AGNICO EAGLE

WHALE TAIL MINE

Landfarm Design and Management Plan

In Accordance with Water License 2AM-WTP1830

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Complex

Version 3
March 2024

EXECUTIVE SUMMARY

The Landfarm Design and Management Plan for the Whale Tail Mine describes the design features and operational procedures of the landfarm constructed for the storage and treatment of petroleum hydrocarbon contaminated soils.

On-site storage and remediation have been established as the preferred method for treatment of light petroleum hydrocarbon contaminated soil that may be generated on the mine site. The landfarm is designed to receive soil, rock, snow, and ice contaminated with light hydrocarbons such as diesel and gasoline, and antifreeze. Additional contingency options are also considered applicable for contaminated soil management in operations and closure.

The landfarm is located close to the IVR Attenuation Pond. This location was chosen due to its proximity to the Fuel Storage Facility and potential synergies. The central location of the landfarm allows to minimize the footprint of the Mine site and the transport distance of contaminated material from potential spill locations. It is also located away from any receiving environment waterbody. The landfarm was designed assuming that 1,000 m^3 per year of PHC soils will need to be managed during the construction, and operation phases of the Project and 350 m^3 of material per year during closure. Water accumulating in the landfarm will be sampled as per Water License 2AM-WTP1830 Schedule 1 Table 1 Group 4. If the water quality from the Landfarm, at monitoring station ST-WT-27, does not exceed the effluent quality limits set in Water License Part F Item 8, water will be pumped to land. If water quality doesn't meet the discharge criteria, water will not be discharged directly to the receiving environment and will be collected and directed to the IVR attenuation pond. The landfarm has an impervious liner and no impacts on shallow groundwater are anticipated.

Soils contaminated with light petroleum hydrocarbons will require an estimated four (4) full summer seasons for complete remediation. When remediated, the soil will be removed from the facility and can be used for construction purposes or placed in the Waste Rock Storage Facility.

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 disposal or re-use location, all analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision
1_NIRB	October 2018			Landfarm Design and Management Plan as Supporting Document submitted to Nunavut Impact Review Board for review and approval as part of Whale Tail Pit – Expansion Project.
1_NWB	April 2019			Landfarm Design and Management Plan as Supporting Document submitted to Nunavut Water Board for review and approval as part of Whale Tail Pit – Expansion Project. Addition of Engineered drawings to address GN IR#17. Addition of water management details to address GN IR#17. Addition of sludge sampling prior to enrichment to address GN IR#20. Addition of PAH sampling prior to removal from landfarm to address GN IR#21.
2	August 2021	Figure 2-1	3	Figure updated with proposed location of landfarm. Design criteria updated from Design and Management Report
		2.3.2 Design Specifications	3-4	Updated from Design and Management Report
		3.6.2 Water Management	11	Construction drawings added
		Appendix A		Landfarm Design and Management Plan updated with Design and Management report. Submitted with 60-Day notice to NWB for construction.
3	March 2024	1.1 Project Overview	1	Expansion Project of Whale Tail was approved under 2AM-WTP1830 License
		2 Spill Prevention	1	Removed section 1.2 and added section 2 to specify the spill prevention on site
		Figure 2-1	3	Figure updated with aerial view of the Landfarm constructed in 2022
		Table 3-2	5	The mine year were updated as the Landfam was constructed in 2022
		3.3.2 Design Specifications	5	Closure details added
		4.4.1 Contaminated Soil/Rock Screening	7	Section added to specify the screening process.
		4.7 Landfarm Closure and Reclamation	11	Section updated
		5 Contingency Options	12	Closure details added
		5.2.4 Underground storage	14	Section 5.2.4 was added to include underground storage
		5.2.5 Direct Placement in the WRSF	14	Closure details added
		Appendix A	16	Landfarm Design for construction - Section removed

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ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
GN	Government of Nunavut
LDMP	Landfarm Design and Management Plan
NIRB	Nunavut Impact Review Board
NPAG	Non-Potentially Acid Generating
NWB	Nunavut Water Board
PAG	Potentially Acid Generating
PAH	Polycyclic Aromatic Hydrocarbon
PHC	Petroleum Hydrocarbon
PID	Photoionization Detector
RMMS	Responsible Mining Management System
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility

1. INTRODUCTION

1.1 Project Overview

Agnico Eagle Mines Limited – Meadowbank Complex (Agnico Eagle) is operating the Whale Tail Mine, a Meadowbank satellite deposit located on the Amaruq property. The property is a 408 km^2 site located on Inuit Owned Land approximately 150 km north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut. The deposit will be mined as an open pit (Whale Tail Pit and IVR Pit) as well as underground operations, and ore is hauled to the approved infrastructure at the Meadowbank Mine for milling.

