AGNICO EAGLE

MELIADINE GOLD PROJECT

Landfarm Management Plan

April 2015
Version 1
6513-MPS-15

ᓇᐃᓈᖅᓯᒪᔪᖅ

ᐊᓃᑯᒃᑯᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᒨᓗᒧᑦ ᐅᔭᕋᖕᓂᐊᕐᕕᓕᕆᓂᕐᓕᐊᔪᑦ (ᐱᓕᕆᐊᖅ), 25 ᑮᓛᒥᑕᒥᒃ ᐅᐊᖕᓇᖕᒐᓂᑦ ᐅᖕᒐᓯᒃᑎᑎᔪᖅ ᑲᖏᖅᓵᓂᕐᒥᑦ, ᐊᒻᒪ 80 ᑮᓛᒥᑕᒥᒃ ᓂᒋᖅᐸᓯᐊᓂᑦ ᐱᖕᒐᖕᓇᖅᐸᓯᐊᓂᑦ ᐅᖕᒐᓯᒃᑎᑎᔪᖅ ᐃᒡᓗᓕᒫᕐᔪᖕᒥᑦ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ. ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒧᑦ ᐸᕐᓇᐅᑕᐅᔪᖅ ᐅᒃᑯᐃᖕᒐᔪᒥᒃ ᐊᒻᒪ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᖕᓂᐊᕐᕖᖅᑲᕐᓂᐊᖅᑐᖅ ᐱᕙᓪᓕᐊᓂᕐᒧᑦ ᑎᑎᕋᓂᐊᖅ-ᒥᑦ ᒨᓗᓂᒃ ᐱᓂᕐᒧᑦ, ᒪᕐᕿᖕᓂᒃ ᐅᒃᑯᐃᖕᒐᔫᖕᓂᒃ ᓄᓇᒥᑦ (ᑎᑎᕋᓂᐊᖅ Pit 1 ᐊᒻᒪ ᑎᑎᕋᓂᐊᖅ Pit 2) ᐊᒻᒪ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᖕᓂᐊᕐᓂᖅ.

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ᐃᓂᐅᔪᒥᑦ ᑐᖅᑯᖅᓯᓯᒪᕗᕕᒃ ᐊᒻᒪ ᐋᕿᒋᐊᖅᓯᓂᖅ ᓴᖅᑭᑕᐅᓚᐅᖅᑐᖅ ᐊᑐᖅᑕᐅᖕᒫᕈᒪᔫᐸᓗᓂ ᐱᓕᕆᐊᖅᑲᕐᓂᕐᒧᑦ ᐊᖕᒋᓗᐊᖕᒋᑦᑐᓂᒃ ᐅᖅᓱᐊᓗᖕᓂᑦ ᐊᒃᑐᖅᓯᓂᖅᑕᖅᑲᖅᐸᑦ ᓄᓇᒥᒃ ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥᓪᓚᕈᖕᓇᖅᑐᒥᑦ. ᓄᓇ ᐃᓂᐅᔪᖅ ᐋᕿᐅᒪᔪᖅ ᐱᖃᑦᑕᕐᓂᕐᒧᑦ ᐃᐸᔪᓂᒃ, ᐅᔭᖅᑲᓂᒃ, ᐊᐳᑎᒥᒃ ᐊᒻᒪ ᓯᑯᒥᒃ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᓂᒃ ᐊᖕᒋᓗᐊᖕᒋᑦᑐᓂᒃ ᐅᖅᓱᐊᓗᖕᓂᑦ ᑕᒪᒃᑯᓂᙶᕋᓗᒃ. ᐃᓚᐅᓂᐊᖅᑐᖅ ᐊᖕᒋᓗᐊᖕᒋᑦᑐᑦ ᐅᖅᓱᐊᓗᐃᑦ ᓄᓇᒃᑰᕈᑎᓄᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᐊᒻᒪ ᐅᖅᓱᖅ, ᐊᒻᒪ ᐋᓐᑎᕗᕆᔅ, ᐱᓕᕆᐊᖑᔪᑦ ᐃᓂᐅᔪᒥᑦ.

