ENVIRONMENT CANADA'S

SUBMISSION TO THE

NUNAVUT WATER BOARD

FOR THE PUBLIC HEARINGS ON THE

DORIS NORTH GOLD MINE PROJECT

REVISED WATER LICENCE APPLICATION SUBMITTED BY MIRAMAR HOPE BAY LIMITED APRIL 2007

AUGUST 2007

1.0 Introduction

Contributing to the realization of sustainable development in Canada's North is a priority for Environment Canada (EC). The Department focuses on the provision of scientific expertise for incorporation into decisions on developments, such that all parties working together can ensure there is minimal impact on the natural environment, and for the continuance and preservation of ecosystem integrity. Toward these goals, EC has reviewed the Miramar Hope Bay Ltd. (MHBL) revised water licence application (April 2007) for the Doris North Project and the supplementary information that has been provided to the Nunavut Water Board (NWB).

Environment Canada's submission focuses on issues related to environmental effects on or related to aquatic quality and waste disposal, to the extent it may affect water quality. As directed by the NWB, EC's submission relates to aspects under the jurisdiction of the NWB and those that fall under EC's mandated responsibilities. The document is divided into four sections: Section One provides an overview of EC's mandate and regulatory responsibilities; Section Two briefly outlines the background to our review; Section Three provides EC's technical comments and recommendations to the Board in response to the revised water licence application and supporting documents; and closing comments are provided in Section Four.

1.1 Mandate of Environment Canada

The general mandate of EC is defined by the *Department of the Environment Act*. This Act provides the Department with a general responsibility for environmental management and protection in terms of the need to foster harmony between society and the environment for the economic, social and cultural benefit of present and future generations of Canadians. The Department shares this responsibility with the provinces and territories. Environment Canada is also responsible for providing specialist or expert information and knowledge to federal government agencies and for the preservation and enhancement of environmental quality.

1.2 Regulatory Responsibilities

Environment Canada is participating in the review of the revised Doris North water licence application in order to provide specialist expertise, information and knowledge to Nunavut Water Board as part of the regulatory process. Environment Canada will not be issuing any permits or authorizations for the Doris North Project. However, EC is working with Fisheries and Oceans Canada to list the tailing impoundment area (TIA) on Schedule 2 of the Metal Mining Effluent Regulations (MMER) under the *Fisheries Act*.

1.3 Relevant Legislation, Regulations, Policies and Guidelines

The following relevant legislation administered or adhered to by EC influenced the content of the submission: *Department of Environment Act*, *Canadian Environmental Protection Act, 1999,* and the *Fisheries Act* – Pollution Prevention Provisions. Details regarding the legislation, regulations, policies and guidelines are provided in Appendix A.

2.0: Background

This submission takes into consideration all of the documents submitted with the water licence application, as well as supplemental information arising from the technical hearings. Should new or additional relevant information be brought forward by the proponent or be identified during the public hearings, this submission will be re-examined. Within the context of the additional information, any changes in EC's recommendations and position will be brought to the attention of the Board and the proponent.

3.0 Technical Comments

EC would like to commend MHBL and their consultants on presenting a comprehensive water licence application, and on the strong focus on adaptive management for all aspects of the project's environmental management. In general, EC's concerns have been addressed by the proposed plans and commitments, but we feel further work is needed in the areas identified in this section.

Environment Canada's technical comments focus on two main areas: water quality, with respect to mine discharges, plus aquatic effects monitoring, and waste disposal and air emissions, insofar as there is the potential to affect water quality. The third section of the Technical Comments itemizes aspects of the proposed project or of the application materials that require clarification.

3.1 Water Quality

3.1.1. Issue:

Discharge Criteria - Tail Lake and Doris Creek

Proponent's conclusion:

Miramar Hope Bay Ltd. (MHBL) has modeled tailings supernatant water quality in Tail Lake and predicts that by managing discharge volumes in accordance with flows in Doris Creek, water quality below the waterfall can be maintained at values which are at or below the Canadian Council of Ministers for the Environment (CCME) Guidelines for the Protection of Freshwater Aquatic Life. MHBL has applied for end-of-pipe discharge criteria to be set for the parameters and at concentrations specified by the Metal Mining Effluent Regulations, in combination with a second compliance point below the waterfall where CCME guideline values will be met. Table 6.5 of the Revised Water Licence Application Support Document (April 2007) specifies the parameters and allowable concentrations. Table 3.10 of the same document lists parameters to be measured for effluent characterization and water quality monitoring.

