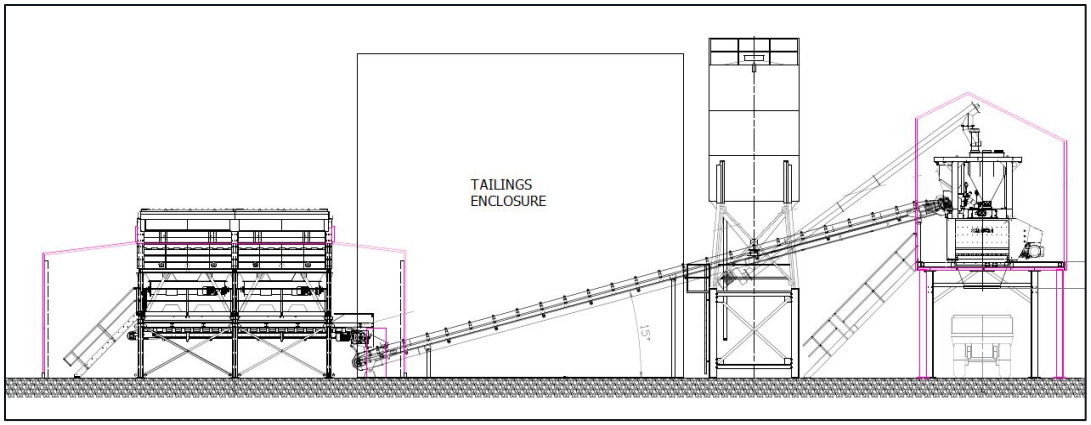
Hecla SM
KENO HILL

Tailings Management Plan



Keno Hill Underground Tailings Management Plan

Revision information

Rev. Number	Issue Date	Description of Revisions Made
1	March 13, 2024	Original

Contents

No table of figures entries found.

1 Introduction

The objectives of the Tailing Management Plan (TMP) are to provide the relevant details for the deposition of tailings underground at the Keno Hill District Mines and to outline Alexco Keno Hill Mining Corp.'s (AKHM) plan for the design, construction and operation of facilities for the transport and storage of tailings, including operations, maintenance and surveillance protocols for the facilities.

The Keno Hill Silver District Mining Operations Project (Keno Mine) currently includes the Flame and Moth, and Bermingham Mines and underground workings.

Dry stack tailings information is not included in this document and is found in the "Dry stack tailings facility construction and operation plan" and characterization of the tailings is found in the "Tailings characterization plan" as per Schedule C of QML-0009.

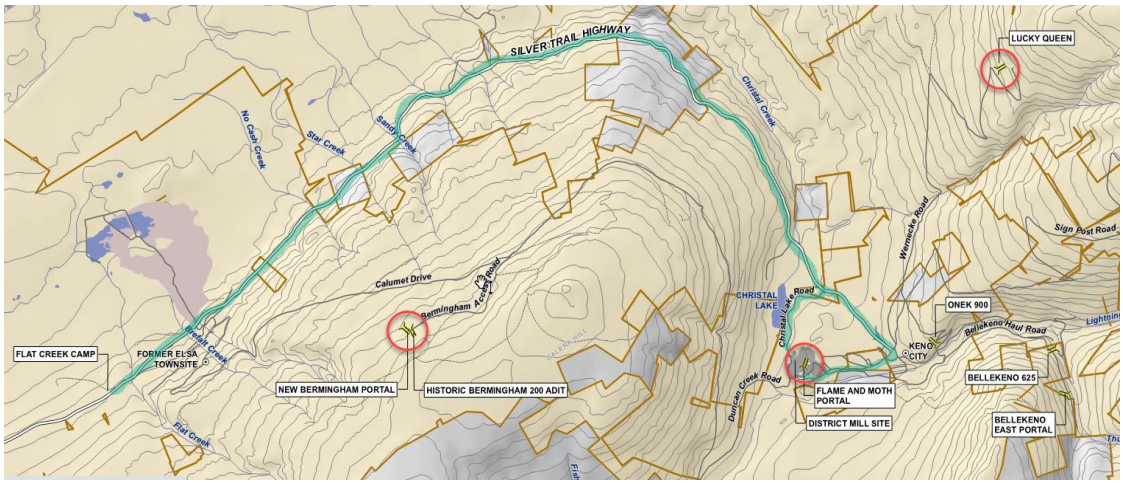
Where relevant, supporting engineering designs and plans for management of water, waste rock, and overburden are referred to in the relevant approved management plans named in Schedule C of the Quartz Mining Licence (QML) 009.