To optimize contaminated soil management and reduce potential contamination, Agnico Eagle constructed a landfarm at the Project site as approved under Water License 2AM-WTP1830.

1.2 Objectives

The Landfarm Design and Management Plan (LDMP), which is a component of the Responsible Mining Management System (RMMS), 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 Mine and Meliadine Gold Project sites. Onsite storage and remediation have been established as the preferred method for treatment of petroleum hydrocarbon (PHC) contaminated soil that may be generated at the Project site. Specifically, remediation through landfarming has been identified as the primary treatment option and, as such, is the focus of this Plan.

The objectives of this plan are to:

- Provide an overview of the contaminated soil management at the Mine;
- Describe the 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; and
- Describe contingency options for alternate treatment/storage of PHC soil.

2 SPILL PREVENTION

Spill prevention is the first stage in contaminated soil management at the Meadowbank site. Three documents describe spill prevention, management and response at this facility: the Spill Contingency Plan, the Emergency Response Plan, and the Oil Pollution Emergency Plan. Specifically, Section 2.1 of the Spill Contingency Plan describes spill prevention measures and can be referred to for further detail. All are updated regularly. General spill prevention methods include:

- Regular inspections of fuel/chemical storage areas for leaks;
- Training in safe handling procedures;

- Keep containers sealed;
- Use methods of secondary containment;
- Keep over pack drums nearby to contain leaking drums;
- Keep storage area secure from unauthorized access, and protected from weathering and damage;
- Segregate incompatible materials; and
- Regular meetings with site departments.

3 LANDFARM DESIGN

3.1 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 the 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. grease), will need to be segregated, packaged, and shipped south for treatment and/or disposal.

A landfarm options analysis prepared for Agnico Eagle by Golder (2007) identified factors relevant to landfarming in the north. This includes 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.

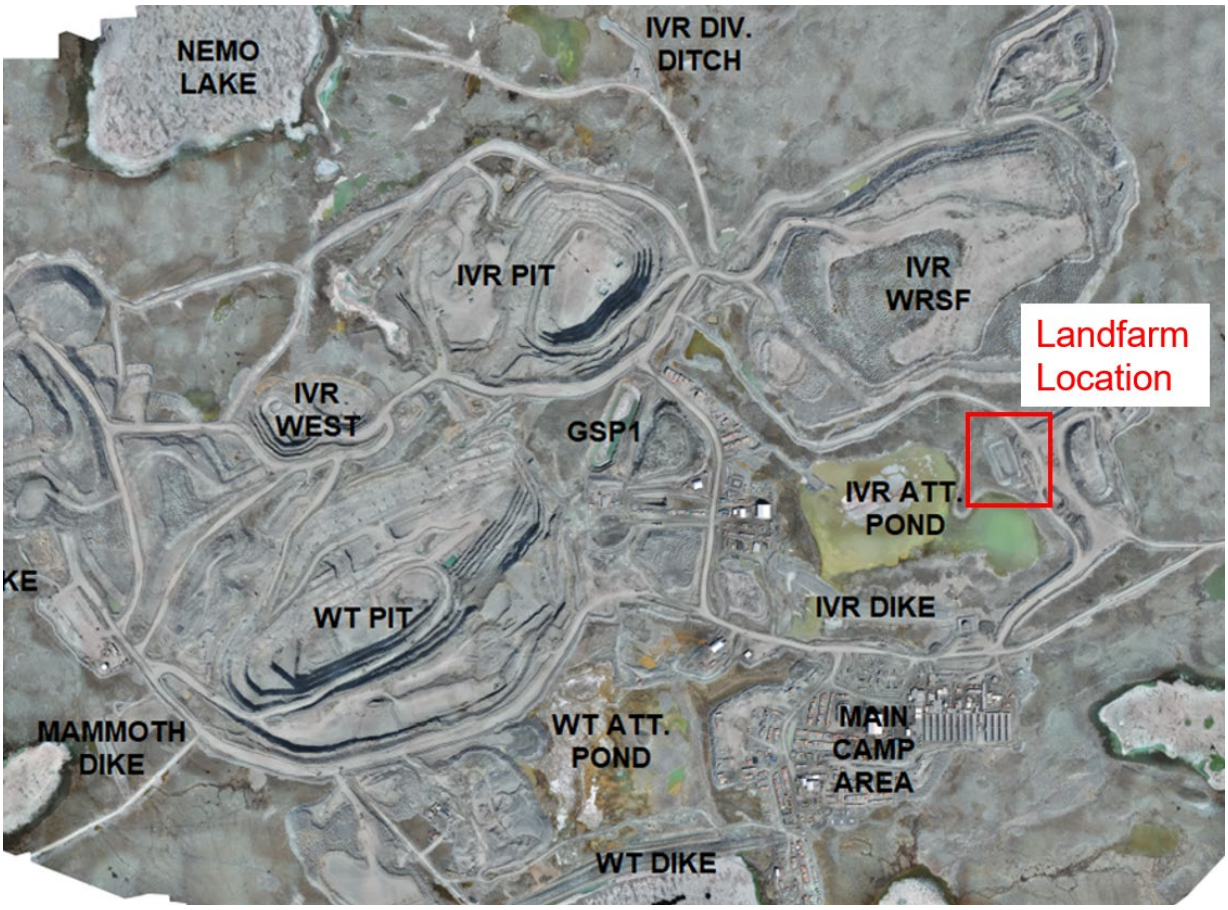
Although rates of biodegradation decline with temperature, landfarming is still a feasible technique in Arctic climates as demonstrated by the Meadowbank landfarm. Degradation in the north is typically restricted because microbial activity stops between 0 to -5 degrees Celsius (°C) restricting biodegradation to the months of June to September[1]. Nevertheless, degradation was reported at 90% over two summers on Resolution Island (Paudyn et al. 2008).

