Volume 2 -

Tailings and Waste Rock Management Plan Framework

Tailings and Waste Rock Management Plan Framework

for the

Pine Point Project

Purpose

This framework document is provided in support of the Mackenzie Valley Environmental Impact Review Board Environmental Assessment Initiation Package for the Pine Point Project (Project). The intent of this document is to describe how this environmental management plan relates to the Project, what information will be provided as the Project develops, and to list applicable guidelines and standards. It was developed with the available Project information. This document is not intended for approval but is provided for review purposes and will be refined as the regulatory process proceeds.

Version History

Pine Point Mining Limited is responsible for the distribution, maintenance, and updating of this document. Changes that do not affect the intent of the document will be made as required (e.g., phone numbers, names of individuals). The table below indicates the version of this document, and a summary of revisions made.

Revision #	Section(s) Revised	Description of Revision	Issue Date
0	-	Framework version for MVEIRB EA Initiation Package	15 December 2020

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Abbreviations

Abbreviation	Definition
ABA	Acid-Base Accounting
Cominco	Cominco Ltd.
EA	Environmental Assessment
HSE	Health, Safety, and Environment
Osisko Metals	Osisko Metals Incorporated
PPML	Pine Point Mining Limited
Project	Pine Point Project
TDA	tailings disposal area
TWRMP	Tailings and Waste Rock Management Plan

Units of Measure

Units	Definition
%	percent
km	kilometre
m	metre

1 Introduction

1.1 Background

Pine Point Mining Limited (PPML) is the sole proponent of the Pine Point Project (Project) and is a 100% owned subsidiary of Osisko Metals Incorporated (Osisko Metals). Pine Point is a brownfield site and the location of the historical Pine Point Mine managed by Cominco Ltd. (Cominco), operated between 1964 and 1988. In February 2018, Osisko Metals acquired PPML and became owner of the Project. PPML is proposing to re-open the Pine Point Mine site to mine mineralized material and produce concentrates of zinc and lead for shipment to independent smelters worldwide.

1.2 Purpose

The Tailings and Waste Rock Management Plan (TWRMP) Framework is a requirement of the Environmental Assessment (EA) Initiation Package (MVEIRB 2018). It is intended to provide a preliminary outline of approaches to managing Project tailings and mine rock. The TWRMP Framework is meant to provide a basis for PPML to engage with regulatory agencies and Indigenous communities and elicit feedback on planned waste management activities and facilities for the Project. A complete TWRMP will be submitted to the Mackenzie Valley Land and Water Board for approval following the EA, and will incorporate feedback obtained through the EA.

The purpose of the TWRMP is to address the management of mined waste rock and tailings to limit the generation of acidic drainage and metal leaching. Physical stability of placed waste rock and management of waste rock from historical mining is not within the scope of this plan.

The TWRMP provides information on:

- country rock geology
- country rock geochemistry
- waste rock classification
- decision criteria for waste rock storage and use
- waste rock management responsibilities
- tailings disposal

Key objectives of PPML waste rock management include:

- Identifying potentially acid-generating waste rock during mining.
- Directing appropriate use and storage of waste rock types.

PPML strategies to achieve these objectives include:

- Standard Operating Procedures to provide clear identification, segregation, storage, and re-mining procedures.
- Criteria for waste rock used in construction.
- Tracking locations of potentially acid-generating waste rock.

1.3 Project Contact

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1.4 Roles and Responsibilities

The Environmental Manager will be ultimately responsible for the success of this plan and approves all relevant policies and documents, auditing, action planning and the verification process. The Environmental Manager is responsible for the implementation of this plan including overall management of the plan, internal reporting, compliance, and adaptive management.

