AGNICO EAGLE

MELIADINE GOLD PROJECT

SD 2-12
Incineration Management Plan

APRIL 2014
VERSION 3

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TABLES AND FIGURES

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	October 2012			First draft of the Incineration Management Plan	John Witteman, Env. Consultant, AEM
2	March 2013			DEIS re-submission; rebranding	
3	April 2014	7.4.2	15	Revision made to address review comments and commitments	John Witteman, Env. Consultant, AEM

EXECUTIVE SUMMARY

This Incinerator Management Plan (SD 2-12) was prepared in accordance with best management practices, Environment Canada's *Technical Document for Batch Waste Incineration,* and guidelines issued by the Nunavut Impact Review Board (NIRB) for the Meliadine Gold Project.

Solid waste incinerators and waste oil burners are regulated in Nunavut under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act* and the federal *Environmental Protection Act*. Performance limits for the incinerator at the Meliadine Project will be in accordance with the emission guidelines set out by the Canadian Council of Ministers of the Environment (CCME). Ash produced from the incineration process will be disposed of in accordance with the *Nunavut Environmental Guideline for Industrial Waste Discharges*.

The Meliadine Project will select and operate its incinerator based on Environment Canada's *Technical Document for Batch Waste Incineration*. In addition to incinerator technology, the implementation of a waste segregation program will limit emissions (e.g., dioxins and furans, mercury) from the incinerator.

A typical modern controlled-air, batch, dual chamber incinerator will be installed. Critical process parameters such as temperature, combustion air flow and burner output will be computer-controlled to maintain optimal combustion conditions. The incinerator will have an incineration capacity of approximately 1,750 kg/h to accommodate predicted volumes of waste to be generated at the site. It will be located in the waste management building and operated by appropriately trained personnel.

Monitoring and testing is planned for incinerator stack emissions, waste oil/fuel to be burned in the incinerator, as well as incinerator ash.

In order to demonstrate conformity with performance limits, an annual incineration management report will be prepared and submitted as part of annual reporting to authorizing agencies. The quantity and type of materials incinerated on site during operation, together with results from periodic stack emission and ash monitoring, will be included in the annual report. Report will also be provided, if necessary, to the National Pollutant Release Inventory. Finally, AEM is committed to reporting greenhouse gas (GHG) emissions in support of Canada's Voluntary Challenge Registry.

ACRONYMS

AEM	Agnico Eagle Mines Limited
CCME	Canadian Council of Ministers of the Environment
CEPA	*Canadian Environmental Protection Act*
CWS	Canada-Wide Standards
EC	Environment Canada
EMS	Environmental Management System
GHG	Green House Gases
GN	Government of Nunavut
IMP	Incinerator Management Plan
NPRI	National Pollutant Release Inventory
NT/NWT	Northwest Territories
PCDD	PolyChlorinated Dibenzo-p-Dioxins
PCDF	PolyChlorinated DibenzoFurans
PM	Particulate Matter
$PM_{2.5}$	Particulate matter with diameter less than or equal to 2.5 microns
PM_{10}	Particulate matter with diameter less than or equal to 10 microns
TSF	Tailings Storage Facility

SECTION 1 • INTRODUCTION

1.1 Scope and Purpose of the Incinerator Management Plan

This Incinerator Management Plan (IMP) was prepared in accordance with best management practices, Environment Canada's (EC 2010) *Technical Document for Batch Waste Incineration,* and guidelines issued by the NIRB for Agnico Eagle Mines Limited (AEM) Meliadine Gold Project. It is one in a series of environmental management plans that have been prepared for the Meliadine Project. All are included under the umbrella Environmental Management and Protection Plan (SD 2-5).

The IMP will be updated prior to mine operation and periodically thereafter as needed to reflect changes to Project-specific protocols.

Wastes will be safely managed from the time it is produced to its final disposal – in other words from cradle to grave. All waste will be segregated at the Meliadine site and will predominately be landfilled, incinerated or recycled. Used oil burning will be maximised as much as possible using the second chamber of the incinerator. Remaining wastes, including hazardous waste[1], will be packaged for shipment to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

Incineration is an essential part of waste management at the Meliadine site. The incineration of acceptable solid waste from the accommodation complex, kitchen, lunch rooms, shops, warehouses and offices will divert waste from directly reporting to the on-site landfill. It will have the advantage of eliminating putrescible waste that could potentially attract wildlife to the landfill, thereby reducing possible dangerous interactions between humans and wildlife.

Filtered sewage treatment plant sludge may be incinerated during the construction phase, or disposed of in some other acceptable manner. During the operation phase, the incinerator should allow for filtered sewage to continue to be incinerated. If it is not possible, once the processing plant is operational, sewage sludge will be disposed of in the TSF.

The objectives of this IMP are summarized as follows:

1) To understand the quantity and composition of the waste to be generated at the Meliadine site, and separate waste acceptable for incineration from waste that is not;

2) To select the proper batch waste incinerator based on the characteristics and quantity of waste, and to locate it in an appropriate building away from other site infrastructure;

3) To properly equip and install the incinerator;

[1] Please refer to the Hazardous Materials Management Plan (SD 2-13) for further information on the handling and management of hazardous waste.

4) To operate the incinerator for optimal combustion and avoid the formation of dioxins and furans in the combustion process;

5) To safely handle and dispose of incinerator residues; and

6) To establish a record keeping system for managing the facility and for future reporting.

As a component of the Meliadine Project Environmental Management System (EMS), the IMP will be updated prior to mine operation and periodically thereafter to ensure that site experience is reflected in the IMP and subsequently communicated to all parties. The Meliadine Project Environment Superintendent will be responsible for managing and implementing the IMP.

1.2 Incinerator Location

The incinerator will be located in its own building away from the process plant and accommodations complex (Figure 1-1). It will be adjacent to the concrete batch plant and cold storage, both being up-wind from the prevailing NNW wind direction. It will have sufficient floor space to receive all wastes generated at the mine site.