ᓄᓇ ᐃᓂᐅᔪᖅ ᓴᓂᐊᓃᑐᖅ ᑐᙵᕕᒋᔭᐅᔫᑉ, 200 ᒦᑕᓪᓗᐊᓂᒃ ᐅᖕᒐᓯᒃᑎᑎᔪᖅ ᑲᑎᖅᓱᐃᕕᖕᒥᑦ ᑕᓯᕋᕐᒥᑦ 1 (CP1). ᕿᑎᐊᓃᑐᖅ ᐃᓂᐅᔪᖅ ᓄᓇᐅᑉ ᓂᕈᐊᖅᑕᐅᓚᐅᖅᑐᖅ ᒥᑭᓛᒃᑰᖅᑎᓐᓂᕐᒧᑦ ᖃᓄᐃᖕᒐᓂᐊᕐᓂᐅᔫᑉ ᐅᔭᕋᖕᓂᐊᕐᕕᐅᑉ ᐃᓂᖕᒐ ᐊᒻᒪ ᐃᖕᒋᕐᕋᓂᖕᒐᑕ ᐅᖕᒐᓯᖕᓂᖕᒐ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᐃᑦ ᑕᒪᒃᑯᓄᙵ ᑯᕕᕝᕕᐅᔪᓂᑦ. ᓄᓇ ᐃᓂᐅᔪᖅ ᓂᕆᐅᒋᔭᐅᔪᖅ ᐱᓕᕆᐊᖅᑲᕈᖕᓇᕐᓂᐊᕐᓂᖕᒐᓄᑦ 5,000 m^3-ᓂᒃ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᓂᑦ ᓄᓇᒥᒃ ᓴᓇᔭᐅᑎᓪᓗᒍ, ᐊᐅᓛᖅᑎᓪᓗᒍ, ᐊᒻᒪ ᐅᒃᑯᐊᖅᐸᓪᓕᐊᑎᓪᓗᒍ ᐱᓕᕆᐊᖅ, ᐊᒻᒪ 500 m^3-ᓂᒃ ᐊᐳᑎᒥᒃ ᐊᒻᒪ ᓯᑯᓂᒃ ᐊᕐᖁᒍᑕᒫᑦ. ᐃᒪᙳᖅᐸᓪᓕᐊᔪᖅ ᓄᓇᒥᑦ ᐃᓂᐅᔪᒥᑦ ᑯᕕᔭᐅᔾᔮᖕᒋᑦᑐᖅ ᓯᓚᒧᑦ. ᑲᑎᑕᐅᓂᐊᖅᑐᖅ ᐊᒻᒪ CP1-ᒧᐊᖅᑎᑕᐅᓗᓂ ᐱᓕᕆᐊᖑᓂᐊᕐᓂᕐᒧᑦ. ᓄᓇ ᐃᓂᐅᔪᖅ ᐃᓗᐹᕿᑦᑲᕐᓂᐊᖅᑐᖅ ᐊᒻᒪ ᐊᒃᑐᖅᓯᖅᑲᕐᓂᐊᕐᓂᖕᒐᓄᑦ ᐃᒃᑲᓐᓂᐅᔪᓄᑦ ᐃᒪᕐᓄᑦ ᓂᕆᐅᒋᔭᐅᖕᒋᑦᑐᖅ.

