Appendix E
Updated Management Plans

AGNICO EAGLE

MELIADINE GOLD PROJECT

Landfill Design and Management Plan

Water Licence 2BB-MEL1424

March 2017

EXECUTIVE SUMMARY

This Landfill Design and Management Plan outlines the conceptual design, operation and closure for an industrial waste landfill as part of Agnico-Eagle Mines Limited's (AEM) Meliadine Gold Project in Nunavut. This Plan was developed to operate a landfill as part of advanced exploration at the Meliadine Gold Project.

The landfill is required for the disposal of non-salvageable, non-hazardous, solid wastes generated during exploration activities. The proposed landfill will be located within the area where the future tailings/waste rock storage facility will be located. The camp is expected to accommodate a maximum of 150 to 300 persons during advanced exploration, dependent on the time of year.

The leachate from the landfill is anticipated to have very weak ionic strength (dilute) due to the controls on materials placed in the landfill. Also, abundant landfill cover material is to be found in the area, which will result in sufficient cover to isolate the waste in the landfill from the environment. At the end of its life, the landfill will be covered by a sufficient depth of material to isolate it from the environment, to permanently freeze it within the permafrost layer, and to chemically and physically stabilize it.

During operations, the slopes of the landfill will be protecting from erosion by covering them with waste rock or coarse granular material. Additional surface water and erosion control measures will be incorporated into the landfill design, as appropriate.

To meet NWB guidelines, AEM conducted an environmental effects assessment to characterize environmental resources and determine the anticipated environmental effects of a landfill. The primary potential environmental effects from landfill activities included leachate generation, windblown debris, and habitat (vegetation) loss. Given the effective implementation of mitigation plans, no residual environmental effects to valued ecosystem components from construction, operation or closure of the landfill are anticipated.

This Plan will be implemented once approved, subject to any improvements proposed by the NWB.

DISTRIBUTION LIST

Nunavut Water Board

Nunavut Impact Review Board

Meliadine – General Project Manager

Meliadine – Sr. Environment Coordinator

Meliadine – Environment Superintendent-NU

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	12/03/30			Version 1 of the Landfill Plan
2	17/03/01			Version 2 of the Landfill Plan - Plan approved by: Jamie Quesnel; pg. Document Control - Landfill duration: November 2016-November 2018; pg. 1, 4 - Implementation Date: March 2017; pg. All (header) - Landfill Design - Overall Site Plan: Diagram; pg. 2 - Location of the Proposed Landfill on the Commercial Lease: Diagram; pg. 3 - Conceptual Cross Section: Diagram; pg. 14 - Removal of “Used Tires” from list of materials permitted in the landfill; pg. 7 - Removed Figure “Landfill Detailed Design”, as it is covered in Figure 1-1 “Landfill Design - Overall Site Plan” -Added “empty prilled ammonia nitrate bags” to list of acceptable items to be landfilled

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1. Introduction

1.1 Project Overview

This Landfill Design and Management Plan outlines the conceptual design, operation and closure for a solid waste landfill as part of the advanced exploration program at Agnico-Eagle Mines Limited's (AEM) Meliadine Gold Project. Advanced exploration includes underground exploration comprising of bulk sample collection and ramp extension while surface activities have moved to pre-construction phase.

The Meliadine Gold Project is located on Inuit-owned land in the Kivalliq Region of Nunavut, approximately 25 km north of Rankin Inlet. Figure 1-1 provides an overview of the major infrastructure associated with the proposed landfill while Figure 1-2 shows its proposed location on the commercial lease AEM holds with the Kivalliq Inuit Association[1].

The Meliadine Gold Project operates under Water License 2BB-MEL1424 issued by the Nunavut Water Board on July 31, 2009. This Landfill Design and Management Plan is one of a series of environmental management plans that have been prepared for the Meliadine Gold Project, with all earlier plans required by terms and conditions of the water licence. The objectives of this Plan are summarized as follows:

1. To define the location, design and operating procedures to be used in the landfill disposal of non-hazardous solid waste generated at the Meliadine camp;

2. To define acceptable/non-acceptable types of solid waste to be placed in the Meliadine landfill; and

3. To define monitoring requirements for the landfill.

A landfill is required for the disposal of non-salvageable, non-hazardous industrial wastes from advanced exploration activities that cannot be incinerated. The Landfill Design and Management Plan was developed in accordance with the best management practices. Hazardous wastes will not be placed in the landfill. All waste materials considered unsuitable for landfill deposition will be packaged for shipment south to a certified waste management company for treatment, recycling and/or disposal.

Depending on the time of year, the camp is expected to accommodate from 150 to 300 persons during advanced exploration. A 2 year landfill life has been assumed, November 2016-November 2018.

To meet NWB guidelines, AEM conducted an environmental effects assessment to characterize environmental resources and to determine the anticipated environmental effects of the proposed landfill.

[1] The Kivalliq Inuit Association has approved the construction, operation and closure of a landfill on the commercial lease. Their letter of approval is attached.

Figure 1-1 Landfill Design - Overall Site Plan

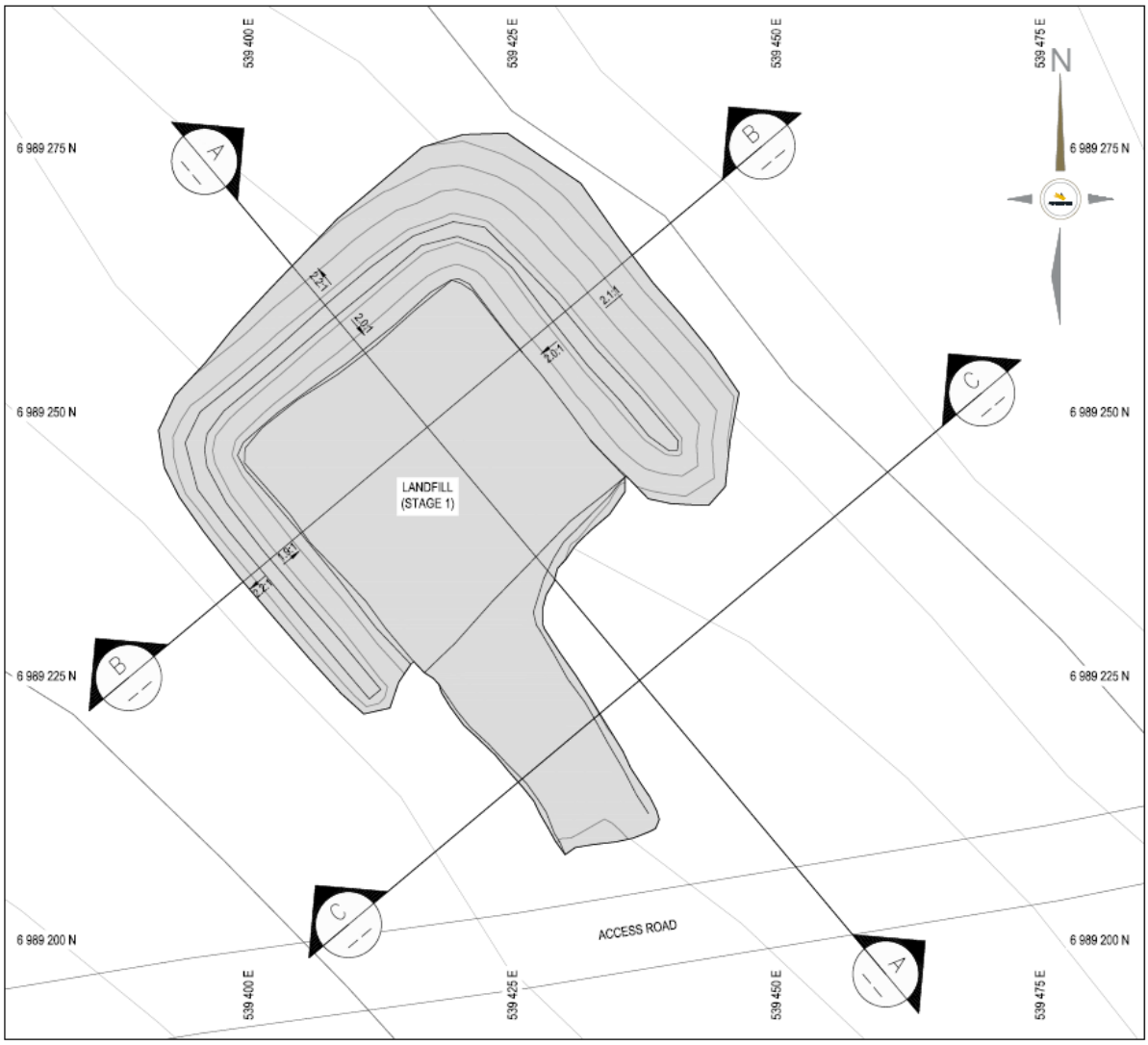
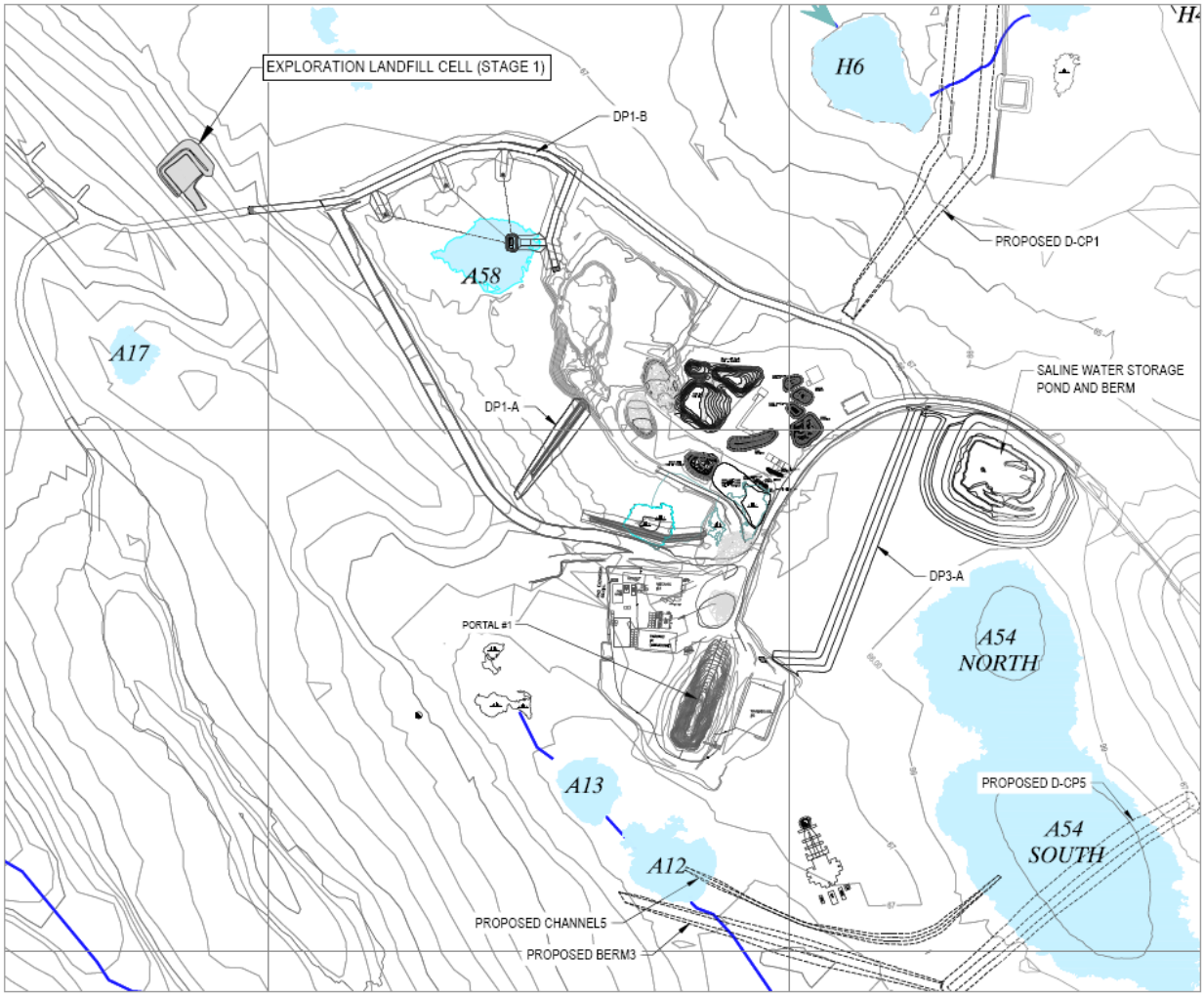


Figure 1-2 Location of the Proposed Landfill on the Commercial Lease



OVERALL LOCATION PLAN FOR EXPLORATION LANDFILL STAGE 1
SCALE: N.T.S.

1.2 Project Description

The Meliadine advanced exploration site includes the following structures and facilities:

- Camp, dormitories and kitchen;
- Core shack, storage and maintenance buildings;
- Portal and underground workings;
- Waste rock pads that hold ore stock piles, underground service buildings, and an underground bulk sample facility;
- Roads;
- Granular borrow pits;
- Water management facilities; and
- A proposed industrial waste landfill.

The Meliadine camp is designed to minimize the areas of surface disturbance, stabilize disturbed land surfaces against erosion, and return the land to a post-mining use that is chemically and physically stable, and consistent with past traditional pursuits and wildlife habitat (MGP, 2010a).

1.3 Location of the Landfill

The landfill will be located considering the following criteria:

- Drainage – sites that drain into areas where water will be collected and monitored as part of the overall site plan are preferred.
- Avoid Ice Rich Soil Excavation – sites where bedrock is at relatively shallow depths are preferred.
- Disturbed Areas – sites that will be within or near areas that will be disturbed as part of the future overall mine plan are preferred.
- Access – sites that are located close to existing access roads are preferred.

The first three criteria are recommendations from the Mine Site Reclamation Guidelines for the Northwest Territories (INAC, 2006).

Based on the above criteria, a landfill is planned east of Lake B7 as shown on Figure 1-1. It would be located in the headwaters of the H drainage basin, which reaches Meliadine Lake approximately 1 kilometre to the east. Drainage patterns are poorly defined in the upper reaches of the H basin and are only active during spring freshet and during large rain events.

The Landfill will be developed and serve as the non-hazardous solid waste disposal site for 2 years of advanced exploration and pre-construction, November 2016 to November 2018.

2. Regulatory Setting

Waste management in Nunavut is regulated under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act* and the federal *Environmental Protection Act*. AEM is also bound by the terms and conditions of its commercial lease with the Kivalliq Inuit Association and its water licence from the Nunavut Water Board.

In addition to mandatory requirements, a number of waste management guidelines are commonly used in the NWT and Nunavut. The most recent of these was developed for municipal solid waste, and is titled "*Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT*"[2]. While not all of the recommendations provided in this guideline are appropriate for the management of industrial waste such as those generated at the Meliadine advanced exploration camp, those principles considered applicable have been adopted in this Plan.

In addition, the *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2006) were followed in this current document regarding specific landfill design and mitigation for impacts pertaining to waste. Where appropriate, recommendations from *Implications of Global Warming and the Precautionary Principle in Northern Mine Design and Closure* (BGC 2003) were also incorporated into this document.

[2] Report was prepared by Ferguson Simek Clark, April 2003, on behalf of the Department of Municipal and Community Affairs, Government of Northwest Territories

3. Plan for the On-Site Disposal of Solid Waste Approach

The strategy for the disposal of solid waste is to first identify and segregate acceptable disposal items from non-acceptable items. Acceptable items that can be disposed of at the on-site facility are those that are non-hazardous, non-putrescible, with a low leachate and heat generation potential. All other materials will either be incinerated or hauled offsite for shipment to a licensed hazardous waste management company. This strategy for limiting the materials that can be placed in the landfill greatly reduces the concentration of constituents in the leachate.

