# NI 43-101 Technical Report

# Preliminary Economic Assessment of the Electric Metals' North Star Manganese Project, Crow Wing County, Minnesota, USA


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**Effective Date: August 15, 2025**
**Issue Date: September 30, 2025**



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## DATE AND SIGNATURE PAGE

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**Prepared by Qualified Persons:**

| QP | Responsibilities | Signature | Date |
|---|---|---|---|
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# Table of Contents

# Tables

# Figures

# 1. SUMMARY

## 1.1 Terms of Reference

In October 2024, North Star Manganese Inc ("NSM"), an indirect subsidiary of Electric Metals (USA) Limited ("EML"), commissioned Forte Dynamics, Inc. ("Forte") to complete a Preliminary Economic Assessment technical study on the North Star Manganese Project (the "NSM Project"), consisting of a manganese mining project and manganese chemical processing facility (the "Report"). North Star Manganese Inc is a 100% indirectly held subsidiary of Electric Metals (USA) Limited, a corporation incorporated under the federal laws of Canada and listed on the TSX Venture Exchange (TSX.V: EML) and on the OTC Venture Market in the United States (OTCQB: EMUSF). The study was prepared in accordance with National Instrument 43-101 (NI 43-101) Standards of Disclosure for Mineral Projects format.

This PEA documents the results of additional geostatistical investigations and metallurgical test work performed during 2024 and 2025. The effective date of this report is August 15, 2025.

## 1.2 Location

The North Star Manganese Project (NSM Project) is a manganese mining and manganese chemical processing facility. The mine will be in Minnesota, and the chemical plant location is still under study. All facilities will be in the United States.

The proposed mineral deposit and extraction portion is the Emily Project. The Emily Project is located near the center of the State of Minnesota, United States of America. Minnesota is situated in the Upper Midwest, Great Lakes, and northern region of the United States.

The Emily manganese mineral deposit is located approximately 143 miles (230 km) north of Minneapolis, MN in northern Crow Wing County and is on the northern portion of the Emily District, of Minnesota's Cuyuna Iron Range, approximately 2 miles (3.2 km) north, northwest of the City of Emily, Minnesota.

## 1.3 History

The deposit was discovered by Pickands Mather Mining Company in the 1940s while exploring for iron ore and has been explored by a variety of companies. U.S. Steel proposed the West Ruth Lake iron ore mining operation, along with two nearby iron ore mines, in the 1950s. All three proposed iron ore mines contained moderate to high-grade manganese concentrations associated with the iron ore. However, by the early 1960s iron ore companies ceased production on the Cuyuna Iron Range, and the West Ruth Lake complex was not developed. In the late 1950s Minnesota's iron ore companies moved operations to the Mesabi Iron Range for the mining of taconite and production of taconite pellets for steel mills.

## 1.4 Geology

The Cuyuna Iron Range is about 100 miles (160 km) west-southwest of Duluth, in Aitkin, Cass, Crow Wing, and Morrison Counties. It is part of an Early Proterozoic geologic terrane that occupies much of east-central Minnesota. The Cuyuna Iron Range is traditionally divided into three districts: the Emily District, the North Range, and the South Range.

Since their discovery in 1904, it has been recognized that the iron-formations and associated mineral deposits of the Cuyuna Iron Range in east-central Minnesota contained appreciable quantities of manganese, and large quantities of manganese were extracted as manganiferous iron ores from several mines on the North Range from 1911 to 1967. The presence of this manganese resource sets the Cuyuna Iron Range apart from other iron-mining districts of the Lake Superior region.

The depositional sequence at the Emily deposit records two periods of transgression and regression within the chemical sediments of the Emily Iron Formation and overlying Virginia Formation, bracketed by periods of clastic deposition. The Emily Iron Formation comprises a sequence of fine- and coarse-grained iron formation subunits that correspond to the rise and fall of sea level during deposition. Manganese precipitation is also associated with the rise and fall of the sea level and subsequent mineral deposition.

## 1.5 Exploration and Drilling

After discovery by the Pickands Mather Mining Company in the 1940s, historic drilling was performed by U.S. Steel in the 1950s (Strong, 1959), the USBM and the Minnesota Manganese Resources Company in the 1990s, and Cooperative Mineral Resources in 2011 and 2012. This work continued to support the premise that a potentially significant endowment of manganese exists in this area. The majority of historical drillholes defining the manganese enriched zones were executed in the 1940s-1950s since the objective was to define iron ore resources, leaving them susceptible to deviations from current industry best practices.

In April of 2022, NSM contracted Big Rock Exploration (BRE) to begin scoping and developing a drill program on NSM’s lands in Sections 20 and 21, T138N, R26W. The goal was to demonstrate the westward and down dip extension of the existing mineral resource estimate on the eastern portions of the property. The drill program was initiated in February of 2023 and completed in July of 2023. A total of 3,995m (13,107 ft) of core was drilled from 29 completed drillholes. A finalized bedrock geology and drillhole collar location map of the 29 holes completed in 2023 and all historic drillholes is presented in Figure 10-1. From the new data collected during this drill program, BRE has been able to confirm the lateral and down dip extensions of manganese mineralization on NSM’s eastern land package, as well as its continuation westward approximately 1.25 kilometers (0.8 mi.) across the recently secured “Frank” and “Guelich” 40-acre parcels.

Geological and exploration drilling data and assay analysis for the Report has been provided by BRE and NSM.

Forte has followed industry best practices in preparing the contents of this report. Data used in this report has been verified where possible, work performed by BRE has been reviewed, and the QP confirms that the data was collected using best practice standards.

## 1.6 Metallurgical Testing

Testing has been performed in campaigns since the 1990s by a variety of laboratories for a variety of companies. Metallurgical testing has been performed by Kemetco Research Inc (Kemetco), a metallurgical laboratory in Richmond, Canada. Current work by Kemetco is focused on manganese recovery and developing a process flow to produce high-purity manganese sulphate monohydrate (HPMSM) and other high-grade manganese products. HPMSM is currently one of the high-value manganese products.

## 1.7 Mineral Resource Estimate

The Mineral Resource Estimate was estimated using Leapfrog™ software from Seequent, with statistical support in MicroModel™ from RKM Associates. The mineral domains were developed in Leapfrog cooperatively with BRE and Forte, and they are based on 5 logged portions of the Paleoproterozoic Emily Iron Formations (Peif), Peif1 through Peif5. The mineral resource was estimated in Peif1, Peif2, and Peif3 using inverse distance squared weighting with a dynamic anisotropy for each of the three domains. Peif4 and Peif5 were thin and low grade and were not estimated.

The mineral resource has been tabulated at three cut-off grades, 5%, 10%, and 15% Mn, and limited to an area with a thickness greater than 4 meters, representing a minimum mining thickness. The resources are reported as Indicated Mineral Resource and as Inferred Mineral Resource based on the parameters described in Section 14.11, a sales price of \$2,500/t HPMSM, and the morphology of the higher-grade zones of the Emily iron formations.

The classified mineral resources with a potential for economic extraction are shown in Table 1-1.

**Table 1-1: NSM Emily Classified Mineral Resource Estimate**

| Domain | Class | Cut-off (Mn%) | Metric Tons (kt) | Density (g/cm³) | Mn (%) | Fe (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|
| High Grade | Indicated | 15 | 5,176.30 | 3.11 | 22.07 | 22.00 | 27.70 |
| | | **10** | **7,104.07** | **3.14** | **19.55** | **22.80** | **30.84** |
| | | 5 | 7,932.89 | 3.14 | 18.37 | 22.95 | 32.53 |
| | Inferred | 15 | 2,244.26 | 3.07 | 20.05 | 19.26 | 26.83 |
| | | **10** | **3,611.36** | **3.10** | **17.19** | **18.99** | **29.97** |
| | | 5 | 4,149.80 | 3.09 | 16.00 | 18.69 | 30.68 |

| Domain | Class | Cut-off (Mn%) | Metric Tons (kt) | Density (g/cm³) | Mn (%) | Fe (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|
| Low Grade | Indicated | 15 | 54.94 | 3.05 | 16.74 | 7.73 | 29.43 |
| | | **10** | **496.37** | **2.99** | **12.32** | **15.65** | **32.31** |
| | | 5 | 7,527.56 | 2.88 | 6.82 | 20.97 | 44.75 |
| | Inferred | 15 | 12.86 | 3.15 | 16.73 | 11.20 | 25.35 |
| | | **10** | **113.91** | **3.06** | **12.30** | **20.78** | **32.18** |
| | | 5 | 5,229.69 | 2.88 | 6.41 | 20.25 | 34.67 |

| Domain | Class | Cut-off (Mn%) | Metric Tons (kt) | Density (g/cm³) | Mn (%) | Fe (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|
| **TOTAL** | Indicated | 15 | 5,231.23 | 3.11 | 22.02 | 21.85 | 27.72 |
| | | **10** | **7,600.44** | **3.13** | **19.07** | **22.33** | **30.94** |
| | | 5 | 15,460.44 | 3.01 | 12.75 | 21.99 | 38.48 |
| | Inferred | 15 | 2,257.11 | 3.07 | 20.04 | 19.21 | 26.83 |
| | | **10** | **3,725.28** | **3.10** | **17.04** | **19.04** | **30.03** |
| | | 5 | 9,379.49 | 2.97 | 10.65 | 19.56 | 32.91 |

Mineral Resources are not Mineral Reserves and have not been demonstrated to have economic viability. Inferred resources are too speculative geologically to have modifying factors applied. There are currently no mineral reserve estimates for the project. There is no certainty that the Mineral Resource will be converted to Mineral Reserves. The quantity and grade or quality is an estimate and is rounded to reflect the fact that it is an approximation. Quantities may not sum due to rounding.