ᐊᕙᑎᓕᕆᓂᒃᑯᓐᓄᑦ ᐊᕐᖁᒍᑕᒫᑦ ᐅᓂᑉᑳᓕᐅᖅᑲᑦᑕᕐᓂᐊᖅᑐᑦ ᓄᓇᒥᑦ ᐃᓂᐅᔪᒥᑦ ᖃᓄᐃᓕᐅᕐᓂᐊᔪᓄᑦ, ᓇᓗᓇᐃᖅᓯᓗᓂ ᖃᓄᑎᒋᐅᓂᖕᒋᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐃᓚᔭᐅᖕᒪᖕᒫᑕ ᑕᐃᑯᖕᒐ, ᖃᓄᑎᒋᐅᓂᖕᒐ ᐊᑐᖅᑕᐅᔪᑦ ᐲᖅᑕᐅᓂᖕᒋᑦ ᐊᒻᒪ ᐃᒋᑕᐅᓂᖕᒋᑦ ᐅᕙᓘᓃᑦ ᐊᑐᖅᑕᐅᑲᓐᓂᕐᓂᖕᒐᑕ ᐃᓂᐅᔫᑉ,

ᑕᒪᐃᓂᒃ ᖃᐅᔨᓴᐃᓂᖑᒃᑖᓄᑦ ᖃᓄᐃᖓᓂᐅᔪᑦ, ᐊᖏᓂᖏᑦ ᐊᒪᓗ ᖃᓄᐃᑑᓂᖏᑦ ᐃᓚᔭᐅᔪᑦ, ᑕᐅᑐᒡᓗᒍ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᖃᓄᐃᖓᓂᐅᔪᑦ, ᐊᒪᓗ ᐊᖏᓂᖓ ᐊᒃᑐᖅᑕᐅᔪᖅ ᐃᒪᐅᑉ ᑯᕕᖅᑕᖅᑕᐅᔫᑉ.

ᓄᓇ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᖅ ᐅᖅᓱᐊᓗᕋᓗᖕᓂᑦ ᓇᓚᐅᑖᖅᑕᐅᔪᖅ ᐱᖓᓱᓄᑦ ᐊᐅᔭᓄᑦ ᐋᕿᒃᓱᐊᓂᑦᑎᐊᕐᓂᐊᕐᓂᖓᓄᑦ. ᐋᕿᒃᑕᐅᒃᐸᑦ, ᐃᑉᔪᐃᑦ ᐂᖅᑕᐅᓂᐊᖅᑐᑦ ᐃᓂᐅᔪᒥᑦ ᐊᒪᓗ ᐊᑐᖅᑕᐅᑲᓐᓂᕈᓐᓇᕐᓗᑎᒃ ᓴᓇᔭᐅᓂᕐᒧᑦ ᐃᓚᒋᔭᐅᓗᑎᒃ ᖄᓕᖅᑐᐃᓂᕐᒧᑦ ᕿᒪᒃᑎᑦᑐᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕗᕕᖕᒧᑦ ᐅᕙᓗᓃᑦ ᑲᑎᑕᐅᓗᑎᒃ ᐊᒃᑖᖅᑕᐅᔪᓄᑦ ᐅᔭᖅᑲᐃᑦ ᑐᖅᑲᖅᑕᐅᓯᒪᕗᕕᖓᓄᑦ.

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 series produced for the Type A 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 just off the infrastructure pad, approximately 200 metres from Collection Pond 1 (CP1). The central location of the landfarm was chosen to minimize the footprint of the site and the transport distance of contaminated material from potential spill locations. The landfarm is expected to effectively treat up to 5,000 cubic metres of contaminated soil over the construction, operations, and closure of the Project, and 500 cubic metres of snow and ice annually. Water accumulating in the landfarm will not be discharged directly to the receiving environment. It will be collected and directed to CP1 for treatment. The landfarm will have an impervious liner and no impacts on shallow groundwater are anticipated.

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.

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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TABLES AND FIGURES

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1	April 2015			First version of the Landfarm Management Plan	John Witteman, Env. Consultant, Agnico Eagle

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 forwards).

The Landfarm Management Plan (Plan) focuses on minimizing the waste footprint on-site, and maximizing remediation potential through implementation of bioremediation experience and research carried out at the Agnico Eagle's Meadowbank Gold Mine. In 2013, a Landfarm Management Plan was developed by Agnico Eagle's Meadowbank Division describing the handling and remediation of petroleum hydrocarbon (PHC) contaminated soil at the Meadowbank site. This version, specific to the Project, builds on that developed by the Meadowbank Division.