All solid wastes that may contain food waste, food packaging waste or other organic waste that could attract wildlife will be incinerated onsite at the incinerator. This will include all garbage from the camp, camp kitchen, site lunchrooms and offices. The ash from the incinerator will be placed in drums and disposed of in the landfill. Incinerator ash samples will be collected and tested for metals according to the Government of Nunavut Environmental Guideline for Industrial Waste Discharges (Department of Sustainable Development, 2002). Ash that does not meet these guidelines will be packaged in drums and sent to a licensed hazardous waste management facility in the south.

The development of the landfill will minimize the area required for waste storage and the re-handling of waste. The landfill at the selected location will allow any leachate that may be generated to be collected, monitored and managed in the future waste rock area. The leachate from the landfill is anticipated to be weak in ionic strength due to the controls on materials placed in the landfill and thus site specific landfill leachate management is not considered to be required. Any point of discharge or runoff from the landfill will be sampled and analyzed for parameters as per NWB LIC# 2BB-MEL1424 Part D Item 14.

Based on the above strategy, a liner is not considered to be required for the landfill, nor is any special monitoring recommended. However, the landfill will conform to best management practices allowing for orderly landfill development, which reduces the potential for windblown debris.

3.1 Waste Acceptable for Placement in Landfill

The following materials will be acceptable for disposal at the landfill:

- Plastic (except expanded polystyrene);
- Steel, copper, aluminum, iron;
- White goods;
- Wire;
- Wood;
- Fiberglass insulation;
- Fiberglass;

- Roofing materials;
- Asphalt;
- Concrete;
- Carpet;
- Bricks;
- Ceramics;
- Rubber
- Empty caulking tubes;
- Hardened caulk;
- Clothing;
- Glass including light bulbs, (fluorescent bulbs will require special handling, see below for more details);
- Waste Asbestos (see below for more details);
- Small appliances (with batteries removed);
- Gyproc;
- Ash, provided it has cooled to 60ºC or less; and
- Vehicles and machinery provided all liquids, grease, batteries, and electronics have been removed.
- Empty prilled ammonia nitrate bags from Anfo Plant (explosives production facility)

Waste Asbestos

Waste asbestos includes any type of material with greater than 1% asbestos by weight (Government of Nunavut, Environmental Protection Service, 2002a). Asbestos that has been immersed or fixed in a natural or artificial binder or included in a manufactured product is not considered waste asbestos; it is considered a hazardous waste (and will be disposed of accordingly). Waste asbestos can either be backhauled off-site for disposal in an approved facility or it can be landfilled. The following are guidelines for landfilling waste asbestos:

- Immediately buried and covered with 0.5 m of cover material;
- Buried where it will not be disturbed; and
- The location should be maintained on a map or diagram for future reference.

The complete *Environmental Guideline for Waste Asbestos* is included in Appendix A.

3.2 Waste Unacceptable for Placement in Landfill

Materials that are not listed above will be unacceptable for placement at the landfill, unless approved in writing by the Meliadine Environment department. These materials include:

- Organic matter including food, septic tank pumpings or sludge from waste water treatment, dead animals, paper, cardboard;
- Food containers and wrappings, unless cleaned;
- Hazardous waste including mercury, medical waste, batteries, solvents, glues, ethylene glycol antifreeze, adhesives (except empty caulking tubes);
- Electronics;
- Petroleum products, including materials contaminated with petroleum products; and
- Expanded polystyrene.

In particular, organic matter will not be accepted in the landfill, thus eliminating the attraction to carnivores and/or raptors. This will be accomplished by requiring all personnel to dispose of domestic waste in designated receptacles and by sending all collected domestic waste (e.g. from kitchens, offices and living quarters) to the site incinerator.

Fluorescent Lamp Tubes

Fluorescent tubes contain mercury phosphorus powder and traces of lead and cadmium, which are considered environmental contaminants under the Nunavut *Environmental Protection Act*. The only disposal method for fluorescent tubes is through an approved hazardous waste recycling or disposal facility (Government of Nunavut, Environmental Protection Service, 2003). Ultraviolet (UV) lamp tubes used in the wastewater and potable water treatment systems shall be disposed of in the same way as fluorescent lamp tubes, as they also contain mercury (vapour).

At the Meliadine site and Rankin Inlet Itivia Laydown Area, hazardous waste materials will be stored in secure facilities until they can be backhauled for off-site recycling or disposal at an approved facility in another provincial or territorial jurisdiction. AEM has registered as a Hazardous Waste Storage Facility with the Government of Nunavut Department of Environment.[3]

Ozone Depleting Substances

Ozone Depleting Substances (ODSs) include chlorofluorocarbons (CFCs) or halons. Common sources include refrigeration equipment, air conditioning equipment, motor vehicle air conditioners and fire extinguishing equipment (Government of Nunavut, Environmental Protection Service, 2002b). These materials are hazardous in nature; consequently, all disposal of ODS will take place at an approved facility in another provincial or territorial jurisdiction.

[3] Waste Generator Number - NUG100031

Any equipment containing ozone depleting substances should have the ODS removed by a certified technician prior to disposal in the landfill. The *Environmental Guideline for Ozone Depleting Substances* is included in Appendix A.

3.3 Total Volume Of Waste

An estimate of waste volume is required to determine the appropriate size of the landfill. However, an exact volume of waste is not a critical parameter in the design because of the flexibility of design to accommodate extensions (larger to accept more waste) or contractions (smaller to accept less waste) of the landfill.

For the proposed conservative population of 150 to 300 persons[4], it has been assumed that each person will produce 1 tonne of refuse per year, and that 50% of the refuse by weight can be incinerated (i.e. not landfilled, except for the ash). Thus, 100 to 200 tonnes of solid waste would need to be landfilled each year. If it is further assumed that the density of this solid waste is 0.5 tonnes / m^3, then 200 to 400 m^3 of waste would need to be landfilled each year over the four year life of the landfill.

The quantity of ash from the incinerator is estimated to be between 22.5 to 45 tonnes/yr., assuming incineration results in a 70% reduction in mass. Incinerator ash will be packaged in drums or sacks and the whole container landfilled, thereby eliminating any windblown effects.

3.4 Incinerator Ash Testing Protocol

Upon commissioning the new incinerator at Meliadine Exploration Camp (a Camp Waste Incinerator - model: Westland Environmental Services, Model: CY-2050-FA-D, an ash testing protocol will be implemented to ensure that the incinerator ash is suitable for disposal in the landfill.

Ash samples will be collected and tested annually, or upon a significant change in the source or type of material sent to the incinerator. The samples will be compared to the Government of Nunavut guidelines for solid waste/process residual concentrations suitable for landfill, as described in the Environmental Guideline for Industrial Waste Discharges and presented in Table 3.1 (Department of Sustainable Development, 2002).

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 this exceedance. Ash with elevated metals concentrations will be packaged in drums and sent to a licensed hazardous waste disposal facility in the south.

[4] For conceptual planning of landfill capacity, it was estimated that 300 persons (size of on-site camp facility) will be employed at any one time on-site. 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. Thus, for landfill conceptual planning purposes, 300 tonnes of waste has been assumed to be generated each year.

Table 3.1: Guidelines for Solid Waste/Process Residuals Suitable for Landfill

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

NOTE: Standards based on leachate test results

4. Landfill Location And Construction

The proposed location of landfill is shown on Figure 1-1 to the east of Lake B7. This is an area of level topography having a nearby source of coarse granular esker material for covering the waste in the landfill. It is anticipated that this landfill will serve as the solid waste disposal facility for 2 years of advanced exploration and during pre-construction. The design of the landfill will require no exacting survey data or measurement. This is due to the restriction on materials that can be landfilled and the location of the landfill being within the proposed future waste rock and/or tailing storage facilities. These factors reduce the need for leachate collection or control or mitigation measures against vectors such as carnivores and/or raptors. Thus, the main environmental mitigation measure required is a wind screen to reduce windblown debris.

The area to receive waste will be bounded on sides by a granular material or rockfill berm as shown in Figure 4-1. The purpose of the berm is to confine the waste and to act as a wind shield to reduce windblown debris. The landfill will be a rectangular shape with the length perpendicular to the prevailing wind direction so that much of the waste will be protected from wind by the berm. The landfill will be oriented so that the main wind direction has a minimal impact on the contents of the landfill.

Provided the materials that go into the incinerator are controlled to exclude all hazardous materials (*i.e.*, even small quantities of hazardous waste such as batteries are not disposed in the landfill), then the incinerator ash should be non-hazardous. An ash testing protocol will be implemented to ensure that the incinerator ash is suitable for disposal in the landfill.

4.1 Landfill Protocol For Placement of Material

Annual landfill operation will involve clearing of snow prior to spring melt, placement of waste rock or granular material over the waste during the summer period, and placement of a graded cover prior to the winter period of snow accumulation.

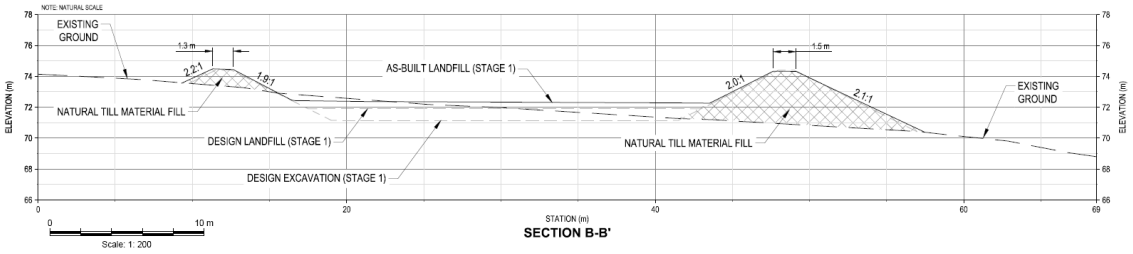
An area method of deposition will be used such that materials will be deposited in rows and covered as required. Wastes will be disposed directly on the ground and compacted with heavy equipment against the berm or an existing row of compacted debris. This is followed by a final cover in excess of 1.5 metres of non-acid generating rock and/or granular material from the esker as shown on figure 1-1.

4.2 Leachate Management

The leachate from the landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill, and as a result site-specific landfill leachate management is not considered to be required.

Owing to their placement within the future waste rock/tailing storage facility, the landfill will also become encapsulated within waste rock/tailings. AEM plans to use NPAG waste rock or granular material to surround and cover the landfill wherever practical. A minimum of 2 m thick layer of cover material would also be placed over the landfill cover as part of planned closure activities for the landfill.

Figure 4-1 Conceptual Cross Section



5. Landfill Conceptual Operations Plan

The following is a conceptual plan for operating the landfill:

a) Materials Acceptable for Disposal

See Section 3.1.

b) Materials Not Acceptable for Disposal

See Section 3.2.

c) Waste disposal rate

The proposed landfill capacity assumes an average of 200 to 400 m^3 of waste will be landfilled per year.

d) Site Development and Landfilling Method

The site for the landfill will be prepared by first excavating soil down to bedrock or to 2.1 metres depth, whichever is less. The excavation will then be filled with granular material. This will provide a suitable working surface for the landfill for all seasons.

The landfill will be filled progressively in an orderly manner. Specifically, waste will be placed at one end of the landfill at full height and then the active waste area would progressively advance. Areas where the waste has been placed to full height and levelled would be progressively covered by placement of a minimum 0.3 m thickness of rock fill or granular material on top of the waste.

e) Staffing and Equipment

The landfill will not require a full-time attendant. Trucks will haul waste to the landfill and a dozer would be used to spread and level the waste.

f) Leachate Management

The leachate from the landfill is anticipated to be of very weak (dilute) ionic strength due to the controls on materials placed in the landfill. Therefore, specific leachate management is not considered to be required.

g) Surface Water and Erosion Control

The slopes of the landfill will be covered with rockfill or coarse granular material, thereby protecting them from erosion. Additional surface water and erosion control will be incorporated into the landfill design, as appropriate.

h) Operational Inspections

The Meliadine Environment Department to undertake periodic inspections of the landfill operations to verify compliance with the water licence, and operations and closure plan, including the condition of landfill works, evidence of erosion, excessive ponding or unusual landfill settlement, and adequacy of safety measures.

6. Conceptual Closure plan

The following is a conceptual plan for closing the landfill:

a) Estimate of Total Waste Volumes, Tonnage and Life of Landfill

Upon closure, it is estimated that the landfill will have a maximum volume of 2,000 m^3 of waste.

b) Final Cover Design

The waste in the landfill will be covered granular material or waste rock, and should thereafter be stable.

c) Water Management

Contact water from the landfill in closure will continue to be managed using best management practices.

7. Potential Environmental Effects

The landfill will be designed and built as part of the future waste rock/tailing storage facilities. The access road to the Tiriganiaq esker borrow pit will be used to access the landfill. Landfill activities that were identified to have potential effects on valued ecosystem components (VECs) include site preparation and construction, operations and closure.

Potential effects from the landfill on VECs were assessed as follows:

- Degradation of permafrost;
- Change in surface water and groundwater drainage patterns due to the landfill footprint (altered landscape);
- Change in groundwater and surface water quality from leachate percolation, leading to degradation of aquatic habitat;
- Change in air quality from dust and windblown debris;
- Loss of vegetation cover and terrestrial mammal habitat due to landfill footprint;
- Attraction of predatory, small mammals to waste and raptors; and
- Loss of sites of heritage significance or traditional ways of life.

A summary of the environmental effects assessment, including mitigation measures and potential for residual effects is provided in Table 7.1.

Table 7.1: Environmental Overview Effects Assessment Summary

Valued Ecosystem Component	Description of Potential Project Effect	Mitigation of Effect	Residual Effect
Permafrost	Permafrost Degradation The construction, operations and closure of the landfill may disturb permafrost.	The landfill will be designed and built within the footprint of the proposed future waste rock/ tailing facilities to minimize ground disturbance and permafrost degradation, as per the Pre-mining Planning Option objectives outlined in the Mine Site Reclamation Guidelines for the Northwest Territories (INAC, 2006).	None
Surface Water and Groundwater Quantity and Distribution	Change in Drainage Pattern The construction, operations and closure of the landfill may alter surface water and groundwater drainage patterns.	The landfill will be designed and built within the footprint of the proposed future waste rock/ tailing storage facilities. Construction control measures are available for existing facilities to limit impacts to groundwater.	None
Water Quality	Change in Water Quality Leachate generation from landfill waste during operations may have an effect on water quality in the nearby water bodies.	Waste that can result in high toxicity leachate will be incinerated or hauled offsite, and will not be landfilled. Incinerator ash will be tested periodically to confirm that it is not hazardous waste. The leachate from the landfill is anticipated to be very low ionic strength (dilute) due to controls on materials to be placed in the landfill. At the end of its life, the landfill will be capped with waste rock and or coarse granular material (> 2m).	None
Air Quality	Change in Air Quality (Emissions and Dust) Emissions, dust and windblown debris from landfill operations may affect air quality.	Emissions and dust deposition are anticipated to be low due to the small quantity of waste and the covering by waste rock or coarse granular material. A rockfill or granular material berm will be constructed to act as a wind shield to reduce amount of windblown debris.	None

Valued Ecosystem Component	Description of Potential Project Effect	Mitigation of Effect	Residual Effect
Vegetation Cover	<u>Vegetation Loss</u> Landfill construction and operation will reduce vegetation.	The landfill will be designed and built within the footprint of the proposed future waste rock/ tailing facilities; therefore there will be no additional effects to vegetation cover. Where appropriate, these mitigation measures will be incorporated into landfill closure.	None
Predatory Mammals	<u>Attraction to Landfill</u> Food and camp wastes attract scavengers during landfill operations including grizzly bear, Arctic fox and wolverine. Mortality of animals may occur if they are a threat to human safety.	Putrescible waste will be incinerated and will not be landfilled and thus there should be no food attraction for animals.	None
Small Mammals	<u>Attraction to Landfill and Habitat Loss</u> Landfill construction and operation will reduce vegetation cover and habitat for small mammals. Food and camp wastes attract scavengers during landfill operations.	Putrescible waste will be incinerated and will not be landfilled and thus there should be no food attraction for animals.	None
Raptors	<u>Nesting and Foraging Habitat Loss</u> Construction and operation of the landfill will reduce vegetation cover and habitat for raptor prey (small mammals and birds).	The landfill will be designed and built within the footprint of the proposed future waste rock/ tailing facility; therefore there will be no additional effects to vegetation cover.	None