## 1.8 Mining

As part of Forte's work, mineable resources were estimated from the above mineral resource estimate constrained by a 10% Mn grade shell based on the cut-off grade calculation discussed in this report. Due to the inclined nature of the zone, Forte has applied 12% ore loss and 6% dilution to the in-place mineral resource.

Due to the strength of mineralized rock and geometry at the Emily deposit, the underground mining method of underhand cut and fill has been chosen with delayed cemented rock fill. Stairstep room and pillar was also considered as an alternative mining method but was dropped due to the dip of the mineralization (varying from 20 to 40 degrees).

The cemented rock fill serves both to support the drift walls and act as a stable roof from which additional mineralized material can be extracted in a lateral and downward direction. Additionally, the cemented rock fill prevents any surface subsidence from manifesting itself, controls any underground water (which is not thought to be significant), and allows larger spans to be taken under the cemented rock fill.

The mineable resource summary in Table 1-2 includes inferred mineral resource.

**Table 1-2: Minable Resource Estimate**

| Domain | Class | Cut-off (Mn%) | Metric Tons (kt) | Density (g/cm³) | Mn (%) | Fe (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|
| High Grade | Indicated | 15 | 4,176.85 | 2.91 | 20.46% | 20.35% | 34.17% |
| | | **10** | **5,703.93** | **2.94** | **18.16%** | **20.93%** | **37.97%** |
| | | 5 | 6,394.31 | 2.93 | 17.04% | 21.01% | 40.15% |
| | Inferred | 15 | 1,940.49 | 2.88 | 18.79% | 18.00% | 31.89% |
| | | **10** | **3,122.26** | **2.90** | **16.11%** | **17.85%** | **35.90%** |
| | | 5 | 3,524.17 | 2.90 | 15.13% | 17.60% | 36.59% |

Mineral Resources are not Mineral Reserves and have not been demonstrated to have economic viability. Inferred resources are too speculative geologically to have modifying factors applied. There are currently no mineral reserve estimates for the project. There is no certainty that the Mineral Resource will be converted to Mineral Reserves. The quantity and grade or quality is an estimate and is rounded to reflect the fact that it is an approximation. Quantities may not sum due to rounding.

## 1.9 Mineral Processing

The ROM ore will be shipped to a remote location, yet to be decided, and will be stockpiled for processing. The process will consist of the following unit operations:

- Two to three stage crushing to $P_{80}$ of 12.5 mm (0.5 inch)
- Ball mill grinding to ± 400 micrometers
- Agitated leach circuit at 45% solids for 5 hours with sulfuric acid and sulfur dioxide
- Removal of iron, aluminum, sodium, potassium, and silica by the addition of calcium carbonate and calcium hydroxide
- Base metals (copper, nickel, cobalt, zinc sulfides) removal by the addition of hydrogen sulfide
- Removal of calcium and magnesium by the addition of reagents yet to be determined
- Crystallization of HPMSM

The leaching of the ore recovered 95% to 98% of the manganese into the pregnant solution. Removal of impurities and crystallization of the HPMSM will result in a loss of some manganese. Hence, the overall recovery of manganese is conservatively estimated at 90%.

## 1.10 Economic Evaluation

Capital costs for the mine and facilities were estimated by interpolating published data from CostMine™. Surface and underground mine equipment are grouped separately. Shaft sinking and completion costs were provided by Miller Contracting Services, LLC of Carrier Mills, IL, who have recent experience in sinking shafts with freeze collars. Mining equipment capital cost includes both the construction and operation phases. The initial capital cost, which includes process, pre-production, and facilities, is estimated at $634 million USD with a 25% contingency in Mining and Processing. There is an estimate of sustaining capital and closing costs of $276 million for this Project.

The estimated NPV at a 10% discount rate has been performed to determine if there is sufficient mineralized material to develop the NSM Project. The deposit is open to the west and north of the current drilling and down dip if those surface and mineral rights can be secured.

The initial capital cost estimate is shown in Table 1-3.

**Table 1-3: Initial Capital Cost**

| Category | Total Cost (Millions $US) |
|---|---|
| Vertical Development: Shafts and Raises | $34.00 |
| Horizontal Development (Drifts & Spiral) | $6.86 |
| Underground Rubber Tired Mobile Equipment | $22.68 |
| Underground Auxiliary Equipment | $1.13 |
| Underground Infrastructure | $7.30 |
| Surface Infrastructure | $57.44 |
| Project Engineering | $9.12 |
| Surface Rubber Tired Mobile Equipment | $1.32 |
| Mineral Process Plant | $360.00 |
| Working Capital | $10.00 |
| Contingency | $124.96 |
| **GRAND TOTAL** | **$634.81** |

An operating cost summary is shown in Table 1-4.

**Table 1-4: NSM Project Operating Cost Summary**

| Concept | Total (Millions $US) | $/t ore | $/t HPMSM |
|---|---|---|---|
| Mining Cost | $832.31 | $94.30 | $192.31 |
| Transportation | $799.21 | $90.55 | $184.66 |
| Processing | $1,765.24 | $200.00 | $407.87 |
| G&A | $132.39 | $15.00 | $30.59 |
| **TOTAL** | **$3,529.15** | **$399.85** | **$815.44** |

The after-tax discounted cash flows at several interest rates are shown in Table 1-5.

**Table 1-5: DCF Analysis - After-tax**

| Discount Rate | DCF Millions $US |
|---|---|
| (Cumulative Cash Flow) NPV@0% | $5,354.96 |
| NPV @ 8% | $1,776.10 |
| **NPV @ 10%** | **$1,390.15** |
| NPV @ 12% | $1,097.75 |
| NPV @ 15% | $780.22 |
| **IRR** | **43.5%** |

Initial metallurgical testing has shown that Emily ores can be processed to produce a battery grade product, high-purity manganese sulfate monohydrate (HPMSM). Other manganese products may be produced as well as potential iron products. Development of a definitive mineral processing flowsheet will require continuing test work.

## 1.11 Interpretation & Conclusions

The Emily Project demonstrated good continuity of mineralization, with a large lower-grade mineral resource and a significantly higher-grade core more amenable to beneficiation and processing to saleable high-grade manganese chemicals.

It is assumed that Emily minerals would be extracted by underground mining, thus avoiding a large open pit. Based on the analysis herein, and the expected market prices for manganese sulfate, Emily carries manganese grades sufficient to support such an operation.

Initial metallurgical testing has shown the potential to produce high purity manganese products including battery grade HPMSM. Evaluation of other co-products or by products will require additional study. Ore beneficiation prior to transport would be economically beneficial to the Project but will also require further test work. Energy requirements for crushing and grinding, as well as optimal reagent dosage can be improved, and work will be required for a more definitive determination of the total production costs and process circuits needed to produce the final products.

Review of historical data and exploration by former mining companies has shown potential to grow the mineral resource outside of the current property limits. The potential for this is discussed in Section 10.2 and in project Recommendations below.

## 1.12 Risks and Uncertainties

There has never been any mining in the Emily District and mining ceased in the Cuyuna Iron Range in the 1960s.

To date there have been no difficulties with the permitting for exploration drilling. Because Minnesota is a significant mining state, ranking fifth in non-fuel production value for 2024, it has a well-defined permitting approach for mining operations. Crow Wing County has not recently been a mining area, accordingly, maintaining government relations and community outreach is vital to ensuring an efficient and effective permitting process for both construction and operations.

There is an incomplete understanding of the hydrogeology of the area, and successful underground mine construction and operations will require a detailed understanding of the technical and economic hurdles imposed by the saturation of the glacial tills overlying the deposit.

Metallurgical test work has shown that manganese can be recovered from the Emily resource, but a process flow chart that will produce high-value manganese products has yet to be optimized. The principal manganese mineral, manganite, a high-grade manganese mineral, is not the lower grade pyrolusite more commonly found in current operations around the world.

## 1.13 Recommendations

The QPs recommend that ongoing exploration continue to refine the geological model, the domain model, and the resource classification. This will improve the reliability of the model for project decision-making. As discussed in Section 10.2, earlier drilling by U.S. Steel and others, there are extensions to the Emily deposit for which current data are not available for inclusion in the mineral resource estimate. North Star Manganese should drill to the west and north-west on lands it controls and endeavor to acquire more surface and mineral rights surrounding the current mineral resource.

Metallurgical test work should focus on refining the process to produce HPMSM and any potential co-products. Composites of various Mn grades and Mn/Fe ratios will be needed to optimize plant performance. The Fe/Mn separation process and the required reagents and feed materials are not currently defined. Production of marketable HPMSM, as well as finding more definitive markets or market partners, will be key to a smooth market entry. Completing flowsheet development to allow a more definitive determination of the economic cut-off grade will be an important next step.

As a major contributor to production cost, there is potential to optimize transportation, a siting study for both the truck rail transfer in Minnesota as well as the leaching and purification facility. The focus will be on efficient material handling, readily available consumable supplies, and lower-cost energy. This may enhance transportation, reagent, and energy costs.

Additional study should be given to self-manufacture of both sulfuric acid and $SO_2$ from raw sulfur. This may offer savings over the purchase and transport of commercial acids.

Geotechnical and Hydrogeological studies will be key to understanding pumping requirements for underground mining and to understanding the most appropriate mining method for Emily. Ore loss and dilution have been assumed, both may be reduced and optimized with the full development of a detailed mine plan.