This TMP is intended to meet the requirements of Schedule B of QML-0009 (Plans to be submitted for approval as approved plans):

> *Tailings Management Plan* – A plan that describes the activities for the design, construction and operation of facilities for the transport and storage of tailings, including operations, maintenance and surveillance protocols for these facilities.

2 Mine Plan and Facilities Overview

Keno Mine is located in central Yukon Territory, 354 km (by air) due north of Whitehorse. The locations of the mines, the mill and the tailing facilities described in the plan are shown on Figure 1.



The District Mill site and Dry Stack Tailings Facility Phase 1 and Phase II are located approximately 1 km west of Keno City. The Flame & Moth portal is located just to the east of the District Mill approximately 1 km west of Keno City. The Bermingham portal is situated on Galena Hill, close to the historical Bermingham 200 adit and approximately 6.5 km due west of Keno City.

2.1 Overview of Tailings Management Facilities

Facilities relevant to underground tailings management at Keno Mine are shown in Figure 1. The key elements are:

- District Mill
- Tailings storage building (capacity of ~2,000 tonnes)
- Cement storage silos (100 tonnes each)
- Backfill batch plant (designed by Paterson and Cooke and manufactured by SIMEM)
- Bermingham underground workings
- Flame & Moth underground workings

FIGURE 2 - Overview Map of New Facilities for Cemented Tailings

3 Underground Tailings Storage Requirements

3.1 Tailings

Estimated ore release and tailings production through 2029 are presented in Table 1. The density of deposited tailings used in planning is 2090 kg /m^3. These densities are based on 220,000 tonnes of placed tailings and are considered reliable for planning purposes.

Table 3-1: Estimated Ore and Tailings Production as of February, 2024

Mining Area	Ore (Tonnes)	Tailings (Tonnes)	Tailings Volume (m^3)
Bermingham	885,284	814,461	389,694
Flame&Moth	198,494	182,615	87,376
Total	1,083,778	997,076	477,070

3.2 P-AML Waste Rock

For planning purposes, AKHM is predicted to generate approximately 181,000 tonnes of P-AML waste rock through 2029. All of the PAML is planned to be placed underground. Waste Rock is managed through the Waste Management Plan as per Schedule C of QML-0009.

Table 2: Estimated N-AML and P-AML Waste Rock Production as of February 2024

Mining Area	Total N-AML Waste Rock Volume tonnes)	Total P-AML Waste Rock Volume (tonnes)
Bermingham	668,004	162,850
Flame & Moth	132,329	18,220
Total	800,333	181,070

3.3 Water

Plans for water management during operations are detailed in the Water Management Plan. Dewatering will continue with the same procedures as currently.

Discharge from the new Bermingham advanced exploration decline is pumped from the underground sump at the bottom of workings to the water treatment plant and conveyed to a lined settling pond, which decants to the No Cash Creek catchment. The treated water from the new Bermingham water treatment plant will be conveyed to the water management pond, where it will be discharged via a pipeline to a diffuser structure consisting of rip rap to the No Cash Creek catchment. The Bermingham pond has a total capacity of 1205 m^3 with freeboard of 0.5 m (350 m^3) that accommodates the 24-hour maximum rain event of 48.7 mm.

The Flame and Moth Mine is licenced to discharge up to 35 L/s (3,024 m^3/day) to both Lightning and Christal Creek following treatment. Discharge to date from the initial development of the Flame and Moth Mine is pumped to the water treatment plant and then conveyed to the Flame and Moth water treatment pond before discharging via a pipeline to Lightning Creek. In the future Flame and Moth treated water may be discharged to Christal Creek via a pipeline and diffuser structure consisting of rip rap. The Flame and Moth water treatment pond has a capacity 6,993 m^3.

The water quality associated with cemented tailings compared to cemented waste rock is not anticipated to be significantly different. Current water monitoring is weekly from each discharge location and will continue to be monitored for all requirements. This will be sufficient to determine if there is a change in water quality. The monitoring program at the site includes in-situ measurements / internal analysis and external lab analysis, these measurements are taken either continuously, daily or weekly while discharging. More information on the monitoring programme can be found in the "Keno Hill Silver District Mining Operations – Monitoring, surveillance and reporting plan".