Valued Ecosystem Component	Description of Potential Project Effect	Mitigation of Effect	Residual Effect
Breeding Birds	<u>Roosting, Foraging and Nesting Habitat Loss</u> Construction and operation of the landfill will reduce vegetation cover resulting in loss of nesting sites.	The landfill will be designed and built within the footprint of the future waste rock/ tailing facilities; therefore there will be no additional effects to vegetation cover (breeding bird habitat). Progressive reclamation of the landfill will restore small breeding bird habitat.	None
Ungulates (caribou and muskoxen)	<u>Habitat Loss (foraging)</u>	The landfill will be designed and built within the footprint of the proposed future waste rock/ tailing facilities; therefore there will be no additional effects to vegetation loss (ungulate foraging habitat). Progressive reclamation of the landfill will restore foraging habitat for ungulates after mine closure.	None

Valued Ecosystem Component	Description of Potential Project Effect	Mitigation of Effect	Residual Effect
Fish Habitat and Fish Populations	Aquatic Habitat Degradation Leachate generation from landfill waste during operations and closure may have an effect on water quality in the nearby water bodies.	Waste that can result in high toxicity leachate will be incinerated and hauled offsite. It will not be landfilled. Incinerator ash will be tested periodically to confirm that it is not a hazardous waste. The leachate from the landfill is anticipated to be very low ionic strength (dilute) due to controls on materials to be placed in the landfill. At the end of mine life, the landfill would be capped with at least 2 metres of either waste rock or coarse granular material.	None
Sites of Heritage Significance	Loss to Heritage Sites	Project design was adjusted to the extent practicable to ensure that identified/known heritage resources sites are away from planned infrastructure. Sites on the nearby esker were mitigated.	N/A
Traditional Way of Life	Loss to Traditional Way of Life	According to traditional knowledge, there has been little to no human activity in the Meliadine area where the proposed landfill is to be located.	N/A

8. Effects Summary

The primary potential environmental effects from landfill activities include leachate generation, windblown debris and habitat (vegetation) loss. Given the effective implementation of mitigation plans, no residual environmental effects to VECs from construction, operation or closure of the landfill are anticipated. See summary below:

- The leachate that will be generated by the landfill is anticipated to be of very low ionic strength (dilute) due to restrictions on the materials that would be placed in the landfill. A rockfill or granular material berm will be constructed to act as a wind shield to reduce amount of windblown debris.

- Habitat loss will be minimized because the landfill will be designed and built within the footprint of proposed future waste rock/ tailing storage area. With the implementation of terrestrial habitat reclamation strategies, the final surfaces of the landfill will be graded to blend into the existing topography and enhance conditions for wildlife.

- The landfill will be within the footprint of the proposed future tailings/waste rock storage facility for the mine, and at the end of its life be covered with waste rock or coarse granular materials to a minimum of 2 metres.

9. Plan Review And Continual Improvement

The Landfill Design and Management Plan will be reviewed annually by the Meliadine Environment Department. If necessary, it will be updated every two years as required. Improvements suggested through these reviews will be implemented in consultation with the Nunavut Water Board.

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Appendix A

Government of Nunavut Environmental Guidelines

Environmental Guideline for Waste Asbestos
Environmental Guideline for Ozone Depleting Substances

Environmental Guideline for

Waste Asbestos

Department of Environment
Government of Nunavut

GUIDELINE: WASTE ASBESTOS

Original: January 2002
Revised: January 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with waste asbestos. This Guideline does not replace the need for the owner or person in charge, management or control of the waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of waste asbestos.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

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Introduction

Asbestos is the commercial term given to a group of silicate minerals that occur naturally in the environment. These minerals have separable long fibers that are heat resistant, strong and flexible enough to be woven or spun. Because of these characteristics, asbestos has been used in a wide range of manufactured products, mostly in building materials (i.e. roofing shingles, ceiling and floor tiles, wallboard, clapboard and asbestos cement products), friction products (i.e. automobile clutch, brake and transmission parts) and heat resistant insulation, fabrics, packaging, gaskets and coatings. Loose-fill vermiculite insulation may also contain small amounts of asbestos.

During the 1980s the health and safety risks associated with asbestos started to become known. As a result, the use of asbestos was banned or phased out throughout North America. Asbestos products may still be found when buildings are being renovated or demolished, or when carrying out repairs on older vehicles and electrical appliances.

Although asbestos is typically considered to be a human health hazard, the route of exposure is through breathing air and drinking water that contain the very small asbestos fibres. The *Environmental Guideline for Waste Asbestos* (the Guideline) provides information on the characteristics and potential environmental and human health effects of waste asbestos and guidance on its proper storage, handling and removal, transportation and disposal. It is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of waste asbestos is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of waste asbestos.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

Asbestos	A commercial term given to naturally occurring fibrous silicate minerals including crocidolite, amosite, chrysotile, fibrous anthophyllite, tremolite, actinolite and mysorite.
Commissioner's Land	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.

Dangerous Good	Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the schedule provided in the *Transportation of Dangerous Goods Act*.
Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Friable Waste Asbestos	Waste asbestos which can be crumbled by hand pressure when it is dry.
Minister	The Minister of Environment of the Government of Nunavut.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
Responsible Party	The owner or person in charge, management or control of the waste.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations and Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and (c) Marine – *International Maritime Dangerous Goods Code* (IMDG).
Waste Asbestos	A substance containing asbestos in a concentration greater than 1% by weight that is no longer wanted or is unusable for its intended purpose and is intended for storage or disposal. Waste asbestos does not include asbestos that is immersed or fixed in a natural or artificial binder.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key environmental agency responsible for ensuring parties properly manage waste asbestos and will provide advice and guidance on its management. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be

obtained by contacting the Department of Environment or by visiting the web site at http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Generators of Waste Asbestos

The owner or person in charge, management or control of waste asbestos is known as the responsible party. In general, the responsible party must ensure asbestos is properly and safely managed from the time it is produced to its final disposal. This is referred to as managing the waste from cradle-to-grave. Information on the general management of hazardous waste in Nunavut, including generator, carrier and receiver responsibilities, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste*.

Contractors may manage unwanted or waste asbestos on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of waste asbestos as there may be other environmental or public and worker health and safety issues to consider.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers. The *Asbestos Safety Regulations* provide specific requirements for the safe handling of asbestos in the workplace and for medical surveillance of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the handling and management of waste asbestos may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division of the Department of Economic Development and Transportation is responsible for the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* (CEPA)[1] and for regulating the interprovincial and international movement of hazardous waste, including waste asbestos, under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters, including the impact waste asbestos may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of waste asbestos. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites and sewage lagoons only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue involving asbestos is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of waste asbestos may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

[1] Asbestos is listed in Schedule 1 of the *Canadian Environmental Protection Act* as being a 'Toxic Substance"

Characteristics and Potential Effects of Asbestos

2.1 Characteristics

Asbestos is a naturally occurring silicate mineral with several unusual properties. Its long flexible silky fibres are strong enough to be spun or woven into a variety of blanket-like products. It is resistant to high temperatures, chemical corrosion and wear. A poor conductor of electricity, asbestos also insulates well against heat and electricity. This combination of properties gives asbestos performance characteristics that are difficult to match and, as a result, it has been used in a wide range of manufactured products over the years including building materials (i.e. roofing shingles, ceiling and floor tiles, wallboard, clapboard and asbestos cement products), various automotive friction products (i.e. clutch, brake and transmission parts) as well as heat resistant insulation, fabrics, packaging, gaskets and coatings. Although asbestos use was either banned or largely phased out in North America starting in the mid 1980s, it can still be found in many older buildings, vehicles and appliances. Appendix 3 provides a listing of products that have been manufactured in the past using asbestos.

Figure 1 - Anthophyllite Asbestos Fibres
Source: Public Domain

2.2 Potential Effects on Environment and Human Health

Asbestos fibres are stable and do not break down into other compounds in soil, evaporate into air or dissolve in water. In other words, the basic silicate structure of the flbre remains largely intact in the environment. Small diameter fibres may remain suspended in air and water and be carried long distances while larger fibres tend to be deposited more quickly. Asbestos fibres are not able to move through soil.

Human exposure to asbestos occurs when the asbestos-containing material is disturbed in some way so as to release fibres into the air and water. Small amounts can also be released to the environment through the breakdown of natural deposits. Health risks occur when fibres are present in drinking water and in the air that people breathe. When inhaled, asbestos fibres can cause asbestosis (a scarring of the lungs which makes breathing difficult), lung cancer and mesothelioma (a rare cancer of the lining of the chest or abdominal cavity). The risk of contracting an asbestos related disease is greatest when fibre concentrations in the air are high and the exposure period is long, such as in the workplace. Smoking combined with asbestos inhalation also greatly increases the risk of lung cancer.

Waste Management

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.[2]

3.1 Pollution Prevention

Pollution prevention is a term used to describe methods and practices that minimize or eliminate the generation of waste. If asbestos is known to be present, removal of the asbestos material should only be undertaken by a qualified person and only when the material is beyond repair or, if it is in a building, when the building is undergoing renovation or demolition. Asbestos that is not disturbed or deteriorated does not, in general, pose a risk to human health and can be left alone.

Other pollution prevention opportunities for waste asbestos include:

Reduce

- Replace asbestos-containing materials with less hazardous materials. A number of materials have been developed as replacements for asbestos in manufactured products including fiberglass, carbon and graphite fibres and PTFE (polytetra fluroethylene).

Reuse

- Encapsulate existing asbestos material by sealing with paint or an epoxy product or cover the material with paneling or other non-asbestos product. The Workers' Safety and Compensation Commission, Chief Medical Officer of Health and your Regional Environmental Health Officer must be consulted prior to encapsulating or sealing existing asbestos material.
- Friable asbestos materials should never be reused for any purpose once it has been removed. Non-friable asbestos materials (i.e. asbestos cementous board) can only be re-used if it remains intact and unbroken. This will extend the life of the product and reduce replacement costs.

Public and commercial building and home owners should keep an inventory of asbestos material so as to inform users, contractors and regulatory and municipal authorities in the event of renovation or demolition activities or an emergency (i.e. fire).

3.2 Handling and Removal

The safe handling and removal of asbestos requires a thorough understanding of the potential risks and knowledge of abatement measures. As long as the asbestos fibres remain enclosed or tightly bound in the material, the fibres will not be released to the air and there is no significant health risk. However, asbestos materials that are disturbed, broken or removed can result in the release of fibres if adequate safety measures are not in place. Unfortunately, simply looking at the material may not confirm whether asbestos is present. If in doubt, have the material analyzed by a qualified person.

Homeowners should contact the Chief Medical Health Officer or Regional Environmental Health Officer before handling material that contains asbestos. Check the material regularly for any sign of damage or wear and have renovations or asbestos removal carried out by a trained and qualified person.

[2] Source – Canadian Council of Ministers of the Environment.

The *Asbestos Safety Regulations* provide employers with specific requirements for the safe handling of asbestos in the workplace. The *Regulations* require that employers:

- Provide workers with protective respiratory equipment, clothing and eye protection.
- Enclose the work area and ventilate the air using filtering equipment.
- Post warning signs and notices.
- Soak the asbestos material through its entire thickness with water during its removal to minimize release of asbestos fibres.
- Thoroughly clean the work area each day.
- Place all asbestos material and debris in clearly labeled, sealed and airtight containers.
- Provide training to workers in the use of protective equipment, the safe handling and disposal of asbestos waste and health information on the potential effects of asbestos exposure.
- Pay and arrange for a medical examination upon the written request of a worker involved in handling and disposing of asbestos materials and waste.

Employers should consult the *Asbestos Safety Regulations* in order to obtain a complete description of the regulatory requirements. A consolidated copy of the current *Regulations* is provided in Appendix 2. The authoritative text can be obtained by contacting the Workers' Safety and Compensation Commission or by downloading a copy from the Department of Justice web site at http://www.justice.gov.nu.ca/apps/search/docSearch.aspx.

The handling and removal of asbestos should only be undertaken by trained and qualified persons. The names of qualified asbestos abatement companies can be obtained by contacting the Workers' Safety and Compensation Commission or the waste management exchanges and associations listed in Appendix 10 of the *Environmental Guideline for the General Management of Hazardous Waste.*

3.3 Storage

Storage refers to the maintenance of waste asbestos while awaiting its transport and disposal. Storage is not acceptable for the long-term management of waste asbestos except under extraordinary circumstances and should be considered as a temporary measure only.

Waste asbestos should be stored in the following manner:

- Store wet waste asbestos in airtight, non-leaking plastic or 16 gauge steel drums. Dry asbestos can be stored in 6 mil plastic bags sealed within non-reusable drums or a second 6 mil plastic bag. Containers should be tightly sealed when not in use to prevent release of asbestos fibres.
- Each container must be clearly labeled "ASBESTOS" in accordance with the *Asbestos Safety Regulations.* If waste asbestos is being stored in an institutional, commercial or industrial location or if the asbestos is being stored for transport, the containers must also be labeled in accordance with the *Workplace Hazardous Materials Information System* (WHMIS) and relevant Transport Authority.
- Place all labeled containers in a secure and clearly marked area.
- Containers should be located so as to be protected from the sun, weather and physical damage.
- Workers must be trained in the safe handling and shipping for waste asbestos, have access to material safety data sheets and be provided with personal protective equipment. Only trained personnel should have access to the designated storage area.

If a commercial facility is used to store hazardous waste for periods of 180 days or more or the quantity of asbestos and other waste on-site at any one time exceeds the criteria set out in the *Environmental Guideline for the General Management of Hazardous Waste*[3], the facility must be registered with the Department of Environment as a hazardous waste management facility. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

3.4 Transportation

Friable waste asbestos should never be transported in bulk, but in storage containers as described in section 3.3 of the Guideline. The waste should be properly secured and transported within an enclosed vehicle or covered with a tarpaulin or net if transported in a vehicle that is not enclosed. A compaction type waste haulage vehicle must never be used to transport friable asbestos waste. Asbestos waste that is non-friable (i.e. asbestos that is immersed or fixed in a natural or artificial binder) does not need to be specially packaged for transport and disposal.

Under the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations,* no person may transport hazardous waste in Canada for the purpose of disposal or recycling in a quantity greater than five litres or five kilograms unless it is accompanied by a completed manifest. Manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or Environment Canada's *User's Guide for the Hazardous Waste Manifest*.

Friable waste asbestos is classified as a Class 9 Miscellaneous Waste by the *Transportation of Dangerous Goods Act*. The classification, packaging, labeling and placarding of this waste must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations*. Schedule I of the *Regulations* classifies waste asbestos as follows:

Shipping Name: WASTE Asbestos Blue (crocidolite)
Classification: 9
Product Identification Number: UN2212
Packing Group: II

Shipping Name: WASTE Asbestos Brown (amosite, mysorite)
Classification: 9
Product Identification Number: UN2212
Packing Group: II

Shipping Name: WASTE Asbestos White (chrysotile, actinolite, anthophyllite, tremolite)
Classification: 9
Product Identification Number: UN2590
Packing Group: III

[3] The criterion for Class 9 Miscellaneous Waste is 1000 kilograms or litres and the total aggregate quantity is 5000 kilograms or litres.

Non-friable asbestos is not a hazardous waste and does not need to be accompanied by a manifest.

The transport of waste asbestos by air must conform to the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions,* while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these materials can be obtained by contacting Transport Canada or by referring to the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Disposal

Friable waste asbestos may be disposed of at a municipal landfill site in Nunavut provided that authorization and approval has first been obtained from the local municipal government. The local municipal government must be registered with Nunavut's Department of Environment as a hazardous waste receiver before accepting the waste.

Upon arrival at the landfill site, the waste asbestos should immediately be buried and covered with at least 30 centimetres (one foot) of soil to ensure further direct contact with people and heavy equipment is avoided. Care should be taken to ensure the asbestos containment (i.e. plastics bags) is not broken or ruptured while being covered. A final cover of at least 60 centimetres (two feet) of soil should be placed over the waste asbestos within 24 hours. The excavation site should be separate from other disposal or burning activities and a sign erected so the asbestos is never disturbed. A detailed map or drawing of the excavation site location should also be maintained by the local municipal government for future reference.

