol dehydrators used in the upstream oil and gas industry have the potential for emitting benzene into the environment. Environment Canada recommends that, should the MGP employ glycol dehydrators for gas conditioning, BATEA and BMPs should be employed to reduce benzene emissions.

POLLUTION PREVENTION CONSIDERATIONS

2.39 A number of pollution prevention measures could be incorporated in the design and operation of the MGP. Measures that increase the overall system efficiency by reducing the fuel required to operate the project, that reduce the amount of gas lost to venting and fugitive emissions, or that find uses for the waste heat from project facilities have the potential to reduce both GHG and air pollutant emissions.

NO_x and GHG Emissions from Gas Turbines

2.40 A large proportion of GHG and NO_x emissions from operating the proposed gas processing and pipeline facilities will come from the fuel consumed by compressor units (21 units, roughly 250 MW). Thus, station design and the choice of efficient, low emission gas turbine drivers are important, and are affected by the following:

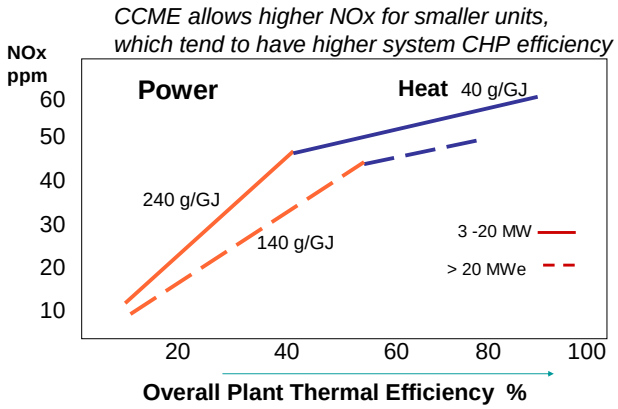
- fuel thermal efficiency, baseload and transient operation;
- number of units and engine size, to optimize efficiency over the operating range;
- minimizing station auxiliary and parasitic losses;
- seasonal low-flow gas compressor wheels;
- pipeline gas temperatures controlled by aerial coolers and heat exchangers;
- NO_x emission levels, and proven Dry Low NO_x (DLN) combustor experience;
- engine reliability, and pipeline system operational stability

2.41 Most modern gas turbine engines have Dry Low NO_x (DLN) combustors that reduce NOx emissions by 70-90% from uncontrolled levels of about 200 parts per million (ppm), or 3 kg/MWhr.

2.42 The 1992 *National Emission Guidelines for Stationary Combustion Turbines* published by the CCME, promotes reasonable prevention technology to achieve a sizeable reduction in NO_x emissions. Energy efficiency and the minimization of CO_2 emissions were deemed to be important in the derivation of the standards, as well as considerations of operational reliability and cost-effectiveness. The CCME Guideline uses an energy output basis, with NO_x levels directly tied to the overall demonstrated plant efficiency for both power and waste heat utilization to actively promote cogeneration and Combined Heat & Power.

2.43 In promoting high efficiency and pollution prevention, there is generally no need to require ultra-low NO_x emissions which would require the installation of post combustion controls such as selective catalytic reduction (with its associated difficulties with ammonia transport and storage, toxics and particulate emissions, and reduction in overall system efficiency). The CCME Guideline reflects levels in the 25 - 50 ppmv range for most units, levels which are achievable with DLN combustors.

CCME Gas Turbine Guideline



2.44 There may be some gas turbine engine reliability compromises if the lean premix combustors are designed for NO_x concentrations which are too low (much less than 0.4 kg/MWhr). Lower reliability can result in an increased number of unit and station blowdowns, and flaring and venting in upstream gas production, releasing significant amounts of methane GHGs. Therefore the environmental objectives of the system should be treated as a set of sometimes diverging factors, which should be optimized in overall system design from wellhead to delivery point.

2.45 The Applicants have confirmed that proposed gas turbine units will be chosen to meet or exceed the CCME guideline. The 18 small gas turbine engines in the 3-20 MW size range must meet a 240 g/GJ of power CCME limit (0.86 kg/MWhr, or about 30-40 ppm depending on efficiency). The three larger units in Inuvik and Taglu must meet the more stringent 140 g/GJ level, (0.5 kg/MWhr).