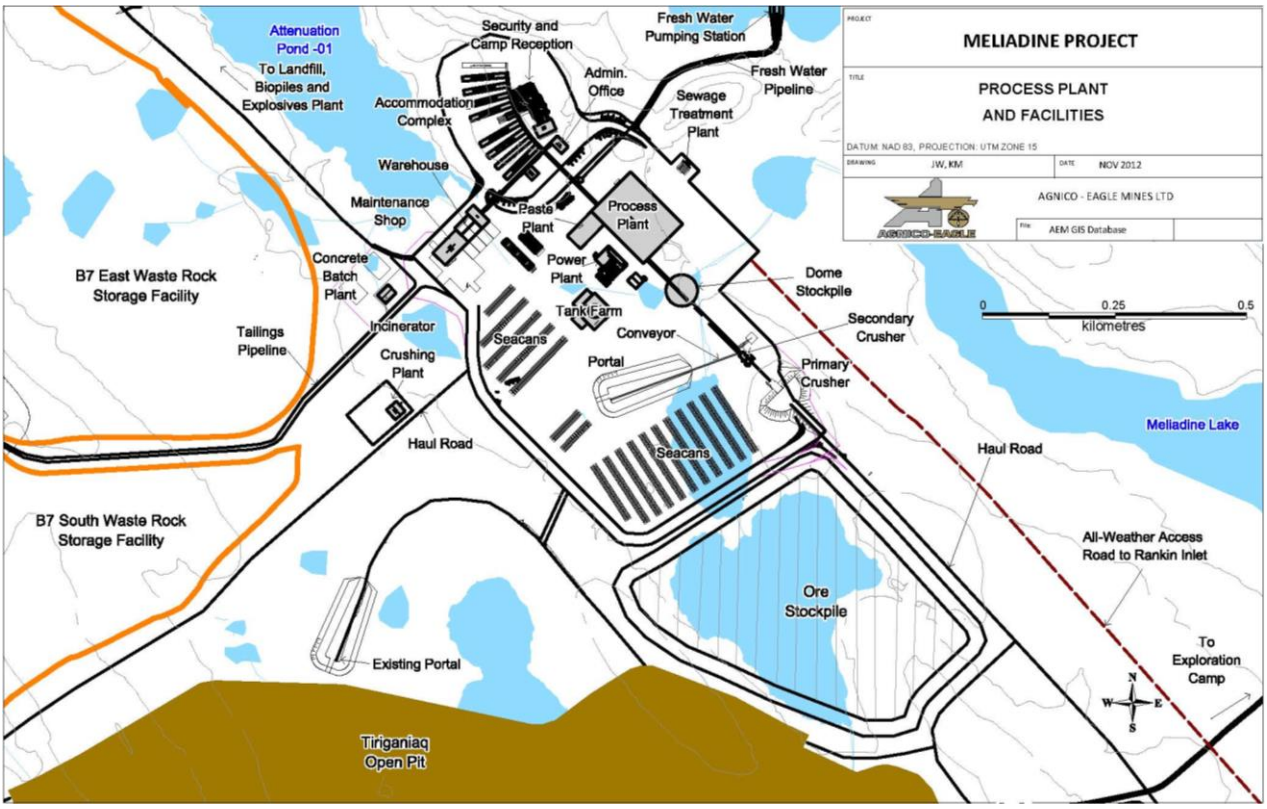

Figure 1-1 Location of the Incinerator

SECTION 2 • RELATED DOCUMENTS

Environmental Impact Statement documents that provided input to the Incineration Management Plan (SD 2-12) include the following:

- Landfill and Waste Management Plan (SD 2-11);
- Hazardous Materials Management Plan (SD 2-13);
- Mine Closure and Reclamation Plan (SD 2-17); and
- Occupational Health and Safety Plan (SD 9-6).

The Incinerator Management Plan is one in a series of environmental management plans that have been prepared for the Meliadine Project. All are included under the umbrella Environmental Management and Protection Plan (SD 2-5).

SECTION 3 • REGULATORY SETTING

Solid waste incinerators and waste oil burners are regulated in Nunavut under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act* and the federal *Environmental Protection Act*. Various regulations and guidelines under these Acts as well as guidelines developed by the Canada Council of Ministers of the Environment (CCME) were reviewed in preparing the IMP. They are as follows:

- *Canadian Environmental Protection Act* (CEPA)
  - Schedule 1: List of Toxic Substances
  - *Interprovincial Movement of Hazardous Waste Regulations*
  - *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*
- Environment Canada (EC) Technical Document for Batch Waste Incineration (EC 2010)
- Canada-Wide Standard for Dioxins and Furans (CCME 2001a)
- Canada-Wide Standard for Mercury (CCME 2000)
- Northwest Territories *Environmental Protection Act*
  - *Used Oil and Waste Fuel Management Regulations*
- Nunavut *Environmental Protection Act*
- Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities (GN 2011b)
- Environmental Guideline for the Burning and Incineration of Solid Waste (GN 2012)
- Environmental Guideline for Ambient Air Quality (GN 2011a)
- Environmental Guideline for Mercury-Containing Products and Waste Mercury (GN 2010)
- Nunavut *Public Health Act*

Provincial and/or territorial regulations that pertain to emissions from incinerators were not found for Nunavut or the Northwest Territories. Therefore, performance limits for the incinerator at the Meliadine Project will be in accordance with the emission guidelines set out by the CCME: Canada-Wide Standard for Dioxins and Furans (CCME 2001a), and Canada-Wide Standards for Mercury Emissions (CCME 2000).

The management of used oil is regulated in the Northwest Territories (NT) through the *Used Oil and Waste Fuel Management Regulations* (N.W.T. Reg. 064-2003). In the absence of Nunavut guidance/regulations pertaining to used oil and waste fuel, the NT regulations will be followed for the Meliadine Project.

Ash produced from the incineration process will be disposed of in accordance with the Nunavut Environmental Guideline for Industrial Waste Discharges (GN 2011b).

SECTION 4 • BACKGROUND INFORMATION

4.1 Dioxins and Furans

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), commonly known as dioxins and furans, are toxic, persistent, and bioaccumulative chemicals. Their presence in the environment results predominantly from human activity. The biggest source of dioxins and furans in Canada is the large-scale burning of municipal and medical waste. Other major sources include:

- The production of iron and steel;
- Backyard burning of household waste, especially plastics;
- Fuel burning, including diesel fuel and fuel for agricultural purposes and home heating;
- Wood burning, especially if the wood has been chemically treated;
- Electrical power generation; and
- Tobacco smoke.