3.2 Location

The overall site plan of the Whale Tail Mine and the location of the landfarm facilities are shown in Figure 2.1. The landfarm is located close to the IVR Attenuation Pond. This location was chosen due to its proximity to the Fuel Storage Facility and potential synergies. The central location of the landfarm allows to minimize the footprint of the Mine site and the transport distance of contaminated material from potential spill locations. It is also located away from any receiving environment waterbody. Surface drainage in this area is westerly, towards the IVR Attenuation Pond and the landfarm.

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

Figure 3-1 Landfarm Location for Whale Tail Mine



3.3 Design

The landfarm is designed to receive soil, rock, snow, and ice contaminated with light hydrocarbons such as diesel and gasoline. Design drawings for the landfarm are presented in Appendix A. The design volume of the landfarm was based on allowances for the materials being treated at the Project.

3.3.1 Soil Volume Requirements

For 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 m³ per year. Similar assumptions were made at the Meliadine site during the design phase, but experience showed that the volume of soil entering the landfarm yearly is higher than expected when large spills occur. Therefore, the landfarm at Whale Tail Mine was designed assuming that 1,000 m³ per year of PHC soils will need to be managed during the construction, and operation phases of the Project. During closure, 350 m^3 of material per year is expected to enter the landfarm. Similar to the Meadowbank and Meliadine designs, it was assumed that a yearly volume of 500 m³ of contaminated ice and snow would require management and the landfarm was designed to account for this volume. Based on observations at Meadowbank and Meliadine, this assumption is conservative.

Based on experience, it is estimated that soils contaminated with light end PHCs will require four (4) full summer seasons for complete remediation. When remediated, the soils will be removed from the landfarm and used on-site or placed in the Waste Rock Storage Facility (WRSF).

3.3.2 Design Specifications

The design criteria for the landfarm are outlined in Table 3-1.

Table 3-1 Landfarm Design Criteria

Design Criteria	Value
Potential volume of PHC per year during construction and operation	1000 m^3
Potential volume of PHC per year during closure	350 m^3
Potential volume of contaminated snow/ice per year	500 m^3
Remediation time	4 years
Estimated snowmelt water equivalent in spring freshet for a 1 in 100 wet precipitation year	171 mm
Thickness of PHC in containment facility	1.5 m
Facility Structure	2.0 m
Facility base thickness	350 m^3
Side Slopes of Berm (inside)	3(H):1(V)
Side Slopes of Berm (outside)	2(H):1(V)
Berm Crest Width	4 m
Berm Height	2.6 to 4.8 m
Berm crest elevation	270.000
Geomembrane liner crest elevation	269.650
Landfarm footprint area	10 000 (m^2)

To prevent movement of contaminants from the landfarm facility into groundwater and the surrounding environment, the landfarm was built with an impervious liner.

Table 3-2 shows the growth and stabilization of the volume of PHC considering remediation over four (4) years and the maximum volume of contaminated material that is anticipated to be stored over a period of 22 years.