EC's conclusion:

The proponent has done a credible job of modeling tailing water quality based on all predicted site inputs, and has put forward an innovative approach to regulating the mine discharge. EC supports the dual compliance point approach; in effect, this results in the

mine being regulated for the full suite of parameters shown in Table 6.5 of the Revised Water Licence Application Support Document (April 2007). However, many of the baseline values for these parameters are considerably lower than CCME levels. Also, there are a number of major ion parameters of potential concern which do not have guideline values yet. In addition, ammonia should be regulated at end of pipe.

Rationale:
The CCME numbers provide a national standard that may be modified as necessary based on site-specific conditions. For example, where background concentrations of a parameter exceed guideline values, site-specific objectives must be set; where a higher level of protection is warranted due to the pristine nature of the aquatic system, then objectives may be set using the non-degradation approach. (Please reference the 2003 CCME document "Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives".)

The CCME (1987, 1999) cautions against using the Canadian water quality guidelines as "pollute up to" values, and have stated:

> "Environmental quality guidelines should not be regarded as blanket values for national environmental quality. Variations in environmental conditions across Canada will affect environmental quality in different ways. Therefore, the users of EQGs may need to consider local conditions and other supporting information (e.g., site-specific background concentrations of naturally occurring substances) during the implementation of EQGs. Science-based site-specific criteria, guidelines, objectives, or standards may therefore differ from the Canadian EQGs recommended in this document. For ecosystems of superior quality, impairment to guideline concentrations is not advocated."

(Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines. Environment Canada, Guidelines and Standards Division. Winnipeg, Manitoba.
Canadian Council of Resource and Environment Ministers. 1987. Canadian Water Quality Guidelines. Prepared by the Task Force on Water Quality Guidelines. Winnipeg, Manitoba.)

Recommendations:
<u>Doris Creek Criteria</u>:
EC recommends that compliance criteria in Doris Creek be set for a broader range of parameters, with receiving environment targets which are more site-specific. All the parameters listed in Table 6.5 of the Revised Water Licence Application Support Document (April 2007) should be measured for compliance (with the exception of selenium), not just those listed as required parameters in the first three columns of table 3.10.

In the case of parameters which have baseline concentrations which are substantially below CCME guideline values, (i.e. ammonia, nitrate, nitrite, arsenic, iron, lead, mercury, molybdenum, nickel, silver, thallium and zinc), management objectives should be to

maintain those parameters at the lowest possible concentrations in the receiving environment. EC supports the conservative management practice proposed by MHBL to use 80% of the value as a threshold for action for naturally elevated parameters (such as copper), and would suggest targeting 50% as a reasonable approach for the preceding parameters which occur in low levels in the receiving environment.

For parameters which do not have CCME guidelines (such as chloride and TDS) it is recommended that MHBL set management targets which will maintain ambient conditions within a reasonable range, to ensure concentrations in the downstream aquatic environment will be protective of aquatic life. An approach used in the Diavik water licence uses a change of two standard deviations from baseline values as a threshold for management action, and this would be an appropriate tactic in this case.

In monitoring the SNP compliance point in Doris Creek at the bottom of the falls, it is recommended that a full metals scan be routinely run, but that the compliance parameters be those listed in Table 6.5, with the exception of selenium.

Total suspended solids (TSS) criteria are proposed to be set at 15 mg/L at the base of the falls in Doris Creek. Background TSS levels are 3-4 mg/L, and the predicted effluent level is 2.1 mg/L. EC recommends maintaining receiving environment TSS concentrations at 5 mg/L or lower, with a higher grab limit set to accommodate natural events such as heavy rainfall or freshet peaks.