2.46 The Applicants have further confirmed that several reciprocating engines proposed for local power generation (about 10 MW total) will meet or exceed the Alberta requirements for reciprocating engines set out in EUB Guide 56. These requirements specify NO_x emissions of no more than 6 kg/MWhr for these small units.

Waste Heat Recovery

2.47 System efficiency for gas processing and pipelines is important in minimizing GHGs and conserving valuable natural gas fuel. Where opportunities exist for capturing and using the waste energy from high temperature gas turbine exhaust, these should be maximized for compression, electricity generation or thermal heating purposes. Process plants and nearby communities can often use much of the steam or hot water heat for some opportunities. Without providing details, the Applicants have indicated that some degree of waste energy use will be incorporated into the Inuvik gas processing facility. Although opportunities for waste heat recovery are unlikely to be present at some sites, other opportunities for cogeneration or district energy should continually be investigated and implemented where feasible.

Operational Methane Emissions

2.48 GHG emissions from methane fugitive leaks and venting may make up a significant proportion of total project GHG emissions. Methane has a global warming potential 21 times greater than CO_2. Coupled with the high economic value of natural gas, GHG emission reduction brings added priority to providing efficient and "tight" systems. Methane leakage averages about ½ percent for gas production and delivery for a normal 1000 km long transmission system in Canada. Substantial mitigation can be cost effectively done to prevent up to 80% of "uncontrolled" methane leakage, blowdowns and venting.

2.49 Piping valves and fittings have a small amount of leakage which can be minimized by regular maintenance checks, leak surveys and component repair. Most methane emissions stem from a small number of larger sources within the processing or compression facilities and from compressor station trips and transient stops and starts. Leakage prevention efforts can often pay for themselves in reduced gas loss, and are also important for safety purposes.

2.50 The gas turbine engine starter systems can be electric or compressed air starting, rather than the traditional gas expansion starters (which cause venting of methane during each start). This is also greatly affected by the overall system reliability, which if maximized can reduce the number of annual stops and starts of the compressor sets. Therefore the scheduling of pipeline pigging inspections, maintenance, as well gas turbine reliability, (sometimes traded off against high efficiency or ultra-low NO_x emissions) can be important for methane GHG mitigation and prevention of upstream flaring activities in production and processing.

2.51 The Applicants have indicated the use of several options to address methane fugitive prevention, and overall system reliability and gas control functions to avoid operational pipeline upsets. These include dry gas seals on compressors, unit isolation valve systems, optimized maintenance and pigging scheduling, statistical or computational leak detection, aerial surveys, line break controls, operator training and an emergency response plan.

Pipeline Repair and Modifications

2.52 Pipeline repairs may have to be made for various reasons, as permafrost and geotechnical conditions may present new challenges. About 3/4 of total operational methane releases can stem from blowdown or venting release of large pipeline valve sections during repairs. These releases can be large if long valve sections of 50-100 km must be emptied for safe repair or maintenance. The evacuation of the high pressure gas into the next valve section can normally be done by using a mobile gas transfer compressor; although the Applicant has indicated that this would be impractical in the remote inaccessible location of the MGP. Operational contingency plans for line pigging and maintenance should consider the avoidance of system blowdowns.

2.53 Sometimes a new gas service is needed, necessitating a connection to an existing line, with a valve section blowdown. To avoid this situation, the company has indicated that it will pre-install “tees” during initial construction, with a valve system, for future gathering lines and compressor stations. The extra cost of doing this can prevent an expensive and GHG intensive operation in the future.

2.54 The Applicants have said that they will develop procedures for hot-tapping, which allows for welding onto a live pressurized line. Recent advances in metallurgy, “buttering” welding and hot tap equipment have made this safer than in the past.

Detailed Design Submission on Pollution Prevention Measures

2.55 Environment Canada has reviewed the applications and the IR Responses relating to air pollution and GHG emissions for the proposed MGP and possible pollution prevention measures to minimize these emissions. While the Applicants have addressed pollution prevention measures in a general sense, it is recognized that at this stage the final detailed design choices are still being considered.