The estimated budget for the next stage of work is shown in Table 1-6. The focus will be on resource improvement, geological confidence, mineral processing, plant location, and permitting considerations.

**Table 1-6: Budget for Future Work**

| Budget Item | Estimated Cost |
|---|---:|
| Resource Definition & Expansion Drilling | $2,500,000 |
| Structural, Geotechnical & Hydrological Activities | $500,000 |
| Metallurgical Test Work | $1,000,000 |
| Transport, Logistics & Sighting Studies | $500,000 |
| Environmental, Water & Cultural Studies | $1,000,000 |
| **TOTAL** | **$5,500,000** |

# 2. INTRODUCTION

## 2.1 Terms of Reference

In October 2024, North Star Manganese Inc ("NSM"), an indirect subsidiary of Electric Metals (USA) Limited ("EML"), commissioned Forte Dynamics, Inc. ("Forte") to complete a Preliminary Economic Assessment technical study on the North Star Manganese Project (the "NSM Project", consisting of a manganese mining project and manganese chemical processing facility (the "Report"). North Star Manganese is a 100% indirectly held subsidiary of Electric Metals (USA) Limited, a corporation incorporated under the federal laws of Canada and listed on the TSX Venture Exchange (TSX.V: EML) and on the OTC Venture Market in the United States (OTCQB: EMUSF). The study was prepared in accordance with National Instrument 43-101 (NI 43-101) Standards of Disclosure for Mineral Projects format.

This PEA documents the results of additional geostatistical investigations and metallurgical test work performed during 2024 and 2025.

## 2.2 Qualifications of Consultants

The qualified persons responsible for this report are:

- Donald E. Hulse, P.E., SME Registered Member (SME-RM), Director of Mining Resources, Forte Dynamics is a QP as defined by NI 43-101 and is responsible for Sections 1-6, 14-15, and 18-25, parts of 26, and a contributor of the overall content of this report. Mr. Hulse is independent of NSM.
- Deepak Malhotra, Ph.D., SME Registered Member (SME-RM), Director of Metallurgy, is responsible for Section 13, 17, and parts of 26. Dr. Malhotra is independent of NSM.
- Gordon Sobering, P.E., SME Registered Member (SME-RM), Senior Associate Mining Engineer is a Qualified Person (QP) defined by NI 43-101 and is responsible for Section 16 and parts of 20 and 26. Mr. Sobering is independent of NSM.
- Ronald A. Steiner, Ph.D., CPG-AIPG, is a QP as defined by NI 43-101 and is responsible for Sections 7-12 and parts of 26. Dr. Steiner is independent of NSM.
- Douglas Hambley, P.E., P.Eng, SME Registered Member (SME-RM), is a QP as defined by NI 43-101 and is responsible for Sections 1.8, 16.3, and 16.5. Mr. Hambley is independent of NSM.

## 2.3 Effective Date

The effective date of this report is August 15, 2025.

## 2.4 Units of Measurement

All units of measurement are in the Metric system. Costs are in U.S. dollars.

# 3. RELIANCE ON OTHER EXPERTS

Big Rock Exploration ("BRE") staff provided documentation related to geological setting and mineralization (Section 7), deposit types (Section 8), exploration (Section 9), drilling (Section 10), sample preparation, analysis, and security (Section 11), quality control testing (Section 12.2), geologic model (Section 14.1), domaining (Section 14.4), and specific gravity (Section 14.6 and 14.9.1).

North Star Manganese Inc ("NSM") management provided additional documents related to property description and location (Section 4), accessibility, climate, local resources, infrastructure, and physiography (Section 5), history (Section 6), mineral processing and metallurgical testing (Section 13), environmental studies, permitting and social or community impact (Section 20), and adjacent properties (Section 23).

Electric Metals contracted CPM Group for a market study of High Purity Manganese Sulfate Monohydrate (HPMSM), which was used in preparation of the economic model[1].

Data was reviewed and accepted by the QPs.

[1] High Purity Manganese Market Update, CPM Group Andrew Zemek, 2024,

# 4. PROPERTY DESCRIPTION AND LOCATION

The North Star Manganese Project (NSM Project) is a manganese mining and manganese chemical processing facility. The mine will be in Minnesota, and the chemical plant location is still under study. All facilities will be in the United States.

The proposed mineral deposit and extraction portion is the Emily Project. The Emily Project is located near the center of the State of Minnesota, United States of America. Minnesota is situated in the Upper Midwest, Great Lakes, and northern region of the United States.

The Emily Project is in northern Crow Wing County and is on the northern portion of the Emily District, of Minnesota's Cuyuna Iron Range, approximately 2 miles (3.2 km) north, northwest of the City of Emily, Minnesota, and west of State Highway 6, as shown on Figure 4-1.

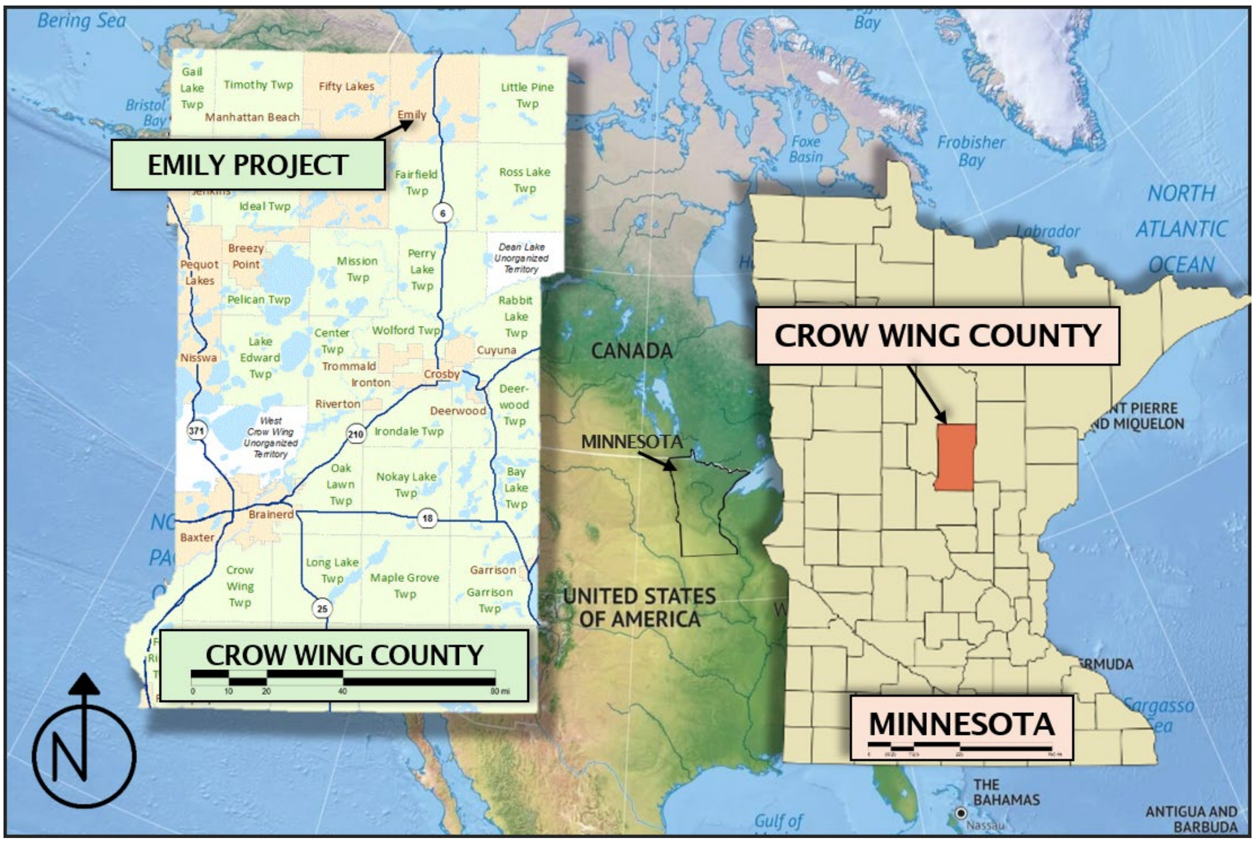



Figure 4-1: Location of the Emily Project in Crow Wing County, Minnesota

(Source: North Star Manganese)

The Emily Project is in the Emily District of the northern portion of the historic Cuyuna Iron Range in Minnesota, as shown on Figure 7-5.

Mines in the Cuyuna Iron Range mined iron ore and manganese from 1907 to 1967 and sold stockpiled iron ore and manganese through 1982. The Emily Project is located south of the western end of Mesabi Iron Range, which hosts the largest iron ore mining and processing operations in the United States and North America. The location offers nearby services, equipment suppliers and labor associated with the iron mining and processing industry.

Regionally, the Emily Project site benefits from proximity to medium to large cities and regional industrial centers (iron mining and processing), with major domestic and international transportation linkages, as shown in Table 4-1.