Due to the environmental persistence and capacity to accumulate in biological tissues, dioxins and furans are slated for virtual elimination under the CEPA, the Environment Canada Toxic Substances Management Policy (TSMP; EC 2004) and the CCME *Policy Statement for the Management of Toxic Substances* (CCME 1998).

4.2 Mercury

Mercury is a naturally occurring substance, which can be 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, essentially through combustion processes. Under a variety of regional, national, bi-national and internal programs, treaties and agreements, mercury is being targeted for emissions reductions consistent with the CCME *Policy Statement for the Management of Toxic Substances* (CCME 1998), which identifies that mercury shall be managed through its lifecycle to minimize release.

4.3 Used Oil and Waste Fuel

According to the *Used Oil and Waste Fuel Management Regulations*, “used oil” means: any oil, including lubrication oil, hydraulic fluids, metal working fluid and insulating fluid, that is unsuitable for its intended purpose due to the presence of impurities or the loss of original properties, but does not include waste oil derived from animal or vegetable fat, a petroleum product spilled on land or water, or waste from a petroleum refining operation. “Waste fuel” means: a flammable or combustible petroleum hydrocarbon, with or without additives, that is unsuitable for its intended purpose due to the presence of contaminants or the loss of original properties, and includes gasoline, diesel fuel, aviation fuel, kerosene, naphtha and fuel oil, but does not include paint, solvent or propane.

SECTION 5 • PERFORMANCE LIMITS

5.1 Incinerator Selection

The Meliadine Project will select and operate its incinerator based on Environment Canada's *Technical Document for Batch Waste Incineration*. The incinerator for the Meliadine Project will be similar to the one installed at AEM's Meadowbank Gold Mine. The Meadowbank incinerator is a camp waste incinerator (model no. ECO 1.75TN 1P MS 60L) from Eco-Waste Solutions, which is in keeping with Environment Canada's technical document. The incinerator complies with the guidelines listed in Table 5-1, where the maximum emissions are expressed as a concentration in the exhaust gas exiting the stack of the facility. The specifications of a potential incinerator are available in Appendix A. In addition to incinerator technology, the implementation of a waste segregation program will limit emissions of dioxins and furans, and mercury from the incinerator.

Table 5-1 Emission Regulations for Solid Waste Incinerators

Emissions	Sector	Guideline (max)[1]	Units	Reference
Dioxins and Furans	Municipal Solid Waste[2]	80	pg I-TEQ/Rm^3	CCME, CWS 2001a
Dioxins and Furans	Sewage Sludge Incineration	80	pg I-TEQ/Rm3	CCME, CWS 2001a
Mercury	Municipal Waste	20	µg/Rm^3	CCME, CWS 2000
Mercury	Sewage Sludge Incineration	70	µg/Rm3	CCME, CWS 2000

[1] Stack concentrations are corrected for 11% oxygen.

[2] According to the Canada-Wide Standards (CWS),"municipal solid waste" includes any waste that might be disposed of in a non-secure landfill site if not incinerated (i.e., non-hazardous wastes regardless of origin), but does not include "clean" wood waste.

The incinerator at Meliadine Project is expected to achieve compliance immediately upon attaining normal full scale operation. Compliance to these performance limits will be confirmed by periodic stack testing, normally on an annual basis.

5.2 Used Oil and Waste Fuel

AEM will manage used oil and waste fuel according to the *Used Oil and Waste Fuel Management Regulations* (NWT 2003; Table 5-2).

Table 5-2 Summary of Used Oil and Waste Fuel Regulations

Activity	
Registration	• Waste oil burner shall be registered with the Chief Environmental Protection Officer.
Disposal	• Used oil/waste fuel will not be disposed of directly into the environment.
Storage	• Used oil/waste fuel will be stored in specifically designed container for hydrocarbons to minimize the risk of spills; • Used oil/waste fuel containers will be periodically inspected for leaks or potential leaks; and • Used oil/waste fuel will be stored as per the Hazardous Materials Management Plan (SD 2-13).

Sampling and Analysis	• A sample of one month's feedstock of used oil/waste fuel is required to be tested at least once a year;
	• Used oil/waste fuel will be tested for:
	  • Flash point; and
	  • Existence and amount of each impurity Listed in Table 5-3.

Burning	• Used oil/waste fuel will not be burned openly; • Used oil will not be burned in residential areas; • Used oil with a flash point of less than 37.7°C will not be burned or blended with another used oil/waste fuel; • Used oil that exceeds guidelines will not be burned; and • A 14-day notice will be given for the burning of waste fuel.

Records	• The following will be recorded in association with the incineration of used oil/waste fuel:
	  • Volume of used oil/waste fuel generated;
	  • Volume of used oil/waste fuel incinerated/consumed;
	  • Name and address of person in charge, management or control of the used oil;
	  • Location of production of used oil/waste fuel;
	  • A summary of maintenance performed on used oil/waste fuel burners or processing equipment; and
	  • Volume and nature of the products produced from the used oil.

Table 5-3 summarizes the maximum level of contaminants in used oil that can be incinerated as stipulated in the *Used Oil and Waste Fuel Management Regulations* (NWT 2003). Under the regulations blending of used oil that exceeds one of more of the criteria listed in Table 5-3 is not allowed.

Table 5-3 Used Oil Impurity Limit

Impurity	Maximum Level Allowed in Used Oil (ppm)
Cadmium	2
Chromium	10
Lead	100
Total Organic Halogens (as Chlorine)	1,000
Polychlorinated Biphenyls	2

5.3 Incinerator Ash

Provided the materials that go into the incinerator are controlled to exclude all hazardous materials, the incinerator ash should be non-hazardous. Even small quantities of hazardous waste such as batteries should not be mixed with waste to be incinerated. An ash testing protocol developed by the Government of Nunavut will be implemented to ensure that the incinerator ash is suitable for disposal in the landfill. Ash not meeting the guidelines will be packaged in drums to be sent to a certified waste management facility for appropriate treatment, recycling and/or disposal in another provincial or territorial jurisdiction, or will be buried within the Tailings Storage Facility (TSF). Materials buried within the TSF are expected to freeze over a period of time, resulting in permafrost encapsulation as described in the Mine Closure and Reclamation Plan (SD 2-17).