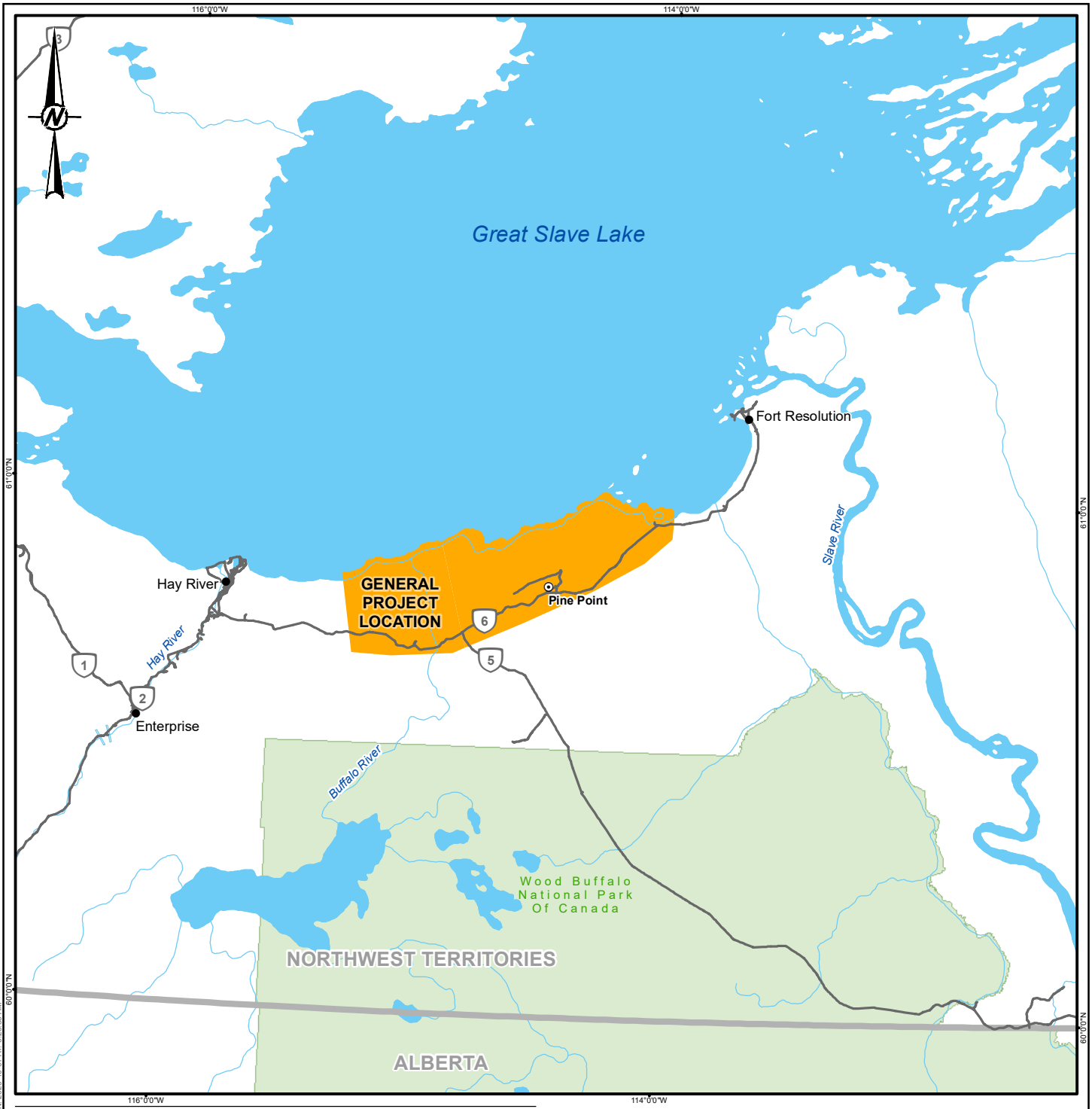
Other relevant personnel will be responsible for the effectiveness of this Plan by completing required training and supporting the implementation of and compliance to this Plan, as appropriate to their roles, as set out by this Plan.

1.5 Project Details

The Project is located in the South Slave Mining District, south of Great Slave Lake in the Northwest Territories, approximately 175 km directly south of Yellowknife, 75 km east of Hay River, and 53 km southwest of Fort Resolution (Figure 1). It is located on a brownfield site resulting from Cominco's historical mining and milling operations and includes the historical town of Pine Point and associated working accommodations. The closest major transportation hubs are Yellowknife and Hay River. Access to the Project is presently via all-weather Highways 5 and 6. Further details are provided in the Project Description (Volume 1, Section 1.0).

The Project will consist of open pit and underground mining for zinc and lead, construction and operation of up to three pre-concentration plants, construction and operation of a processing mill (or "concentrator"), storage and management of processed mineralized materials and waste materials, water management, construction and operation of ancillary support facilities including a camp for workers, and the shipping of zinc and lead concentrates to global markets. Further details are provided in the Project Description (Volume 1).

Maps indicating the Project footprint, infrastructure, storage locations of each hazardous material, probable spill locations and direction of flow on land and in water, catchment basins, locations of all response equipment, topography, approved disposal sites, and any other important on- or off-site features will be included when these details have been finalized.



LEGEND

- FORMER PINE POINT TOWN SITE
- POPULATED PLACE
- ALL-SEASON ROAD
- PARK/PROTECTED AREA
- WATERBODY
- GENERAL PROJECT LOCATION

0 25 50

1:1,250,000 KILOMETERS

REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. PARKS AND PROTECTED AREAS OBTAINED FROM CONSERVATION AREAS REPORTING AND TRACKING SYSTEM (CARTS), CANADIAN COUNCIL ON ECOLOGICAL AREAS, 2017.