**Table 4-1: Regional Cities and Transportation Linkages**

| Regional City | Distance from the Emily Project Site | Rail Connections | Water Shipping Connections | Airport Connections |
|---|---|---|---|---|
| Brainerd, MN | 38 miles / 61 km southwest | One Class-1 Railroad | | Brainerd Lakes (Regional) |
| Grand Rapids, MN | 47 miles / 76 km northeast | One Class-1 Railroad | | Range (Regional) |
| Duluth, MN / Superior, WI | 109 miles / 175 km east | Two Class-1 Railroads | Great Lakes and Ocean shipping | Duluth (International) |
| Minneapolis, MN | 149 miles / 240 km south | Three Class-1 Railroads | | Minneapolis/St. Paul (International) |
| St. Paul, MN (State Capital) | 154 miles / 248 km south | Three Class-1 Railroads | Mississippi River barge shipping | Minneapolis/St. Paul (International) |

## 4.1 Ownership and Mining Rights

The Emily Project's mineral assets are held by multiple leases and are a mix of mineral and surface rights, and mineral rights (without the surface rights). The underlying manganese mineral assets assessed in this Report are owned by Cooperative Minerals Resources LLC (CMR) and People's Security Company, Inc. (PSC), both subsidiaries of Crow Wing Power Corporation (CWP), a Minnesota electric cooperative, and by two private landowners, held under the Guelich lease and the Frank lease.

Crow Wing Power's interest is via a contract mining and sales arrangement between NSM and CMR, where NSM has the exclusive right to mine and purchase manganese ore and separate property lease and a manganese processing agreement between NSM, CMR and PSC which provides NSM exclusive rights to the properties and extend certain downstream processing arrangements between the parties.

The Guelich and Frank private leases provide NSM with the right to mine manganese and pay the landowners a net smelter return royalty on the mined material.

The land leases are located in the northeast and southeast quarters of the northeast quarter, and the northeast quarter of the southeast quarter of Section 20, Township 138 North, Range 26 West, the northwest and northeast quarters of the southwest quarter, the northwest, southwest and southeast quarters of the northeast quarter, and the northwest quarter and the west half of the northeast quarter of the southeast quarter of Section 21, Township 138 North, Range 26 West, all in Crow Wing County, Minnesota. Table 4-2 below lists the parcels, their location, mineral and surface rights, and acreage. Figure 4-2 is a map of the boundaries of each land holding.

**Table 4-2: Emily Project Land Parcels**

| Parcel | Location | Surface Rights | Mineral Rights | Acres / Hectares |
|---|---|---|---|---|
| NE ¼ NE ¼ | S20 T138 N R26 W | X | X | 41.02 / 16.60 |
| SE ¼ NE ¼ | S20 T138 N R26 W | X | X | 41.06 / 16.60 |
| NE ¼ SE ¼ | S20 T138 N R26 W | X | X | 41.30 / 16.71 |
| NW ¼ SW ¼ | S21 T138 N R26 W | X | X | 38.72 / 15.67 |
| NE ¼ SW ¼ | S21 T138 N R26 W | X | X | 39.19 / 15.86 |
| NW ¼ NE ¼ | S21 T138 N R26 W | - | X * | 37.86 / 15.32 |
| SW ¼ NE ¼ | S21 T138 N R26 W | X | X | 37.60 / 15.22 |
| NW ¼ SE ¼ | S21 T138 N R26 W | X | X | 38.16 / 15.44 |
| SE ¼ NE ¼ | S21 T138 N R26 W | - | X * | 35.36 / 14.31 |
| W ½ NE ¼ SE ¼ | S21 T138 N R26 W | - | X * | 18.95 / 7.67 |
| **Total Area Acres / Hectares** | - | **277.05 / 112.12** | **369.22 / 149.40** | **369.22 / 149.40** |

**In these land parcels, mineral rights include manganese and all other non-coal and non-iron ore resources (coal and iron ore mineral rights are reserved by the State).*

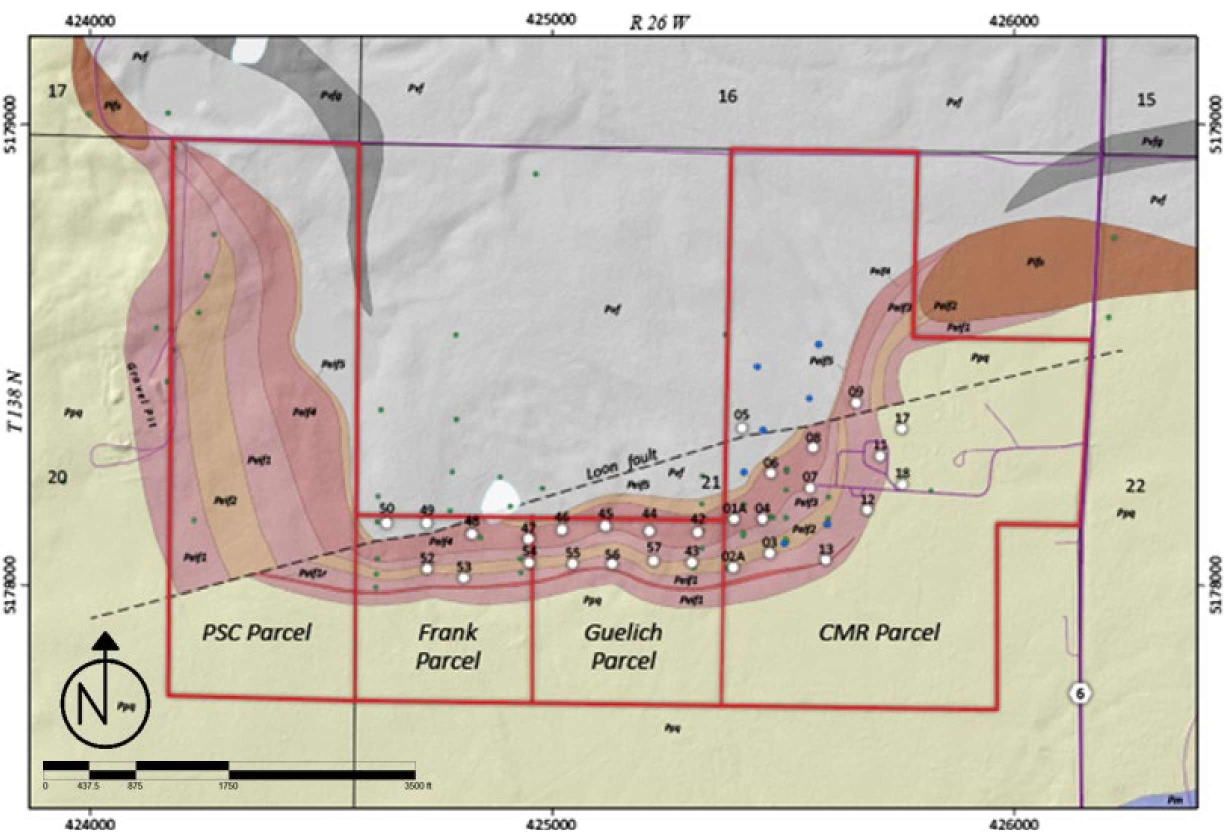



**Figure 4-2: Land Holdings**

(Source: Steiner, A., et. al., 2024)

## 4.2 Permits and Authorizations

All exploratory drilling and general operations for this program were conducted on private land (surface and minerals). As such, and per Minnesota State Statutes, regulatory oversight of drilling activities was overseen by the Minnesota Department of Natural Resources (DNR) and the Minnesota Department of Health (MDH). The following entities, roles and license numbers were involved in the drilling, oversight, and abandonment of all drillholes for the mineral project:

- DNR Registered Explorer: North Star Manganese – License No. E23-0126
- MDH Registered Explorer: Big Rock Exploration LLC – License No. 3228
- MDH Registered Explorer: Timberline Drilling Inc. – License No. 4166
- MDH Certified Responsible Individual – Gabriel Sweet, MSc PG – License No. 2992

These permits were used during the 2023 drilling season and the QP assumes they can be renewed as needed by completion of the necessary requirements.

## 4.3 Environmental Permits

The Emily Project is an exploration stage mineral project, and permits will be acquired as needed.

Reclamation of the 2023 drill campaign has been completed and confirmed on site by MDNR and MDH as of July 2025.

# 5. ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

## 5.1 Accessibility

The mineral deposit of the NSM Project is located near Emily, Minnesota. The Emily manganese deposit is located approximately 2 miles (3.2 km) north of the City of Emily, Minnesota, and is accessed by Minnesota State Highway 6, which runs adjacent to the Emily Project site. The nearest airport is the Brainerd Lakes Regional Airport situated approximately 34 miles (54.7 km) southwest of the Emily Project. The nearest Class-1 Railroad terminals are via the Burlington Northern Santa Fe line with a terminal and service yard in Brainerd, approximately 38 miles (61.2km) southwest of the Emily Project, and a terminal in Grand Rapids, approximately 47 miles (75.6 km) northeast of the Emily Project.

The manganese chemical processing facility site location of the NSM Project will be remote to the Emily deposit location and is still under review and consideration.

## 5.2 Climate

The climate at Emily will vary seasonally from daytime high temperatures in the summer of up to 81 degrees Fahrenheit (27.2 degrees Celsius) and 5 degrees Fahrenheit (-20.6 degrees Celsius) in winter. Average precipitation is 27 inches (68.6 centimeters) per year, and the annual average snowfall is 45 inches (165.1 centimeters), with the greatest accumulation in December through March.

## 5.3 Local Resources and Infrastructure

Local infrastructure and resources are well established in the Emily area. Historical iron ore mining on the Cuyuna Iron Range has left a permanent mark on the landscape and infrastructure through an excellent network of roads, rail connections, and utilities. However, there is no current iron ore mining activity in the Cuyuna Iron Range, only sand, gravel, and aggregate operations.