SECTION 6 • INCINERATOR OPERATION

The Meliadine Project will select a dual chamber, high-temperature incinerator as the primary incinerator. The technical specifications of one possible brand to be installed are included in Appendix A. The incinerator will be housed inside a separate building that will have sufficient floor space to manage all Project wastes in one convenient location.

6.1 Incinerator Specifications

Typical modern, controlled-air, batch, dual chamber incinerators are design using the principles of pyrolysis (starved-air burning condition) and complete oxidation (high temperature, excess oxygen and sufficient combustion time). The incineration system will be a two-stage process. In the first stage, waste will be converted to gas in the primary chamber at approximately 650 to 850°C. This process will be self fueling until the volume is reduced by 90 %. Gasses from the primary chamber will enter the secondary chamber of oxygen-rich and turbulent conditions, which is typically at a higher temperature – around 1,000°C. Combustion will be complete after a retention time of about two seconds. The temperature of combustion gases exiting the stack is anticipated to exceed 700°C and to flash cool in the ambient air, thereby leaving little opportunity for the *de novo* synthesis of dioxins/furans. Heat capture will not be used on the exhaust gases.

Critical process parameters such as temperature, air flow, and burner output will be computer-controlled to maintain optimal combustion conditions.

For an incinerator capacity suitable for the predicted volumes of waste to be generated at the Meliadine Project, the total particulate matter (PM) generated is expected to be extremely low. Therefore, dust collection technologies such as baghouse filters will not be necessary, as very minor amount of fly ash will be generated. Ash residues generated in the primary chamber will be manually removed on a daily basis using a shovel emptied into a metal bin.

6.1.1 Operation Procedures

General operating procedures for the incinerator will include:

1. Sort the waste on the basis of origin and heating value. Food waste and waste that has been in contact with food will have priority for incineration;
2. Mix the waste to ensure a calorific value within the incinerator's specification and to achieve good combustion inside the primary chamber;
3. The operator will observe the start of the burn cycle to ensure the incinerator is operating correctly;
4. The door to the incinerator will only be opened after the burn cycle is complete and the unit cooled;
5. The ash will be removed from the incinerator before it is charged with the next load of waste to be incinerated;

6. The ash will be placed in drums or bags before disposal; and
7. The ash will be disposed of in the landfill; if the concentration of trace metals exceeds the Government of Nunavut's *Environmental Guideline for Industrial Waste Discharges* (GN 2011b), ash will be either packaged and sent to an approved disposal facility or buried within the TSF.

The system will have a sizable front door for easy access to manually load-feed waste into the unit with a front-end loader. The proposed waste streams, garbage and possibly sewage sludge, will be layered wherever possible during loading to ensure proper combustion.

A full set of operating procedures specifying how to operate the incinerator will be developed in consultation with the supplier/manufacturer prior to its use, and its operation will be conducted in accordance with the EC *Technical Document for Batch Waste Incineration* (EC 2010).

6.1.2 Emissions

The incinerator to be purchased for the Project will be designed to meet performance limits described in Section 5.1. It will use good engineering practice to ensure required incineration temperatures and dispersion of gases to meet applicable air quality standards/guidelines.

The incinerator stack design will incorporate appropriate sampling ports, with caps where necessary, at appropriate locations to allow for stack testing to be undertaken during incinerator operation.

6.1.3 Dust/Odour Control Measures

Modern incinerators are commonly designed such that the non-turbulent atmosphere in the primary burn chamber reduces the formation of particulate matter. Therefore, the need for additional dust and/or odour control measures is not anticipated. Organic/putrescible wastes will be given incineration priority to limit odours.

6.1.4 Staffing and Equipment

The computerized incinerator will typically require one operator to interact with the equipment for approximately 1 to 1.5 hour per day, largely for ash removal, loading and start-up. Operators are not typically required to be in attendance during the rest of the operation, as it is normally a fully automated process. The incinerator will be designed, installed and operated so that the operators are not exposed to high temperatures during loading or ash removal due to complete cool down after the burn cycle. Also, the waste will not be allowed to combust until the chamber is sealed thus isolating the worker from smoke and high temperatures.

6.1.5 Operator Training

Operator training will be provided by a suitably experienced technician from the incinerator supplier/manufacturer or from an associated company. Special emphasis will be given to system safety including identification of hazards that the operator should recognize. Environment staff will provide training and record keeping.

6.2 Used Oil and Waste Fuel

The incinerator will be able to efficiently burn used oil and waste fuel. A quantity of about 350,000 liters of used oil and waste fuel will be incinerated per year. The quantity of waste fuel is expected to be small and will be dependent on the adherence to standard operating procedures. The goal is to avoid practices that could result in waste fuel. The principal sources of the used oil will be from oil changes on the mining equipment and light vehicles, as well as oil changes to mechanical gearboxes within the mill. Typical used oil and waste fuel furnaces include a storage tank and a filter to recover sludge prior to burning. Sludge collected in the filters will be drummed and shipped, as needed, to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

6.3 Shipboard Incinerator

See Section 8 of the Shipping Management Plan (SD 8-1).

6.4 Closure Plan

In accordance with the Mine Closure and Reclamation Plan (SD 2-17), salvageable buildings and surface structures, including the incinerator and waste management building, will be dismantled and demobilized from the site.

SECTION 7 • WASTE MANAGEMENT

The amount of waste will be reduced through purchasing policies that focus on reduced packaging. Reduce, reuse, and recycle initiatives as well as a waste segregation program will be developed at the Meliadine Project as per the Landfill and Waste Management Plan (SD 2-11) to minimize the quantity of waste incinerated or directed to the landfill.

7.1 Approach

A waste segregation program will be implemented at the site. This will allow materials that are unsuitable for incineration to be either landfilled on-site or shipped off-site to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction. The waste segregation program will document the quantities and types of materials that are incinerated.