Tail Lake Effluent Discharge Criteria:
A limit for ammonia in the Tail Lake effluent outflow should be set, and EC recommends this be set at 6 mg/L NH_3-N for the Maximum Average Concentration. This value is intended to be consistent with effluent concentrations which will not result in bioassay failure (given that tests are run at 15ºC and the predicted pH value is 7.6). Placing an end-of-pipe limit is also a good driver for source control. With respect to source control, the Explosives Management Plan is proposed to be a "living document" and should be updated with best practices for the site as operations commence. One example would be the section directing disposal of spilled ANFO to the tailings pond (Table 2-1); other disposal options which keep ammonia and nitrate out of Tail Lake should be reviewed. EC recommends that ammonia, nitrite, and nitrate concentrations from all sources be tracked, and water quality predictions revised on a periodic basis in order to be able to forecast trends which may affect discharge management.

3.1.2. Issue:
Aquatic Effects Monitoring Program (AEMP)

Proponent's conclusion:
The Monitoring and Follow-Up Plan (April 2007) and the November 2003 Final Report on Effluent and Aquatic Monitoring Study Design outline the monitoring program which is designed to meet the requirements of the federal legislation.

EC's conclusion:
EC has identified several areas that are lacking within the program, which focuses on meeting Environmental Effects Monitoring (EEM) requirements as set out in the Metal Mining Effluent Regulations (MMER). It appears that there have been no changes to this program since the initial development in 2003. Further discussion will need to take place on monitoring program development.

Rationale:
It is critical to fully understand the range of natural variability and to be able to discern changes in the receiving environment which are attributable to mine-related effects, and to recognize the need for and implement adaptive management activities. Under the MMER EEM (Schedule 5) a limited set of parameters must be measured in the effluent, and in the receiving environment. Study design and subsequent reports are due for submission over a relatively extended time frame: effluent and water quality monitoring is to commence 6 months after, and biological study design would be due 12 months after the mine becomes subject to the MMER. Thirty months after the mine becomes subject to the MMER the Interpretive report would be due. The time scale contemplated by the national EEM program is not suitable for a potentially two-year mine life.

The monitoring plan which was submitted with the water licence application is outdated in that it references a two month discharge only (Section 2.3.1) and lower discharge volumes (221,000 m^3/year) so effluent percentages in stream waters need to be re-evaluated (Section 4.4.2) along with timing of sampling. The plan provides the framework for meeting the MMER EEM requirements, but needs to be further developed to ensure environmental effects are detected. EC does generally support the components which are proposed to be monitored (water, sediments, benthic invertebrates, and fish) and the associated parameters shown in Sections 6.4 and 7.4 of the Nov. 2003 report. Further discussion is warranted on sampling frequency, locations, methods and data analysis. Some examples of details which need to be included would be:

- for sediments, ensure consistency of analytical methods with past work, determine the sediment depth that will be analyzed, and identify which statistical tests would best detect changes;
- have dissolved as well as total analyses done on water samples for parameters which may be associated with particulates, such as aluminum;
- the proposed presentation of water quality data (Section 2.3.4) will not provide an objective measure of change; statistical tests need to be identified which can provide evaluations of changes in various parameters;
- parameters which do not have guidelines need to be tracked and reported on, e.g. chloride and TDS.
- Some measure of primary productivity will also need to be included, such as chlorophyll *a*, in order to track changes related to nutrient addition.

Recommendations:
EC recommends that the proponent design an AEMP which monitors water quality, sediments, benthic invertebrates, and fish on an appropriate frequency, with annual reporting of results. The program should be designed to capture the extent of seasonal

and spatial variability in the aquatic ecosystems, and should utilize appropriate reference sites.

In addition to meeting the objectives outlined in Section 1.3 of the Monitoring and Follow-Up Plan the AEMP should be sufficiently comprehensive to detect effects which may not have been predicted.

This program should be compatible with the work required under the EEM program so as to avoid duplication.

3.1.3. Issue:
Seepage Monitoring
Sections 2.4.15 and 7.8 Revised Water Licence Application Support Document; Table 1, Monitoring and Follow-Up Plan

Proponent's conclusion:
After construction, annual freshet surveys will be done of seepage at points along areas where blast rock has been used. Elevated field measurements will be followed up with lab analyses of appropriate parameters.