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 420 cubic metres (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., hydraulic fluid or 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 contaminated soil management plan. A pilot project to enhance rates of bioremediation through addition of a nutrient source is being carried out at Meadowbank and will be employed at the Project should it prove successful. Alternate contingency options in the event that landfarming is not successful or as efficient as planned are also discussed.

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

- provide an overview of 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 contaminated soil management at the Project. Documents containing information related to this Plan and submitted as part of the Type A Water Licence Application include:

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

There is also a related Oil Pollution Emergency Plan (Agnico Eagle 2014), which is specific to spills at Agnico Eagle's Itivia Oil Handling Facility located in Rankin Inlet. The Oil Handling Facility is located on the shore of Melvin Bay, which is part of Hudson Bay. The Oil Pollution Emergency Plan was prepared as a requirement of *Canadian Shipping Act* and associated regulations. It will be submitted to Transport Canada for approval prior to any shipping related to the development of the proposed mine.

1.4 Spill Prevention

Similar to the waste management philosophy, plans are to actively work towards minimizing spills through suitable 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, mechanical mixing, and placing the contaminated soil in windrows within a containment area and promoting 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 420 m^3), resulting from spills that occurred during the exploration phase. This material will be moved to the landfarm facility if treatment is not complete at the start of construction. This volume has been accounted for in the design of the facility.

A landfarm options analysis prepared for Agnico Eagle by Golder (2007) identified factors relevant to landfarming in the north. This include environmental factors and physical properties of the soil that affect microbial growth and rates of biodegradation, including 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) restricting 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).

The landfarm design was based on the design and operation of the Meadowbank landfarm (Tetra Tech EBA 2014). At the Meadowbank mining operation, it was estimated during the design phase of the landfarm that the volume of PHC soils would be between 300 and 350 m^3 per year (Agnico Eagle 2008). Therefore, the landfarm at the proposed mine has been designed assuming that 350 m^3 per year of PHC soils will need to be managed for the construction, operations, and closure of the Project. Similar to the Meadowbank landfarm, it was assumed that a yearly volume of 500 m^3 of contaminated ice and snow would require management and the landfarm has been designed to account for this volume.

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

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 purpose 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 landfarm facility on three years after the end of the process plant operation.

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 has no exposed bedrock and up to 20 metres (m) of glacial-fluvial till that has little ground ice and shows no permafrost degradation. The central location of the landfarm was chosen to minimize the footprint of the site and the transport distance of contaminated material from potential spill locations. The management of all waste generated at the Project in the form of dry stack tailings, waste rock, incinerator, and landfill waste are located in close proximity to the main infrastructure.

2.2.1 Proximity of Surface Water

The landfarm is located just off the infrastructure pad, approximately 200 m from Collection Pond 1 (CP1). Collection Pond 1 was previously Pond H17, which before development discharged to Meliadine Lake. The landfarm is to be located on land that slopes towards the southwest corner, which results in any rainwater or snowmelt draining to temporary water storage having the capacity to store a 1:100 wet year spring freshet plus 500 m^3 of water from melting of the contaminated snow/ice. Drainage from the landfarm may be used as water in the turning of the windrows during the remediation process. Excess water from the landfarm will be pumped to an oil pre-treatment plant to remove any oil. The pre-treated water will then be discharged into the CP1. Discharge from CP1, is controlled by a dike, which stops direct flow to Meliadine Lake. Meliadine Lake is the source of freshwater for the site and is used by Inuit for traditional pursuits. If water is to be discharged from CP1 to Meliadine Lake, it is treated to meet discharge criteria. Except for a short duration during the spring freshet or a heavy rainfall, water ponding will be eliminated in the landfarm by the end of the summer such that a sufficient storage capacity is available for the upcoming spring freshet.