3.4 Total Storage Requirements

Table 3-3 summarizes the total storage requirements, including tailings and both N-AML and P-AML waste rock for underground at Bermingham and Flame&Moth mines.

Table 3-2: Tailings & Waste Rock Management Facility Storage Requirements through 2029, as of February 2024

Component	Required Storage Volume (tonnes))
Tailings	673,092
N-AML Waste Rock	Maximum of 190,000 at Berm; 35,000 at F&M. Total of 225,000
P-AML Waste Rock	Maximum of 16,000 at Berm; 12,000 at F&M. Total of 28,000
Total Volume Required	926,092

4 Tailings Storage Capacity

The following sections describe the underground tailings storage facilities and their storage capacities.

4.1 Underground Tailings Management Facility

Upon completion of mining each stope , it becomes available for the storage of tailings and/or waste rock.

Table 4-1: Storage Capacities of Underground

Facility	Volume (tonnes)
Bermingham	448,069
Flame & Moth	103,217
Total Underground Storage Capacity	551,286

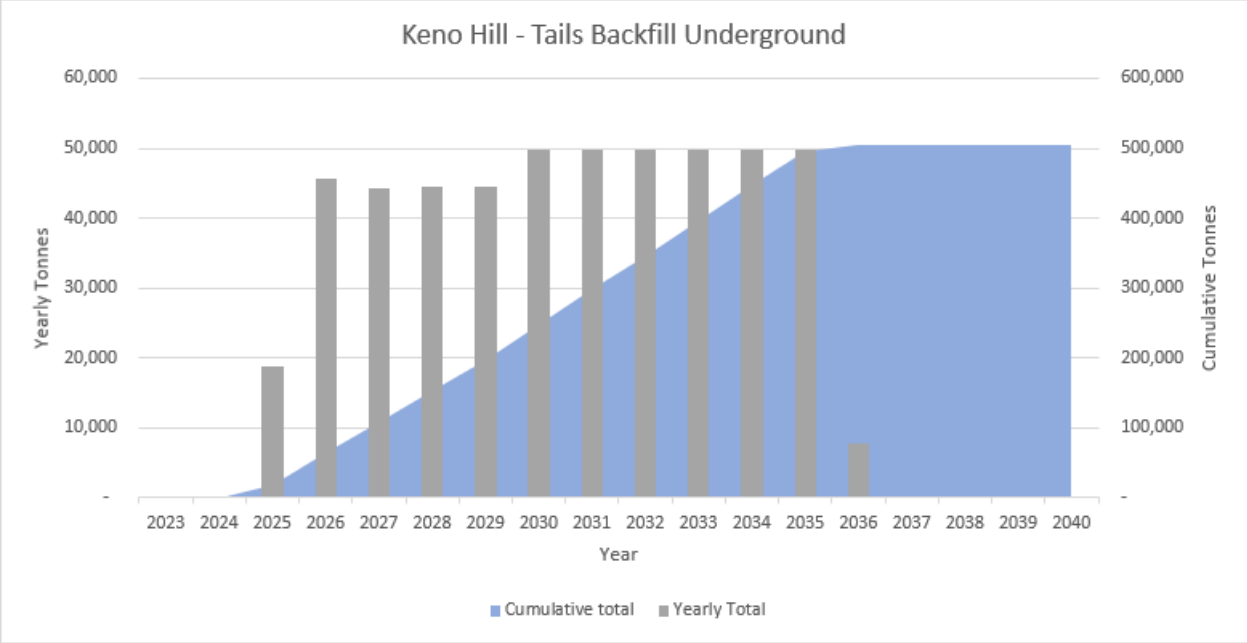
The remaining capacity underground is not sufficient to store all of the remaining waste rock and tailings anticipated to be generated by the remaining mine life. As a result, approximately 75% of the tailings will be stored within the Dry Stack Tailings Facility while Bermingham's N-AML waste rock that is not stored underground will be utilized for construction or reclamation or permanently stored on surface within the N-AML Bermingham Waste Rock Storage location or another approved storage location.

5 Deposition Schedule

The tailings and waste rock deposition plan is summarized below:

- From 2025, approximately 25% of the annual tailing volume will be backfilled underground (~46,000 – 60,000 tonnes). The remaining 75% of the annual tailing volume will be placed in the dry stack tailings storage facility.
- All of the P-AML waste rock will be placed underground at closure with temporary storage of P-AML waste rock approved for each mine site.
- From 2024, 91,354 tonnes of N-AML waste rock will be backfilled underground while a maximum of 190,000 tonnes of waste rock will placed in the Bermingham N-AML waste rock storage facility. Additional waste rock produced from the Bermingham is planned to be utilized for construction purposes and/or utilized in the United Keno Hill Mine reclamation project.