Where friable asbestos is being unloaded for the purpose of disposal, the unloading must be carried out so that no loose asbestos waste or punctured, broken or leaking containers are landfilled. Any friable asbestos that is in a punctured, broken or leaking container must be repackaged in drums or two 6 mil plastic bags prior to its disposal.

Where local disposal of friable waste asbestos is not available, the asbestos should be transported for disposal by a registered hazardous waste carrier to a receiver or management facility that is registered to operate in Nunavut. A listing of hazardous waste carriers, receivers and management facilities is available by contacting Nunavut's Department of Environment. A listing of receivers and management facilities authorized to accept waste asbestos in other territories and provinces can be obtained by contacting the environment department in that jurisdiction or the Canadian waste exchanges and associations found in Schedule 10 of the *Environmental Guideline for the General Management of Hazardous Waste.*

Conclusion

Asbestos is a commercial term given to a group of fibrous silicate minerals that occur naturally in the environment. Because of its unique and unusual properties, asbestos has been used over the years in the manufacture of a wide range of products. These products include building materials, friction products, heat resistant insulation, fabrics, packaging, gaskets and various coatings. During the 1980s the human health and safety risks associated with asbestos started to become known. As a result, the use of asbestos was banned or phased out throughout North America. However, a variety of asbestos products may still be found when older buildings are being renovated or demolished, or when repairs are being carried out on older vehicles and electrical appliances. The *Environmental Guideline for Waste Asbestos* is an introduction to the management of asbestos. It provides information on the characteristics of asbestos, its possible effects on the environment and human health and guidance on its proper storage, handling and removal, transportation and disposal.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of waste asbestos to comply with all applicable federal and territorial legislation and municipal by-laws. The management of waste asbestos may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of waste asbestos, or to obtain a listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

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Health Canada. Health Risks of Asbestos Webpage. http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/asbestos-amiante-eng.php

Krytiuk Specialty Contracting Inc. What is Asbestos Webpage. http://ksccanada.com/21.html

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;

(d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – *SAFETY ACT: ASBESTOS SAFETY REGULATIONS*

This consolidation is not an official statement of the *Asbestos Safety Regulations*. It is a current consolidation prepared for convenience of reference only. The authoritative text of the *Regulations* should be obtained from the Northwest Territories and Nunavut Workers' Safety and Compensation Commission.

1. In these regulations,

"Asbestos" means crocidolite, amosite, chrysotile, fibrous anthophyllite, tremolite, actinolite or any mixture containing any of these minerals;
"Asbestos dust" means dust consisting of or containing asbestos fibres;
"Asbestos process" means the handling of materials containing asbestos and includes:
(a) sawing, cutting, sanding or spraying materials,
(b) repair or maintenance of materials,
(c) cleaning or disposal of materials,
(d) mixing or applying asbestos shorts, cements, grouts, putties or similar compounds,
(e) storage or conveyance of materials.

2. These regulations apply to every establishment.

3. No person shall use crocidolite in any asbestos process.

4. No person shall apply, by spraying, insulation materials containing asbestos.

5. (1) An employer conducting an asbestos process shall:
(a) provide each worker who may be exposed to asbestos with respiratory equipment designed for use in asbestos processes and that has been approved by the Canadian Standards Association;
(b) provide each worker who may be exposed to asbestos with dustproof coveralls, gauntlets, eye protection and headgear;
(c) ensure that, at all times during the asbestos process, ventilation and air filtering equipment is in operation and removing asbestos dust from the air;
(d) enclose the work area to prevent the escape of asbestos dust;
(e) post warning notices in prominent places indicating that an asbestos process is in progress;
(f) ensure that, prior to disturbing any asbestos surface, the asbestos is soaked with water through its entire thickness;
(g) where a safety officer is of the opinion that it is not practicable to comply with the requirements in paragraph (d), ensure that any asbestos surface is kept wet as it is being disturbed;
(h) clean the work area surrounding an asbestos process thoroughly each day by vacuum equipment or a wet cleaning method approved by a safety officer; and
(i) ensure that all asbestos materials, debris and dust are placed in sealed, airtight containers and clearly labeled "ASBESTOS".

(2) A safety officer may, in writing, exempt an employer from the requirements of paragraph 1(a) where the safety officer is of the opinion that the nature of the asbestos process is such that the employer cannot, practically, comply with the requirements.

(3) An employer providing equipment under subsection (1) shall dispose of the equipment after use or shall remove all traces of asbestos dust and shall store the equipment in an airtight container.

6. An employer conducting an asbestos process shall provide the following training to any worker who is likely to come in contact with asbestos:
   (a) demonstration and instruction in the use of all protective equipment;
   (b) the safe handling and proper disposal of waste asbestos;
   (c) health education including information relating to pneumoconiosis, lung cancer, mesothelioma and the effects of smoking; and
   (d) any other information a safety officer considers necessary.

7. (1) Where an employer uses ventilation and air filtering equipment, the employer shall inspect and clean the equipment weekly.

   (2) A safety officer may designate a person in the workplace to inspect any ventilation and air filtering equipment yearly to report to the employer on the condition of the equipment and the need for repair.

   (3) An employer receiving a report recommending repair under subsection (2) shall complete the recommended repairs within 30 days of receipt of the report.

8. No person shall employ a minor where an asbestos process is being conducted unless
   (a) the process is conducted under constant supervision; and
   (b) the process has been inspected and approved by a safety officer.

9. (1) Within 30 days of receipt of a written request for a medical examination by a worker involved in an asbestos process, an employer shall arrange and pay the full cost of an examination by a physician.

   (2) The employer shall make arrangements for a medical examination that includes:
   (a) a complete physical examination with special attention to the respiratory system;
   (b) lung function tests including forced vital capacity and forced expiratory volume at one second; and
   (c) any medical procedures considered necessary by the examining physician for the diagnosis of asbestos related illness.

   (3) Upon written request by the Minister, a physician who has conducted an examination under subsection (2) shall provide the Minister with a report containing all information resulting from the examination.

   (4) Every report provided under subsection (3) is a privileged communication of the person making it.

APPENDIX 3 – ASBESTOS CONTAINING MATERIALS

The following products have in the past been manufactured using asbestos. If in doubt, confirm with the product's manufacturer as to whether it is asbestos-free.

- Acoustical Plaster
- Base Flashing
- Breaching Insulation
- Cement Pipes
- Chalkboards
- Ductwork
- Electrical Panel Partitions
- Fire Blankets
- Fireproofing Materials
- Heating and Electrical Ducts
- Joint Compounds
- Packing Materials
- Roofing Shingles
- Taping Compounds (thermal)
- Wallboard
- Vinyl Floor Tile
- Adhesives
- Blown-in Insulation
- Caulking and Putties
- Cement Siding
- Construction Mastics and Adhesives
- Electrical Wiring Insulation
- Elevator Brake Shoes
- Fire Curtains
- Flexible Fabric Connections
- High Temperature Gaskets
- Laboratory Gloves
- Pipe Insulation
- Spackling Compounds
- Textured Paints and Coatings
- Vinyl Sheet Flooring
- Cooling Towers
- Asphalt Floor Tile
- Boiler Insulation
- Ceiling Tiles
- Cement Wallboard
- Decorative Plaster
- Electrical Cloth
- Elevator Equipment Panels
- Fire Doors
- Flooring Backing
- HVAC Duct Insulation
- Laboratory Hoods and Table Tops
- Roofing Felt
- Spray-Applied Insulation
- Thermal Paper Products
- Vinyl Wall Coverings

Source - Krytiuk Specialty Contracting Inc.

APPENDIX 4 – GOVERNMENT AND INDUSTRY CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Industry

National Demolition Association
16 N. Franklin Street, Suite 203
Doylestown, Pennsylvania USA 18901-3536
Telephone: (215) 348-4949 Fax (215) 348-8422
Website: http://www.demolitionassociation.com

Environmental Guideline for

Ozone Depleting Substances

Department of Environment
Government of Nunavut

GUIDELINE: OZONE DEPLETING SUBSTANCES

Original: January 2002
Revised: April 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with ozone depleting substances. This Guideline does not replace the need for the owner or person in charge, management or control of ozone depleting substances to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of these substances.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

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Introduction

A layer of colourless gas known as "ozone" surrounding the earth helps to filter the sun's harmful ultraviolet radiation from reaching the planet's surface. This layer is located in the stratosphere eight to ten kilometres above the earth. Scientific evidence shows that this ozone is being destroyed, and therefore this protective layer is becoming thinner, because of manufactured chlorofluorocarbons, halons and other similar substances being released into the air. These substances are commonly referred to as 'ozone depleting substances'.

As one of the early signatories to the *Montreal Protocol on Substances that Deplete the Ozone Layer*, Canada is committed to protecting the earth's ozone layer from further deterioration. The Protocol, developed in 1989 under the auspices of the United Nations Environmental Programme, provides a coordinated international response to the global problem of ozone depletion.

Canada's *National Action Plan for the Environmental Control of Ozone Depleting Substances and their Halocarbon Alternatives* was initially endorsed in 1998 through the Canadian Council of Ministers of the Environment (CCME) in response to Canada's commitments under the Montreal Protocol. The Action Plan is a national framework under which federal, provincial and territorial governments commit to implementing an ozone layer protection program focused on chlorofluorocarbons. The Action Plan was updated in 2001 to include all ozone depleting substances.

The original *Environmental Guideline for Ozone Depleting Substances*, which was approved by the Government of the Northwest Territories in 1999 and subsequently adopted by the Government of Nunavut in 2002, represented the Government's initial response to the National Action Plan. This version of the *Environmental Guideline for Ozone Depleting Substances* (the Guideline) provides updated information on the most common ozone depleting substances and their replacements, the impacts of ozone depletion and best practices respecting the phase-out, recovery, reuse and disposal of these substances. It focuses on the refrigeration, air conditioning and fire protection sectors, although ozone depleting substances have been used by many other sectors in Canada. The Guideline does not address the production, import or export of new or recovered ozone depleting substances as these activities are controlled under regulations administered by Environment Canada. It is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of an ozone depleting substance is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of these substances.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

Air Conditioning and Refrigeration Equipment	Equipment used to remove heat from one medium or another using an inert gas (i.e. ozone depleting substance). The Equipment may be stationary (i.e. building air conditioner, commercial or household refrigerator) or mobile (i.e. vehicle air conditioner).

Certified Service Technician	A person who is qualified to service air conditioning, refrigeration or fire extinguishing equipment through the successful completion of an environmental awareness course for ozone depleting substances approved by Environment Canada.
Commissioner's Land	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.
Dangerous Good	Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the schedule provided in the *Transportation of Dangerous Goods Act*.
Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Fire Extinguishing Equipment	A handheld, wheeled or fixed unit or system that is designed to control or extinguish a fire.
Minister	The Minister of Environment of the Government of Nunavut.
Motor Vehicle Air Conditioner	A mechanical vapour compression refrigerant system on a motor vehicle that is designed to provide cooling for the passenger compartment.
Ozone	A colourless gas containing three atoms of oxygen (O^3). In the upper atmosphere, ozone absorbs ultraviolet radiation thereby preventing the radiation from reaching the surface of the earth. In the lower atmosphere (i.e. near the surface of the earth), ozone is one of the detrimental component of urban smog.
Ozone Depleting Substance	A chlorofluorocarbon, hydrochlorofluorocarbon, halon or other substance that is sufficiently stable to reach the stratosphere and has the potential of reacting with and destroying ozone.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.

Reclamation	The cleaning of recovered ozone depleting substances by filtering, drying, distillation or chemical treatment to meet or exceed industry-accepted reuse standards.
Recovery	The transfer of an ozone depleting substance into a container that is not part of the system from which the substance is transferred.
Recycle	The reuse of recovered ozone depletion substances by transferring the substance back into similar equipment after servicing.
Refillable Container	A container that meets the requirements of Transport Canada and is approved for multiple use.
Responsible Party	The owner, vendor or service technician in charge, management or control of the ozone depleting substance.
Servicing	Repairing, maintaining or adjusting a component of air conditioning, refrigeration or fire extinguishing equipment.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and (c) Marine – *International Maritime Dangerous Goods Code* (IMDG).

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key territorial government agency responsible for ensuring parties properly manage ozone depleting substances. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Owners, Wholesalers, Retailers and Service Technicians

Owners, wholesalers, retailers and service technicians in charge, management or control of an ozone depleting substance are considered to be the responsible party. The responsible party must ensure the substance is properly and safely managed from the time it is purchased to its final destruction so as to prevent its release to the environment.

Building, equipment and vehicle owners need to be aware of the presence of ozone depleting substances in their air conditioning, refrigeration and fire extinguishing equipment. Equipment that may be leaking or discharging these substances into the air must immediately be taken out of service, the leak stopped and the discharge reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130 (refer to table 3 on page 11 of the Guideline). Owners may also be affected by the phase-out of ozone depleting substances in Canada and should develop a plan for replacing the ozone depleting substance with an acceptable alternative.

Wholesalers and retailers of ozone depleting substances, other than where the substance is an integral part of the equipment, should sell replacement substances only to companies that employ certified service technicians.

A service technician may become certified by successfully completing an environmental awareness course for ozone depleting substances that is approved by Environment Canada. Only certified service technicians should maintain and repair air conditioning, refrigeration and fire extinguishing equipment that contain ozone depleting substances. Technicians should immediately advise the owner when they become aware of leaking equipment and the equipment must not be refilled or put back into service until the necessary repairs are completed.

Contractors may manage ozone depleting substances on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the ozone depleting substance, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of ozone depleting substances as there may be other environmental or public and worker health and safety issues to consider.

Environment Canada

Environment Canada is responsible for controlling the import, manufacture, use in some cases, sale and export of ozone depleting substances through the federal *Ozone-depleting Substances Regulations* and *Federal Halocarbon Regulations* which have been adopted under the *Canadian Environmental Protection Act.* Environment Canada is also responsible for regulating the international and interprovincial movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.

Department of Community and Government Services

The Office of the Fire Marshal in the Department of Community and Government Services is responsible under the *Fire Prevention Act*, National Fire Code and National Building Code for ensuring adequate fire prevention and response measures are in place. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Health and Social Services

Activities related to the management of ozone depleting substances may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of unwanted ozone depleting substances and equipment and vehicles that contain these substances. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of ozone depleting substances may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Characteristics and Impacts of Ozone Depleting Substances

2.1 Characteristics

Ozone depleting substances generally contain a combination of chlorine, fluorine, bromine, carbon and hydrogen and are often referred to by the general term 'halocarbons'. Although each has its own unique chemical characteristics, ozone depleting substances are described as having low toxicity, low boiling points and low flammability. These characteristics have resulted in their wide use as refrigerants, fire extinguishing agents, blowing agents in manufacturing foam, propellants in aerosols and medical applications, and degreasing solvents.

Many halocarbons are highly effective in breaking down ozone. Unlike many other substances that are released into the atmosphere, ozone depleting substances are not 'washed' back to Earth by precipitation or destroyed by other chemicals but can remain in the atmosphere for several decades or more. This enables the substances to drift upward into the stratosphere where ultraviolet radiation from the sun releases the chlorine or bromine atoms which, in turn, destroy stratospheric ozone. Many ozone depleting substances are also powerful greenhouse gases with a much higher potential to enhance the greenhouse effect than carbon dioxide and methane.

Table 1 describes the characteristics of many common ozone depleting substances.

Ozone depleting substances are broadly grouped into the following categories, depending upon their molecular structures.

Chlorofluorocarbons — Chlorofluorocarbons, or CFCs, contain chlorine, fluorine and carbon atoms. First developed in the 1920s, they began to replace ammonia as a refrigerant gas in the 1930s and as an aerosol propellant in the 1940s. By the 1980s they were widely used as coolants in refrigerators and air conditioners, solvents in degreasers and cleaners, and as blowing agents in the production of foam.