2.56 Environment Canada recommends that before commencement of pipeline construction, the Applicants should be required to provide a more detailed

submission on final design choices regarding compressor facilities and pipeline operation, addressing the following;

i) a compilation of all of the measures to mitigate methane leakage and venting throughout the system, from gas processing, compressor stations and the mainline piping and valve systems; taking into account new best practices under development in the natural gas industry;
ii) details on how overall system operation optimization and maintenance scheduling would be done to maximize system reliability and safety and to minimize methane releases;
iii) details on design choices for the Inuvik gas processing plant for the capture of exhaust energy; and
iv) details on the various compressor stations regarding unit size, efficiency and conformity with the CCME *National Emission Guidelines for Stationary Combustion Turbines*.

CONCLUSION – MANAGEMENT OF AIR EMISSIONS

2.57 The MGP will increase Canadian emissions of GHGs. The MGP will also emit air pollutants in an area of Canada that currently has generally clean air due to low population density and lack of large emission sources. The increase in both GHGs and air pollutants can be minimized to the extent possible by a pollution prevention approach as outlined in this submission, and by the use of BATEA and BMPs to meet the intent of the various Canada-wide Standards.

3.0 THE KENDALL ISLAND BIRD SANCTUARY

3.1 The Kendall Island Bird Sanctuary (KIBS) is created in PART X of the *Migratory Birds Sanctuary Regulations*. It is one of 5 sanctuaries in the NWT. The KIBS lies within the northeastern section of the Mackenzie Delta. In order to understand the value of the KIBS as a migratory bird sanctuary, it is important to set the regional context by discussing the entire Mackenzie Delta.

3.2 The Mackenzie Delta includes the area stretching from Point Separation in the south, to Richards Island in the northeast, and to a point 15 km west of the Northwest Territories/Yukon border in the west (Figure 1). The Delta covers an area of >14,250 km^2 and contains approximately 25,000 lakes. The Delta is one of the most important breeding, moulting, and staging areas for waterfowl in North America. In studies by Latour et al (in press) and Alexander et al (1991) the Mackenzie Delta was identified as a Key Habitat Site. A “Key Habitat Site” is a site that supports at least one percent of the national population of a migratory bird species for any portion of its annual cycle.

Migratory Birds in the Mackenzie Delta

3.3 The islands of the outer Delta are important staging grounds from late August to late September for geese. Large numbers of **Lesser Snow Geese** congregate in this area for short periods, prior to southward migration. Counts in early to mid-September 1990-93 averaged 38,600 Lesser Snow Geese, but as many as 95,000 birds were present during one survey. Estimates in 1973, 1974, and 1976 averaged 15,000 adults and 10,000 young and were an estimated 1% of the Canadian breeding population at that time. However, in years when the Yukon and Alaskan North Slope was snow-covered, up to 10% of the Canadian breeding population have staged for extended periods in the Delta (in 1975, 152,350 adults and 170,650 young used this area).

3.4 The Fall migration route of Lesser Snow Geese leads from Banks Island to the mainland and across the Mackenzie Delta to the North Slope of Yukon and Alaska. In mid-September, the geese return eastwards towards the Mackenzie Delta before heading south. Given the turnover of migrating geese moving through the area, it is probable that most of the Western Arctic Population of Lesser Snow Geese uses the Mackenzie Delta at one time or another (>10% of the Canadian population of Lesser Snow Geese).

3.5 In 1990-93, peak numbers of **Greater White-fronted Geese** ranged from 10,500 to 21,147 (>1 % of the mid-continent Greater White-fronted Goose population). Between 1973 and 1976, peak numbers of staging Greater White-fronted Geese ranged from 12,500 to 23,700 birds (possibly as much as 5% of the mid-continent population at that time).

3.6 In 1990-93, peak fall counts of **Canada Geese** ranged from 1,645 to 8,527 birds. Peak numbers would have exceeded 5% of the short-grass prairie population during some years.

3.7 It is likely that a large proportion of the Canadian **Black Brant** population migrates west through the outer Mackenzie Delta in Fall, but it appears that stopovers are short in duration. From 1990-93 the highest count of Brant was 3,533. During 1973 to 1976, the largest number during one survey was 6,112. The peak counts would have made up as much as 20% of the Canadian population of this subspecies.

3.8 In 1990-93 peak numbers ranged from 6,046 to 9,714, representing about 10% of the Eastern Population of **Tundra Swans**. From 1973 to 1976, peak Fall numbers of Tundra Swans ranged from 1,900 to 3,100 adults and young. Swans concentrate around Mallik Bay, Swan Channel, the outer section of the Kendall Island Bird Sanctuary, and near Shallow Bay. The Swan Channel area supports the densest concentration of nesting swans in the Delta. Up to 200 nesting pairs and 1,100 non-breeding adults occur there annually.