Figure 1 – Tailings Deposition Over Time in Underground



Based on the plan described above, Figure 1 shows a schedule of total volumes in the underground facilities. It is subject to change as a result of operational factors such as water levels, mining rates, as-built surveys of completed stopes, and changes in recovery and the ability to mine the underground reserves.

6 Tailings Management Facilities Operation

This following section outlines the facilities components, operation plans, and maintenance and surveillance plans for the Underground Tailings Storage Facility. Additional information on the management of the tailings prior to being stored underground can be found in AKHM's "Operation, Maintenance, and Surveillance Manual – Dry Stack Tailings Facility".

6.1 Facilities Design Description

The following sections summarize the design of the Underground Tailings Facility and background information used for the design.

6.1.1 Facilities Overview

The Underground Tailings Storage Facility is the underground mine at Bermingham and Flame&Moth as shown in Figure 1.

Tailings will be transported underground using haul trucks and depending on mining method used, will be drop filled with haul truck, placed with a loader or placed with a loader and jammed into the excavation. The batch plant will produce the required daily tonnages to achieve the mine plan up to 2,000 tonnes per day. Backfill production is limited to material and supporting equipment availability.

6.1.2 Cemented Tailings Components

The Underground Cemented Tailings process is made up of the components outlined below:

- Surface Tailings Storage Building
- Backfill Batch Plant
- Cement storage Silos
- Haul trucks for transportation to underground and drop filling
- Loader for placement in underground excavations too narrow for haul trucks
- Jammer (as required)

6.2 Operation

The timeline for construction of these surface components is based on the upcoming year's tailings placement plan and is anticipated to be completed, based on approval, to be Q4 2024.

The Operations Manager and the Project Managers are responsible for overseeing the general construction of the surface cemented tailings facilities with the support of the design consultants, if necessary. The Mine Manager and Superintendents are in charge of completing day to day tailings placement and the Technical Services Manager is responsible for the relevant tracking of space to ensure that all P-AML material is permanently placed underground.

6.3 Equipment Used for Cement Tailings Process

AKHM will use equipment readily available on site for all aspects of construction to achieve the design criteria of the surface facilities and to place tailings underground. Table XX lists typical equipment that may be employed in the process. A general contractor and their equipment will also be used for the placement of foundation materials, concrete foundations, micro piling and erection of the backfill plant.

Table 6-1 Typical Construction Equipment

Unit	Use
Cat 966 (or similar)	Wheel Loader Loading tailings from stockpile at the tailings filter building into the haul truck
Cat D7 Dozer (or similar)	Spreading of construction material and construction of components
Cat A40 Articulated Rock Truck (or similar)	Hauling tailings from stockpile to the facility

Cat 563 Packer (or similar)	Packing placed tailings to achieve design criteria
Cat 12G/14G Grader (or similar)	Clearing and leveling lifts for general erosion control and snow removal
CAT AD22 (or similar)	Transporting backfill underground.
CAT Loader 1600 or 1300 (or similar)	Transferring backfill to final location
Jammer	Retrofitted piece of equipment (usually loader) with jammer implement used to compact material in place.

6.4 Maintenance Program

The objective of the maintenance program is to maintain the underground tailings facility in accordance with all the performance criteria, legislative requirements, Hecla company standards, and sound operating practices.

6.4.1 Maintenance Procedures

A preventive maintenance program is in place for the heavy equipment used by Hecla under the direction of the Maintenance Manager. Event-driven maintenance for the heavy equipment would be due to breakdowns or incidents. Whether a piece of equipment is down due to preventive, routine, or event-driven maintenance, other equipment on site can be made available for use at the underground tailings facility as required.

Event-driven maintenance to the underground tailings facility components will be directed by the Mine Manager under the consultation of the facility designer and Technical Services. The actual maintenance program completed will depend on the severity of the occurrence.

Load cells on fixed equipment such as the mixer and the binder weigh hopper will be calibrated and checked in accordance with the OEM's recommendations to ensure batch-to-batch consistency and compliance with the prescribed mix design.

A quality control/quality assurance program that includes uniaxial compressive strength testing, particle size distribution, moisture analysis and visual inspections will be followed in accordance with the Ground Control Management Plan.