EC's conclusion:
The proposed monitoring is prudent, and EC supports the tiered approach to monitoring However, a subset of the field measurements should be backed up with laboratory analysis of a seepage sample for the parameters of concern (ammonia, sulphate, iron, aluminum) Given the variability in natural tundra pH values, it would be advisable to add reference sites to the routine surveys.

Rationale:
Although preliminary surveys of tundra pH values showed the lowest pH measurement to be 5.37 (Item #14, Water Licence Pre-Hearing Technical Meeting Information Supplement), measurements at other mines located above the tree line evidenced pH values as low as in the 3-4 range, depending on the amount of peat, rainfall, and other conditions. While the 14 sites measured in June of this year captured local spatial variability, there may also be some variability between years based on freshet characteristics.

Recommendations:
The annual seepage surveys should include periodic analysis of a limited subset of seepage samples, and routine field monitoring of several reference points which are not subject to mine influences.

3.2 Waste Disposal

3.2.1. Issue:
Incineration of Waste

Proponent's conclusion:
In section 5.3 of the Landfill Management Plan, the proponent states that "kitchen waste will be incinerated on a daily basis in a small diesel fuel incinerator unit".

> In section 3.1 of the Air Quality Management Plan, the Proponent States:
>
> > *Installation of an incinerator that complies with the Nunavut EPA standards, Canada-Wide Standards for Dioxins and Furans and Canada- Wide Standards for Mercury emissions. A waste segregation program will be implemented (i.e., materials that are unsuitable for incineration, e.g., chlorinated plastics, will be diverted to alternate waste disposal facilities) and personnel will be properly trained in incinerator operations. Compliance with the Canada-Wide Standards will be determined by annual stack testing.*

In section 3.5 of the Hazardous Materials Management Plan, the proponent states that "waste oils will be disposed of by incineration in a dedicated waste oil burner unit".

EC's conclusion:
EC supports the commitments made by the Proponent in section 3.1 of the Air Quality Management Plan, listed above. To ensure that these commitments are met and incineration emissions are minimized the Proponent should develop an incineration management plan in consultation with EC. The management plan should include an annual incineration report to demonstrate an ongoing commitment to minimizing emissions.

The incineration management plan and annual incineration report could provided as stand alone documents or included as components in other management plans and annual reports.

R**ationale:**
Environment Canada recognizes that timely disposal of camp waste - specifically food waste - is of critical importance to minimize safety risks associated with wildlife attraction. Timely disposal is usually achieved through burning. However, burning of waste products releases numerous contaminants to the air, many of them persistent, bioaccummulative and toxic (e.g. polycyclic aromatic hydrocarbons - PAH's - heavy metals, chlorinated organics – dioxins and furans).

> Although incineration contaminants are released to the atmosphere the dominant exposure pathways for wildlife are through vegetation, water column and

sediments. Deposition onto vegetation and subsequent ingestion of that plant material by animals is the primary mechanism by which dioxins and furans enter the terrestrial food chain (McLachlan and Hutzinger 1990). Deposition onto soil with subsequent erosion and runoff into water bodies with subsequent uptake by benthic organisms is the primary mechanism by which dioxins and furans enter the aquatic food chain (Muir et al. 1992). Therefore incineration is a land and water issue. Air is simply a pathway from the incinerator to the other media.

The type of incineration technology and the management practices can greatly affect the amount of dioxins and furans released to the environment. Incinerators capable of meeting the Canada-wide Standards for Dioxins and Furans (controlled incineration) will release about 9.5 µg TEQ of dioxins and furan per tonnes of waste combusted (Chandler 2006, Lanfranco 2006). Poor incineration equipment (uncontrolled burning) can release much greater amount of dioxins and furans, 3500 µg TEQ per tonne of waste combusted (UNEP, 2005). Webster and Mackay (2007) used an environmental fate model to predict contaminant concentrations in air, soil, water, sediment, aquatic and terrestrial wildlife (including fish, birds and terrestrial herbivores and carnivores) resulting from incineration emissions at a typical remote work camp. The conclusions from the study are quoted below.