3.9 A diverse assemblage of ducks showing arctic, boreal, and more southerly affinities occurs in the Mackenzie Delta each summer. Annual surveys carried out by the U.S. Fish and Wildlife Service indicate that during the 1990's an average of over 270,000 ducks were present in the Delta during June of each year. During that period, an average of over 1% of the continental population of at least five species occurred in the Delta. These species include:

- American Wigeon,
- Lesser Scaup,
- Canvasback,
- White-winged Scoter, and
- Long-tailed Duck.

In addition, over 1% of the continental population of seven other species of ducks occurred in the Mackenzie Delta in some years.

3.10 In addition to waterfowl, the Mackenzie Delta hosts a variety of waterbirds. Aerial surveys conducted in 1991-93 suggest that >1% of the Canadian

populations of several species occurred within the Delta. These species include:

- Sandhill Cranes,
- Glaucous Gulls,
- Red-throated Loons, and
- Pacific Loons.

3.11 Nine species of shorebirds breed regularly in the Mackenzie Delta and another two species occur infrequently. The most favourable habitat is found in the outer Delta where extensive tundra (e.g., low centre polygons, wet sedge lowland) occurs. Annual flooding over some parts of the Delta has resulted in a lack of ground cover that may limit shorebird numbers in these areas. However, the sheer amount of suitable habitat in the Delta gives it importance as a shorebird breeding area. Approximately 60,000 breeding shorebird pairs use the outer Delta annually. Densities of shorebirds nesting in part of the outer Delta averaged over 30 birds/km^2 and, thus, local breeding numbers would have exceeded 1% of the Canadian population for several species including Hudsonian Godwit, Whimbrel, Stilt Sandpiper, Red-necked Phalarope, Common Snipe, and American Golden Plover.

3.12 Little is known about the abundance and distribution of shorebirds in the middle and southern Delta but good numbers are expected to occur there because of the abundance of wetland habitat near the multitude of small ponds and lakes. Significant numbers of shorebirds migrate through the Delta in fall but the exact extent of use is not known.