Minnesota is the fifth highest non-fuel mineral value producing state, with iron ore being the primary mineral commodity by value in Minnesota, leading the country in iron ore production. A significant portion of the iron ore mined in the United States over the past one hundred years has come from mines in Minnesota, specifically the Mesabi Iron Range, located to northeast of the Emily Project area. The Mesabi Iron Range extends approximately 120 miles (201 km) in length, from Grand Rapids Minnesota in the west to Babbitt Minnesota in the east and includes both historic and current mining operations. Grand Rapids is approximately 47 miles (76 km) to the north-northeast of the Emily Project. Currently, there are six mining-processing complexes on the Mesabi Iron Range, and these operations currently supply more than 90% of domestic U.S. iron ore production in the form of taconite and taconite pellets (manufactured iron pellets). Mining and processing infrastructure and services are readily available in the area.

The Emily Project area is serviced by State and Federal roads and highways, regional and international air transport, and local, national, and international rail connections, via the Burlington Northern Santa Fe Railroad at Brainerd and Grand Rapids and are linked to domestic and international waterways. St. Paul is approximately 154 miles (248 km) south of Emily and is the northernmost commodity transshipment riverport on the Mississippi River and the Gulf of Mexico.

The lake seaports of Duluth Minnesota and Superior Wisconsin are also connected to the nearby rail junctures. Duluth is located on the north shore of Lake Superior at the westernmost point of the Great Lakes. Superior Wisconsin is immediately adjacent, and to the east of Duluth. The ports of Duluth and Superior are accessible to oceangoing vessels from the Atlantic Ocean 2,300 miles (3,700 km) via the

Great Lakes Waterway and the Saint Lawrence Seaway. Duluth and Superior are major transportation centers for the transshipment of bulk commodities, including coal, taconite pellets, agricultural products, steel, limestone, and cement, as well as manufactured goods, shown on Figure 5-1.


**Figure 5-1: Emily Project in Proximity to Great Lakes Shipping**

(Source: MITECHNEWS.COM, 2015)

## 5.4 Physiography

The Project area is in the Mississippi River Watershed, as shown on Figure 5-2, with an eventual flow into the Gulf of Mexico.

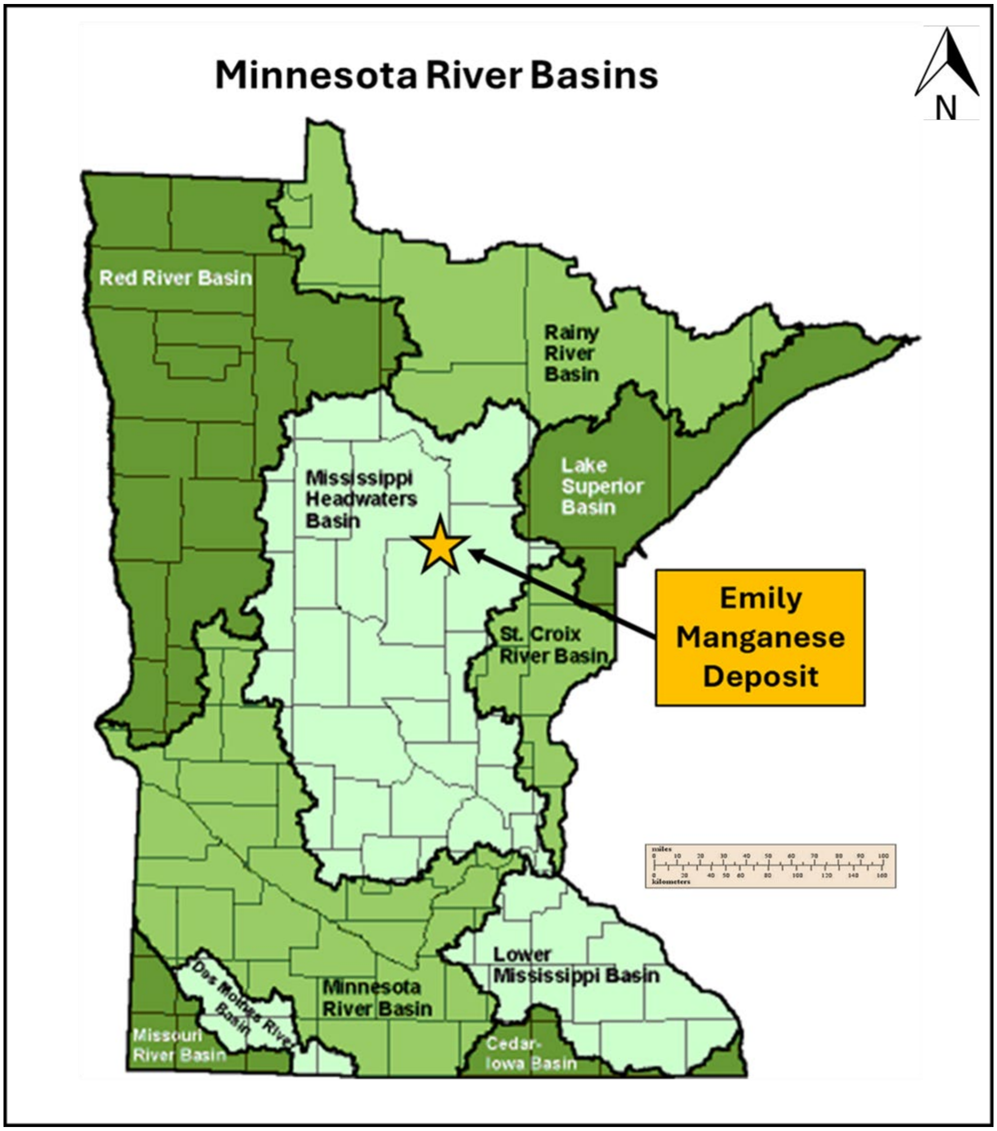



**Figure 5-2: Minnesota River Basins**

(Source: Minnesota Geospatial Information Office)

## 5.5 Topography

The Emily Project properties range from 1,280 – 1,325 feet (390 – 404 meters) above sea level. The local topography is relatively low and flat, as shown on Figure 5-3. There are no bedrock outcrops at the Emily Project site due to approximately 200 feet (61 meters) of glacial outwash and till surface cover. The Emily Project area, totaling 369.22 mineral acres (149.40 hectares) and 277.05 surface acres (112.12 hectares), includes a small, seasonal endorheic wetland, approximately 10-12 acres (4-5 hectares) in size.

**Figure 5-3: Emily Project Lands**

(Source: North Star Manganese, 2022)

In the immediate Emily area, the area is relatively flat due to glacial scraping and includes glacial lakes. Regionally, there are some localized areas of rugged relief due to numerous natural glacial lakes and a limited number of man-made lakes. Low lying hills and ridges frequently occur beside lakes, especially the post-mining lakes.

The landscape includes lake-dotted terrain with thin glacial deposits over bedrock, to hummocky or undulating plains with deep glacial drift, and wide, poorly drained peat lands. Vegetation in the area is common of Laurentian mixed forest regions, consisting of areas of conifer forest, mixed hardwood and conifer forests, and conifer bogs and swamps. Drainage from the area follows the Upper Mississippi River Basin.

# 6. HISTORY

The following history was reported to Forte by NSM and previous NI 43-101 reports. In general, these items have not been verified by the QP.

## 6.1 Ownership

- In 1913, two holes were drilled by Osterburg & Johnson in the greater Emily Project area.
- In the 1940s Pickands Mather Mining Company (today, part of Cleveland-Cliffs Corporation), while exploring for iron ore during a search for a geologic connection between the north-west section of the Cuyuna Iron Range and the western end of the Mesabi Iron Range, discovered the Emily District, including the Emily manganese deposit (the Emily Project area).
- The Oliver Mining Company (a historic U.S. Steel company) operated in the Cuyuna Iron Range to 1969, and specifically in the Emily District from 1951 to 1960. Emily Project area lands, including land adjacent properties, owned, or leased by Oliver Mining from private owners and the State of Minnesota, were explored by Oliver Mining during this period. Upon completion of the exploration, including extensive geophysical work and drilling, U.S. Steel (Oliver Mining's parent corporation) designed an open pit mine for the West Ruth Lake area, which includes the Emily Project property (Strong, 1959). By the early-1960s U.S. Steel decided not to proceed with the West Ruth Lake Mine and two nearby proposed mines, the East Ruth Lake Mine, and the Mary Lake Mine, and proceeded to move its iron mining operations to the Mesabi Iron Range for the mining of taconite and production of taconite pellets for its steel mills.
- In the 1960s, Pickands Mather's Chief Mining Engineer, Delno W. Carlton, converted a lease to privately owned property, containing manganese-rich iron ores held since the 1950s and purchased five (5) mineral parcels, two (2) with surface rights (together, the "Carlton Properties"), from Pickands Mather Mining Company.
- On November 20, 2008, a subsidiary of Crow Wing Power (the future CMR) signed an Agreement for Purchase of Land and Mineral Rights on the Carlton Properties from Cammilla C. Carlton, Steven C. and Katherine D. Carlton, and Raymond Culp (sellers). The sellers received U.S. two million, five hundred thousand dollars ($2,500,000) with the residual obligation of U.S. two million dollars ($2,000,000) to be paid to the sellers within thirty (30) days following the receipt of all necessary governmental permits for full operation of a mine and after full production of the mine has commenced, they reserved certain royalty interests in the mineral parcels. Deeds for the lands were conveyed to Hunt Enterprises, LLC (predecessor company to CMR) on December 16, 2008. The deeds are applicable to the following:
    - Two (2) surface parcels in Crow Wing County, Minnesota:
        - the SW ¼ of the NE ¼ of Section 21 / Township 138 North / Range 26 West (37.60 surface acres - 15.22 surface hectares), and
        - the NW ¼ of the SE ¼ of Section 21 / Township 138 North / Range 26 West (38.72 surface acres - 15.67 surface hectares).
    - Five (5) mineral parcels in Crow Wing County, Minnesota:
        - the NW ¼ of the NE ¼ of Section 21 / Township 138 North / Range 26 West (37.86 mineral acres - 15.32 mineral hectares) and the State of Minnesota mineral reservation on the production of coal and iron ore on this parcel,

        - the SW ¼ of the NE ¼ of Section 21 / Township 138 North / Range 26 West (37.60 mineral acres - 15.22 mineral hectares),
        - the NW ¼ of the SE ¼ of Section 21 / Township 138 North / Range 26 West (38.72 mineral acres – 15.67 mineral hectares),
        - the SE ¼ of the NE ¼ of Section 21 / Township 138 North / Range 26 West (35.36 mineral acres - 14.31 mineral hectares) and the State of Minnesota mineral reservation on the production of coal and iron ore on this parcel, and
        - the W ½ of the NE ¼ of the SE ¼ of Section 21 / Township 138 North / Range 26 West (18.95mineral acres - 7.67 mineral hectares) and the State of Minnesota mineral reservation on the production of coal and iron ore on this parcel.