> *It is concluded that uncontrolled burning of waste could result in substantial accumulations of dioxins and furans in the local ecosystem, some of which will persist for some 8.5-years with exposure levels approaching those considered to be of toxicological concern. The use of controlled incineration will substantially reduce the expected contamination levels and correspondingly reduce the likely exposure and effects.*

To minimize the release of contaminants the Proponent should include the following as part of the incineration management plan:

- **Technology:**
  The proponent should ensure that the incineration device is capable of meeting the emission limits established under the *Canada-wide Standards (CWS) for Dioxins and Furans* and the *CWS for Mercury Emissions* (both the Government of Canada and the Government of the Nunavut are signatories to these Standards and are required to implement them according to their respective jurisdictional responsibility). The minimum requirement for incineration technology should be a dual-chamber controlled-air incinerator.

- **Waste Management:**
  The goal should be to minimize the amount of waste to be incinerated and only incinerate appropriate types of waste.
  - The amount of waste should be reduced through purchasing policies that focus on reduced packaging and on-site diversion and segregation

programs (i.e. the separation of non-food waste items suitable for storage and subsequent transport and disposal or recycling).
    - Only food and food contaminated waste should be incinerated.
    - Used absorbent materials, oily or greasy rags, and equipment servicing wastes (such as used engine oil, antifreeze, hydraulic oil, lead acid batteries, brake fluid and other lubricants) should be safely stored and transported in sealed containers (odour free to prevent animal attraction) and safely transported to a facility that is authorized for the treatment and disposal of industrial hazardous wastes.

- **Operation:**
  Proper operation and maintenance of incineration equipment is essential to minimizing the release of contaminants
    - Appropriate training should be provided to the personnel operating and maintaining the incinerator.
    - Maintenance records should be kept and reported in an annual report
    - The amount of waste incinerated is recorded and reported in an annual report.

R**ecommendations:**
An Incineration Management Plan should be developed by the Proponent in consultation with EC. The management plan should include annual reports to provide details on the following:

- Recycling/segregation waste program
- Incineration technology selected
- Waste audit -- amount and types of waste incinerated
- Operational and maintenance records
- Operator training
- Emission measurements
- Incineration ash disposal

Waste oil may contain metals and other contaminants. If waste oil is incinerated it should be burned in an approved waste oil burner and the waste oil should be tested for contaminants as required in the NWT under the *Used Oil and Waste Fuel Management Regulations.*

Incineration ash can be contaminated with incineration byproducts, such as dioxins and furans, and therefore should be tested to ensure the ash is suitable for the landfill.

3.2.2. Issue:
Open burning of contaminated wood waste.

Proponent's conclusion:
Section 4.2 of the Landfill Management Plan the Proponent states the following:

> *The sodium cyanide used in the mill will generate wood waste in the form of a plywood shipping crate. MHBL proposes to burn these*

wood crates in a burn pit to be sited within the landfill area along with other untreated wood debris that cannot be recycled. This eliminates a potential safety concern related to wood being reused that may have accidentally come into contact with cyanide briquettes during shipping. Cyanide is totally destroyed in the burning process consequently the resultant ash will not contain any cyanide traces.

EC's conclusion:
The Proponent states that "Cyanide is totally destroyed in the burning process". Since the melting and boiling point temperatures of sodium cyanide are 560°C and 1500°C, respectively, it is unlikely that it will be destroyed in the low temperatures of an open burn. It is more likely that the cyanide waste will be dispersed through fly ash or be concentrated in the resultant ash and ultimately lead to contamination of water bodies.

R**ationale:**
As stated in the GNWT position paper *Municipal Solid Waste Suitable for Open Burning* attached to the Landfill Management Plan as Appendix A, only paper products, paperboard packing and untreated wood waste is suitable for open burning. Plywood is treated wood that is held together with glue and therefore not suitable for open burning.

Open burning is not an efficient method of combustion due to low temperatures and uncontrolled air flow and mixing. The maximum temperatures of open burning are usually less than 500°C and can smolder for extended periods at lower temperatures (100°C). To destroy most toxins (like dioxins and furans) a sustained temperature of more than 1000°C is required. Dioxins and furans are byproducts of burning with an optimum temperature range for formation from 200-400°C. Open burning is not hot enough to destroy toxins and may lead to formation of toxins such as dioxins and furans.