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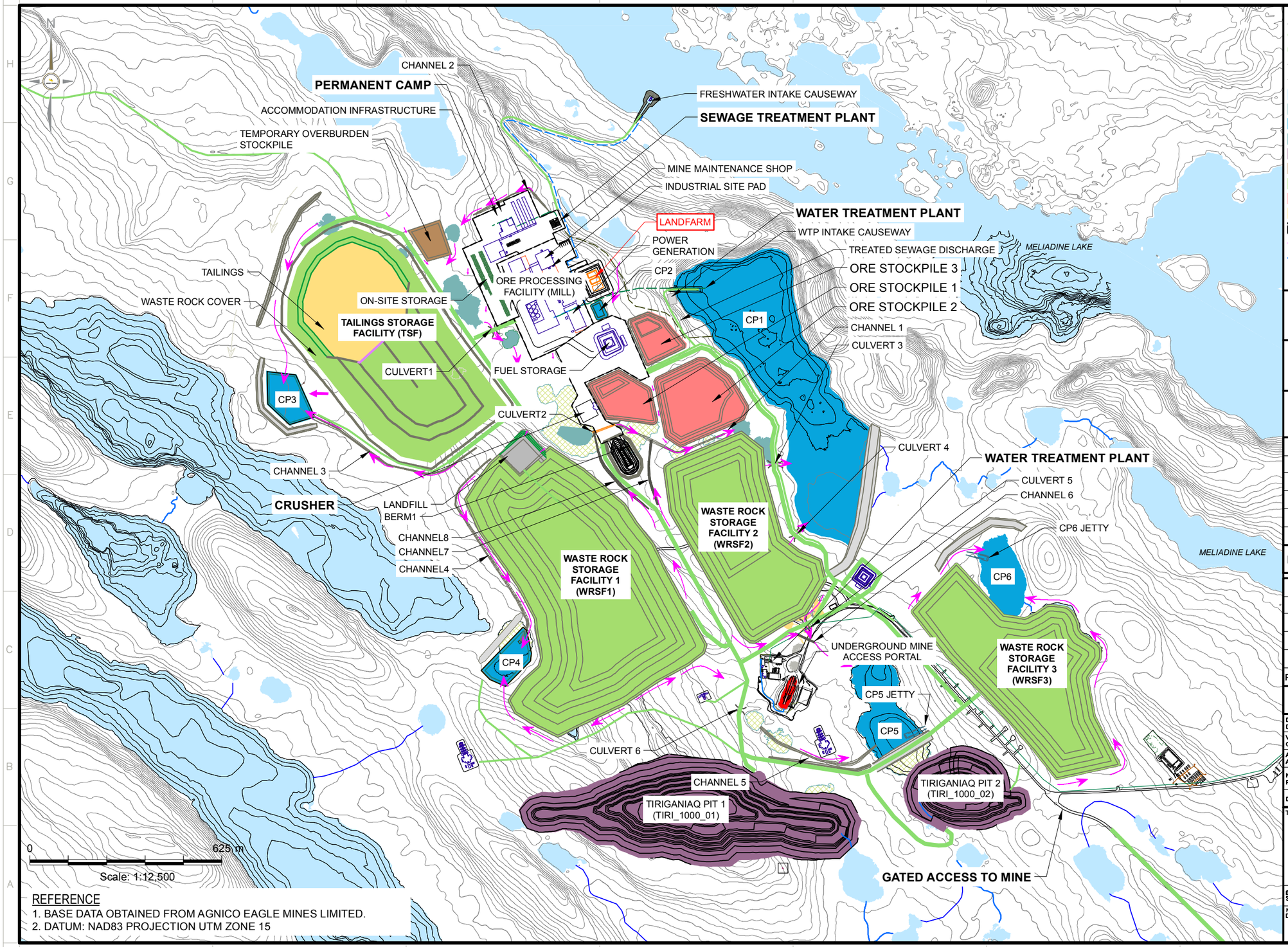