Halons — Halons contain bromine, chlorine, fluorine and carbon atoms. The characteristics of halons make them very effective for extinguishing fires and are suitable for all types of fire extinguishing equipment ranging from industrial total flooding equipment to hand-held fire extinguishers popular for home or office use.

Hydrochlorofluorocarbons — Hydrochlorofluorocarbons, or HCFCs, contain chlorine, fluorine, hydrogen and carbon atoms. HCFCs have been developed for use as transitional or temporary replacements for CFCs because the hydrogen atom makes them less stable and therefore less damaging to the ozone layer. HCFCs are used mainly for foam blowing, refrigeration and air conditioning, solvent cleaning and, to a lesser extent, aerosols and fire protection.

Table 1.		Classification under Transportation of Dangerous Goods Regulations	ODP[a]	GWP[b]	Life Time[c]
Chlorofluorocarbons (CFC's)					
CFC-11	Trichlorofluoromethane	Not restricted under TDG	1.0	4600	45
CFC -12	Dichlorofluoromethane	UN 1029 Class 2.2 Non-flammable Gas	1.0	10600	100
CFC-113	Trichlorofluoroethane	Not restricted under TDG	0.8	6000	85
CFC-114	Dichlorotetrafluoroethane	Not restricted under TDG	1.0	9800	300
CFC-115	Chloropentafluoroethane	UN 1020 Class 2.2 Non-flammable Gas	0.6	7200	1700
All other chlorofluorocarbons		Consult TDGA for classification			
Halons (Bromofluorocarbons)					
Halon 1011	Bromochloromethane	Un 1887 Class 6.1 Toxic Substance	0.12	-	-
Halon 1211	Bromochlorodifluoromethane	Not restricted under TDG	3.0	1300	11
Halon 1301	Bromotrifluoromethane	Un 1009 Class 2.2 Non-flammable Gas	10.0	6900	65
Halon 2402	Dibromotetrafluoroethane	Not restricted under TDG	6.0	-	-
All other halons		Consult TDGA for classification			
Hydrochlorofluorocarbons (HCFC's)					
HCFC-22	Chlorodifluoromethane	Un 1018 Class 2.2 Non-flammable Gas	0.055	1700	11
HCFC-123	Dichlorotrifluoroethane	Not restricted under TDG	0.02	-	1
HCFC-124	Chlorotetrafluoroethane	UN 3297 Class 2.2 Non-flammable Gas	0.022	620	6
HCFC-141b	Dichlorofluoroethane	Not restricted under TDG	0.11	700	9
HCFC-142b	Chlorodifluoroethane	Not restricted under TDG	0.065	2400	18
HCFC-225ca	Dichloropentafluoropropane	Not restricted under TDG	0.025	-	2
HCFC-225cb	Dichloropentafluoropropane	Not restricted under TDG	0.033	-	6
All other hydrochlorofluorcarbons		Consult TDGA for classification			

a. 'Ozone Depleting Potential' is a measure of the capability of a chemical to destroy ozone. It is measured against CFC-11 which has an ozone depleting potential of one (1.0). As an example, one molecule of Halon 1301 has the potential to destroy ten times more ozone than one molecule of CFC-11.
b. 'Global Warming Potential' is a measure of the warming effect that the emission of a gas has on the atmosphere. It is measured as a factor relative to carbon dioxide (CO^2) which has a global warming potential of one (1.0). As an example, one molecule of CFC-11 has the potential to warm the atmosphere 4600 times more than one molecule of carbon dioxide.
c. 'Life time' is the number of years it takes for the substance to break down in the lower atmosphere.

2.2 Impacts

Ozone is very effective in absorbing ultraviolet radiation in the stratosphere. Its depletion, or thinning, allows more of this high-energy radiation to reach the Earth's surface. Releases of halocarbons, particularly chlorofluorocarbons and halons, enable photochemical reactions[1] to take place in the stratosphere that destroy the ultraviolet radiation-shielding layer of ozone.

Increased exposure to ultraviolet radiation by humans can lead to an increase in sunburn, skin cancer, eye cataracts, weakening of the immune system and aging of the skin (i.e. the skin becomes drier and

[1] The most important reaction is the photo-induced breaking of the carbon-chlorine or carbon-bromine bond. Once released, the radical chlorine and bromine atoms catalyze the conversion of ozone (O^3) into oxygen (O^2).

looses elasticity). Ecosystem impacts can also occur. This begins at the bottom of the food chain where plankton populations in the ocean have been reduced by increased ultraviolet radiation. Damage and impacts to vegetation, food crops, wildlife and domestic animals can also occur.

The atmospheric impact of ozone depleting substances is not limited solely to the reduction of ozone. Many of these substances are also powerful greenhouse gases with much higher 'global warming potentials' than carbon dioxide and methane.

The Management of Ozone Depleting Substances

> *Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.*[2]

In the past, the refrigeration, air conditioning and fire protection sectors have incorporated ozone depleting substances as critical components in their equipment and processes. Although a large portion of Canada's ozone depleting substances consumption has been eliminated in recent years, a significant quantity remains in use or storage. Many of the same ozone depleting substances used by the commercial, industrial and institutional sectors were also used in domestic applications (i.e. household refrigerators, freezers, vehicle air conditioners). An inventory completed for the Government of the Northwest Territories in 1992 confirmed that approximately three-quarters of the ozone depleting substances in use in the Northwest Territories and Nunavut at that time were accounted for by the commercial, industrial and institutional sectors. As a result, this section focuses on the use of ozone depleting substances by the commercial, industrial and institutional refrigeration, air conditioning and fire extinguishing sectors in Nunavut. References are made to domestic sector use where appropriate.

3.1 Phase-out Objectives and Approaches

The overall strategy in Canada has been to eliminate the manufacture, import and export of ozone depleting substances and to phase-out their sale and use as suitable replacements become available. Several substances have been identified as being suitable replacements for chlorofluorocarbons in refrigeration and air conditioning equipment including hydrochlorofluorocarbons and hydrofluorocarbons. Unfortunately, these replacements are not totally benign (i.e. some are very powerful greenhouse gases) and an active approach to controlling their sale and use continues to be necessary.

Under the federal *Ozone-depleting Substances Regulations,* no person may use, sell or offer for sale halons in Canada. The Nunavut Office of the Fire Marshal should be consulted on suitable replacements for halon systems when the servicing, recharging or replacement of existing equipment is being considered[3].

Table 2 describes the phase-out objectives and approaches that apply to these ozone depleting substances in refrigeration, air conditioning and fire extinguishing equipment in Nunavut along with their primary replacement, hydrochlorofluorocarbons,. The phase-out objectives and approaches described in the table are consistent with those outlined in *Canada's Strategy to Accelerate the Phase-Out of CFC and Halon Uses and to Dispose of Surplus Stocks 2001* and the federal *Ozone-depleting Substances Regulations*.

[2] Source – Canadian Council of Ministers of the Environment.
[3] The United States Environmental Protection Agency periodically updates a list of acceptable alternatives to halons and other ozone depleting substances. The listing can be downloaded at http://www.epa.gov/ozone/snap/lists/index.html#halons.

Table 2. Phase-out Objectives

Objective	Phase-Out Date
Refilling or replacement of chlorofluorocarbon-containing small (< 5 horsepower), medium, (5-30 horsepower) and large (>30 horsepower) commercial, industrial or institutional refrigeration and air conditioning equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of chlorofluorocarbon-containing mobile air conditioning equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of chlorofluorocarbon-containing mobile commercial and industrial refrigeration and chiller equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of halon-containing handheld or wheeled fire extinguishing equipment with a suitable alternative, except for critical uses[a].	September 2011 or next service
Refilling or replacement of halon-containing fixed fire extinguishing equipment with a suitable alternative, except for critical uses[a].	September 2011 or next service
Use and sale of hydrochlorofluorocarbons, except dichlorotrifluoroethane (HCFC-123).	January 2020
Use and sale of dichlorotrifluoroethane (HCFC-123).	January 2030

a. 'Critical use' for halons only include fire extinguishing equipment in military equipment.

3.2 Releases to the Environment

Ozone depleting substances must not be released to the environment. Equipment owners, managers and service technicians should be made aware of the environmental and human health impacts of ozone depleting substance emissions and the use of alternatives. To prevent releases from occurring, compressors, condensers, evaporators, piping and all associated equipment fitted to them need to be thoroughly inspected according to manufacturers' specifications, or at least twice each year if no specifications exist. These inspections should be incorporated into the facilities' regular maintenance plan.

Leaking equipment must not be 'recharged' with an ozone depleting substance until all necessary repairs have been completed by a certified service technician.

Spills or releases of ozone depleting substances must be immediately reported to the Nunavut/NWT 24-Hour Spill Report Line by phoning (867) 920-8130 in accordance with Schedule B of the *Spill Contingency Planning and Reporting Regulations.* Table 3 describes the minimum reportable quantities for ozone depleting substances as described in Schedule B.

Table 3. Minimum Reportable Quantities Following a Release

Ozone Depleting Substance	Minimum Reportable Quantity
CFC-12, CFC-15, HCFC-22, HCFC-124, Halon 1301[a]	Any release from a container with a capacity greater than one hundred (100) litres
Halon 1011[b]	5 litres or 5 kilograms
All other ozone depleting substances	100 litres or 100 kilograms

a. Transportation of Dangerous Goods Class 2.2 Non-flammable Gas
b. Transportation of Dangerous Goods Class 6.1 Toxic Substance

3.3 Recovery, Reclamation and Disposal

Table 2 describes the phase-out objectives of ozone depleting substances currently in use in Nunavut. Owners of fire extinguishing equipment and commercial, industrial or institutional mobile and stationary refrigeration and air conditioning equipment should either replace existing chlorofluorocarbons and halons with acceptable alternatives by September 2011 or during the next scheduled equipment service, or provide the Department of Environment with a suitable phase-out plan for the substance.

3.3.1 Stationary Refrigeration and Air Conditioning Systems

All compressor rooms housing stationary refrigeration and air conditioning systems should have refrigerant detectors and alarms installed in accordance with the Canadian Standards Association publication *B-52 – Mechanical Refrigeration Code* to detect refrigerant leaks and emissions. A refrigerant level greater than 10 parts per million in the compressor room is an indication that one or more of the systems is leaking. While refrigerant alarms are important, they are not substitutes for the physical leak testing of the system itself, which should take place a minimum of one time each year. Leak testing should also immediately be undertaken upon finding that a refrigeration or air conditioning system appears to be short of refrigerant. Any leak must be repaired prior to the system being recharged with refrigerant or put back into service. Chlorofluorocarbons must not be used to 'top up' a system. Recommendations on acceptable alternative refrigerants should be sought from the equipment's manufacturer.

Refrigerant must be recovered during the servicing of equipment to avoid its venting or release to the atmosphere. All recovery equipment should meet the Air-Conditioning, Heating and Refrigeration Institute (AHRI) *Standard 740 – Refrigerant Recovery/Recycling Equipment* or the Underwriters' of Canada (ULC) *Standard C1058.5-2004 - Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment*.

Only refillable containers may be used to store recovered refrigerants. These containers are less likely to leak and their use eliminates emissions caused by the disposal of throwaway or recyclable containers. All containers must meet the specifications listed in the *Transportation of Dangerous Goods Act* and be labeled in accordance with the *Workplace Hazardous Materials Information System* (WHMIS).

The venting or release of refrigerants to the atmosphere for the purposes of disposal is unacceptable. Chlorofluorocarbons that are recovered from equipment must be returned to the original supplier, an independent reclaimer or licensed disposal facility for destruction. Contact Refrigerant Management Canada[4] (RMC) by telephone at 1-866-622-0209 or by email at rmc@hrai.ca for information on the nearest reclaimer or licensed disposal facility. Only hydrochlorofluorcarbons and hydrofluorocarbons may be reclaimed to their original properties and used to 'top up' or recharge refrigeration and air conditioning equipment.

Unwanted refrigeration and air conditioning equipment must be completely emptied of refrigerant by a certified service technician prior to its disposal. A weatherproof notice should be permanently attached to the equipment stating the date of servicing, name of the certified technician and servicing company, and a statement confirming the equipment no longer contains refrigerant. Household refrigeration and air conditioning equipment is exempt from this requirement as long as it is disposed of in a separate area of the landfill specifically set aside for the disposal of 'white goods'. Local municipal governments are encouraged to use certified service technicians to recover the refrigerant from stored 'white goods' when quantities warrant.

Additional design and service practices are described in Environment Canada's *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.*

3.3.2 Mobile Air Conditioning Systems and Chillers

The basic principles outlined in section 3.3.1 also apply to mobile air conditioners and chillers containing chlorofluorocarbons – recovery of the refrigerant during the installation, operation and servicing of equipment; avoiding the venting of refrigerants to the atmosphere; use of refillable containers to store recovered refrigerants; and servicing by certified service technicians.

Newer-model vehicle air conditioners and chillers already contain alternative non-chlorofluorocarbon refrigerants while older vehicles are likely to still contain CFC-12. The servicing of a motor vehicle air conditioner should be undertaken by a certified service technician in accordance with the Society of Automotive Engineers publication *SAE J1661 – Procedures for Retrofitting CFC-12 (R-12) Mobile Air-Conditioning Systems to HFC-134a (R-134a)* and *SAE J1989 - Recommended Service Procedure for the Containment of CFC-12 (R-12).* Owners and service technicians should refer to the manufacturers' specifications when choosing a replacement refrigerant.

All motor vehicle air conditioning systems and chiller refrigerant must be recovered before the vehicle is wrecked or scrapped. A certified service technician who is trained in the safe handling of refrigerants should remove the refrigerant, transfer it to a suitable refillable and labeled container, and arrange to have it transported to the original supplier, an independent reclaimer or licensed disposal facility for destruction. A personal motor vehicle delivered to a landfill by its owner is exempt from this requirement as long as the vehicle is disposed of in a separate area of the landfill specifically set aside for this purpose. Local municipal governments are encouraged to use certified service technicians to recover refrigerants from discarded vehicles when quantities warrant.

[4] RMC is a not-for-profit corporation established by the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) to ensure the responsible disposal of surplus ozone depleting substances from refrigeration and air conditioning equipment. The program is an EcoLogo™ certified program.

Additional design and service practices for mobile air conditioners and chillers are described in Environment Canada's *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.*

3.3.3 Fire Extinguishing Equipment

The basic principles outlined in section 3.3.1 also apply to halon fire extinguishing equipment - recovery of the extinguishant during servicing and decommissioning; avoiding release of halons during training and equipment testing; use of refillable containers to store recovered halons; and servicing by certified service technicians.

Owners of fire extinguishing equipment that contain halons should develop a management plan in accordance with the phase-out objectives described in Table 2. Fire extinguishing equipment may not be recharged with halons in Canada except for use in military applications. Owners should contact the Underwriters' Laboratories of Canada (ULC) for information on the nearest reclaimer or licensed disposal facility. The Office of the Fire Marshal should also be consulted on suitable replacement fire extinguishing equipment when decommissioning halon systems.

Existing halon equipment must be properly maintained for as long it remains in service in order to avoid releases to the environment and to ensure the facility or asset is not without adequate fire protection. The training of personnel and testing of equipment must not result in any release of halons. Alternative procedures, such as video demonstrations and the use of halon stimulants, should be used to achieve the same testing and training objectives.

The servicing and decommissioning of halon fire extinguishing equipment must only be undertaken by a certified service technician. All equipment and servicing procedures must comply with Underwriters' Laboratories of Canada *Standard ULC/ORD-C1058.5-2004: Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment* and the *Standard ULC/ORD-C1058.18-2004: The Servicing of Halon and Clean Agent Extinguishing Systems*.

The venting or release of halons to the atmosphere for the purposes of disposal is unacceptable and must be avoided. Should a release occur, it must immediately be reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130.

Additional design and service practices for fire extinguishing equipment containing halons are described in Environment Canada's *Environmental Code of Practice on Halons.*

3.4 Transportation

Under the federal *Ozone-depleting Substances Regulations,* any person wishing to import or export a controlled ozone depleting substance must first obtain a permit from Environment Canada. In addition, several ozone depleting substances are classified as either Class 2.2 or 6.1 dangerous goods under the *Transportation of Dangerous Goods Act* and must be transported in accordance to this Section.