7.2 Acceptable Waste for Incineration

Acceptable wastes for incineration will include:

- Organic matter including food;
- Food containers and wrappings including plastics that are contaminated by food;
- Medical waste from the Health Care Station;
- Paper, cardboard and the like;
- Hydrocarbon spill absorbents;
- Plastic and Styrofoam except plastic containing chlorine;
- Sludge from the sewage treatment plant;
- Dead animals; and
- Used oils and waste fuel.

7.3 Unacceptable Waste for Incineration

Materials that are not listed above would be unacceptable for incineration. These materials include, but are not limited to:

- Chlorinated plastics;
- Inert materials such as concrete, bricks, ceramics, ash;
- Bulky materials such as machinery parts or large metal goods such as appliances;
- Radioactive materials such as smoke detectors;
- Potentially explosive materials such as propane tanks, other pressurized vessels, unused or ineffective explosives;
- Hazardous materials such as organic chemicals (pesticides), other toxic substances (arsenic, cyanide);
- Electronics;

- Batteries;
- Asbestos;
- Dry wall;
- Vehicles and machinery;
- Fluorescent light bulbs;
- Whole tires;
- Paint and solvents;
- Any materials containing mercury;
- Used oil or waste fuel that exceeds the maximum impurity limits for parameters listed in Table 5-3;
- Waste oil and waste fuel with a flash point of less than 37.7°C; and
- Propane.

7.4 Waste Volumes

7.4.1 Solid Waste and Incinerator Ash

The number of people working on-site and the activities occurring at the time have a direct bearing on the volume of waste destined for the landfill, the incinerator, and the amount removed from waste streams for reuse and recycling.

It has been assumed that each person will produce 1 tonne of refuse per year[2]. Mean camp populations of 500 during construction, 350 during operation and 50 during closure have been estimated. Fifty percent of the refuse by weight can be incinerated thereby reducing the mass by 70 percent. Thus for 350 workers, the annual quantity of ash would be about 52.5 tonnes. Table 7-1 estimates the annual tonnes of ash resulting from incineration for each project phase and cumulatively over the life of mine.

Table 7-1 Estimation of Ash over the Life of the Project

Project Phase	Workers on Site	Annual Tonnes of Waste Incinerated	Annual Tonnes of Ash	Numbers of Years	Cumulative Tonnes of Ash
Construction	500	250	75	3	225
Operation	350	175	52.5	13	682.5
Closure	50	25	7.5	3	22.5
Total					**930**

[2] Environment Canada's "State of the Environment InfoBase", Environmental Indicator Series 2003 (http://www.ec.gc.ca), indicates that the per capita non-hazardous solid waste generation in 2000 for Canada was almost 1 tonne per person per year.

Incinerator ash will be packaged in drums or sacks before being disposed of, thus eliminating any wind-blown effects.

7.4.2 Used Oil and Waste Fuel

The quantity of used oil anticipated to be generated from the servicing of machinery at Meliadine was estimated to be approximately 350,000 liters per year, this being similar to the quantity generated at Meadowbank. Meliadine and Meadowbank are approximately the same size and will generate approximately the same quantity of used oil each year. The reason being that both mines are located in Nunavut and use, or will use, approximately the same number and type of equipment, have a similar ore processing circuit, and operate 365 days a year. One difference between Meadowbank and Meliadine is that the Meliadine Project will have underground mining, which will generate an additional quantity of used oil. The amount of additional used oil from underground is not anticipated to be significant; however, actual amounts will not become known until underground operations begin and maintenance of the underground equipment is underway.

The quantity of waste fuel is expected to be small and may vary each year.

7.5 Waste Incineration Rate

Due to the predicted volumes of waste to be generated at the site, the incinerator will have an approximate incineration capacity of 1,750 kg/h. If this cannot be achieved due to a lower volume of waste, the primary chamber could be used as storage of wastes until the desired volume is reached. This will primarily be wastes associated with food and small amount of medical waste. The batch cycle will be of approximately 10 hours for the burn cycle, followed by a cool-down of approximately 6 hours. The secondary chamber will operate with a retention time of approximately 2 seconds.

SECTION 8 • MONITORING AND TESTING

The following presents the monitoring and testing plan for the incinerator.

8.1 Incinerator Emissions Testing

The incinerator stack design will incorporate appropriate sampling ports at appropriate locations, in right angle configuration, to allow for stack testing to be undertaken during incinerator operation. Table 8-1 summarizes the frequency of testing that will be completed as per relevant guidelines (see also CCME 2001b).

Table 8-1 Summary of Incinerator Emissions Testing

	Frequency	Number of Test Required	Reference
Dioxins and Furans	Annual	3	CCME, CWS 2001
Mercury	Annual	3	CCME, CWS 2000

8.2 Used Oil/Waste Fuel Testing

A sample of feedstock of used oil/waste fuel will be collected each month with one of the monthly samples being tested each year. Used oil/waste fuel not meeting impurity limits or having a flash point less than 37.7°C will be drummed and shipped to a certified management facility for re-refining, treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

8.3 Ash Testing

Upon commissioning of the new incinerator at Meliadine Project, an ash testing protocol will be implemented to ensure that the incinerator ash is suitable for disposal in the landfill.

Three (3) ash samples will be collected (one per month for the first 3 months of the incinerator in operation) and the leachate tested for metals content. The samples will be compared to the *Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities* (GN 2011b) presented in Table 8-2. Following the initial testing, ash samples will be collected and tested annually, or upon a significant change in the source or type of material sent to the incinerator.

If monitoring indicates the ash is above the guidelines and not suitable for landfilling, an investigation will be undertaken to identify the cause and eliminate the source for the exceedance. If deemed necessary, the ash will be packaged in drums and sent to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

Table 8-2 Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities

Parameter	Maximum Concentration (mg/L)
Arsenic	2.5
Barium	100
Cadmium	0.5
Chromium	5
Lead	5
Mercury	0.1
Selenium	1
Silver	5
Zinc	500

SECTION 9 • REPORTING

In order to demonstrate conformity with performance limits, an annual incineration management report will be prepared and submitted as part of annual reporting to authorizing agencies. The quantity and type of materials incinerated on-site during operations, together with results from periodic stack emissions and ash monitoring, will be included in the annual report.