R**ecommendations:**
EC recommends that any type of contaminated wood be dealt with under the incineration management plan and not burned in open pits.

3.2.3 References:

Chandler. 2006. Review of Dioxins and Furans from Incineration in Support of a Canada-wide Standard Review, Prepared by A. J. Chandler & Associates Ltd. for The Dioxins and Furans Incineration Review Group, CCME.

Lanfranco. 2006.Emissions Compliance Survey Monitoring Report: Fort Smith Health Centre, Prepared by A. Lanfranco & Associates INC. for GNWT.

McLachlan, M.S.; Hutzinger, O. (1990) Accumulation of organochlorine compounds in agricultural food chains. Organohalogen Compounds 1:479-484.

Muir, D.C.G.; Lawrence, S.; Holoka, M; Fairchild, W.L.; Segstro, M.D.; Webster, G.R.B.; Servos, M.R. (1992) Partitioning of polychlorinated dioxins and furans between water, sediments and biota in lake mesocosms. Chemosphere 25(1-2):199-124.

UNEP. 2005. Standardized Toolkit for Identification and Quantification of Dioxins and Furans Releases, Second Edition, United Nations Environment Program. http://www.chem.unep.ch/pops/pdf/toolkit/toolkit.pdf

Webster, E.; Mackay, D., 2007. Modeling the Environmental Fate of Dioxins and Furans Released to the Atmosphere During Incineration, Prepared for Environment Canada by the Canadian Environmental Modeling Centre, CEMC Report No. 200701. http://www.trentu.ca/academic/aminss/envmodel/CEMC200702.pdf

3.3. Points for clarification:

3.3.1. Nitrate/nitrite performance standards for the sewage treatment plant.
All references (e.g. Table 2.1 of the Revised Water Licence Application Support Document) to the expected effluent quality from the sewage treatment plant show average concentrations of nitrate to be 1.0, and of nitrite to be 30 mg/L. Presumably these values have been transposed? Also, what units are the nitrogenous compounds in – as N, or as the whole molecule?

3.3.2. Item #48 of the information supplement states that MHBL plans to incorporate the new Fuel Storage Regulations into the project design and contingency planning. EC encourages the use of these as standards and good practices, but would like to clarify that CEPA 1999 Part 9 regulations, including the storage tank regulations, do not apply on Inuit Owned Lands.

3.3.3. Table 5.1 Proposed SNP Monitoring Stations, Sampling Frequency and Monitoring Parameters.
The revised table shows that the acute lethality testing will be done at TL1 (at the reclaim pump, at a depth of 1.5 m) prior to discharge, and monthly thereafter. It will also be done at TL4 (the discharge end-of-pipe) on a monthly basis during active discharge. This appears to be redundant, as there should be little change in effluent quality during the trip through the pipe. Similarly, water quality monitoring is duplicated at both stations, and could be scaled back if results show comparable quality at the pipe intake and outfall stations.

3.3.4. Erosion prevention for all land-based discharges.
Discharge from the various collection ponds (Section 3.7 of the Revised Water Licence Application Support Document) and sewage discharges during construction (Item #16 of the Information Supplement) should be done onto appropriate substrates such that erosion is not a concern. This includes discharging in such a fashion that water does not pond and potentially result in thermal erosion.

4.0. Closure

Environment Canada would like to thank the Board for the opportunity to comment on the MHBL Water Licence application, and we hope that these technical comments and recommendations are useful to the Board in their decision making process. Environment Canada respectfully requests the opportunity to submit additional written comments after the public hearings to address any new information brought forward at the hearings. EC staff are available to review a draft water licence, and would be pleased to participate in any working groups deemed necessary by the Board.

APPENDIX A: RELEVANT LEGISLATION, POLICIES AND GUIDELINES

Department of the Environment Act

The *Department of the Environment Act (DOE Act)* provides EC with general responsibility for environmental management and protection. It's obligation extend to and include all matters over which Parliament has jurisdiction, and have not by law been assigned to any other department, board, or agency of the Government of Canada as related to:

- Preservation and enhancement of the quality of the natural environment (e.g. water, air, soil)
- Renewable resources including migratory birds and other non-domestic flora and fauna
- Water
- Meteorology
- Coordination of policies and programs respecting preservation and enhancement of the quality of the natural environment.