LEGEND

- SERVICE ROAD
- HAUL ROAD
- TOPOGRAPHIC CONTOUR (5 m INTERVAL
- TOPOGRAPHIC CONTOUR (1 m INTERVAL)
- NON CONTACT WATERBODY
- CONTACT WATERBODY
- WATER COLLECTION POND
- DRAINED POND AREA
- OPEN PIT
- OVERBURDEN
- WASTE ROCK
- ORE
- TAILINGS
- INDUSTRIAL SITE PAD
- CONTACT WATER FLOW DIRECTION
- STREAM

AGNICO EAGLE

Golder Associates

TITRE / TITLE	# DWG
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DESSINS EN RÉFÉRENCE/REFERENCE DRAWINGS

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REVISIONS

DESSINÉ PAR DRAWN BY	CDB	DATE 29–04–2015
VÉRIFIÉ PAR CHECKED BY	LY	29–04–2015
APPROUVÉ PAR APPROVED BY	DRW	29–04–2015
No. PROJET PROJECT NO.	1405283	
DATE	–	

TITRE / TITLE

AGNICO EAGLE – MELIADINE DIVISION
FIGURE 2–1 MAIN INFRASTRUCTURE FOR THE MELIADINE PROJECT, INCLUDING THE LANDFARM

ÉCHELLE/ SCALE	1:12500	FICHIER FILE	.DWG

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REFERENCE
1. BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. DATUM: NAD83 PROJECTION UTM ZONE 15

AE–CART–ANSI B

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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. Shallow groundwater flow in the area of the landfarm is towards the industrial site.

To prevent movement of contaminants from the landfarm facility into groundwater and the surrounding environment, Environment Canada (SAIC 2006) recommends implementation of a barrier with 10^{-7} centimetres per second hydraulic conductivity at a thickness of 0.6 m. The Meliadine landfarm will have an impervious liner and no impacts on shallow groundwater are anticipated.

2.3 Design

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[3]. The design volume of the landfarm is based on allowances for the materials being treated at Meadowbank.

2.3.1 Soil Volume Requirements

The landfarm is expected to effectively treat up to 5,000 m^3 of contaminated soil over the construction, operations, and closure of the Project, and 500 m^3 of snow and ice annually. Based on the experience at Meadowbank, the volume of PHC would be approximately 350 m^3 per year during construction, operation, and closure phases. Table 2-1 outlines the estimated volumes of contaminated soils and rock, and contaminated snow and ice expected during each phase of the mine.

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)
Advanced exploration	420 (volume in exploration landfarm to date)[(a)]	500 per year
Predevelopment (2 years)	350 (175 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.

As described in (Agnico Eagle 2008), it is estimated that soils contaminated with light end PHCs would require three full summer seasons for complete remediation. 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 a WRSF or used as cover at the TSF.

2.3.2 Design Specifications

The design criteria for the landfarm are outlined in Table 2-2. Its footprint will be approximately 11,000 square metres (m^2), with a perimeter berm that is approximately 2.0 m high over the landfarm surface.

Table 2.2 Landfarm Design Criteria

Design Criteria	Value	Source
Potential volume of PHC per year during construction, operation and closure	350 m³	Agnico Eagle (2008)
Potential volume of contaminated snow/ice per year	500 m³	Agnico Eagle (2008)
Remediation time	3 years	Tetra Tech EBA (2014)
Estimated snowmelt water equivalent in spring freshet for a 1 in 100 wet precipitation year	171 mm	Tetra Tech EBA (2014)
Thickness of PHC in containment facility	1.5 m	Tetra Tech EBA (2014)
Facility Structure		
Facility base thickness	2.0 m	Tetra Tech EBA (2014)
Side Slopes of Berm	3(H):1(V)	Tetra Tech EBA (2014)
Berm Crest Width (m)	4	Tetra Tech EBA (2014)
Berm Height (m)	Approximately 2	Tetra Tech EBA (2014)
Total Fill Thickness below Liner System (m)	1.6	Tetra Tech EBA (2014)
Total Fill Thickness above Liner System (m)	0.4	Tetra Tech EBA (2014)

Table 2-3 shows the growth and stabilization of the volume of PHC considering remediation over three years and the maximum volume of contaminated material that is anticipated to be stored over a period of 13 years.