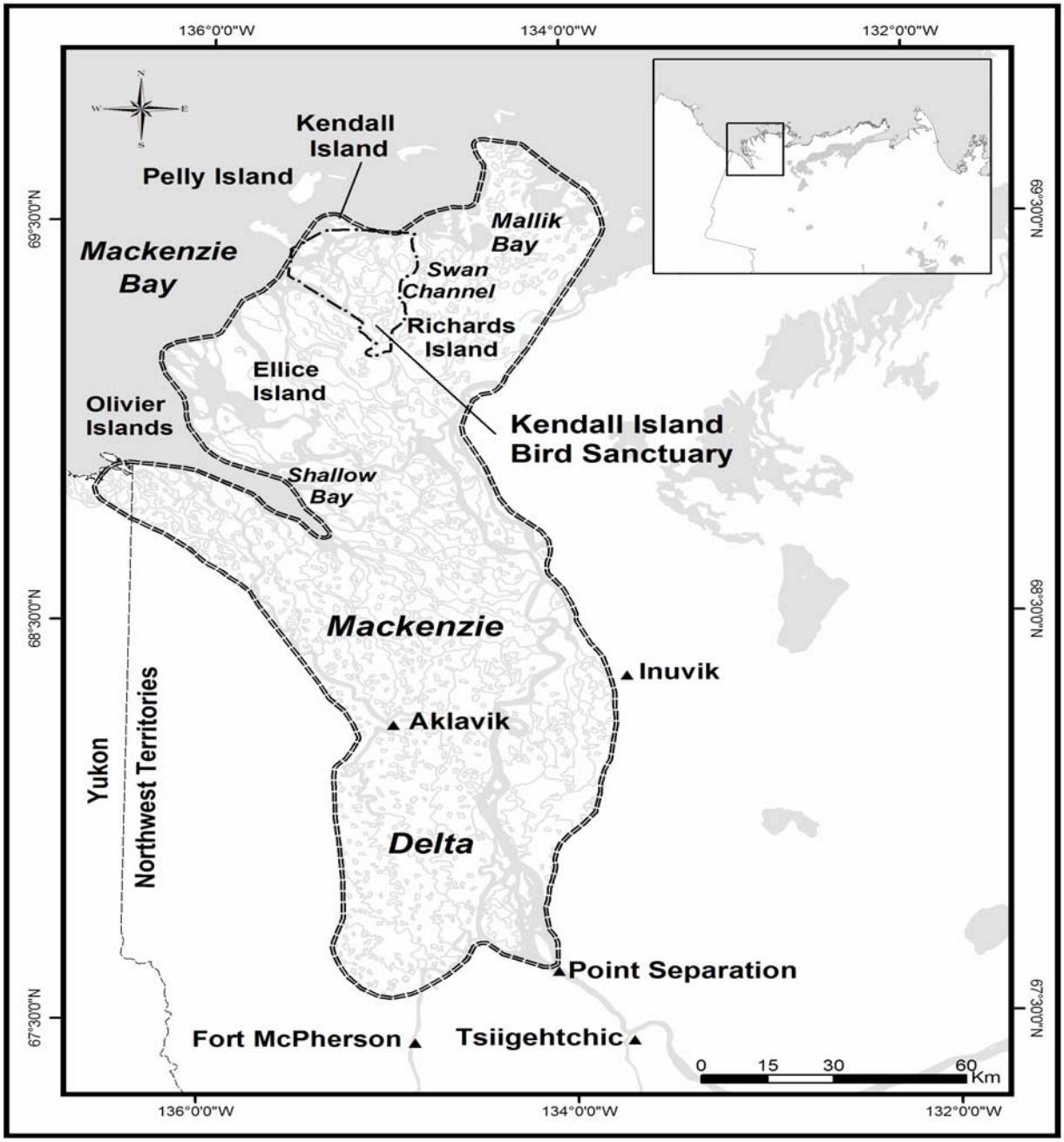


Figure 1. Location of Kendall Island Bird Sanctuary within the Mackenzie Delta Key Habitat Site.

MIGRATORY BIRDS SANCTUARIES - KIBS

3.13 Adequate habitat (both quantity and quality) is fundamental to the welfare of all wildlife species. Loss of habitat is the single greatest threat to wildlife in general and species at risk, in particular. Migratory Birds Sanctuaries are established to protect important habitats for migratory birds.

3.14 The KIBS is situated in the outer margin of the Mackenzie Delta (Figure 2). The KIBS protects 623 square kilometres of habitat. This represents about four percent of the Mackenzie Delta.

3.15 The KIBS was established in 1961 to protect a colony of Snow Geese, which occurs on Kendall Island, as well as the numerous other species of migratory birds which breed and nest within its boundaries.

Migratory Birds in the Kendall Island Bird Sanctuary

3.16 Over 90 bird species, including songbirds, waterfowl, shorebirds, and other aquatic birds, have been recorded within the KIBS. KIBS serves two primary functions – it provides breeding habitat for a variety of species and it provides staging habitat for the large regional aggregations of certain species which pass through this area during Autumn.

3.17 Thousands of Snow Geese, Canada Geese, Greater White-fronted Geese, Brant, Tundra Swans, other waterfowl, and shorebirds stage in the outer Mackenzie Delta in late summer and fall. As these species are highly mobile during the staging period, and move back and forth between the Sanctuary and the surrounding area, it is not possible to assign estimated numbers to KIBS. The Sanctuary is a key part of the much larger Delta which supports thousands of staging birds during the autumn months.

3.18 Since the 1950's, the number of Snow Geese nesting in the KIBS has ranged from nearly zero to 8,300. The actual numbers nesting are highly dependent on spring weather conditions, flooding, and the presence of grizzly bears which destroy many nests. From 1995-2001, the number of nesting geese averaged 1,120 birds and the total number of geese associated with the colony (including non-breeders) averaged 2,470.

3.19 Environment Canada's current estimates of the breeding species which occur in the KIBS include:

- Lesser Snow Goose 3000
- Greater White-fronted Goose: 2700
- Canada Goose 460
- Sandhill Crane 800
- Tundra Swans 1000
- Dabbling ducks 3000
- Diving ducks 2000
- Arctic Terns 875

Species at Risk in the Kendall Island Bird Sanctuary

3.20 The *Species at Risk Act* (*SARA*) lists four distinct classifications for organisms: extirpated, endangered, threatened and special concern. Species that have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) are considered by the Federal government and may be added to Schedule 1 in *SARA*. There are currently four species or subspecies of birds listed in the *SARA* Schedules that have been known to occur in the KIBS.