- On May 15, 2019, People's Security Company, Inc., a wholly owned subsidiary of Crow Wing Power, purchased certain lands in Crow Wing County, Minnesota: The deeds are applicable to the following:
    - Three (3) surface and mineral parcels in Crow Wing County, Minnesota:
        - the NE ¼ of the NE ¼ of Section 20 / Township 138 North / Range 26 West (41.02 mineral acres – 16.60 mineral hectares),
        - the SE ¼ of the NE ¼ of Section 20 / Township 138 North / Range 26 West (41.02 mineral acres – 16.60 mineral hectares), and
        - the NE ¼ of the SE ¼ of Section 20 / Township 138 North / Range 26 West (41.30 mineral acres – 16.71 mineral hectares).
- On April 22, 2020, CMR and PSC signed a series of agreements with NSM on the mining and processing of manganese minerals which established two general arrangements (described in Item 1.0 of this Report):
    - a contract mining and sales arrangement between NSM and CMR for the extraction of manganese from the property whereby NSM has the exclusive right to mine and purchase the manganese minerals; and
    - separate property leases and a manganese processing agreement between NSM, CMR and PSC, where CMR and PSC, collectively, will receive as rent for their properties a portion of NSM's distributed profits from downstream sale of processed advanced materials from any mineralized materials mined by NSM from the AOI.
    - As part of the agreements, NSM also has a right to purchase the CMR and PSC properties for thirty million, two hundred and fifty thousand dollars ($30,250,000) at any time prior to the initiation of commercial production. There are no limitations on NSM or CMR/PSC to negotiate a different purchase and sale arrangement.
- On January 17, 2023, NSM signed a series of agreements including a fifty (50)-year property lease, with two (2) renewals of thirty-five (35)-years each, with Jay W. Guelich and Jeffery L. Guelich, tenants in common (the "Guelich Property").
    - The Guelich Property is in the NE ¼ of the SW ¼ of Section 20 / Township 138 North / Range 26 West (39.19 acres – 15.86 hectares) and consists of both surface and mineral rights.

- Lease terms include annual lease payments of U.S. six thousand dollars ($6,000) escalating at three percent (3%) per year, one-time payments of U.S. one-thousand five hundred dollars ($1,500) per drill pad developed (multiple drillholes can be drilled from each pad), and a two and one-half percent (2½%) Net Smelter Return Royalty of any products or commodities mined and sold from the Guelich Property. NSM has a royalty buy-back agreement on the Guelich Property.
- NSM also has the right to purchase the Guelich Property at any time for its assessed fair market value, plus fifteen (15%) percent. The Net Smelter Return Royalty is independent of any property purchase.

- On February 3, 2023, NSM signed a series of agreements including a fifty (50)-year property lease, with two (2) renewals of thirty-five (35)-years each, with Kenneth R. Frank and Julie M. Frank, Trustees of the Frank Living Trust (the "Frank Property").
  - The Frank Property is located in the NW ¼ of the SW ¼ of Section 20 / Township 138 North / Range 26 West (38.72 acres – 15.67 hectares) and consists of both surface and mineral rights.
  - Lease terms include annual lease payments of U.S. six thousand dollars ($6,000) escalating at three percent (3%) per year, one-time payments of U.S. one-thousand five hundred dollars ($1,500) per drill pad developed (multiple drillholes can be drilled from each pad), and a two and one-half percent (2½%) Net Smelter Return Royalty of any products or commodities mined and sold from the Frank Property. NSM has a royalty buy-back agreement on the Frank Property.
  - NSM also has the right to purchase the Frank Property at any time for its assessed fair market value, plus fifteen (15%) percent. The Net Smelter Return Royalty is independent of any property purchase.
- As of the date of this Report, all leases are current.

## 6.2 Work History

- Exploration work by the Pickands Mather Mining Company from 1945 to 1962 defined the "Carlton Reserve" at the Emily Project site.
- In 1951, Oliver Mining Company leased lands in the area and conducted extensive geophysical work detailed exploration through 1959.
- Extensive studies of the Emily deposit were conducted in the 1990s by the United States Bureau of Mines, the University of Minnesota, and the Minnesota Geological Survey.
- The United States Bureau of Mines undertook exploration work in 1995.
- John E. Pahlman completed a resource estimation of the Emily deposit in 1996 following the 1995 exploration work and this was reported in a United States Bureau of Mines document.

In 2008 with the acquisition of the Emily Project property to April 2020, CMR spent more than U.S. $23 million on technical studies, exploratory drilling, and process development.

Significant activities undertaken by CMR included:

- Michael Ward of Marston & Marston Inc. completed a resource estimation of the Emily deposit as part of a due diligence study on the property, in 2008.

- CMR initiated a pilot test involving a borehole mining tool in 2009 to assess the effectiveness of extracting manganese enriched zones to the surface for commercial mining using this technique. Rice Lake Construction was contracted to undertake this pilot test.
- Barr Engineering performed a geotechnical and hydrogeological investigation in conjunction with the borehole mining pilot test being undertaken in 2009.
- Rice Lake Construction completed the borehole mining pilot test in the fall of 2011.
- Barr Engineering undertook and completed a resource drilling program in the fall of 2011. Part of this program included a geotechnical analysis of the manganese-enriched zone.
- Barr Engineering undertook and completed a resource drilling program in the fall and winter of 2012.
- Kemetco Research Inc, a metallurgical laboratory in Richmond, Canada, to conduct bench-level pilot processing to extract, upgrade and process manganese carbonate (MnCO3), Electrolytic Manganese Metal (EMM), and Electrolytic Manganese Dioxide (EMD).

## 6.3 Historical Mineral Resource Estimates

- In 1950, A. D. Chisholm (Pickands Mather Mining Company) estimated a manganese resource of 2,142,500 short tons grading at 20.82% manganese at the Emily deposit. No cut-off grade was stipulated with this estimation.
- In 1950s U.S. Steel (Oliver Mining Company) undertook additional drilling, and in 1959 designed the West Ruth Lake Open Pit Mine, targeting 24,012,200 short tons manganese resource @ 15.29% Mn and 23.38% Fe (Strong 1959). The West Ruth Lake Mine included the CMR Property (including the Pickands Mather "Carlton Reserve"), the Guelich Property, the Frank Property, and the PSC Property and certain portions of adjacent land outside their original pit domain as part of the total reserve of the proposed mine.
- In 1996, John E. Pahlman (United States Bureau of Mines) estimated 500,000 short tons of manganese contained in 7.2 acres of ore containing a Mn>10% cut-off grade at the Emily deposit. No manganese grade was stipulated with this estimate.
- In 2008, Michael Ward (Marston & Marston Inc.) estimated 2,102,000 short tons of mineral grading at 19.8% manganese with a Mn>10% cut-off grade at the Emily deposit. This was estimated for the CMR mineral parcels only.
- In 2012 through 2016, Barr Engineering prepared a scoping level estimate of about 2.8 million short tons of mineralized rock grading at 20.37% manganese at a Mn>10% cut-off grade at the Emily deposit. The internal estimate was prepared for CMR on their own mineral parcels only and cannot be considered representative of the overall deposit.

The first references to estimating reserves in Emily District date from 1950. Unpublished scoping level work was done as recently as 2012, these mineral resources are considered "historical" in nature, as a qualified person has not done sufficient work to classify the historical estimate as current mineral resources or mineral reserves. NSM is not treating the historical estimates as current mineral resources or mineral reserves.

- BRE was contracted by NSM in October 2021 to perform basic modeling of the manganese (Mn) resource on their Emily Property in northcentral Minnesota. The work undertaken was for internal analysis and future drill targeting, and included:
  - An updated basic geological model for the Emily Manganese Deposit area of interest (AOI),
  - An internal resource model and grade-tonnage estimate (non–NI 43-101 Compliant) for the Emily Manganese Deposit AOI for future drill targeting purposes.

The mineral resources noted in this section are now considered “historical” in nature. The first references to estimating reserves in Emily District dated from 1950, and these historical works do not comply with the modern industry standards in terms of quality control and quality assurance of the information provided by drilling, sampling, and laboratory analysis. It is not possible to track an effective control or work replication for this historical data which does not comply with current NI 43-101 or similar industry standards. For these reasons item “14. Mineral Resources Estimates” of this report supersedes all previous estimations.