The size of the landfarm was based on the design criteria (Table 3-1), the estimated volume of material (Table 3-2), and the requirement to turn over the surface of the piles during the summer months. The footprint of the landfarm is 10,000 m^2. Contaminated material will be piled 1.5 m high so that the material is below the crest height of the perimeter berm. The maximum accumulated quantity of contaminated material in the landfarm at any one time is expected to be 5,500 m^3.

Table 3-2 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)
2023	1000	2000		500	2500
2024	1000	3000		500	3500
2025	1000	4000		500	4500
2026	1000	5000	1000	500	5500
2027	1000	5000	1000	500	4850
2028	350	4350	1000	500	4200
2029	350	3700	1000	500	3550
2030	350	3050	1000	500	2900
2031	350	2400	1000	500	2250
2032	350	1750	350	500	2250
2033	350	1750	350	500	2250
2034	350	1750	350	500	2250
2035	350	1750	350	500	2250
2036	350	1750	350	500	2250
2037	350	1750	350	500	2250
2038	350	1750	350	500	2250
2039	0	1400	350	500	1900
2040	0	1050	350	500	1550
2041	0	700	350	500	1200
2042	0	350	350	0	350
2043	0	0	350	0	0

The liner is protected from travel over top by aggregates added above and below the liner. Based on the conceptual design, freeze thaw cycles are not expected to affect the performance of the liner as contaminated soil, only, will be stored in the landfarm.

During the early stages of the mine closure in comparison to operation, additional contaminated soil may be generated following demolition of infrastructures, reclamation and remediation of infrastructures pads and roads.

4 LANDFARM OPERATION AND MAINTENANCE

Agnico Eagle will be responsible for managing and implementing the landfarm operation plan.

4.1 Acceptable Materials

4.1.1 Contaminants

The landfarm facility will only treat and/or store light PHC contaminated material that have been generated through mine-related activities at the Project. Material from other sites will not be accepted without approval from the NWB, Crown-Indigenous Relation and Northern Affairs Canada (CIRNAC), Water Resources Officers and the Kivalliq Inuit Association.

The following products may be treated in the landfarm if used onsite and spilled on soil:

- Diesel fuel;
- Gasoline;
- Aviation fuel (Jet A);
- Hydraulic oil;
- Other light oil (e.g. engine oil, lubricating oil); and

In the event that the contaminant source is unknown, soil samples will be analyzed for PHCs and Polycyclic Aromatic Hydrocarbons (PAH) 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 with any substances not approved for landfarming (i.e. non-PHC contaminants), the spill material will not be placed in the landfarm. This is to ensure PHC contaminated soils are not contaminated with other products.

Spills of > 100 L of non-PHC material (e.g. solvents, glycol) will be placed in drums and stored in the site Hazmat area for shipment south to approved facilities during barge season. Spills of non-PHC material < 100 L will be placed in the Meadowbank Tailings Storage Facility (TSF) or placed in drums and stored in the site Hazmat area for shipment south to approved facilities during barge season.

4.1.2 Grain Size

Bioremediation of very coarse-grained larger soil material is inhibited as it does not readily retain moisture. Thus, 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 centimeters (cm) will be separated from larger-grained material, where possible. This will occur in the landfarm using a screen sieve, should it prove necessary. The two soil fractions will be handled separately in the landfarm.

4.2 Contaminated Soil Additions

Soil contaminated with the above-described petroleum hydrocarbon materials will be excavated and transported to the landfarm facility in bucket loaders, 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. All material collected (coarse and fine) from spill locations will be deposited at the landfarm to be remediated.

4.3 Contaminated Snow

For spills < 100 L, PHC-contaminated snow will be placed in a designated area of the landfarm and treated as contact water after snowmelt.

For spills > 100 L, PHC-contaminated snow will be excavated and stored in labeled drums or at the TSF. After snowmelt, the contaminated water will be pumped through the site's oil-water separator (carbon filter) to remove PHC residue. The treated water will be sampled per Part F, Item 8 of the Water License 2AM-WTP1830, and discharged to the tundra if water quality meets Water Licence criteria. If criteria are not met, water will be treated as hazardous material and shipped south or placed into the Tailings Storage Facility (TSF). Also, after snowmelt, visible products will be cleaned up with absorbent pads or booms.

4.4 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.