Under the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations,* no person may transport waste dangerous goods in Canada for the purpose of disposal or recycling in a quantity greater than five kilograms or five litres unless it is accompanied by a completed manifest. Manifest forms are available

from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or Environment Canada's *User's Guide for the Hazardous Waste Manifest*.

The classification, packaging, labeling and placarding of several ozone depleting substances must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations* while the substances are being transported. Schedule I of the *Regulations* classify these substances as follows:

Shipping Name:	WASTE Bromotrifluoromethane; or Refrigerant Gas R-13b1 Classification: 2.2 Product Identification Number: UN1009
Shipping Name:	WASTE Chlorodifluoromethane; or Refrigerant Gas R-22 Classification: 2.2 Product Identification Number: UN1018
Shipping Name:	WASTE Chloropentafluoroethane; or Refrigerant Gas R-115 Classification: 2.2 Product Identification Number: UN1020
Shipping Name:	WASTE Dichlorofluoromethane; or Refrigerant Gas R-21 Classification: 2.2 Product Identification Number: UN1029
Shipping Name:	WASTE Bromochloromethane Classification: 6.1 Product Identification Number: UN1887 Packing Group: III
Shipping Name:	WASTE Ethylene Oxide and Chlorotetrafluoroethane Mixture Classification: 2.2 Product Identification Number: UN3297

The transport of ozone depleting substances by air must conform to the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions,* while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these substances can be obtained by contacting Transport Canada or referring to the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Certification and Awareness Training

Only certified service technicians may service refrigeration, air conditioning and fire extinguishing equipment containing an ozone depleting substance. To achieve certification, a technician must successfully complete an environmental awareness training course approved by Environment Canada. A card indicating completion of training should be carried by the certified service technician at all times. Completion of training only enables the person to handle ozone depleting substances as provided in the Guideline and is not evidence of qualifications to otherwise service refrigeration, air conditioning or fire extinguishing equipment.

Only certified service technicians may purchase or possess an ozone depleting substance for the purpose of servicing equipment that already contains an ozone depleting substance. Companies employing certified service technicians must maintain records indicating the name, training date and qualifications of employees who are certified to service ozone depleting substance-containing equipment.

3.6 Labeling and Record Keeping

Each piece of refrigeration, air conditioning and fire extinguishing equipment containing an ozone depleting substance must be permanently labeled with the quantity and type of ozone depleting substance contained within that equipment. The label must be amended if the equipment has been 'evacuated' of ozone depleting substances or if the equipment is recharged with a different refrigerant or extinguishant.

An up-to-date service record should be maintained in close proximity to equipment containing ozone depleting substances, or with the owner of the facility. The record should include servicing dates, name of servicing company and certified technician, details on leak testing and detection, quantities of substances recovered or re-charged, and any other information pertinent to the servicing, operation and maintenance of the equipment. The record must be retained for the operating life of the equipment and be made available for inspection upon the request of an Inspector appointed under the *Environmental Protection Act.*

3.7 Sales Records

Any person who sells an ozone depleting substance, except where the substance is a component of another product, should maintain a sales record indicating the type of ozone depleting substance sold, the date of sale, the name of the person who purchased the substance and the name of that person's business. Only persons who are certified service technicians should purchase ozone depleting substances, except where the substance is a component of another product.

Conclusion

The *National Action Plan for the Environmental Control of Ozone Depleting Substances and their Halocarbon Alternatives* commits federal, provincial and territorial governments to implement an ozone layer protection program focused on all ozone depleting substances. The *Environmental Guideline for Ozone Depleting Substances* represents the Government of Nunavut's updated response to the National Action Plan. The Guideline focuses on the industrial, commercial and institutional refrigeration, air conditioning and fire protection sectors, although it is recognized that ozone depleting substances can still be found in older-model household refrigerators and freezers and older-model vehicle air conditioners and chillers. The Guideline provides information on the most common ozone depleting substances and their replacement, the impacts of ozone depletion and best practices respecting the phase-out, recovery, reuse and disposal of these substances.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of ozone depleting substances to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these substances may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of ozone depleting substances, or to obtain a complete listing of guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

References

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Society of Automotive Engineers (SAE). J1989: Recommended Service Procedure for the Containment of CFC-12 (R-12). 1998. Available for purchase online. http://standards.sae.org/j1989_199811

Underwriters' Laboratories of Canada. ULC/ORD-C1058.18-2004: The Servicing of Halon and Clean Agent Extinguishing Systems. Available for purchase online.

Underwriters' Laboratories of Canada. ULC/ORD-C1058.5-2004: Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment. Available for purchase online.

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;

(d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT AND INDUSTRY CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Industry

The Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI)
2800 Skymark Avenue, Building 1, Suite 201
Mississauga, Ontario L4W 5A6
Telephone: 1-800-267-2231 (toll free)
http://www.hrai.ca

Refrigerant Management Canada (RMC)
http://www.refrigerantmanagement.ca

Underwriters' Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (866) 937-3852) Fax: (416) 757-8727
Email: customerservice@ulc.ca

AGNICO EAGLE

MELIADINE GOLD PROJECT

Landfarm Management Plan

March 2017

Version 3

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ᐊᓃᑯᒃᑯᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᒨᓗᒧᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᓕᕆᕙᓪᓕᐊᔪᑦ (ᐱᓕᕆᐊᖅ), 25 ᑭᓛᒥᑕᒥᒃ ᐅᐊᖕᓇᖓᓂᑦ ᐅᖓᓯᒃᑎᒋᔪᖅ ᑲᖏᖅᖠᓂᕐᒥᑦ, ᐊᒪᓗ 80 ᑭᓛᒥᑕᒥᒃ ᓂᒋᖅᐸᓯᐊᓂᑦ ᐱᖓᖕᓇᖅᐸᓯᐊᓂᑦ ᐅᖓᓯᒃᑎᒋᔪᖅ ᐃᒡᓗᓕᒫᕐᔪᖕᒥᑦ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ. ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒧᑦ ᐸᕐᓇᐅᑕᐅᔪᖅ ᐅᒃᑯᐃᖓᔪᒥᒃ ᐊᒪᓗ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᖃᕐᓂᐊᖅᑐᖅ ᐱᕙᓪᓕᐊᓂᕐᒧᑦ ᑎᕆᒐᓂᐊᖅ-ᒥᑦ ᒨᓗᓂᒃ ᐱᓂᕐᒧᑦ, ᒪᕐᕉᖕᓂᒃ ᐅᒃᑯᐃᖓᔫᖕᓂᒃ ᓄᓇᒥᑦ (ᑎᕆᒐᓂᐊᖅ Pit 1 ᐊᒪᓗ ᑎᕆᒐᓂᐊᖅ Pit 2) ᐊᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᖕᓂᐊᕐᓂᖅ.

ᑖᓐᓇ ᑎᑎᖅᑲᖅ ᑕᑯᒃᓴᐅᑎᑦᑎᔪᖅ ᓄᓇᒋᔭᐅᓂᐊᖅᑐᒧᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᒥᑦ ᐱᓕᕆᐊᒧᑦ ᐊᒪᓗ ᐋᕿᒃᓯᑉᓗᓂ ᐃᓚᒋᔭᐅᔪᒥᒃ ᑎᑎᖅᑲᓄᑦ Type A ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒧᑦ ᑐᒃᓯᕋᐅᑎᒥᑦ. ᐸᕐᓇᐅᑎ ᐅᖃᐅᓯᖃᖅᑐᖅ ᖃᓄᐃᑑᓂᐊᕐᓂᖓᓄᑦ ᐋᕿᐅᒪᓂᕆᔭᖓ ᐊᒪᓗ ᐊᐅᓛᕐᓂᐅᓂᐊᖅᑑᑉ ᓄᓇᒋᔭᐅᓂᐊᖅᑑᑉ ᓴᓇᔭᐅᓂᐊᖅᑐᖅ ᐱᓕᕆᐊᒥᑦ ᑐᖅᑯᖅᑐᐃᕕᖕᓄᑦ ᐊᒪᓗ ᐱᓕᕆᐊᖃᕐᓂᕐᒧᑦ ᐅᖅᓱᐊᓗᖕᓂᑦ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᓄᑦ ᓄᓇᓂᒃ.

ᐃᓂᐅᔪᒥᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕙᒃ ᐊᒪᓗ ᐋᕿᒋᐊᖅᓯᓂᖅ ᓴᖅᑭᑕᐅᓚᐅᖅᑐᖅ ᐊᑐᖅᑕᐅᖐᕈᒪᔫᑉᓗᓂ ᐱᓕᕆᐊᖃᕐᓂᕐᒧᑦ ᐊᖏᓗᐊᖏᑦᑐᓂᒃ ᐅᖅᓱᐊᓗᖕᓂᑦ ᐊᒃᑐᖅᓯᓂᖅᑕᖃᖅᐸᑦ ᓄᓇᒥᒃ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥᓪᓛᕈᖕᓇᖅᑐᒥᑦ. ᓄᓇ ᐃᓂᐅᔪᖅ ᐋᕿᐅᒪᔪᖅ ᐱᖃᑦᑕᕐᓂᕐᒧᑦ ᐃᑉᔪᓂᒃ, ᐅᔪᖅᑲᓂᒃ, ᐊᐳᑎᒥᒃ ᐊᒪᓗ ᓯᑯᒥᒃ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᓂᒃ ᐊᖏᓗᐊᖏᑦᑐᓂᒃ ᐅᖅᓱᐊᓗᖕᓂᑦ ᑕᒪᒃᑯᓂᙵᓗᒃ. ᐃᓚᐅᓂᐊᖅᑐᖅ ᐊᖏᓗᐊᖏᑦᑐᑦ ᐅᖅᓱᐊᓗᐃᑦ ᓄᓇᒃᑰᕈᑎᓄᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᐊᒪᓗ ᐅᖅᓱᖅ, ᐊᒪᓗ ᐋᓐᑎᕗᕇᔅ, ᐱᓕᕆᐊᖑᔪᑦ ᐃᓂᐅᔪᒥᑦ.

ᓄᓇ ᐃᓂᐅᔪᖅ ᓴᓂᐊᓃᑐᖅ ᑐᙵᕕᒋᔭᐅᔫᑉ, 200 ᒦᑕᓪᓗᐊᓂᒃ ᐅᖓᓯᒃᑎᒋᔪᖅ ᑲᑎᖅᓱᐃᕕᖕᒥᑦ ᑕᓯᕋᕐᒥᑦ 1 (CP1). ᕿᑎᐊᓃᑐᖅ ᐃᓂᐅᔪᖅ ᓄᓇᐅᑉ ᓂᕈᐊᖅᑕᐅᓚᐅᖅᑐᖅ ᒥᑭᓚᒃᑰᖅᑎᓐᓂᕐᒧᑦ ᖃᓄᐃᖓᓂᐊᕐᓂᐅᔫᑉ ᐅᔭᕋᖕᓂᐊᕐᕕᐅᑉ ᐃᓂᖓ ᐊᒪᓗ ᐃᖏᕐᕋᓂᖓᑕ ᐅᖓᓯᖕᓂᖓ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᐃᑦ ᑕᒪᒃᑯᓄᙵ ᑯᕙᕝᕙᐅᔪᓂᑦ. ᓄᓇ ᐃᓂᐅᔪᖅ ᓂᕆᐅᒋᔭᐅᔪᖅ ᐱᓕᕆᐊᖃᕈᖕᓇᕐᓂᐊᕐᓂᖓᓄᑦ 5,000 m^3-ᓂᒃ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᓂᑦ ᓄᓇᒥᒃ ᓴᓇᔭᐅᑎᓪᓗᒍ, ᐊᐅᓚᖅᑎᓪᓗᒍ, ᐊᒪᓗ ᐅᒃᑯᐊᖅᐸᓪᓕᐊᑎᓪᓗᒍ ᐱᓕᕆᐊᖅ, ᐊᒪᓗ 500 m^3-ᓂᒃ ᐊᐳᑎᒥᒃ ᐊᒪᓗ ᓯᑯᓂᒃ ᐊᕐᕌᒍᑕᒫᑦ. ᐃᒪᙳᖅᐸᓪᓕᐊᔪᖅ ᓄᓇᒥᑦ ᐃᓂᐅᔪᒥᑦ ᑯᕕᔭᐅᔾᔮᖏᑦᑐᖅ ᓯᓚᒧᑦ. ᑲᑎᑕᐅᓂᐊᖅᑐᖅ ᐊᒪᓗ CP1-ᒧᐊᖅᑎᑕᐅᓗᓂ ᐱᓕᕆᐊᖑᓂᐊᕐᓂᕐᒧᑦ. ᓄᓇ ᐃᓂᐅᔪᖅ ᐃᓗᐹᕈᑕᖃᕐᓂᐊᖅᑐᖅ ᐊᒪᓗ ᐊᒃᑐᖅᓯᓂᖃᕐᓂᐊᕐᓂᖓᓄᑦ ᐃᒃᑲᓐᓂᐅᔪᓄᑦ ᐃᒪᕐᓄᑦ ᓂᕆᐅᒋᔭᐅᖏᑦᑐᖅ.

ᐊᕙᑎᓕᕆᔩᒃᑯᓐᓄᑦ ᐊᕐᕌᒍᑕᒫᑦ ᐅᓂᑉᑳᓕᐅᖃᑦᑕᕐᓂᐊᖅᑐᑦ ᓄᓇᒥᑦ ᐃᓂᐅᔪᒥᑦ ᖃᓄᐃᓕᐅᕐᓂᐊᔪᓄᑦ, ᓇᓗᓇᐃᖅᓯᓗᓂ ᖃᓄᑎᒋᐅᓂᖏᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐃᓚᔭᐅᖕᒪᖏᑕ ᑕᐃᑯᖓ, ᖃᓄᑎᒋᐅᓂᖓ ᐊᑐᖅᑕᐅᔪᑦ ᐲᖅᑕᐅᓂᖏᑦ ᐊᒪᓗ ᐃᒋᑕᐅᓂᖏᑦ ᐅᕙᓗᓃᑦ ᐊᑐᖅᑕᐅᑲᓐᓂᕐᓂᖓᑕ ᐃᓂᐅᔫᑉ, ᑕᒪᐃᓂᒃ ᖃᐅᔨᓴᐃᓂᓗᒃᑖᓄᑦ ᖃᓄᐃᖓᓂᐅᔪᑦ, ᐊᖏᓂᖏᑦ ᐊᒪᓗ ᖃᓄᐃᑑᓂᖏᑦ ᐃᓚᔭᐅᔪᑦ, ᑕᐅᑐᒡᓗᒍ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᖃᓄᐃᖓᓂᐅᔪᑦ, ᐊᒪᓗ ᐊᖏᓂᖓ ᐊᒃᑐᖅᑕᐅᔪᖅ ᐃᒪᐅᑉ ᑯᕙᖅᑕᖅᑕᐅᔫᑉ.

ᓄᓇ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᖅ ᐅᖅᓱᐊᓗᕋᓗᖕᓂᑦ ᓇᓚᐅᑖᖅᑕᐅᔪᖅ ᐱᖓᓱᓄᑦ ᐊᐅᔭᓄᑦ ᐋᕿᒃᓯᐊᓂᑦᑎᐊᕐᓂᐊᕐᓂᖓᓄᑦ. ᐋᕿᒃᑕᐅᒃᐸᑦ, ᐃᑉᔪᐃᑦ ᐲᖅᑕᐅᓂᐊᖅᑐᑦ ᐃᓂᐅᔪᒥᑦ ᐊᒪᓗ ᐊᑐᖅᑕᐅᑲᓐᓂᕈᖕᓇᕐᓗᑎᒃ ᓴᓇᔭᐅᓂᕐᒧᑦ ᐃᓚᒋᔭᐅᓗᑎᒃ ᖄᓕᖅᑐᐃᓂᕐᒧᑦ ᕿᒪᒃᑎᑦᑐᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕙᖕᒧᑦ ᐅᕙᓗᓃᑦ ᑲᑎᑕᐅᓗᑎᒃ ᐊᒃᑕᑰᖅᑕᐅᔪᓄᑦ ᐅᔭᖅᑲᐃᑦ ᑐᖅᑲᖅᑕᐅᓯᒪᕝᕙᖓᓄᑦ.