PROJECTION: ALBERS CONIC EQUAL AREA

CLIENT
PINE POINT MINING LTD.

PROJECT
PINE POINT PROJECT

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-07
DESIGNED	DC
PREPARED	BW / MM / JE
REVIEWED	DP
APPROVED	DP

TITLE
PROJECT LOCATION

PROJECT NO.	CONTROL	REV.	FIGURE
19125747		0	1

2 Description of Pine Point Geology and Rock Types

2.1 Pine Point Rock Geology

The Project is divided into six zones: the East Mill Zone, the North Zone, the North-East Zone, the Central Zone, and the N-204 Zone all of which are mainly located east of the Buffalo River. The West Zone is located west of the Buffalo River.

The recoverable minerals at Pine Point are sphalerite (zinc sulphide) and galena (lead sulphide), which are hosted in dolomitic limestone with minor amounts of marcasite (iron sulphide) that is locally associated with some of the deposits. The deposits occur in varying shapes and thicknesses but basically fall into two categories: Tabular and Prismatic.

Tabular deposits may extend along strike for several kilometres at varying lateral widths from 50 to 200 m wide, and usually between 5 to 10 m in thickness. Prismatic deposits have a more vertical cylindrical morphology or shape, and often are not larger in diameter than their vertical dimension. The deposits to be mined are both tabular and prismatic and hosted within similar stratigraphy as those deposits previously mined by Cominco in this area.

The mineral deposits in the sector east of the Buffalo River are shallower and are anticipated to be mined mainly from surface (open-pit mining). The mineral deposits located west of the Buffalo River are deeper and will likely require underground mining. Mining methods will be optimized for each deposit and will vary depending on their respective conditions. Mine dewatering requirements and methods are also being evaluated based on past experience and studies. Dewatering methods are anticipated to be variable for each zone based on the site conditions. In contrast, the shallow open pits in the East Mill Zone area will be relatively dry except for surface water inflow.

The potential for acid generation was tested by acid-base accounting (ABA) analysis on a total of 82 samples and the results are presented in TetraTech (2018). The ABA analyses completed included determination of paste pH, total carbon, inorganic total sulphur, sulphate sulphur, sulphide sulphur, neutralization potential (NP), and fizz rating. The analyzed samples are consistently classified as non-potentially acid generating.

2.2 Pine Point Waste Rock Type Classification

Waste rock classifications based on total sulphur content will be developed to segregate potentially acid-generating waste rock, from non-acid generating rock (Table 1).

Table 1: Pine Point Waste Rock Type Classification

Waste Rock Classification	Criteria (total sulphur in wt%)	Description
-To be determined-		

2.3 Waste Rock Segregation Operating Procedures

The procedure for segregating waste rock may be as follows:

- Visually inspect the development face.
- Identify the waste rock type where the rock contains acid-generating potential more than 10% (combined amount).
- Identify the waste rock type where the rock contains acid-generating potential less than 10% (combined amount).
- Clearly delineate the muck piles (blasted rock from the development face) as into the two types using spray paint and/or stakes.
- Haul the muck to the appropriate location of the temporary storage location based on the type of rock.

Further details on waste rock segregation will be developed as the Project design advances. Standard Operating Procedures for segregation of waste rock will provide detailed descriptions for specific tasks.

3 Tailings and Waste Rock Distribution

3.1 Waste Rock Storage Facilities

For open-pit mining, mine ramps will be advanced progressively through the operating life of the mine using drill and blasting techniques. The mining process will generate waste rock. Waste rock will be deposited into historical mined open pits where feasible or in waste rock storage facilities adjacent to the deposits being mined. Nearly all this waste will be dolomitized limestone.

Waste rock will be mined using excavators and/or shovels. If rock is needed for on-site construction purposes (i.e., road building, pad construction, and berms), it will be crushed to the desired size and used as required, providing that the geochemical properties of the material are appropriate for such use. Excess waste rock that is not required for construction will be stored on-site. Waste rock will either be disposed of onto constructed waste rock storage facilities, or where possible, into historical open pits.

Waste rock in excess of available proximal open pit space will be placed in waste rock storage facilities designed for stability adjacent to active open pits and underground mines.

3.2 Overburden

To the extent possible and practical, infrastructure will be built on disturbed sites. Prior to the development of the surface and the underground mining operations, overburden will be removed to expose the rock to be excavated from the open pits and the underground portals.

The stripping operation for the open pits and underground operations will produce approximately 85-105 Mt or more of overburden. Overburden disposal locations will aim at optimizing haulage distance and a best effort segregation will be made to segregate topsoil and gravel in separate stockpiles for re-use and reclamation.