A template for a stand-alone incinerator management annual report is provided within Appendix B. However, it is recognized that this annual report could be included as a component in other management plans and annual reports.

9.1 National Pollutant Release Inventory (NPRI)

The NPRI is a Canadian database containing information on the annual on-site release of specific substances to the air, water, and land from industrial and institutional sources (EC 2012). The NPRI provides a list of tracked substances and requirements for reporting incinerator emissions. Table 9-1 lists the substances under the NPRI that the Meliadine Project expects to report annually. In addition, there are certain substances, as indicated in Table 9-1, that may require reporting depending on the quantity of incinerator emissions. Whether or not reporting is necessary will depend on results of the periodic stack emission testing data and the quantity of annual emission calculated with emissions factors.

9.2 Greenhouse Gas Emissions and Global Warming

AEM is committed to reporting greenhouse gas (GHG) emissions in support of Canada's Voluntary Challenge Registry (currently termed the Canadian GHG Challenge Registry). AEM will develop a baseline and monitoring system for GHG to evaluate and report on progress in improving efficiency and reductions in GHG.

Table 9-1 NPRI Incineration Reportable Substance List

Substance	Note
Hexachlorobenzene Dioxins and Furans	Required to report
Carbon Monoxide Oxides of Nitrogen Sulphur Dioxide Total Particulate Matter (PM) with diameter <100 microns	Required to report if released to air from facility in a quantity of 20 tonnes or more per annum
Particulate matter with diameter less than or equal to 10 microns (PM_{10})	Required to report if released to air from facility in a quantity of 0.5 tonne or more per annum
Particulate matter with diameter less than or equal to 2.5 microns ($PM_{2.5}$)	Required to report if released to air from facility in a quantity of 0.3 tonne or more per annum

SECTION 10 • PLAN REVIEW AND ADAPTIVE MANAGEMENT

The IMP will be updated for the Class A Water Licence application, and regularly thereafter to reflect the operating conditions at the Meliadine Project during construction, operation and closure. The IMP will be reviewed annually by the Meliadine Project management team and an updated version will be produced every two (2) years of operation at a minimum.

The up-to-date IMP will be made available by AEM at all times for review by the Government of Nunavut, Water Licence Inspectors, and Environment Canada.

REFERENCES

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APPENDIX A • TECHNICAL SPECIFICATIONS OF THE PROPOSED INCINERATOR

TECHNICAL DATA SHEET

Technical Data

Supply all technical data for each item applicable, in the format shown on the following pages. Include drawings necessary for a technical evaluation of each item.

Equipment Number	TBD
Equipment Description	Camp Waste Incinerator
Manufacturer	Eco Waste Solutions
Model Number	ECO 1.75TN 1P MS 60L
Total Installed Weight, kg	44,500 kg (estimated with building)
1 Waste Incinerator	
Waste classification: (TYPES)	1. Camp Waste
	2. Sewage Sludge
	3. Waste Oil
Mixed waste charge classification: Break-down of each type of waste (%)	1. Camp Waste - 75%
	2. Sewage Sludge - 25%
	3. Waste Oil - N/A charged into secondary
****Emissions:**	
SO_2 (mg/m^3)	50 mg/m^3
CO (mg/m^3)	7 mg/m^3
NOx (ppm)	< 50 ppm
VOCs µg/m^3	50 - 2000 µg/m^3
Particulate (mg/m^3)	20 mg/m^3
PM_{10} (g/s)	N/A
Dioxins/Furan (pg I-TEQ/m^3)	< 80
Mercury (µg/Rm^3)	N/A - Materials cotaining Mercury to be excluded from incinerator waste stream
Flue Gas Temperature (°C)	1000°C
Flue Gas Flow Rate (kg/s)	1.996 kg/s (max)
Incineration capacity: (kg/h)	175 kg/h (10 hour burn)
Charge per cycle: (kg)	1750kg
Burning rate: (kg/h)	175 kg/hr average
Off-time per cycle: (h)	6 hr cool down
Heat value: (kJ/kg or BTU/lb)	5125 BTU/lbs (Solid and Sewage sludge mixed waste)

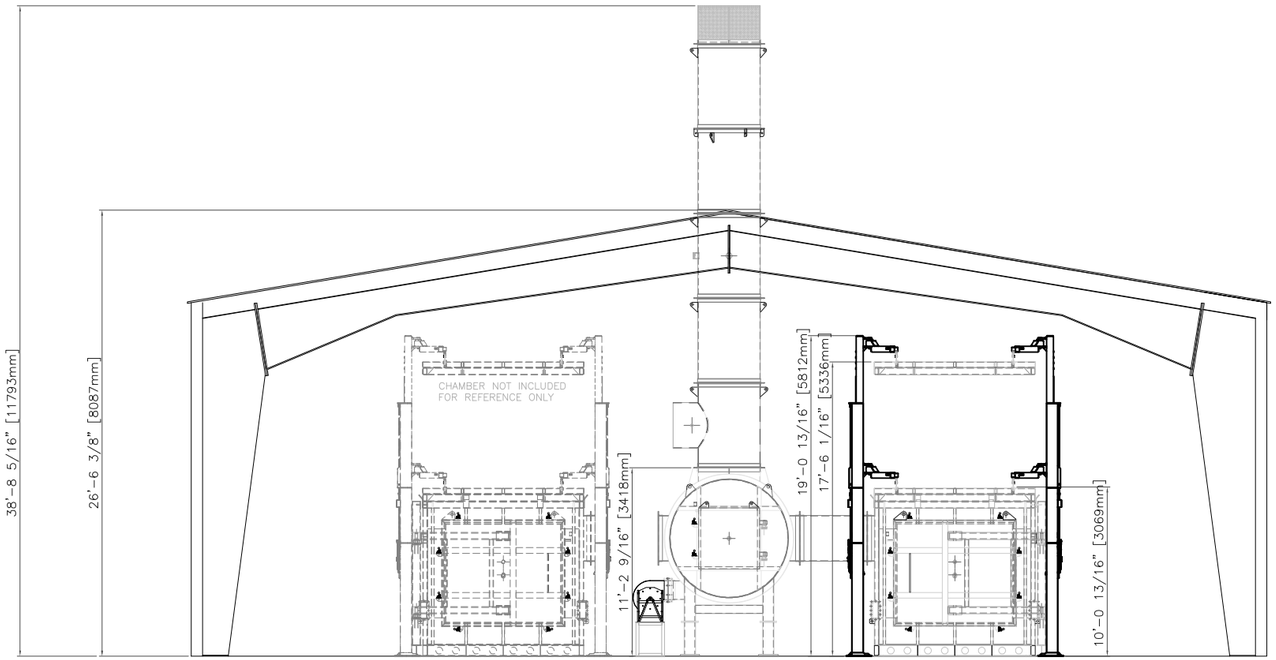
**The emission estimates provided are given as volumetric concentrations or pollutants; as per test reporting standards. Estimates are based on previous air emission tests.