6.4.2 Documentation

Record keeping and documentation the any heavy equipment maintenance is the responsibility of the Maintenance Manager.

Event-driven maintenance for a component is the responsibility of the Mine Manager and Mine Superintendents. It involves completion of inspection reports and depending on the severity of the event involves the Operations Manager and the Geotechnical Engineer~~,~~ if necessary. Documentation of any maintenance completed will be used to access the performance of the specific component and determine whether the design, operation, or surveillance of that component must be adjusted.

6.4.3 Reporting

Reporting of any heavy equipment maintenance is limited to a specific request by the Mine Manager to the Operations Manager to the General Manager.

Inspection reports and any other documentation regarding event-driven maintenance for underground tailings components should be submitted to the facility designer and Technical Services Manager to determine whether any adjustments to the design, operation, or surveillance are required. The geotechnical engineer will also be contacted, if necessary.

6.5 Surveillance of Underground Tailings

Surveillance involves inspection and monitoring of the operation, structural integrity, and safety of the Underground Mine, and must be consistent with the life cycle and regulatory requirements of the Mine. Surveillance consists of both routine and event-driven activities.

Key surveillance parameters and procedures must be identified for:

- Monitoring the operation, safety, and environmental performance;
- Promptly identifying and evaluating deviations from expected behaviour that affect operation safety, structural integrity, and environmental performance of the facility; and
- Reporting significant observations for response.

The surveillance program will continue to evolve as the facility changes in design or performance criteria, site conditions and/or the operation it is accommodating.

All personnel will be involved in surveillance as a routine part of daily activities, maintaining visual awareness of the facility in the course of their regular and/or routine duties, in addition to surveillance-specific site engineering, instrument monitoring, analysis, inspection, periodic review and oversight.

It is the combination of all the regular inspections assisted by the eyes of all site personnel that ensures continued integrity and performance of the mine.

Outside consultants will also be on site periodically inspecting the backfill as part of an annual 3rd party review or as needed.

6.5.1 Responsibility

A number of personnel conduct routine inspections. The Technical Services Manager, or ~~his~~ a designated replacement is assigned the responsibility of obtaining the monitoring information and preparing a monthly report for the facility designer and geotechnical engineering review.

6.5.2 Surveillance Parameters

Key parameters of surveillance are identified through identifying and describing potential failure modes.

Visual observations can indicate potential failure modes such as:

- Tension cracking.
- Spalling.
- Cold joints.
- Water infiltration.
- Backfill to host rock contact ravelling.

Routine monitoring for ensuring facility performance include:

- Uniaxial compressive strength testing.
- Moisture sampling of tailings.
- Particle size distribution of tailings.
- Coring.

6.5.3 Surveillance Procedures

This section will be updated following the amendment to the Quartz Mining Licence and any additional conditions regarding the deposition of tailings underground.

6.6 Tailings Deposition Strategy

The cemented tailings process consists of tailings being transported from the mill via empty back haul ore trucks and stored in the tailings storage building, which has ~2,000 tonnes storage capacity (around one week of-backfill production). The storage of tailings allows for continuous operation during times when the mill is not operational and when transportation isn't possible (for example during night-time hours when allowed traffic is limited).

Bulk cement delivery will be utilized and cement will be stored in 100-tonne silos. Cement will be transferred to the mixer using screw feeders and metered into a weigh hopper to ensure consistent batching. Tailings from the storage building will be transferred to the feeder hopper and conveyed to the mixer to be blended with the cement. Once the tailings and cement are sufficiently blended, the mixer will discharge the batch into an underground haul truck. This process is repeated until the underground haul truck is completely loaded. The backfill will be transported underground and deposited as required. Methods of deposition include (but are not limited to), drop filling, placement with loader, and jamming.

The Ground Control Management Plan as per Schedule C of QML-0009 will be updated to include the cemented fill aspect of the underground tailings storage regime.

6.7 Emergency Management

Emergency Management is managed through the AKHM Emergency Response Plan as per Schedule C of QML-0009. Emergency Management will continue the same procedures as currently carried out.

6.8 Environmental Protection and Environmental Management

Environmental Protection and Environmental Management is managed through the AKHM Adaptive Management Plan and the Environmental Monitoring, Surveillance and Reporting Plan as per Schedule C of QML-0009.

The TCP outlines how tailings will be characterized during operations of the underground tailings facility.