4.4.1 Contaminated Soil/Rock Screening

Contaminated soil and rock being disposed of at the landfarm will need to be free of any debris such as spill matting, rags, gloves. To treat contaminated soils, the finer soils will be separated from coarse material by using a screen sieve. Material that is larger than 2.5 cm will be sorted and handled separately from material smaller than 2.5 cm. Once the materials have been screened, the finer material will be placed into windrows. Coarser material will be placed into separate windrows and will be assess by the Environmental Department to determine when/if the material can be brought to the Waste Rock Storage Facility.

4.4.2 Coarse-Grained Soils

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 brought to the site Hazmat area for shipment south to approved facilities during barge season.

4.4.3 Aeration

To promote aerobic conditions throughout the windrows, soil will be mixed mechanically with earth-moving equipment. This turnover of soil piles will occur at least once per year, during the summer months. The presence of coarse material also helps creating gaps within the piles which will increase aeration and help degradation of PHC.

4.4.4 Soil Moisture

Prior to aeration, 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 a freshwater supply will be used. If the windrows are saturated, aeration will be delayed until the moisture content is reduced.

4.4.5 Nutrient Amendment

The use of sewage sludge as a nutrient amendment does not only provide 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 needed basis. The excess will be stored in the WRSF.

4.5 Removal of Soil from the Landfarm

When PHC vapors are no longer detected, coarse-grained material will be removed to the site waste rock disposal area and disposed of as potentially acid generating (PAG) material. PAG will be covered with a minimum of 2 m of non-potentially acid generating (NPAG) material to closure, such that freeze-back occurs and any potentially remaining contaminants are not mobile in the environment.

4.5.1 GN Remediation Guidelines

Prior to removal of the finer grained soil from the landfarm, soil samples will be analyzed to ensure they meet GN guidelines, as described below. 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 4-1 presents the applicable Tier 1 criteria for coarse-grained soil, assuming agricultural/wildlife or industrial land uses, and Table 4-2 presents remediation criteria for PAHs contaminants in soil as presented in the Environmental Guideline for Contaminated Site Remediation.

Table 4-1 Summary of relevant GN Tier 1 Soil Remediation Criteria for Surface Soil

Parameter	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

Table 4-2 Summary of relevant remediation criteria for PAHs

Parameter	Land Use Criteria (mg/kg soil)	
	Agricultural/Wildlife	Industrial
Benzo-a-pyrene	0.1	0.7
Naphthalene	0.1	22

Source: Government of Nunavut Environmental Guideline for Contaminated Site Remediation Table A4-1 (Canadian Soil Quality Guidelines)

4.5.2 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 and PAH 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.

Degradation rates are assessed regularly to estimate the total remediation time required for PHC-contaminated soil under these conditions. If remediation to GN guidelines is feasible within the timeframe, landfarm operations will continue, with aeration and nutrient amendments as described above. If rates of total petroleum hydrocarbons degradation are not sufficient through this method, alternate options could be further investigated (see Section 5).

4.5.3 Soil Removal

Coarse-grained material will be assessed after segregation from mechanical screening has been started, by Environment Department technicians for PHC product and odors. A photoionization detector (PID) monitor may be employed to assist in petroleum-hydrocarbon based vapor detection. When PHC vapors are no longer detected, the material will be removed and sent to the WRSF to be disposed of as potentially acid generating (PAG) material. This material will be capped with non-potentially acid generating (NPAG) material at closure, allowing freeze-back and permanent encapsulation to occur (Agnico Eagle, 2023).

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.

Soil remediated to agricultural/wildland criteria will be appropriately delineated by Environment Department staff, and stockpiled outside the landfarm for use in site works or reclamation activities. Soil remediated to industrial-use criteria will be removed from the landfarm and placed in the WRSF as PAG material.

4.6 Water Management

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

4.6.1 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 (no less than 10 cm) in place. Following snowmelt, any contaminated product from winter spill clean-up operations will be collected using site absorbent material. 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.

4.6.2 Water Management

The landfarm has an impermeable liner to prevent water from reaching the receiving environment. A sump area is located in the lower portion of the landfarm to allow accumulation of water. A low filter berm around the sump area was built to help reduce soil particles in the water flowing into the sump area. In the event of water accumulation or seepage, the ponded water will be analyzed for Water License 2AM-WTP1830 Schedule 1 Table 1 Group 4 monitoring parameters prior to discharge. If the water quality from Landfarm, monitoring station ST-WT-27, does not exceed the effluent quality limits set in Water License Part F Item 8, water will be pumped to land. If water quality doesn't meet the discharge criteria, water will not be discharged directly to the receiving environment and will be collected and directed to the IVR Attenuation Pond. Alternatively, ponded water will be sprayed on the windrows to increase moisture content, as required. Water accumulating in the landfarm will not be discharged to the receiving environment if water quality result set in the Water License are not met.