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine.

This document presents the Landfarm Management Plan for the Project and forms a component of the documentation produced for the Type B Water Licence Application. The Plan describes the design features and operational procedures for the landfarm to be constructed at the Project for the storage and treatment of petroleum hydrocarbon contaminated soils.

On-site storage and remediation has been established as the preferred method for treatment of light petroleum hydrocarbon contaminated soil that may be generated on the proposed mine site. The landfarm is designed to receive soils, rock, snow, and ice contaminated with petroleum hydrocarbons and antifreeze. This will include light hydrocarbons such as diesel and gasoline, and also antifreeze, being treated in the landfarm.

The landfarm is located in the former ‘‘fuel bladders’’ containment behind the fuel farm. It consists of a lined basin structure that can hold approximately 2,500 cubic meter of light petroleum product contaminated soil. The landfarm has an impervious liner and no impacts on shallow groundwater are anticipated. Water accumulating in the landfarm will be discharged directly to the receiving environment, if the discharge criteria from Licence 2BB-MEL1424 part D, item 15, is met. The water will go through the EVAC water filtration for TSS and petroleum removal prior to releasing the water to the environment. If the water meets the criteria for discharge , the water will be released West of the road on the West side of the landfarm.

A report of landfarm activities will be prepared annually by the Environment Department indicating the volume of material added to the facility, amount of material removed and disposed of or re-use location, all analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped.

Soils contaminated with light end petroleum hydrocarbons will require an estimated three full summer seasons for complete remediation. When remediated, the soils will be removed from the facility and can be used for construction purpose, such as part of the cover of the Tailings Storage Facility or stacked in the Waste Rock Storage Facility.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			First version of the Landfarm Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	February 2015	All		Operational revision for the year 2014	Meliadine Environmental department
3	March 2017	All		Operational revision for the year 2017	Meliadine Environmental department

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
BTEX	benzene, toluene, ethylbenzene, and xylene
CP1	Collection Pond 1
GN	Government of Nunavut
NWB	Nunavut Water Board
PHC	Petroleum hydrocarbons
Project	Meliadine Gold Project
RMMS	Responsible Mining Management System
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility

SECTION 1 • INTRODUCTION

1.1 Project History

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit Owned Lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 onwards).

The Landfarm Management Plan (Plan) focuses on minimizing the waste footprint on-site, and maximizing remediation potential through implementation best practices.

During the advanced exploration phase of the Project, the Nunavut Water Board (NWB) approved amendment #6 to Water Licence 2BB-MEL1424, which allowed the operation of light PHC soil stockpile. This approval supported using a landfarm developed inside a bermed and lined area previously used to store fuel bladders. Soil contaminated with light PHC is being deposited in this bermed and lined area for treatment. To date, there is approximately 1414 cubic meters (m^3) of contaminated soil being treated. This quantity resulted from inadvertent spills that occurred during the advanced exploration phase of the Project. Some or all of this material will be transferred to the landfarm for the proposed mine upon its completion and commissioning.

Materials contaminated with heavy hydrocarbons (e.g. grease), continue to be segregated, packaged, and shipped south for treatment and/or disposal.

1.2 Objectives

On-site storage and remediation has been established as the preferred method for treatment of light PHC contaminated soil that may be generated at the proposed mine. Specifically, remediation through landfarming has been identified as the primary treatment option and, as such, is the focus of this Plan is the management of contaminated soil.

This Plan is a component of the Responsible Mining Management System (RMMS)[1]. The objectives of this Plan are to:

- provide an overview of the actual contaminated soil management at the Project;
- describe the physical setting, location, and design criteria of the landfarm;
- define acceptable types of contaminated soils to be placed in the landfarm and conditions for removal of treated soil;
- define operating procedures and monitoring requirements for the landfarm; and
- describe contingency options for alternate treatment/storage of PHC contaminated soil.

1.3 Related Documents

Spill prevention is the first stage in the contaminated soil management for the Project. Documents containing information related to this Plan are submitted as part of the Type A and B Water Licenses and include:

- Spill Contingency Plan;
- Environmental Management and Protection Plan; and
- Risk Management and Emergency Response Plan.

1.4 Spill Prevention

Similar to the waste management philosophy, Agnico Eagle actively works towards minimizing spills through the implementation of suitable plans and work procedures. Plans developed from the environmental impact study address the management of spills on land, ice, water, and into the marine environment. When spills do occur, the goal is to limit the spread of the spill, and then manage contaminated material resulting from the spill. The Spill Contingency Plan describes spill prevention measures.

[1] The RMMS is described in the Environmental Management and Protection Plan.

SECTION 2 • LANDFARM DESIGN

2.1 Background

In the event of a spill, on-site storage and remediation is the most practical and efficient method in handling contaminated soil, particularly in an isolated location such as the Project. Any PHC contaminated soils generated during the construction, operation, and closure phases will be adequately managed. Soils contaminated with light PHCs, such as diesel, will be treated on-site in a landfarm. This method involves spreading and placing the contaminated soil within a containment area to promote conditions favorable for the volatilization and aerobic microbial degradation of hydrocarbons.

Materials contaminated with heavy hydrocarbons (e.g., hydraulic fluid or grease) will need to be segregated, packaged, and shipped south for treatment and/or disposal.

There are currently PHC contaminated soils stored on-site (approximately 1414 m^3), resulting from spills that occurred during the exploration and pre-construction phase. This material will be moved to the Water License A landfarm facility if treatment is not complete at the start of construction. This volume has been accounted for in the design of the future facility.

A landfarm options analysis prepared for Agnico Eagle by Golder (2007) identified factors relevant to landfarming in the north. These include environmental factors and physical properties of the soil that affect microbial growth and rates of biodegradation, such as temperature, pH, soil moisture, nutrient content, salinity, and soil particle size.

Although rates of biodegradation decline with temperature, landfarming is still a feasible technique in Arctic climates as demonstrated by the Meadowbank landfarm. Degradation in the north is typically restricted because microbial activity stops between 0 to -5 degrees Celsius (°C) limiting biodegradation to the months of June to September[2]. Nevertheless, degradation was reported at 90% over two summers on Resolution Island (Paudyn et al. 2008).

It is estimated that soils contaminated with light-end PHCs would require three full summer seasons for complete remediation. When remediated, the soils will be removed from the facility and can be used for construction purposes such as part of the cover of the Tailings Storage Facility (TSF) or stacked in the Waste Rock Storage Facility (WRSF). Based on a remediation period of three seasons, it would be possible to close the Licence B landfarm facility on the third year following the start of construction and usage of the Licence A landfarm facility.

[2] Even though bioremediation ceases below -5°C, volatilization of the PHCs does continue but at a much slower rate.

2.2 Location

The overall site plan showing the main infrastructure for the Project, including the landfarm, is shown in Figure 2-1. The area is located within the Fuel farm and drilling core storage. The pad is located north of the service road leading the exploration camp.

2.2.1 Proximity of Surface Water

The landfarm is located just off Fuel Farm pad. It is located at the most elevated point of the local topographical area. Meliadine Lake is located approximately 620 m north-east and Lake H-20 is approximately 311 m north-west of the landfarm area. On the other side of the road, south of the landfarm, Lake J3 is located at approximately 265 m.

Figure 2-1 Main Infrastructure for the Meliadine Project, including the Landfarm

2.2.2 Proximity of Groundwater

In the Project area, the groundwater within the active layer is estimated to reach 1.5 m in October. The active layer begins to form in July when temperatures largely remain above 0°C, and deepens to a maximum in October. The shallow groundwater in the area of the landfarm flows towards Meliadine Lake, located approximately 620 m from the landfarm.

To prevent movement of contaminants from the landfarm facility into the groundwater and the surrounding environment, the Meliadine Landfarm has an impervious liner.

2.3 Design

The Landfarm was originally designed as a lined containment to hold PHC fuel bladders for exploration purposes. In 2016, the edges of the landfarm containment were resloped and locations of exposed liner were recovered to ensure protection. The contaminated material placed in the Landfarm can include light hydrocarbons such as diesel and gasoline, and also antifreeze[3]. The design volume of the Landfarm is based on the allowances for the materials being treated at Meadowbank during operation, as described below.

2.3.1 Soil Volume Requirements

Remediation of the existing contaminated soil in the Licence B Landfarm is expected to be completed in 2017 or 2018. The total capacity of the Landfarm is approximately 2,500 m^3 and the actual quantity of contaminated soil being remediated is 1,414 m^3. The estimated remaining capacity for future contaminated material represents approximately 1,000 m^3, which should be sufficient according to the estimated volume for the pre-development period (Table 2-1), until the decontamination activity from the Water License 2BB landfarm get transferred to the Water License 2AM landfarm.

Table 2-1 Estimated Volume of Petroleum Hydrocarbon/Antifreeze Contaminated Soil and Ice/Snow to be Managed

Project Phase	Volume of PHC Soil/Rock (m^3)	Annual PHC Snow/Ice (m^3)
Pre-development (2 years)	**350 (175 per year)**	500 per year
Construction (3 years)	1,050 (350 per year)	
Operations (7 years)	2,450 (350 per year)	
Closure & Reclamation (2 years)	700 (350 per year)	
Total	**4,970**	

[(a)] The contaminated soil in the advanced exploration landfarm will be transferred to the mine landfarm upon its completion and commissioning.

[3] Metals, solvents, glycols other than ethylene glycol, and heavy oils will not bioremediate in a landfarm; soil or snow/ice containing these contaminants will not be introduced into the landfarm.

It is estimated that soils contaminated with light-end PHCs would require three full summer seasons for complete remediation (Agnico Eagle, 2008). Ethylene glycol or antifreeze is expected to largely biodegrade within one year (Dobson, 2000). When remediated, the soils will be removed from the Landfarm and used on-site, placed in the WRSF or used as cover at the TSF.

SECTION 3 • LANDFARM OPERATION AND MANAGEMENT

Agnico Eagle will be responsible for managing and implementing the Landfarm operation plan. Operation and monitoring of the Landfarm as well as determining the training requirements for personnel will be the responsibility of the Environment department.

3.1 Acceptable Landfarm Material

3.1.1 Contaminants

The Landfarm facility will only treat and/or store light PHC contaminated soils that have been generated through mine related activities at the Project. Material from the Hamlet of Rankin Inlet or other sites will not be accepted without approval from the NWB, Indingenious and Northern Affairs Canada, Water Resources Inspectors, and the Kivalliq Inuit Association.

The following products are acceptable for treatment in the Landfarm if used on-site and has resulted in contamination of soil:

- diesel fuel;
- gasoline;
- aviation fuel (Jet A);
- hydraulic oil;
- other light oil (e.g., engine oil, lubricating oil); and
- ethyl Glycol (antifreeze).

In the event that the contaminant source is unknown, soil samples will be analyzed for PHCs and possibly additional contaminants prior to placement in the Landfarm. These additional parameters could include total metals, oil and grease, and volatile organic compounds. Analysis for additional compounds will be determined by the Environment Department on a case-by-case basis. Concentrations of contaminants will be compared to the site background values (for metals) and/or criteria in the Government of Nunavut (GN) *Guidelines for Contaminated Site Remediation* (GN 2009). If this analysis indicates soil contamination above background or GN guidelines for any substance not approved for landfarming (i.e., non-PHC contaminants), the spill material will not be placed in the Landfarm. This is to ensure that PHC contaminated soils are not contaminated with other products.

Spills of non-PHC material (e.g., solvents) will be placed in drums and stored on-site for shipment south to approved facilities during shipping season.

3.1.2 Grain Size

Bioremediation of very coarse-grained larger soil material is inhibited as it does not readily retain moisture. However, volatilization will occur more rapidly (SAIC 2006). It has been noted that this

material likely contains lower concentrations of contaminants due to a lower volume and surface area ratio, and can typically be screened out prior to landfarming (SAIC 2006). As a result, soils and rock material with grain size less than 2.5 centimetres (cm) will be segregated from larger-grained material, where possible. This will occur at the spill location or in the landfarm using a screen sieve, should it prove necessary. The two soil fractions will be treated separately in the Landfarm when possible.

3.2 Contaminated Soil Additions

3.2.1 Spill Excavation

Soil contaminated with the above-described petroleum hydrocarbon materials will be excavated and transported to the Landfarm facility in dump trucks or other available means of transportation. Care will be exercised to ensure that the entire spill is excavated (verified by olfactory and visual assessment, or sampling if necessary, by the Environment department) and that none of the contaminated material is lost during transport.

3.2.2 Placement in the Landfarm

As above, larger coarse material (rocks) will be separated from the finer material (sand and gravel) in the Landfarm when possible and assessed visually for PHC staining and product. If the material is saturated it will be spread to allow volatilization in the designated area of the landfarm.

Materials identified as acceptable in the Landfarm will be dispersed as space permits. A record will be kept by the on-site Environmental department of the amount of contaminated soil placed in the Landfarm and the location of each load within it.

3.3 Contaminated Snow

Petroleum hydrocarbon contaminated snow and ice will be placed in a designated area of the Landfarm and treated as contact water after snowmelt. After snowmelt, the water will be pumped through the site's EVAC water treatment system. The treated water will be discharged in the environment, if discharge criteria are met, as prescribed in the License 2BB-MEL1424.

3.4 Remediation

Remediation of fine grained PHC contaminated soil in landfarms occurs naturally through volatilization and aerobic microbial degradation. Soil aeration and nutrient amendment are recognized as methods of improving rates of remediation. While it is recognized that pH, salinity, moisture content, and microbial population density also contribute to rates of degradation, these factors will not be explicitly investigated or managed unless remediation rates are too slow to allow meeting targets set for closure.

3.4.1 Absorbent Materials

Coarse-grained soils are not readily bio-remediated, but concentrations of PHC contaminants may still be reduced through volatilization. Oil absorbent pads will be used to help remove visible product from coarse-grained material. Used absorbent materials will be incinerated or packed in Quatrex bag with oily rags and shipped south for treatment in an approved facility.

3.4.2 Aeration

Natural aeration would occur with material sparsely place in the Landfarm, if possible. The goal will be to mechanically aerate the soil with earth-moving equipment. The soil will be run through a gravel separator to separate the large rock from the smaller grained materials. Following this, the material will be turned over to promote aeration to allow the PHC to volatilize.

3.4.3 Soil Moisture

Prior to turning over the soil, site personnel will ensure that the soil has sufficient moisture to prevent generation of significant dust. It will be equally necessary to ensure soil is not overly saturated. If soil is too dry, non-contaminated water from within the Landfarm containment area will be used as a moisture source. If no accumulated water is available, freshwater will be used.

3.5 Removal of Soil From the Landfarm

3.5.1 Government of Nunavut Remediation Guidelines

The following parameters will be measured and compared with the GN industrial remediation criteria to determine whether PHC contaminated soil has been adequately remediated:

- benzene, toluene, ethylbenzene and xylene (BTEX); and
- petroleum hydrocarbon fractions 1 - 4.

The GN remediation criteria are characterized for agricultural/wildlife, residential/parkland, commercial, and industrial land uses. At the Project, remediation to agricultural/wildlife criteria is targeted; however, if these criteria cannot be met, industrial criteria will be followed.

The GN remediation criteria for coarse-grained soils and Licence 2BB-MEL1424 Part D, item 15 criteria will be applied. Table 3-1 presents the applicable Tier 1 criteria for coarse-grained soil, assuming agricultural/wildlife or industrial land uses.