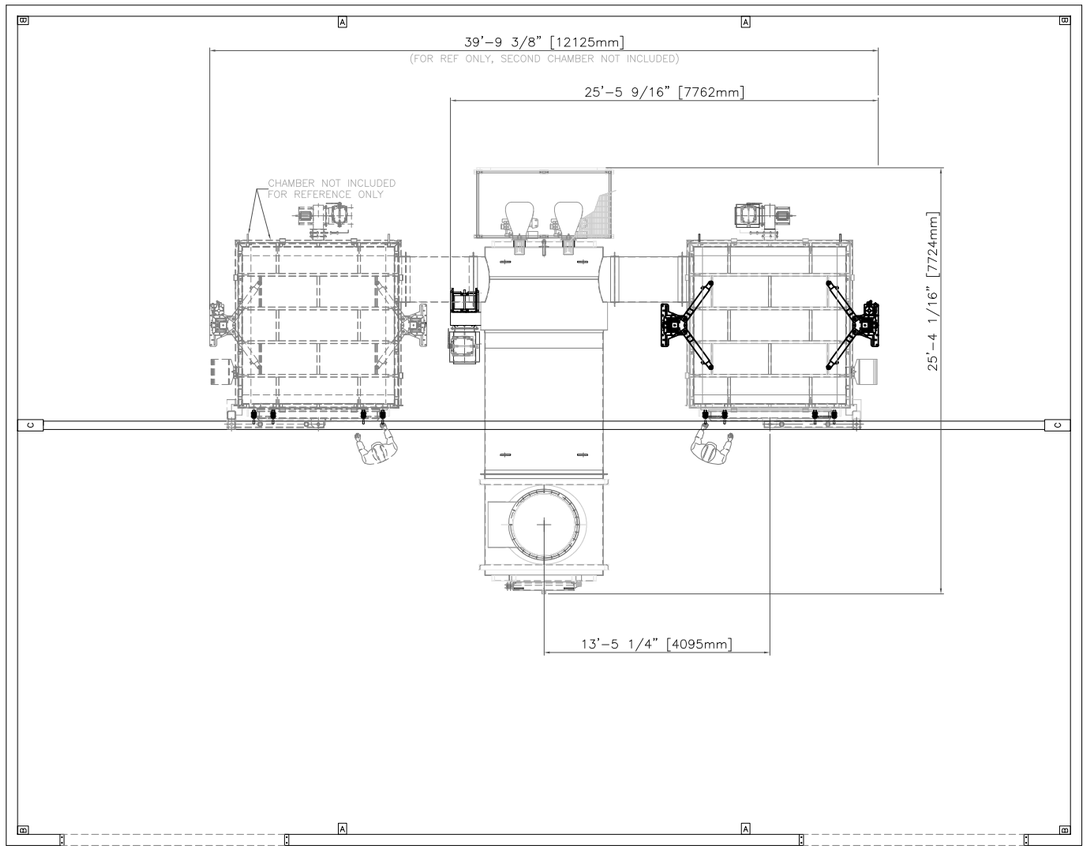
Fuel mixing ratio with waste oil (if applicable)	N/A
Capability to burn waste oil with loading rate (kg/h)	60.6 kg/h (8 hour liquid burn)
Applicable auxiliary burner.	N/A
Incinerator to bear CSA label?	All electrical components CSA or UL approved. Approval of complete incinerator package at additional cost..
Temperature: Primary chamber (°C):	705°C
Temperature: Secondary chamber (°C):	1000°C
Burner Efficiency:	High
Internal Volume of Primary Chamber:	2.43(l) x 2.43(w) x 2.29(h) m
Internal Volume of Secondary Chamber:	1.83 (dia) x 5.49(l) m
Destruction efficiency	95% DRE
Tested Emission results (rates)	- See Section 1 (Emissions)
Stack internal diameter (mm)	965mm
Height of Stack (m)	7.62m
Stack materials of construction	Refractory Lined - Mild Steel (44W HSLA)
Spark Arrester length (mm)	1092mm
Spark Arrester open area (m^2)	0.425m^2
Burner System	Primary Burner - Riello RL28/2
	Secondary Burner - Qty(2) Riello RL100/M
	Liquid Waste Burner - Eco Waste Solution Liquid Waste Oxidizer
Valve Train	N/A - Integrated in Burners
Charging System	N/A - Batch System
Charging opening size	1.78m (w) x 1.43m(h)
Charging Chute size	N/A - no chute
Ash Removal System	N/A - Manual
Expected ash production per cycle (kg)	200kg (estimated)
Maximum Capacity of ash removal system	N/A
2. Materials of Construction	
External Casing	Mild Steel (44W HSLA)
Spark Arrester	Stainless Steel (SS 304)
Insulation in Primary Chamber	Walls - Ceramic Fibre Blocks (152mm (6") Thick)
	Floor, Door Sills & Breech entrance - Castble (101 - 152mm (4-6") Thick)
Insulation in Secondary Chamber	Walls - Ceramic Fibre Blocks (152mm (6") Thick)
	Breech exit & Stack Entrance - Castable - (76 -152mm (3-6") Thick)
Insulation in Stack (materials and thickness)	Insulating Castable (76mm (3") Thick)
Charging Chute	N/A
Paint System Used	Carboline - Silicon Zinc Primer, Silicon Finish
Dry Film Thickness of Paint	Primer - 2 mils (50 micron)
	Final Coat - 2 mils (50 micron)
Primary Chamber Burner Rating	(663 - 1266)x10^3 KJ/hr
Secondary Chamber Burner Rating	(1582 - 6119)x10^3 KJ/hr
3. BLOWERS	
Blower Manufacturer	New York Blower
Primary Chamber Blower Capacity (m^3/hr)	2696
Primary Blower Pressure (kPag)	0.25
HP/ RPM	1.15 hp @ 2200rpm
Secondary Chamber Blow Capacity (m^3/hr)	4247
Secondary Blower Pressure (kPag)	0.5
HP/ RPM	1.9hp @ 4900 RPM
4. CONTROL SYSTEM	
Please list all instrumentation and details including	- Please See Appendix A (Attached)
CSA approval and labelling:	