3.21 The **Eskimo Curlew** is listed as "Endangered" in Schedule 1 is therefore protected under SARA. Six Eskimo Curlews were sighted in the Sanctuary in 1985.

3.22 The **Peregrine Falcon** has been recorded within the Sanctuary. Both Peregrine subspecies (*anatum and tundrius)* have range distributions that include the KIBS. Both subspecies have been assessed by COSEWIC (*anatum* May 2000; *tundrius* 1992) and are listed as "Threatened" (Schedule 1) and "Special Concern" (Schedule 3) of SARA respectively.

3.23 The **Short-eared Owl** occurs in the Mackenzie Delta and KIBS. It was assessed as a species of "Special Concern" by COSEWIC in 1994 and is listed as a species of "Special Concern" in Schedule 3 of *SARA*.

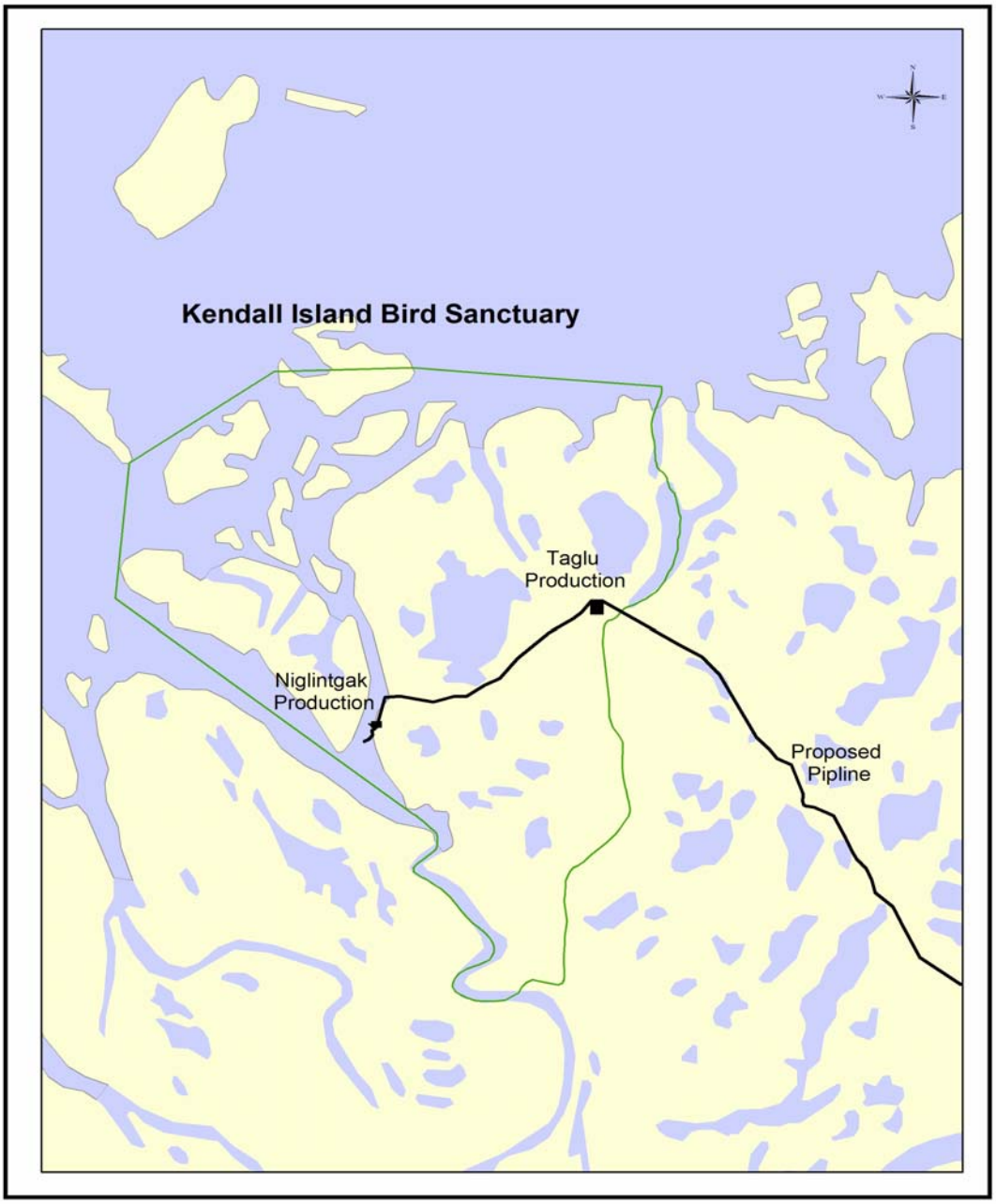


Figure 2: Kendall Island Bird Sanctuary and proposed MGP

ENVIRONMENT CANADA'S REGULATORY AUTHORITY WITHIN KIBS

3.24 Environment Canada has regulatory authority over the surface of the Sanctuary which constitutes habitat (including terrestrial, freshwater and marine habitats) for migratory birds and species at risk. This authority is found under the *Migratory Birds Sanctuary Regulations:*

S. 9(3)

Every permit shall be subject to such conditions, as in the opinion of the Minister are necessary to protect migratory birds or the eggs, nests or habitat of migratory birds within a migratory bird sanctuary.

S. 9(4)

The Minister may
(a) refuse to issue a permit to any person; or
(b) cancel any permit that has been issued to any person,

if, in his opinion, that person has failed to comply with the conditions set out in the permit or the activities being carried on by that person are likely to be harmful to migratory birds or the eggs, nests or habitat of migratory birds within a migratory bird sanctuary.

S. 10(1)

No person shall, in a migratory bird sanctuary, carry on any activity that is harmful to migratory birds or the eggs, nests or habitats of migratory birds, except under authority of a permit.

Management Policies and Practices in KIBS

3.25 Each application for a permit to conduct activities within the KIBS is considered individually on its merits. Factors used to determine the acceptability of a proposed activity include the type of land-use activity, its potential for causing disturbance to nesting birds and/or impact to habitat, and the seasons during which the activities will be carried out.

3.26 In an effort to ensure that hydrocarbon exploration and development activities within the KIBS are managed in a manner that will protect the long-term ecological integrity of the Sanctuary, Environment Canada has established an upper limit of 1% (6.23 square kilometres) of the Sanctuary which may be subject to cumulative long-term ecological impact to habitat.