The size of the landfarm was based on the design criteria (Table 2-2), the estimated volume of material (Table 2-3), and the requirement to turn over the surface of the piles during the summer months. The designed footprint of the landfarm is 11,000 m² with a useful landfarm surface of 3,650 m². Contaminated material will be piled 1.5 m so that the material is below the crest height of the perimeter berm. At the maximum estimated capacity of the facility, three windrows having each 890 m³ of PHC will cover 1,800 m² allowing 1,850 m² for turnover and water management.

Table 2-3 Volume of Petroleum Hydrocarbon Contaminated Material in the Landfarm

Mine Year	Estimated PHC Produced (m^3)	Accumulated PHC in Landfarm for Remediation (m^3)	Treated PHC Removed from Landfarm (m^3)	Hydrocarbon Contaminated Snow or Ice to Landfarm (m^3)	Maximum Accumulated PHC in Landfarm (m^3)
Before -6	420			0	0
-6 and -5	350			0	0
-4	350			0	0
-3	350	1,470		500	1,970
-2	350	1,820		500	2,320
-1	350	2,170		500	2,670
1	350	1,400	1,120	500	1,900
2	350	1,400	350	500	1,900
3	350	1,400	350	500	1,900
4	350	1,400	350	500	1,900
5	350	1,400	350	500	1,900
6	350	1,400	350	500	1,900
7	350	1,400	350	500	1,900
8	350	1,400	350	500	1,900
9	0	1,050	350	0	1,050
10	0	525	525	0	525
11	0	0	525	0	0

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 designation of training requirements will be the responsibility of the Environment Superintendent.

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 and that transferred from the Project's advanced exploration camp landfarm upon closure. Material from the Hamlet of Rankin Inlet or other sites will not be accepted without approval from the NWB, Aboriginal Affairs and Northern Development Canada, Water Resources Inspectors, and the Kivalliq Inuit Association.

The following products are acceptable for treatment in the landfarm if used on-site and spilled on 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: 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 separated 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.

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 in roll-off containers. Care will be exercised to ensure that the entire spill is excavated (verified by olfactory and visual assessment, or sampling if necessary) 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 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 placed in windrows with dimensions about 18 m wide at base x 1.5 m high x 34 m long. Windrows may be piled wider, higher, or longer as space permits. A record will be kept by the on-site Environmental Coordinator 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 contaminated water will be pumped through the site's oil-water separator to remove PHC residue. The treated water will be discharged to the CP1. In addition, after snowmelt, visible product will be cleaned up with absorbent pads or booms.

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.

3.4.2 Aeration

To promote aerobic conditions throughout the windrows, soil will be mixed mechanically with earth-moving equipment. This turnover of soil piles will occur two to four times per year, during the summer months.

3.4.3 Soil Moisture

Prior to turning, site personnel will ensure that soil is not so dry as to generate significant dust, nor overly saturated. If soil is too dry, non-contaminated water from within the landfarm containment area will be used as a moisture source and sprayed on the piles. If no accumulated water is available, water from CP1 or freshwater will be used. If the windrows are saturated, aeration will be delayed until the moisture content is reduced.

3.4.4 Nutrient Amendment

The use of sewage sludge as a nutrient amendment has precedent in the north. Sewage sludge as a nutrient source has also been proposed for the Milne Inlet Mary River Project (EBA 2010). This material not only provides the benefit of nutrients, but also adds organic matter to help retain moisture and microorganisms. Furthermore, the use of sewage sludge produced on-site helps to reduce the waste footprint of the mine by re-directing this material from disposal facilities and avoids needing to import a chemical fertilizer. Sewage sludge will be placed in the landfarm on an as need basis. The excess will be stored in the TSF.