5.	**INCINERATOR BUILDING (if applicable)**	
	Overall Length (mm)	12 192mm
	Overall Width (mm)	12 192mm
	Overall Height (mm)	6420 mm
	Shipping Dimensions (mm)	6660 x 3050 x 914 mm
6.	**DIMENSIONS**	
	Overall Length (mm)	6 858 mm
	Overall Width (mm)	7 188 mm
	Overall Height (mm)	11 049 mm
	Shipping Dimensions (mm)	**Largest Pieces (L x W x H) mm**
		Primary Chamber - 3403 x 3225 x 2895
		Secondary Chamber - 6172 x 2413 x 2794
		Shipping Container - 12 000 x 2438 x 2591
7.	**WEIGHTS (KG)**	
	Incinerator	20 275 kg
	Stack	4082 kg
	Blowers & Burners	400 kg (Blowers) 580 kg (Burners)
	Total Weight	25 337kg

FOR: REVIEW ONLY.

BILL OF MATERIAL			
ITM.	QTY.	DESCRIPTION	WEIGHT kg.
–	–	–	–





REV.	DATE	DESCRIPTION	BY	APPROVED
–	–	–	–	–

DRAWN: J.S.	DATE: 19-08-08	ECO WASTE SOLUTIONS ECO BURN INC.
CHECKED:	DATE:	

PROJECT NAME: HATCH – MEADOWBANK	CUSTOMER P.O. –
PROJECT NUMBER: MDB-S-268	CUSTOMER EQUIPMENT. # –

SCALE: –	TITLE: BUILDING DRAWING HATCH MEADOWBANK	P.1_OF_1
JOB NO. 08-2MS		
THIRD ANGLE	DWG. NO. MDB-ECO1.75TN1PMS60L-XXX	REV. —

APPENDIX B • TEMPLATE - INCINERATOR MANAGEMENT ANNUAL REPORT

Appendix 2
Annual Report for
Incinerated Waste Management

Contact Information			
Company Name:			
Contact Name:		**Position**	
Contact Email:			
Address			
City/Town:		**Province:**	
Postal Code:			
Telephone:		**Fax:**	

Incinerator Data and Information

Name of Emission Unit	

Type of Process	

Description of Process	

Description of Material Produced from incineration	

Manufacturer of Emission Unit	

Model No.	

Dates of Commencing:	**Date**
Construction	
Operation	
Modification	

Operating Information	**Hour/day**	**Days/week**	**Weeks/year**
Maximum Operating hours			
Average Operating hours			

Annual Throughput	Dec-Feb (%)	Mar-May (%)	Jun-Aug (%)	Sep-Nov (%)

Incinerator Charging Rate	Maximum (kg/day)	Average (kg/day)	Annual (tonnes/year

Appendix 2
Annual Report for
Incinerated Waste Management

Waste Description	Maximum Rates		Average Rates	
Type of Waste Material	kg/day	tonnes/year	kg/day	tonnes/hour

Fuel Usage Data	Maximum	Typical
Firing rate		

Fuel Type	

Sector Determination:	Check Applicable Box
Municipal Waste Incineration	
Sewage Sludge Incineration	

Stack Emissions Tests For Compliance (must be corrected for 11% oxygen)

	Date	Test 1	Test 2	Test 3	Average	**Compliance (check)**
Furans and Dioxins						
Mercury						

Provide Test method details:

Appendix 2
Used Oil Impurity Limits

Contact Information			
Company Name:			
Contact Name:		**Position**	
Contact Email:			
Address			
City/Town:		**Province:**	
Postal Code:			
Telephone:		**Fax:**	

Volume of Used Oil Generated:	

Volume of Used Oil incinerated/Cons	

Sample Analysis:

Flash Point:	

Impurity	**Units**	**Maximum Level Allowed**	**Sample #**			
Cadmium	ppm	2				
Chromium	ppm	10				
Lead	ppm	100				
Total Organic Halogens (as chlorine)	ppm	1000				
Polychlorinated biphenyls	ppm	2				
Ash content	%	-				

Volume of Products Produced from Used Oil Use:

Maintenance Performed on Incinerator:

Destination of Used Oil not Incinerated:

Appendix 2
Guidelines for Ash Testing
Environmental Guidelines for Industrial Waste Discharges

Parameter	Concentration maximum (mg/L)	Sample Number		
Ammonia Sulphide	100			
Benzidine	100			
Benzyl Chloride	100			
Enthalamine	100			
Ethylenediamine	100			
Maleic Anhydride	100			
Potassium Permanganate	100			
Quinoline	100			
Strychnine	100			
Tetrachloroethanes	100			
Arsenic	2.5			
barium	100			
Cadmium	0.5			
Carbon tetrachloride	0.5			
Chromium	0.5			
Cyanide (free)	20			
DDT	3			
Endrin	0.02			
Heptachlor + Heptachlor epoxide	0.3			
Lead	5			
Lindane	0.4			
Mercury	0.1			
Methoxychlor	10			
Methyl ethyl Ketone	200			
Metolachlor	5			
PCBs	50*			
Selenium	1			
Silver	5			
Tetrachloroethylene	3			
Toxaphene	0.5			
Trialomethanes	10			
2, 4, 5-TP (Silvex)	1			
Zinc	500			

* based on concentration by mass