In 2020, Barr produced a qualifying National Instrument 43-101 Technical Report, “Resource Estimate on the Emily Property, Minnesota USA”, for NSM. The report was an updated assessment of the original work undertaken by Barr in 2012, using more sophisticated and advanced modeling software, including a reassessment of the geology and drilling data from the prior period. At an Mn>10% cut-off grade, Barr estimated 5,685 thousand Indicated short tons @ 19.20% Mn and 23.02% Fe and 778 thousand Inferred short tons @ 22.48% Mn and 22.15% Fe on the CMR lands (Table 6-1).

**Table 6-1: Barr 2020 Resource Estimate of Emily Manganese Deposit**

| Category | Mn Cut-off % | Avg Mn % | Avg Fe % | Short Tons (x1000) |
|---|---|---|---|---|
| Indicated – Total | 10 | 19.20 | 23.02 | 5,685 |
| Inferred – Total | 10 | 22.48 | 22.15 | 778 |

Table 6-1 above was taken from: Resource Estimate on the Emily Property, Minnesota USA, Prepared for North Star Manganese, June 12, 2020, Barr Engineering Company, page 13.

The 2022 Barr NI 43-101 Technical Report was prepared as an update to the Barr NI 43-101 Technical Report issued in 2020 and principally addressed the addition of important and significant mineral rights acquisitions associated with the Emily deposit. Since the change is focused on the addition of mineral rights, it does not change the Resource Estimate of 2020.

The Barr reports of June 2020 and June 2022 were prepared in accordance with Canadian National Instrument 43-101 standards as of those dates; the Barr reports are superseded by this Report.

**Table 6-2: Forte Dynamics, Inc 2024 Resource Estimate of Emily Manganese Deposit**

| Category | Mn Cut-off % | Metric Tons (kt) | Density (g/cm$^3$) | Mn (%) | Fe (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|
| Indicated – Total | 10 | 6,234 | 3.10 | 19.27 | 22.41 | 29.38 |
| Inferred – Total | 10 | 4,915 | 3.15 | 17.50 | 20.44 | 32.29 |

In May 2024, Forte Dynamics, Inc published a Mineral Resource Estimate for Emily including a drilling program performed in 2023. This resulted in an estimate of 6,234 kt of Indicated Mineral Resource @ 19.27% Mn and 4,915 kt of Inferred Mineral Resource @ 17.50% Mn.

# 7. GEOLOGICAL SETTING AND MINERALIZATION

The Emily deposit is hosted by rocks of the Paleoproterozoic Animikie Basin (the Emily Iron Formation). The stratigraphy, structure, and high-grade manganese mineralization within these rocks is the result of long periods of sedimentation, deformation, and erosion along the ancestral southern margin of the Superior Craton. The driving force in the sedimentation and deformation of these rocks occurred during the Paleoproterozoic Penokean Orogeny, as briefly described below.

## 7.1 Penokean Orogeny

The Penokean orogeny began at about 1880 Ma when an oceanic arc, the Paleoproterozoic Pembine–Wausau terrane, collided with the southern margin of the Archean Superior (Laurentia) craton marking the end of a period of south-directed subduction. The docking of the buoyant craton to the arc resulted in a subduction jump to the south and development of back-arc extension both in the initial arc and adjacent craton margin to the north. Synchronous extension and subsidence of the Laurentia craton resulted in the development of broad shallow seas overlapping the Archean craton. The classic Superior-type banded iron-formations of the Lake Superior District, including those in the Marquette, Gogebic, Mesabi, and Gunflint Iron Ranges, formed in that sea. The newly established subduction zone caused continued arc volcanism until about 1850 Ma when a fragment of Archean crust, now the basement of the Marshfield terrane, arrived at the subduction zone.

The convergence of Archean blocks of the Superior and Marshfield cratons resulted in the major contractional phase of the Penokean orogeny. Rocks of the Pembine–Wausau arc were thrust northward onto the Superior craton causing subsidence of a foreland basin in which sedimentation began at about 1850 Ma in the south (Baraga Group rocks) and 1835 Ma in the north (Rove Formation). A thick succession of arc-derived turbidites constitutes most of the foreland basin-fill along with lesser volcanic rocks. In the southern fold and thrust belt, tectonic thickening resulted in high-grade metamorphism of the sediments by 1830 Ma. At this same time, a suite of post-tectonic plutons intruded the deformed sedimentary sequence and accreted arc terranes marking the end of the Penokean orogeny. A regional geologic map of the Penokean orogen, modified from Schulz and Cannon (2007), is given in Figure 7-1.

The Penokean deformation in Minnesota includes a southern intensely and complexly deformed series of thrust panels (Cuyuna North, Cuyuna South, Moose Lake, McGrath-Little Falls panels) that gives way northward to progressively more weakly and simply deformed rocks (Emily District) across a belt about 66 miles (100km) wide. Farther north strata in the Mesabi and Gunflint Iron Ranges are essentially undeformed (Holst, 1991). It should be noted that the "more weakly and simply deformed rocks" of the Emily District have been shortened ~250% into a series of shallowly east-plunging anticlines and synclines. Substantial progress has been made in deciphering the structure of the poorly exposed rocks of the Minnesota foreland through the use of aeromagnetic and gravity data and drillhole information. Southwick and Morey (1991) and Southwick et al. (1988) have presented syntheses of this information.

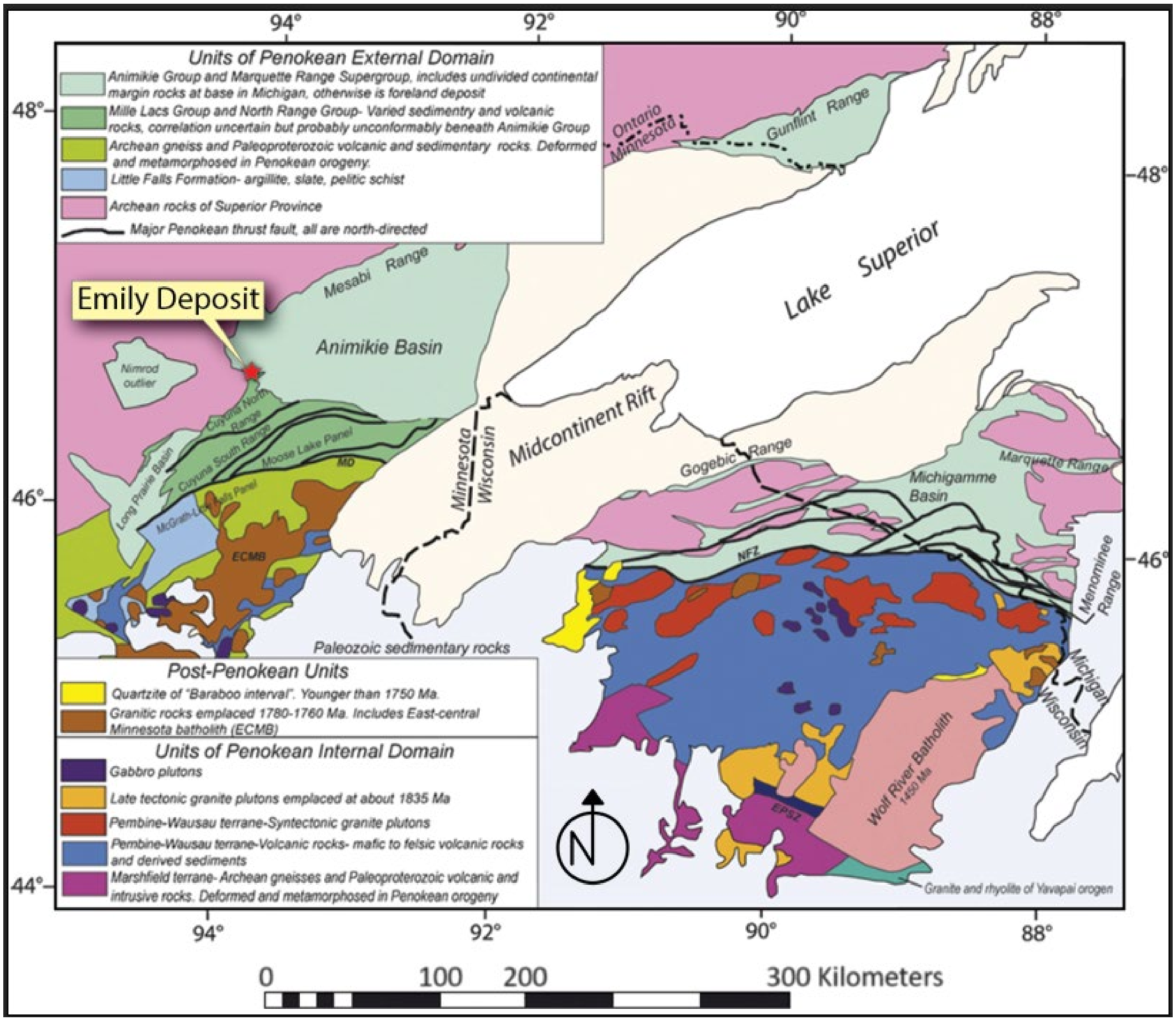



**Figure 7-1: Generalized Geologic Map of the Penokean Orogen**

(Source: Modified from Schulz and Cannon, 2007)

*Notes: Abbreviations: ECMB - East-Central Minnesota Batholith; EPSZ - Eau Pleine Shear Zone; MD - Malmo Discontinuity; NFZ – Niagara Fault Zone.*

The complex thrust panels on the south, like comparable structures in Michigan, appear to be thin-skinned slices without Archean basement rocks. However, as in Michigan, this area of thin-skinned thrusting is also the area where Archean-cored gneiss domes developed during post orogenic collapse of the Penokean orogen (Holm and Lux, 1996; Schneider et al., 2004). Farther north, basement-cover relations are not well known except for the Mesabi Iron Range where Paleoproterozoic strata are mostly nearly flat lying above an undisturbed unconformity with Archean basement rocks. A schematic north-south geologic cross section of the Penokean orogeny in Minnesota, modified from Southwick and Morey (1991) is presented in Figure 7-2.