3.3 Tailings Disposal Areas

Mineralization-bearing material that is sent to the mill will undergo processing including grinding and flotation. After being processed through the flotation cells, the non-sulphide particles remaining in the slurry will be separated as tailings. These tailings will be discharged into a tailings thickener to recover water for recycling and to increase the percent solids before being pumped through a pipeline for disposal into selected mined-out pits (tailings disposal areas; TDAs). Multiple locations are being evaluated for suitability as TDAs. Clarified water, decanted from the thickener will be recirculated back to the grinding circuit for reuse. Decanted water from the TDAs will be pumped to avoid overflow and reclaimed back as part of the overall water management system.

Multiple locations are being evaluated for suitability as TDAs. Survey and bathymetries conducted for the existing pits have confirmed there is sufficient available space for the entire life of mine. Thickened tailings will be transported via pipeline from the concentrator to nearby TDAs. Direct transfer of tailings to TDAs has many advantages including fine ground wet material does not disperse as dust, saturated conditions reduce the potential for oxidation, and the use of previously disturbed land rather than creating new land disturbances.

A hydraulic transport system will have to be constructed for movement of tailings and reclaim water. At this point, it is expected to be above ground, with drainage points and spill containment areas located at naturally occurring low points along the route. Pipelines will follow the existing on-site road alignments where possible and will be protected as necessary by berms. Ditching will direct potential spillage to constructed containment areas. Where the pipelines will need to deviate from existing on-site roads, access roads will be built for construction and used as a service road for pipeline maintenance during operations.

Approximately 3,800 to 6,200 tonnes of thickened tailings could be produced each day. The tailings management system would need to accommodate approximately 18 Mm^3 of tailings over the life of mine. The thickened tailings will be approximately 60% solids by weight when delivered to the disposal site.

Approximately 3,800 to 6,200 tonnes of thickened tailings could be produced each day. The tailings management system would need to accommodate approximately 18 Mm^3 of tailings over the LOM. The thickened tailings will be approximately 60% solids by weight when delivered to the disposal site. Tailings will be managed as described in the Tailings and Waste Rock Management Plan.

3.4 Permanent Waste Rock Storage Facilities

Preliminary locations for waste rock storage facilities and overburden stockpiles have been identified in Section 3.4.1.2 of the Project Description (Volume 1). Preliminary waste rock storage facility locations were established based on proximity, which limited the overall footprint and haulage distances. Site restrictions, such as historical pits and piles as well as transport infrastructure, have also been considered.

The permanent storage location(s) for waste rock and overburden from the open pits and underground mines will be further refined in future iterations of this Plan, as additional Project design details are available (i.e., as part of the Developer's Assessment Report submission or Water Licence/Land Use Permit application).

3.5 Temporary Waste Rock Storage Facilities

Proposed temporary waste rock storage facilities will be defined in future iterations of this Plan, as additional Project details are available (i.e., as part of the Developer's Assessment Report submission or Water Licence/Land Use Permit application)

3.6 Waste Rock for Construction

Waste rock used for construction will be non-metal leaching and non-acid generating. Geochemical characterization will confirm which waste rock will be used for construction.

3.7 Seepage Predictions

Predictions of seepage water chemistry will be submitted as part of effluent quality criteria predictions, as required, in the Type A Water Licence application.

4 Tailings and Waste Rock Management Responsibilities

PPML groups with waste rock management responsibilities include health, safety, and environment (HSE), surface mining, mine technical services, and underground operations.

Waste rock management responsibilities of an HSE group include:

- first point of contact for regulators with issues related to this plan or related plans
- geochemical criteria
- waste rock field testing and effluent predictions
- external reporting of waste rock movement in accordance with Water Licence requirements, i.e., Annual Type A Water Licence reporting

Waste rock management responsibilities of a surface mining group include:

- preparing and distributing open pit mining plans
- mining and hauling waste rock on surface
- surveying the waste rock storage facilities
- surface construction activities

Waste rock management responsibilities of mine technical services include:

- delineation of potentially acid-generating waste rock from non-acid generating rock
- periodic inspections of the mine dig face
- waste rock inspections for stability and seepage

Waste rock management responsibilities of an underground operations group include:

- recording and hauling underground waste rock to the appropriate temporary storage locations

5 References

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2018. Draft EA Initiation Guidelines for Developers of Major Projects. Accessed March 2020. Available at http://reviewboard.ca/file/1132/download?token=c5tFrEqL

TetraTech. 2018. Summary of Geochemical Characterization Data for the Pine Point Project, NWT by TetraTech Canada Inc, Vancouver, British Columbia