Tailings Basin Stability and Environmental Protections

PolyMet has a big advantage over other new or developing mine projects, because we will reuse a tailings basin that already exists at the site as a result of earlier iron ore processing. The basin has proven to be stable over its 60-year existence; even so, before we put the existing basin back into use, we will incorporate additional engineering controls to ensure it remains stable and will protect nearby natural resources over the long-term.

What are tailings?

- Tailings are the rock that is left after ore has been mined, crushed, processed and stripped of its economic metals. The silt- and sand-like material is mixed with water and pumped to large basins or impoundments for permanent storage. The coarser tailings are used to build walls or dams that form large basins. Water collects and pools in the basins during operations, and is recycled back to the plant for reuse.
- Tailings structures from iron-ore mining have been in existence for over half a century along the Iron Range in northeastern Minnesota. Thousands more are found throughout the world. Tailings impoundments have similarities, but their differences often far outweigh their similarities because mining operations vary widely in geography, geology, hydrology, mineralogy, and other characteristics.
- Tailings basins are highly engineered structures that are continuously maintained, monitored, and inspected for stability.

Steps PolyMet is taking to enhance stability and safety of its tailings structure

Dam stability and water management are two key considerations when siting, designing, building, and operating tailings impoundments. The design of the existing four-square-mile basin has stood the test of time for 60 years; we will apply a similar engineering design to the structure, with additional modern engineering controls, before we begin copper-nickel mining operations.

- Geotechnical experts independently performed numerous geotechnical evaluations and concluded it is feasible to add our tailings to the existing facility. These experts will assist in the specification of future engineering requirements prior to and after production begins.
- Foundation conditions at our site have been explored repeatedly beginning more than 60 years ago and more recently with sophisticated methods of exploration and analysis. Minnesota-based Barr Engineering, our engineering firm for the tailings basin, has been designing tailings basins for mines in northern Minnesota since the 1960s and now works on tailings basin projects around the world.
- We will ensure the structure achieves accepted factors of safety for slope stability into the future by adding rock buttresses to the exterior face of the dams during the first few years of operations to supplement the stability of the existing structure.

Other considerations for safety and stability

- Dam safety inspections are currently conducted at the existing facility as required by the Minnesota Department of Natural Resources, and these inspections will continue on a regular basis throughout operations and after closure under the provisions of a future dam safety permit, which will be required from the DNR prior to the start of operations. Any issues identified during these inspections will be addressed accordingly.
- Existing and future slope angles are gradual and not steep, thereby decreasing stability risk by spreading the load over a broader area.

Contingency and emergency planning

- As we plan the project, we do our best to anticipate the events that could cause a failure, including those that could happen in series (the domino effect). Taking this information into account, we design the structure to reduce the risk of those events occurring. In the unlikely event something does go wrong – our Contingency Action Plan is an initial guide to help us respond quickly and appropriately. This plan is included in our dam safety permit application to the Department of Natural Resources.
- We will be continually monitoring, testing, and improving the NorthMet design throughout operations to ensure it's appropriate given the characteristics of the tailings and site.

Steps PolyMet is taking to ensure water quality standards are met and resources used wisely

- Before we put the existing tailings basin back into use, we will upgrade it with a seepage capture system to control leakage and pump it back into the tailings basin for use on our project. This will consist of a nearly five-mile-long cutoff wall – an underground barrier made of clay – that will extend from surface to bedrock around a portion of the tailings basin. This is to keep untreated water from migrating off-site.
- At closure, a permanent pond will be formed within the tailings basin. The pond bottom and exposed beach areas will be amended with clay to limit oxygen infiltration and water percolation into the tailings. This is to minimize future leakage and the potential for water quality impacts.
- Monitoring devices are currently in place and new devices will be installed in and around the basin as the dams are constructed and raised, data from which will be used to systematically and continually evaluate potential movement and slope stability.

Tailings basin water not acidic

Water in the existing basin (left from legacy iron ore processing) is in the pH neutral range and therefore is not acidic. It is safe for fish and wildlife, which inhabit the basin today. Geochemical testing of the tailings resulting from the NorthMet process has confirmed that the tailings basin water will continue to be in a pH neutral range throughout operations and closure.

Mount Polley tailings dam disaster

On August 4, 2014, a tailings basin wall at the Imperial Metals Mount Polley copper mine in southcentral British Columbia failed, allowing 26 million cubic yards of silt- and sand-like material (tailings) and water to escape into the environment. A reasonable question generated by this failure is: could the same thing happen at PolyMet?

After a five-month investigation, a three-member panel of geotechnical experts assembled by the government concluded the Mount Polley failure was caused by a faulty design. The geotechnical modeling during design did not take into account the geologic complexities of the subsurface and therefore underestimated the amount of "loading" of tailings it could sustain. The foundation eventually failed under the weight of the dam walls. The panel concluded the steep slopes of the tailings embankment also contributed to the failure. (To compare, the average dam slope for Mount Polley is roughly six times steeper than dam slopes planned for the PolyMet tailings basin.)

Major tailings basin failures like the one in B.C. are rare; the long-term history of the existing tailings structures and the steps we will take as outlined above will help ensure our tailings structure remains stable throughout its lifetime.

Our tailings basin is one of dozens of large tailings basins found in northern Minnesota, some of which are as old as iron mining itself. None of these iron range tailings basins is known to have ever experienced a catastrophic dam failure.

Were any other tailings storage alternatives such as "dry stack" technology reviewed or considered for the NorthMet Project?

Yes. Several alternatives including dry stack technology were reviewed as part of the environmental review completed by state and federal agencies. When all factors were considered, including the need to relocate the tailings to a large, new greenfield site for dry stacking, the alternatives were not found to have significant environmental benefit over the plan to enhance and re-use the existing tailings basin.