



TWIN METALS MINNESOTA PROJECT MINE PLAN OF OPERATIONS

Environmental Review Support Document

Twin Metals Minnesota Project: An Introduction

Twin Metals Minnesota (TMM) is proud to formally propose its world-class, 21st century underground copper, nickel, cobalt and platinum group metals mining project in northeast Minnesota for environmental review.

The submission of TMM's Mine Plan of Operations (MPO) to the U.S. Bureau of Land Management (BLM), and the Scoping Environmental Assessment Worksheet (SEAW) data submittal to the Minnesota Department of Natural Resources (MDNR), is the culmination of a decade of engineering, environmental and engagement work including the evaluation of dozens of Project configurations and technologies that maximize environmental protection. If permitted, TMM's Project will be the state's first underground mining operation – an approach that minimizes surface disruption, noise and dust – since the closure of Ely's Pioneer Mine in 1967.

For more than 135 years, Minnesota has been a leader in both mining development and regulation to ensure strong environmental and labor standards. TMM is dedicated to building, operating, and closing a mine that employs industry best practices and meets or exceeds all state and federal environmental standards.

Submission of the MPO and SEAW starts a multi-year environmental review process that will thoroughly evaluate this proposal. The review process will include additional baseline data collection, impact analysis, and multiple opportunities for public input. TMM looks forward to this process and the engagement with government and the public which will result in the best outcomes for Minnesota.

The TMM Project site is located between the cities of Ely and Babbitt, an area long-sustained by mining and other industries, including farming, logging, quarries, and recreation. The area in and around Ely alone was once home to 11 operating mines. The site is in an area of the Superior National Forest designated for mining and logging within the U.S. Forest Service Superior National Forest Plan. The Project is outside of the Boundary Waters Canoe Area Wilderness and both the federal and state mining exclusion zones meant to provide a buffer from development.

The TMM Project offers an extraordinary opportunity for long-term, environmentally sound economic growth and job creation in a region of northeastern Minnesota that never fully recovered from iron mine and processing plant closures a generation ago. The construction phase of the project will require several million labor hours under a project labor agreement already negotiated with the Iron Range Building and Construction Trades Council. Once the mine is operational, it will bring 700 new full-time, skilled positions and 1,400 spinoff jobs to the region. Investment in the Project to date is over \$450 million and is expected to amount to approximately \$1.7 billion through construction of the mine. The Project would provide additional economic benefit by generating revenue for state and federal governments from taxes and mineral royalties.



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The growing demand for copper, nickel, cobalt and platinum group metals in technologies from cell phones to clean energy production has made these minerals critical to advancing the quality of life of populations around the globe. The Duluth Mineral Complex beneath this part of northeastern Minnesota is one of the largest undeveloped deposits of these minerals in the world, with more than 7 billion tons of ore containing copper, nickel and other precious metals. Failure to access the minerals of the Duluth Complex will create pressures to mine these metals in other locations that have much less rigorous environmental and labor standards.

TMM and its predecessor company engaged in mineral resource characterization of the Maturi deposit, in the northern area of the Duluth Complex, from 2006 to 2014. This effort has produced detailed characterization of mineral resources. To date, TMM's core storage facility houses approximately 1.5 million feet of core samples from the Maturi deposit; about a half million additional feet of core samples have been sent to state storage facilities. Following mineral resource characterization, several years of process flowsheet engineering work led to conceptual and initial prefeasibility studies.

The outcome of these studies minimized potential impacts in the areas of water, wetlands, noise, dust, light and visual pollution. Specific examples include:

- Project optimization reduced the surface footprint by over four times;
- Ore processing would remove most of the sulfide minerals; therefore, tailings would not produce acid rock drainage (ARD);
- Up to 50% of tailings would be diverted from surface storage and instead be utilized as backfill in the underground mine;
- Tailings stored on surface would be dewatered and compressed which is called dry stacking;
- Adopting dry stacking as the tailings management method reduced the surface impact by approximately 35% and wetlands impact by approximately 65% compared to a previous conventional slurry tailings storage configuration;
- The dry stack facility would not have dams retaining tailings slurry, would be lined and covered, would eliminate a long pipeline to transport tailings to another location, and would be revegetated concurrently as the Project progresses reducing visual impacts;
- The Project would not discharge process water and is designed not to require discharge of contact water. Water used in the mineral concentration process would be reused on site;
- No waste rock would be stored on the surface, eliminating a potential source of ARD;
- Ore crushing would be underground, limiting surface impact, dust and noise;



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- No mining would occur under Birch Lake reservoir; and
- After mine closure, most of mine infrastructure would be removed and the surface area revegetated.

Project at a glance:

- Construction of the mine would occur over two to three years;
- The mine would process 20,000 tons of ore per day;
- Mining operations would occur between 400 and 4,500 feet below the surface;
- The tailings management site would be approximately one mile south of the underground mine and encompass the dry stack tailings facility;
- The plant site includes access to the underground mine and the concentrator used to recover target minerals from ore;
- The mine would be accessed via declines at the plant site with workers and supplies transported by truck;
- Flow of groundwater in bedrock is exceptionally low;
- Water for operations would be reused on site and be sourced from stormwater, groundwater inflow into the mine, and from Birch Lake reservoir;
- Power would be supplied via a transmission corridor from an off-site electrical substation;
- Site employees would be bused to site from Ely and Babbitt, minimizing traffic;
- The Project would operate under National Mining Association CORESafety Program standards, a systematic approach to developing a safety culture.

As the World Bank noted earlier this year in its Climate Change report, the world is rapidly transitioning to low-carbon technologies to combat climate change and will require large quantities of minerals to succeed. The report notes that a single three-megawatt wind turbine requires 4.7 tons of copper. Lithium-ion batteries used in everything from electric vehicles to power grids rely heavily on cobalt, one of the key minerals identified in the Maturi deposit. Catalytic converters, which reduce carbon monoxide emissions from internal combustion engines, use another: platinum group metals such as palladium. Nickel is a key component of corrosion-resistant alloys such as stainless steel and copper-nickel tubing in desalination plants. The report projects that the transition to green energy will require as much copper in the next 25 years as has been produced in the past 5,000 years.

This Project offers the opportunity to provide the minerals essential to the green economy responsibly, with the rigorous environmental and labor standards that are uniquely present here in America – specifically in Minnesota. TMM's commitment is to operate sustainably and preserve and protect our precious natural world as we support the new, green economy.



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Closer to home, hundreds of union jobs, over a thousand spinoff jobs, as well as tax payments and royalties will improve the quality of life in Minnesota and specifically in communities that are struggling economically. TMM's Project raises the bar for how to best extract necessary minerals for society. With this Project, Minnesota can be a model for modern, sustainable and environmentally and socially responsible mining.