3.27 While the projected long-term impact of the MGP on habitat within the KIBS is within the 1% limit, Environment Canada wishes to ensure that the

design approved by the NEB will result in the least possible long term impact on habitat.

3.28 Should the NEB decide to issue an Authorization to construct and operate facilities within the KIBS, Environment Canada recommends that the NEB give special consideration to the long term impacts of such activities on migratory bird habitat. Environment Canada requests that specific attention be paid to the lack of detailed information provided by the Applicants supporting buried versus above-ground pipelines within the KIBS.

3.29 Some species of migratory birds are particularly sensitive to disturbance at certain times of the year. A key period is May-October. To reduce the impact of disturbances on migratory birds, Environment Canada restricts access and activities in certain areas of the KIBS during this key period. It is likely that access to the MGP project area will be restricted, or subject to special conditions during this period.

CONCLUSIONS – KENDALL ISLAND BIRD SANCTUARY

3.30 Environment Canada has responsibility to ensure that activities within the KIBS, authorized by permit pursuant to the *Migratory Birds Sanctuary Regulations,* are consistent with the protection of migratory birds or eggs, nests or habitat within the Sanctuary.

3.31 Although each application for a permit is considered individually on its merits, Environment Canada has established an upper limit of 1% (6.23 square kilometres) of long term cumulative impact on habitat within the KIBS.

3.32 In order to reduce the disturbances to migratory birds, certain activities within the KIBS are restricted at specific times. In the MGP project area, it is likely that activities related to construction, operation, monitoring and decommissioning of the project will be restricted between the months of May and October.

4.0 SUMMARY OF RECOMMENDATIONS

Air Emissions Management

Should the NEB decide to issue a Certificate of Public Convenience and Necessity to the Applicants, Environment Canada recommends that the NEB consider making the certificate subject to the following conditions:

1. To meet the intent of the CWS for PM and Ozone, the MGP should be designed and operated using pollution prevention principles and best available economically feasible technologies to appropriately manage the emissions of PM and of precursors to PM and ozone.