The *DOE Act* states that EC has a mandated responsibility to advise heads of federal departments, boards and agencies on matters pertaining to the preservation and enhancement of the quality of the natural environment. As such, this mandate is extremely broad.

Canadian Environmental Assessment Act

The *Canadian Environmental Assessment Act* (*CEAA*) came into force in January 1995. *CEAA*'s primary purpose is to ensure that the environmental effects of projects are considered as early as possible in a project's planning stages. Section 16 of *CEAA* describes the factors which must be considered in order to assess the environmental effects. Environment Canada attempts to incorporate these factors (e.g. consideration of cumulative effects) into all expert advice and information it provides to environmental assessments.

Canadian Environmental Protection Act, 1999

Proclaimed on March 31, 2000, the new *Canadian Environmental Protection Act, 1999* (CEPA 1999, referred to hereinafter as *CEPA*) is an Act respecting pollution prevention and the protection of the environment and human health in order to contribute to sustainable development. *CEPA* shifts the focus away from managing pollution after it has been created to preventing pollution. The Act provides the federal government with new 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.

For substances that are declared "toxic" under *CEPA* and are added to the List of Toxic substance in Schedule 1 of the Act, instruments will be proposed to establish preventive or control actions for managing the substance and thereby reduce or eliminate its release into the environment. These tools may be used to control any aspect of the substance's life cycle, from the design and development stage to its manufacture, use, storage, transport and ultimate disposal.

Examples of preventive and control instruments include:

- Regulations;
- Pollution prevention plans;
- Environmental emergency plans;
- Environmental codes of practice;
- Environmental release guidelines; and
- Pre-notification and assessment of new substances (chemicals, biochemicals, polymers, biopolymers, and animate products of biotechnology).

Authority to require emergency plans for toxic or other hazardous substances is provided in Part 8 of *CEPA*. Environmental emergency plans for such a substance(s) must cover prevention, preparedness, response and recovery.

Fisheries Act – Pollution Prevention Provisions

The Minister of Fisheries and Oceans is legally responsible to Parliament for administration and enforcement of all sections of the *Fisheries Act*. However, under a Prime Ministerial Instruction (1978) and a Memorandum of Understanding (1985), EC administers and enforces those aspects of the Act dealing with the prevention and control of pollutants affecting fish. In this context, EC works to:

- Advance pollution prevention technologies;
- Promote the development of preventative solution; and
- Work with the provinces, territories, industry, other government departments and the public on issues relating to the pollution provisions of the *Fisheries Act.*

The main pollution prevention provision is found in subsection 36(3) of the Act, and is commonly referred to as the "general prohibition". This subsection prohibits the deposit, into fish-bearing waters, of substances that are deleterious to fish. The legal definition of "deleterious substance" provided in subsection 34(1) of the Act, in conjunction with court rulings, provides a very broad interpretation of deleterious and includes any substance with a potentially harmful chemical, physical or biological effect on fish or fish habitat. One measure of a deleterious substance (such as a liquid discharge) is acute lethality as measure by the standard 96 hour fish bioassay test.

Pertinent regulations under the Fisheries Act include the Metal Mining Effluent Regulations (MMER's). The MMER's were registered and became national law on June 6, 2002. The regulations apply to all metal mines in Canada, including gold mines. The

MMER's take a three tiered approach to monitoring, including end of pipe physical/chemical quality, end of pipe biological quality (through biological testing of lethality), and downstream environmental effect monitoring. The MMER's also have a requirement for comprehensive Environmental Effects Monitoring (EEM). An EEM program is a scientific assessment to evaluate the effects of mine effluent on the aquatic environment, specifically fish, fish habitat and the use of fisheries resources as defined in the Fisheries Act. An "effect" is defined in the MMER's as a statistically significant difference between fish or benthic invertebrate community measurements taken from exposure and reference areas (or along a gradient of effluent exposure). Environment Canada staff are available to assist in the development of EEM programs and to answer questions relating to the MMER's.

Canada-wide Standards for Mercury Emissions

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.

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.

Canada Wide Standards for Dioxins and Furans

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.

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.