Table 3-1 Summary of Relevant GN Tier 1 Soil Remediation Criteria for Surface Soil (mg/kg)

	Land Use Criteria (mg/kg)	
	Agricultural/Wildlife	**Industrial**
Benzene	0.03	0.03
Toluene	0.37	0.37
Ethylbenzene	0.082	0.082
Xylene	11	11
PHC Fraction 1	30	320
PHC Fraction 2	150	260
PHC Fraction 3	300	1,700
PHC Fraction 4	2,800	3,300

mg/kg = milligram per kilogram

3.5.2 Sampling and Analysis

Landfarm soils will be sampled bi-annually, at the earliest possible time and at the end of the summer season, to determine if remediation objectives have been met. Representative composite samples will be taken to estimate remaining PHC concentrations. For each sub cell (Figure 3-1), two composite samples will be collected, one consisting of three surface sub-samples and the other from three sub-samples at 1 m depth. Sub-samples will be taken approximately 3.3 m apart, and will be taken randomly in the sub-cell.

After two seasons of treatment in the Landfarm, degradation rates will be assessed to estimate the total remediation time required for PHC contaminated soil under these conditions. If remediation to GN guidelines is feasible within the life-of-mine timeframe, Landfarm operations will continue with aeration. If rates of degradation are not sufficient through this method, alternative options will be further investigated as described in Section 4.2.

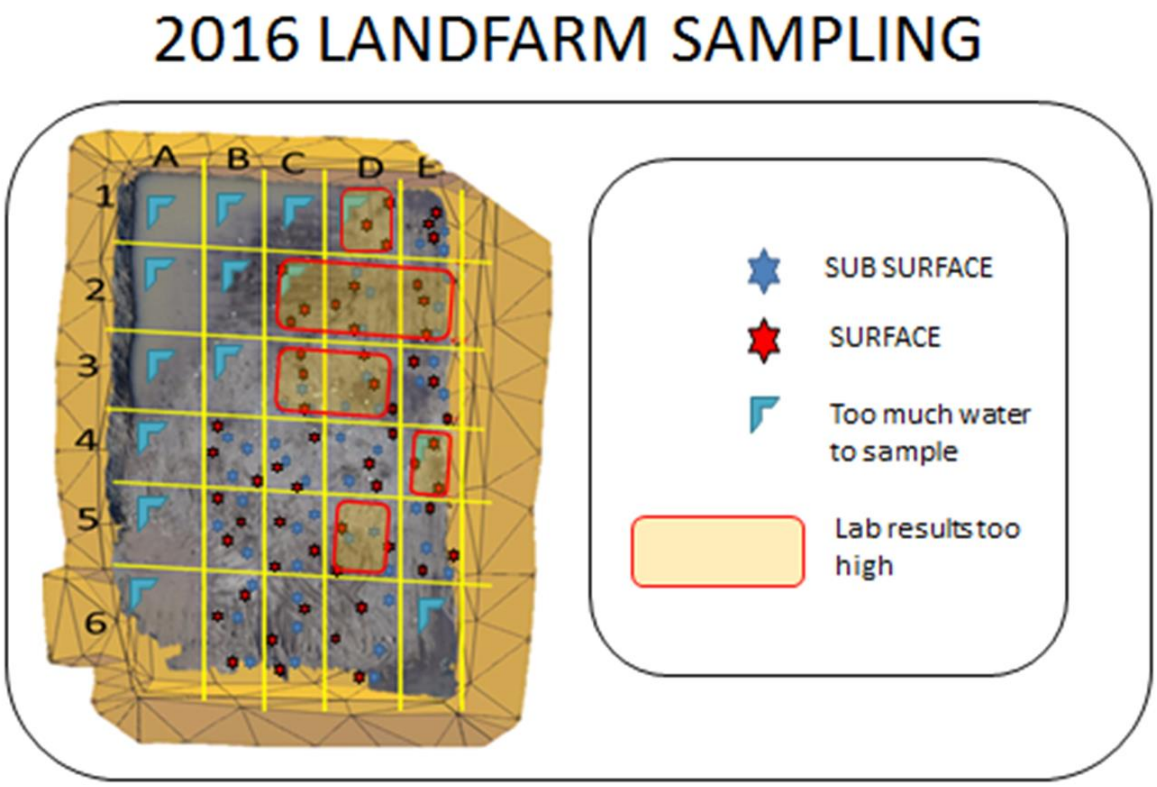

Figure 3-1 Licence 2BB-MEL1424 grid and sampling example

3.5.3 Soil Removal

Coarse-grained soils will be assessed near the end of the summer season by the Environment department technicians for PHC product and odour. A photoionization detector (PID) may be employed to assist in petroleum-based vapour detection. When PHC odours are no longer detected, the material will be removed to the WRSF, or used at the TSF for cover material.

When analysis of the fine-grained material at the end of a season indicates that concentrations of contaminants are below GN guidelines, the appropriate section of soil suitable for removal from the facility is completed. Interim monitoring may also be conducted of the headspace with a portable instrument (e.g., flame ionization detector), however, prior to any material removal, samples will be confirmed to be of suitable quality by an accredited laboratory beforehand.

When remediated, the soils will be removed from the facility and can be used for construction purposes such as normal overburden (i.e., part of the cover of the TSF) or stacked in the WRSF.

3.6 Water Management

Since the Landfarm facility is uncovered to facilitate natural weathering, water accumulating inside the bermed area may come into contact with contaminated material.

3.6.1 Snow Management

Non-contaminated snow will be removed as much as possible during winter to minimize the quantity of spring melt inside the berm. Care will be taken to ensure contaminated snow/soil is not disturbed by leaving a base layer of snow of no less than 10 cm in place. Following snowmelt, any contaminated product left from winter spill clean-up operations could be padded up.

3.6.2 Water Management

While, the Landfarm will have an impermeable liner, visual inspections by the Environment department will be conducted for seepage of contact water coming through the perimeter berm, or the accumulation of water within the containment berm. This will be conducted on a weekly basis starting after freshet and continuing until October when water is likely to be present. In the event of water accumulation or seepage, the ponded water will be pumped through the site's oil-water separator (EVAC by Ci.Agent) to remove PHC residue and will be analyzed for BTEX, lead, and oil and grease prior to discharge to the environment, only if discharge criteria from the Water Licence 2BB-MEL1424 part D, item 15, are met (Table 3-2).

Table 3-2 Licence 2BB-MEL1424 Part D, Item 15 STP

	Licence 2BB-MEL-1424
	Criteria limits (ug/L)
Benzene	370
Ethylbenzene	2
Toluene	90
Lead	1
Oil & Grease	15,000 and no visible sheen
Phenols	20

3.7 Landfarm Closure and Reclamation

After removal of all remediated soil and prior to closure and reclamation of the Licence B Landfarm, the berm and base will be sampled on a 10 m grid to determine if these soils are free from PHC contamination. Results of this analysis will be compared to GN and CCME criteria set out in Table 3-1. No excavation will be necessary if the agricultural/wildlife criteria are met. If industrial criteria are used, the Landfarm will be covered with a 2 m thick layer of waste rock, or other suitable material used for reclamation. The surrounding berm will be breached to avoid water accumulation on the landfarm.

3.8 Summary of Activities

A summary of Landfarm activities including monitoring of the physical condition is provided in Table 3-3. An annual report will be prepared indicating the volume of material added to the facility, amount of material removed, disposal or reuse location, all analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped. This information will be appended to Agnico Eagle's NWB Annual Report.

Table 3-3 Summary of Landfarm Activities, Analyses, and Records

Activity	Analysis	Frequency of Analysis	Record
Excavation of spill and transport of contaminated material to landfarm.	If unsure of full excavation - F1-F4, BTEX If contaminant source unknown, F1-F4, BTEX, metals, oil and grease, VOCs	As needed	Date, time and location of spill and excavation; estimated volume of spill; estimated quantity of excavated soil; storage/disposal location of excavated soil, if applicable. Any evidence of remaining product
Soil aeration	NA	As possible	Date and time of the aeration; location; soil condition (moisture, odour, granulometrie, etc.)
Sampling for progress of remediation	Hydrocarbon vapour in headspace (by PID); F1-F4, BTEX (laboratory)	Vapour – as needed; Laboratory – Bi-annually	Date and time; location; odour; laboratory report
Soil removal from landfarm	Removal subject to meeting GN criteria	Once GN criteria are met	Date and time; location; quantity of soil removed; final location
Ponded contact water	Table 3-2 – as specified in Water Licence 2BB-mel1424 Part D, Item 15	Prior to any dewatering; if re-used in landfarm, no sampling necessary	Date and time, location, laboratory report, in Annual Report
Seepage	Visual inspection; Table 3-2 – as specified in Water Licence 2BB-mel1424 Part D, Item 15	Weekly during summer	Location, extent, approximate depth, evidence of sheen
Identification of maintenance requirements	Visual inspection of landfarm	Twice over the summer	Inspected areas; condition of berm and base; previously unidentified safety concerns

SECTION 4 • CONTINGENCY OPTIONS

This section describes the contaminated soil management plan, should a large spill event occur, and if Landfarm treatment proves not successful.

4.1 Large Spill Event

A large spill event producing a quantity of soil that cannot be contained in the Landfarm is unlikely because the Landfarm is designed to hold sufficiently more contaminated soil than as is expected to be produced (see Table 2-1). Nevertheless, in this event, soils will be placed in a temporary storage area selected to avoid drainage of contaminated material. A temporary stockpile area would be set up in another location as approved by the NWB. As space becomes available, the soil would be transferred to the landfarm. The previously described spill prevention measures intend to minimize the potential of this scenario occurring.

4.2 Alternate Treatment Options

Should Landfarm treatment not perform as anticipated in which the rates of degradation are not sufficient to meet GN Tier 1 criteria within the life-of-mine and the anticipated closure period, the following alternative treatment options will be considered. Implementation will only occur once a detailed protocol and revised plan is approved by the NWB.

4.2.1 Soil Amendment

Since pH, salinity, moisture content, and microbial population density all affect rates of biodegradation by microbes, these factors may be monitored and adjusted through soil amendments if they are not found to be optimal (SAIC 2006). In addition, the dispersion of soil could be repeated to maximize air exposure if space in the Landfarm allows.

4.2.2 Tier 2 – Modified-Criteria Approach

According to the GN *Environmental Guideline for Contaminated Site Remediation* (GN 2009), in cases where site conditions, land uses, receptors, or exposure pathways are different from those assumed in the development of the Tier 1 criteria, modified criteria may be permitted. This process requires the collection of site-specific information on exposure and risk estimates, and is subject to GN approval. For this Project, landfarmed soils are to be encapsulated in a WRSF rather than used in surface applications, as assumed in Tier 1, reducing the likelihood of exposure to any remaining contamination. Therefore, the Tier 2 approach could be warranted if Tier 1 criteria cannot be met. Any consideration for this approach would be based on soil sampling results and science based information.

4.2.3 Direct Placement in Waste Rock Storage Facility or on Tailings Storage Facility

Another option for management of contaminated soil, if bioremediation proves ineffective, would be the direct placement of this material in a WRSF or on the TSF. Although the use of PHC contaminated soils in these storage areas is not optimal, the quantity generated on-site is small in comparison to the quantity of waste rock and cover on the TSF. While this method would not result in the treatment of soil, it is a viable contingency option because it would allow for the safe disposal of the contaminated material. Encapsulation and freeze-back would occur, eliminating any movement of contaminants. Over time, this material would undergo natural degradation. Consideration of this option would also include a suitable monitoring program for PHCs, which would be incorporated into the Closure and Reclamation Plan.

SECTION 5 • ASSESSMENT AND REPORTING

5.1 Feasibility

After three seasons of treatment in the Landfarm, degradation rates of PHC contaminants will be assessed to estimate the total remediation time required under these conditions. If remediation to GN guidelines is feasible within the life-of-mine timeframe, Landfarm operations will continue, with aeration and possible nutrient amendments, as described above. If rates of degradation are not sufficient through this method, alternative options will be further investigated (Section 4).

5.2 Reporting

A report of Landfarm activities will be prepared annually by Environment department, indicating the volume of material added to the facility, amount of material removed and disposal or re-use location, all analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped. This information will be included in the Agnico Eagle's NWB Annual Report.

5.3 Plan Review and Continual Improvement

The Landfarm Management Plan will be reviewed and updated on annual basis, as required, to reflect changes in operations and/or technology.

REFERENCES

Agnico Eagle (Agnico Eagle Mines Limited). 2008. Landfarm Design and Management Plan In Accordance with Water License 2AM-MEA0815, Meadowbank Gold Project, 20 p. + Figures and Appendix. October 2008.

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Appendix F
2016 Consultation Log

Date	Location	Community/Organisation	Communication Type	Topics discussed
10-Feb-16	Rankin Inlet	Community	Public hearing Type A Water License	Meliadine Gold Project
5-May-16	Rankin Inlet	KHTO	Meeting	Nunavut Exploration Projects, Wildlife monitoring program, Construction Summary
11-May-16	Chesterfield Inlet	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Human Resources - Labour Pool Process
12-May-16	Rankin Inlet	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Human Resources - Labour Pool Process
18-May-16	Whale Cove	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Human Resources - Labour Pool Process
19-May-16	Arviat	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Human Resources - Labour Pool Process
19-May-16	Baker Lake	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Human Resources - Labour Pool Process
6-Jun-16	Rankin Inlet	GN-Nunavut Airports, GN-CGS, Hamlet Officials	Meeting, KHTO Official Meeting	Rankin Inlet bypass road, Itivia Quarry, Laydown and fuel farm area
29-Jun-16	Coral Harbour	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Human Resources - Labour Pool Process
30-Jun-16	Naujaat	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Human Resources - Labour Pool Process
7-Jul-16	Rankin Inlet	KHTO	Meeting	Wildlife monitoring program
25-Aug-16	Rankin Inlet	GN-Nunavut Airports, GN-CGS, Hamlet Officials	Meeting	Rankin Inlet bypass road, Itivia Quarry, Laydown and fuel farm area
1-Sep-16	Rankin Inlet	Community	Open house	IIBA - ECC Reporting Human Resources - Labour Pool Process
6-Sep-16	Whale Cove	Community	Open house	IIBA - ECC Reporting Human Resources - Labour Pool Process
13-Sep-16	Arviat	Community	Open house	IIBA - ECC Reporting Human Resources - Labour Pool Process
13-Sep-16	Chesterfield Inlet	Community	Open house	IIBA - ECC Reporting Human Resources - Labour Pool Process
19-Sep-16	Coral Harbour	Community	Open house	IIBA - ECC Reporting Human Resources - Labour Pool Process
20-Sep-16	Rankin Inlet	KHTO	Meeting	Wildlife monitoring program, signage erected on AWAR
20-Sep-16	Naujaat	Community	Open house	IIBA - ECC Reporting Human Resources - Labour Pool Process
21-Sep-16	Baker Lake	Community	Open house	IIBA - ECC Reporting Human Resources - Labour Pool Process

Date	Location	Community/Organisation	Communication Type	Topics discussed
24-Oct-16	Chesterfield Inlet	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Project - Whale Tail Human Resources - Labour Pool Process Environment
25-Oct-16	Baker Lake	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Project - Whale Tail Human Resources - Labour Pool Process Environment
26-Oct-16	Rankin Inlet	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Project - Whale Tail Human Resources - Labour Pool Process Environment
1-Nov-16	Naujaat	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Project - Whale Tail Human Resources - Labour Pool Process Environment
2-Nov-16	Coral Harbour	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Project - Whale Tail Human Resources - Labour Pool Process Environment
3-Nov-16	Whale Cove	Community	Open house	IIBA - BOC Monthly Report IIBA - ECC Reporting Project - Whale Tail Human Resources - Labour Pool Process Environment
28-Nov-16	Rankin Inlet	GN-Nunavut Airports, GN-CGS, Hamlet Officials	Pre-council meeting	Rankin Inlet bypass road, Itivia Quarry, Laydown and fuel farm area
28-Nov-16	Rankin Inlet	Hamlet Council and officials, GN-CGS	Council Meeting	Rankin Inlet bypass road, Itivia Quarry, Laydown and fuel farm area
13-Dec-16	Rankin Inlet	GN-Nunavut Airports, GN-CGS, Hamlet Officials	Council Meeting	Rankin Inlet bypass road, Itivia Quarry, Laydown and fuel farm area