2. To meet the intent of the *Canada-wide Acid Rain Strategy*, the MGP should be designed and operated using BATEA and BMPs to appropriately manage the emissions of SO_2 and NO_x.

3. Incinerators operating at construction work camps and other facilities in the MGP have the potential to emit mercury and dioxins and furans. Any incinerators used in the MGP should be required to meet the emission limits in the Mercury CWS as well as the CWS for Dioxins and Furans.

4. Should the MGP employ any glycol dehydrators for gas conditioning, BATEA and BMPs should be employed to reduce benzene emissions.

5. Before commencement of pipeline construction, the Applicants should be required to provide a more detailed submission on final design choices regarding compressor facilities and pipeline operation, addressing the following:

    i) a compilation of all of the measures to mitigate methane leakage and venting throughout the system, from gas processing, compressor stations and the mainline piping and valve systems; taking into account new best practices under development in the natural gas industry;
    ii) details on how overall system operation optimization and maintenance scheduling would be done to maximize system reliability and safety and to minimize methane releases;
    iii) details on design choices for the Inuvik gas processing plant for the capture of exhaust energy; and
    iv) details on the various compressor stations regarding unit size, efficiency and conformity with the CCME *National Emission Guidelines for Stationary Combustion Turbines*.

Kendall Island Bird Sanctuary

Should the NEB decide to issue an Authorization to construct and operate facilities within the KIBS, Environment Canada recommends that the NEB give special consideration to the long term impacts of such activities on migratory bird habitat.

APPENDIX A: REFERENCES

Pollution Prevention: A Federal Strategy for Action, Government of Canada, 1995

Climate Change 2001: The Scientific Basis - Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), J. T. Houghton, Y. Ding, D.J. Griggs, M. Noguer, P. J. van der Linden and D. Xiaosu (Eds.), Cambridge University Press, UK. pp 944

Kyoto Protocol to the United Nations Framework Convention on Climate Change, UNFCC, 1997

Moving Forward on Climate Change: A Plan for Honouring our Kyoto Commitment, Government of Canada, 2005

Canada-wide Standards for Particulate Matter (PM) and Ozone, CCME, 2000

Canada-wide Acid Rain Strategy for Post-2000, Federal/Provincial/Territorial Ministers of Energy and Environment (Canada), 1998 ISBN 0-662-64061-6

Canada-wide Standards for Mercury Emissions, CCME, 2000

Toxic Substances Management Policy, Government of Canada, 1995
ISBN 0-662-61860-2

Policy for the Management of Toxic Substances, CCME, 1998

Canada-wide Standards for Dioxins and Furans, CCME, 2001

Canada-wide Standard for Benzene – Phase 1, CCME, 2000

Canada-wide Standard for Benzene – Phase 2, CCME, 2001

Companion Document to the CWS for Benzene, CCME, 2000

CCME National Emission Guidelines for Stationary Combustion Turbines, Dec 1992, PN 1072 (ISBN: 0-919074-85-5)

The Need for Output-based Standards for Gas Turbines, article for Cogeneration and OnSite Power Production (COSPP), Manfred Klein, Environment Canada, September 2002

Handbook for Estimating Methane Emissions from Canadian Natural Gas Systems, prepared for Gas Technology Canada Environmental Program, by Clearstone, Enerco, Radian. May 1998.

Discussions from Environment Canada Research and Development activities with Gas Technology Canada, GRI Canada, Crestech Partnership, and the Canadian Energy Partnership for Environmental Innovation (CEPEI 1993-2005)

Latour, P., J. Leger, J. E. Hines, M.L. Mallory, H.G. Gilchrist, P.A. Smith and D.L. Dickson. 2005., *Key Migratory Bird Terrestrial Habitat Sites in the Northwest Territories and Nunavut*. Occasional Paper No. xx, Canadian Wildlife Service, Ottawa. (In press)

Alexander, S. A., R.S. Ferguson and K.J. McCormick. 1991. *Key Migratory Bird Terrestrial Habitat Sites in the Northwest Territories*. Occasional Paper No. 91, Canadian Wildlife Service, Ottawa.

APPENDIX B: POTENTIAL WITNESSES

Management of Air Emissions:

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