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 at the beginning of freshet and continuing until October when water is likely to be present.

4.7 Landfarm Closure and Reclamation

The landfarm facility will be decommissioned at mine closure. Remaining contaminated soil could be stored underground within the underground mine for use in backfill of permafrost areas of the mine or placed directly in the WRSF, as presented in Section 5. 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 4-1. No excavation will be necessary if agricultural/industrial criteria 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, and the liner removed to avoid water accumulation on the landfarm.

4.8 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 4-3. 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 Annual Report.

Table 4-3 Summary of landfarm activities and records to be kept

Activity	Analysis	Frequency	Record
Excavation of spill and transport of contaminated material	If unsure of full excavation - F1-F4, BTEX, PAH	As needed	Date, time and location of spill and excavation; estimated quantity of excavated soil; storage/disposal location of excavated soil, if applicable; any evidence of remaining product
Contaminated soil additions to landfarm	If contaminant source unknown, F1-F4, BTEX, metals, oil and grease, VOCs (at discretion of Environment Department)	Prior to soil addition at facility	Date and time; quantity of soil; original location; landfarm location; spill/excavation record # or storage container label
Soil aeration	N/A	Min. once during summer	Date and time of the aeration; location; soil condition (moisture, odour, 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; location in landfarm, any odour noticed during aeration
Ponded contact water	Water Licence 2AM-WTP1830 Group 4	Prior to any dewatering; if re-used in landfarm, no sampling necessary	Date and time, location, laboratory report
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
Identification of maintenance requirements	Visual inspection of landfarm	At least once over the summer	Inspected areas; condition of berm and base; previously unidentified safety concerns

5 CONTINGENCY OPTIONS

This section describes the contaminated soil management plan, should a large spill event occur, or if landfarm treatment proves not successful or feasible based on site conditions and resources. Those contingency options are considered applicable for contaminated soil management in operations and closure.

5.1 Large Spill Event

A large spill event producing a quantity of soil that cannot be contained in the landfarm could happen and thus the landfarm is designed to hold a greater quantity of contaminated soil as is expected to be produced. In this case, 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.

5.2 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 the development of a more detailed protocol and approval of a revised plan by the NWB.

5.2.1 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 (see SAIC, 2006). In addition, the height of soil windrows could be reduced to maximize air exposure if space in the facility allows.

5.2.2 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 will be encapsulated in the WRSF rather than used in surface applications, as assumed in Tier 1, reducing the likelihood ofexposure 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.

5.2.3 Thermal Desorption

In the thermal desorption process, excavated soils are heated in a chamber to rapidly volatilize PHCs. Gases produced are consumed in an oxidation unit, and particulate matter removed (baghouse). Soil, free of any contamination, can then be replaced, or used in site reclamation or construction processes. The other advantage of this approach is that this equipment is mobile and could be brought to any spill site for remediation activities (e.g. spills along the All Weather Access Road). This method is described by Environment and Climate Change Canada (2002).

5.2.4 Underground storage

Contaminated soil may be placed in the underground mine for permanent storage, for use in backfill of permafrost areas of the mine only. Contaminated soil can be co-disposed with rockfill required for backfill. While this method would not result in the treatment of soil, it is a viable contingency option as it would allow for the safe disposal of the contaminated material. Encapsulation and freeze-back would occur, eliminating any movement of contaminants. Consideration of this option will be included in the management of contaminated soil in closure, and will include a suitable monitoring program, which will be incorporated into the Closure and Reclamation Plan.

5.2.5 Direct Placement in the WRSF

Another option for management of contaminated soil if bioremediation proves not effective would be the direct placement of this material in a WRSF. 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. 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 will be included in the management of contaminated soil in closure, and will include a suitable monitoring program, which will be incorporated into the Closure and Reclamation Plan.

5.2.6 Direct Placement or encapsulation in the Meadowbank TSF

Disposal or encapsulation of the contaminated soil in the Meadowbank TSF could be a potential option. With the NPAG cover over the facilities, encapsulation and freeze-back would occur, eliminating any movement of contaminants. Over time, this material would undergo natural degradation.

6 PLAN REVIEW AND CONTINUAL IMPROVEMENT

The Landfarm Design and Management Plan will be reviewed regularly by the Environmental and Critical Infrastructures Superintendent, and updated, when needed.

7 REFERENCES

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