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 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 windrows will be sampled annually at the end of the summer season to determine if remediation objectives have been met. Representative composite samples will be taken of each windrow to estimate remaining PHC concentrations. For each 10 m of windrow length, one composite sample will be collected, each consisting of three surface sub-samples and three sub-samples at 1 m depth. Sub-samples will be taken approximately 3.3 m apart, and will be taken from both sides of the windrow.

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 and possible nutrient amendments as described above. If rates of degradation are not sufficient through this method, alternate options will be further investigated as described in Section 4.2.

3.5.3 Soil Removal

Coarse-grained soils will be assessed near the end of the summer season by 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 waste rock storage facility or at the TSF to be used as cover material.

When sample analysis of fine-grained material at the end of a season indicates that concentrations of contaminants are below GN guidelines, a soil pile or the appropriate section of a pile will be

deemed acceptable for removal from the facility. Interim monitoring may be conducted through measurements of headspace with a portable instrument (e.g., flame ionization detector), but samples will be confirmed by an accredited laboratory prior to soil removal.

When remediated, the soils will be removed from the facility and can be used for construction purpose such as normal overburden (i.e., part of the cover of the TSF) or stacked in the WRSF. Based on a remediation period of three seasons, it would be possible to close the landfarm facility three years after the end of the process plant operation.

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 water 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 will be padded up. The base soil in these areas will be excavated and added to existing remediation windrows as soon as possible after snowmelt to minimize migration into the facility substrate.

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 to remove PHC residue and will be analyzed for BTEX, lead, and oil and grease prior to discharge to CP1 or used on the windrows to increase moisture content, as required. Water accumulating in the landfarm will not be discharged directly to the receiving environment.

3.7 Landfarm Closure and Reclamation

After removal of all remediated soil and prior to closure and reclamation of the 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 criteria set out in Table 3-1. No excavation will be necessary if agricultural/wildlife are met. If industrial criteria are used, the landfarm will be covered with 2 m of waste rock or other 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 and potential environmental impacts of the landfarm is provided in Table 3-2. 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 3-2 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	Two to four times over the summer	Date and time of the aeration; location; soil condition (moisture, odour, granulometrie, etc.)
Soil treatment with sewage sludge as nutrient supplement.	Visual inspection to ensure proper incorporation	At least once during summer on selected windrows	Date and time; type of treatment (aeration or nutrient amendment); location in landfarm; any odour noticed during aeration
Sampling for progress of remediation	Hydrocarbon vapour in headspace (by PID); F1-F4, BTEX (laboratory)	Vapour – as needed; Laboratory - 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	BTEX, oil and grease, lead – as specified in Water Licence	Prior to any dewatering; if re-used in landfarm, no sampling necessary	Date and time, location, laboratory report, in Annual Report
Seepage	Visual inspection; BTEX, oil and grease, lead – as specified in Water License	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 nearly two times as much contaminated soil as is expected to be produced. Nevertheless, in this event, soils will be placed in a temporary storage area. A temporary stockpile area would be set up in another location as approved by the NWB. As space becomes available, the soil would be added to the landfarm. Through spill prevention measures discussed earlier in this Plan, Agnico Eagle is minimizing the probability of this scenario occurring.

4.2 Alternate Treatment Options

Should landfarm treatment not perform as anticipated and it is evident that rates of degradation are not sufficient to meet GN Tier 1 criteria within the life-of-mine and the anticipated closure, the following alternative treatment options will be considered. Implementation will be after development of a more detailed protocol and approval of a revised plan 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 height of soil windrows could be reduced 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 not effective 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 two 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, alternate 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 appended to Agnico Eagle's NWB Annual Report.

5.3 Plan Review and Continual Improvement

The Landfarm Management Plan will be reviewed annually by the Meliadine Environmental Superintendent in consultation with the Mine General Manager, and, if necessary, updated at least every two years of operation.

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