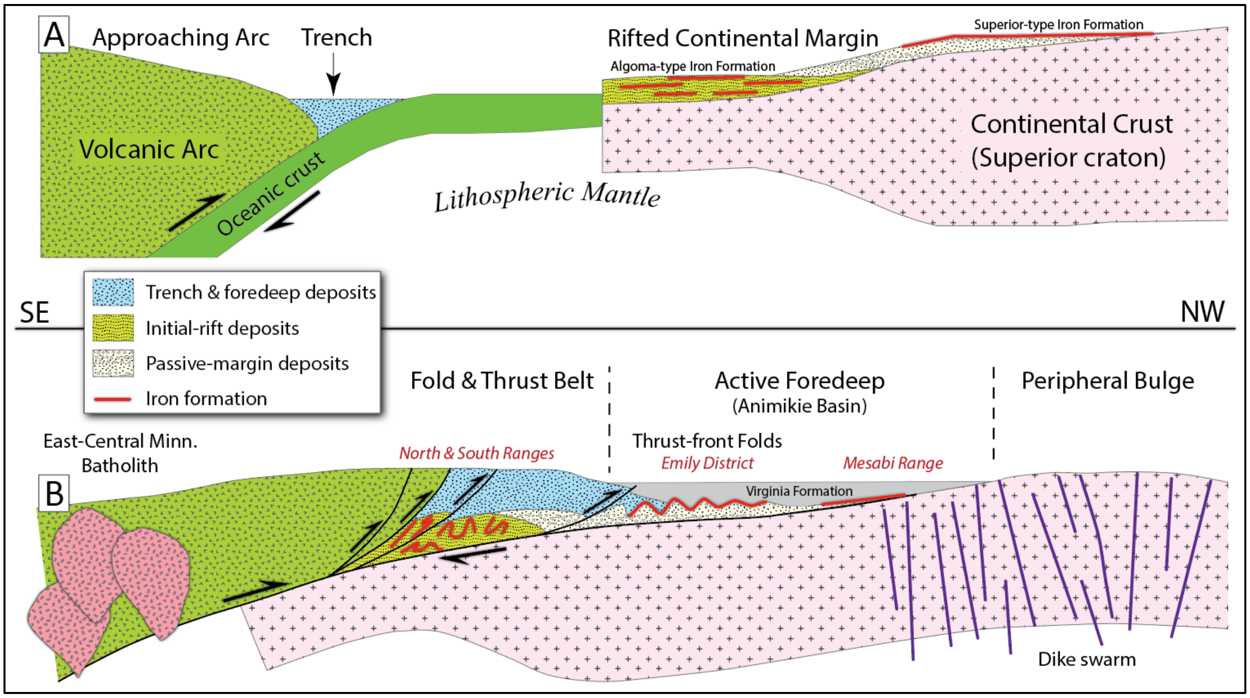



**Figure 7-2: Schematic Diagram Illustrating the Interpreted Tectonic Setting of the Penokean Orogen in Minnesota**

(Source: Modified from Southwick & Morey, 1991)

*Notes: A) continental margin sedimentation, and B) thin-skinned thrusting and deformation related to the Penokean orogeny.*

## 7.2 Post Penokean Weathering and Erosion

Perhaps the most important component in the formation of the high-grade manganese resource at the Emily deposit is the vast amount of time (measured in hundreds of millions of years) upon which the newly formed and uplifted Penokean mountains of the southern Laurentia craton weathered and eroded. As plate tectonic forces moved Laurentia across the globe to its current position on planet Earth there were long periods of time when it resided within the tropical weathering zone (+30° to -30° latitude) near the Earth's equator. It is believed that the supergene enrichment of manganese (to >50 wt.% elemental Mn) at the Emily deposit largely formed during the protracted periods of time that the area resided within the tropical weathering zone. A paleogeographic reconstruction of the location of Laurentia on planet Earth is given in Figure 7-3.

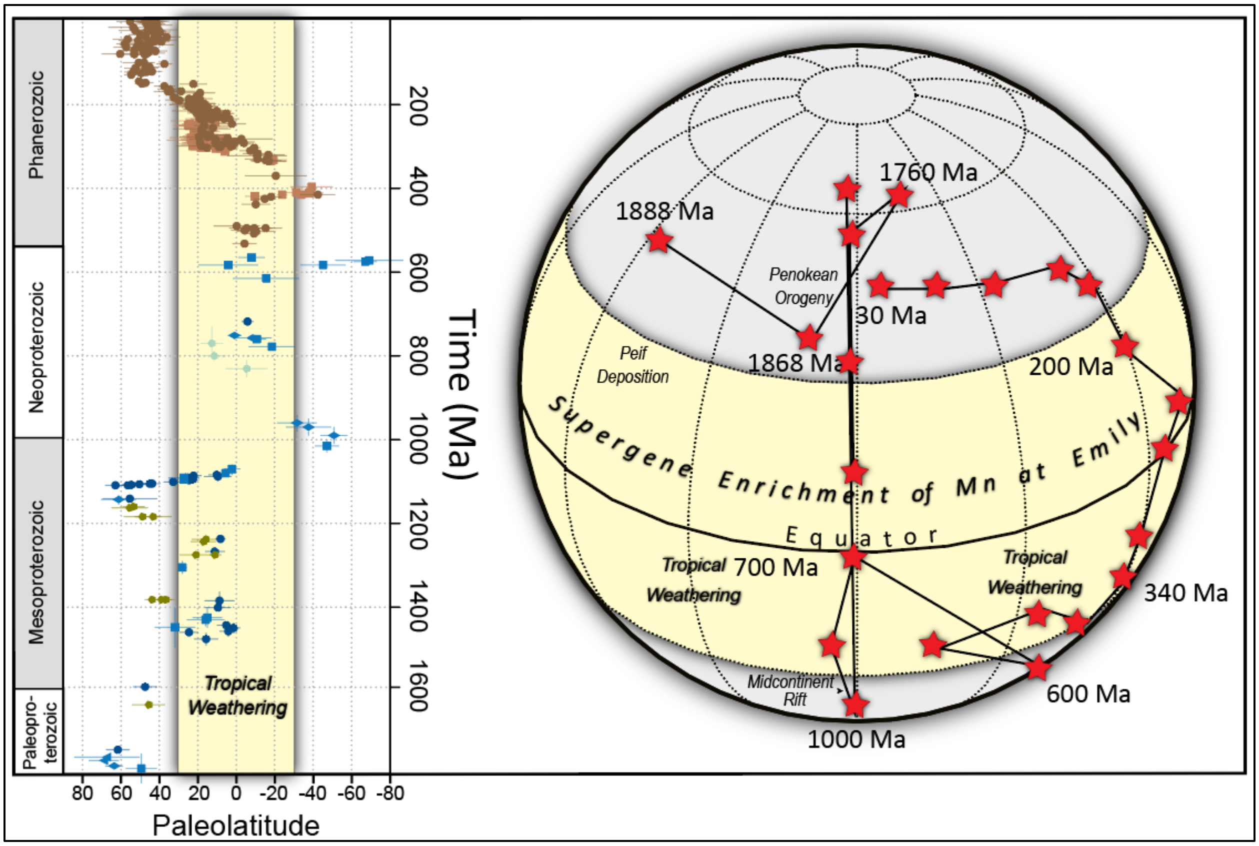



**Figure 7-3: Paleogeographic Reconstruction of the Laurentia Craton from the Paleoproterozoic to Present Times**

(Source: Steiner, A., et. al., 2024)

## 7.3 Animikie Basin Mineral Resources

To gain a true understanding of the geology and mineral resources of the Emily Manganese Deposit, it is best to start with an understanding of the regional-scale geologic setting and its contained ferrous mineral resources. For this Report, a brief description of Minnesota's Paleoproterozoic Iron Ranges (Figure 7-4) and their contained ferrous mineral resources is included herein. These Paleoproterozoic Iron Ranges include several categories of marine chemocline mineral systems outlined in recent USGS publications (Schulz et al., 2017 and Hofstra and Kreiner, 2020). These categories include:

1) Superior-iron deposits (Mesabi Iron Range, Gunflint Iron Range and the Emily District of the Cuyuna Iron Range) and
2) Algoma-type iron +/- manganese deposits (Cuyuna North and South Iron Ranges, and the Vermilion Iron Range).

### 7.3.1 Superior Type Iron Resources of the Mesabi Iron Range

Superior type iron formation resources of Minnesota are exemplified by the long-standing mining of iron resources of the Biwabik Iron Formation along the length of the Mesabi Iron Range. The Mesabi Iron Range is largely located in St. Louis and Itasca counties and has been the most important iron ore district in the United States since ~1890s. The Mesabi Iron Range is 120 miles (193km) long, averages one to two miles wide, and is comprised of rocks of the Paleoproterozoic Animikie Group. The Animikie Group on the Mesabi Iron Range consists of three major conformable formations: Pokegama Formation at the base; Biwabik Iron Formation in the middle; and the overlying Virginia Formation. On the Mesabi Iron Range, these three formations generally dip gently to the southeast at angles of 3-15 degrees.

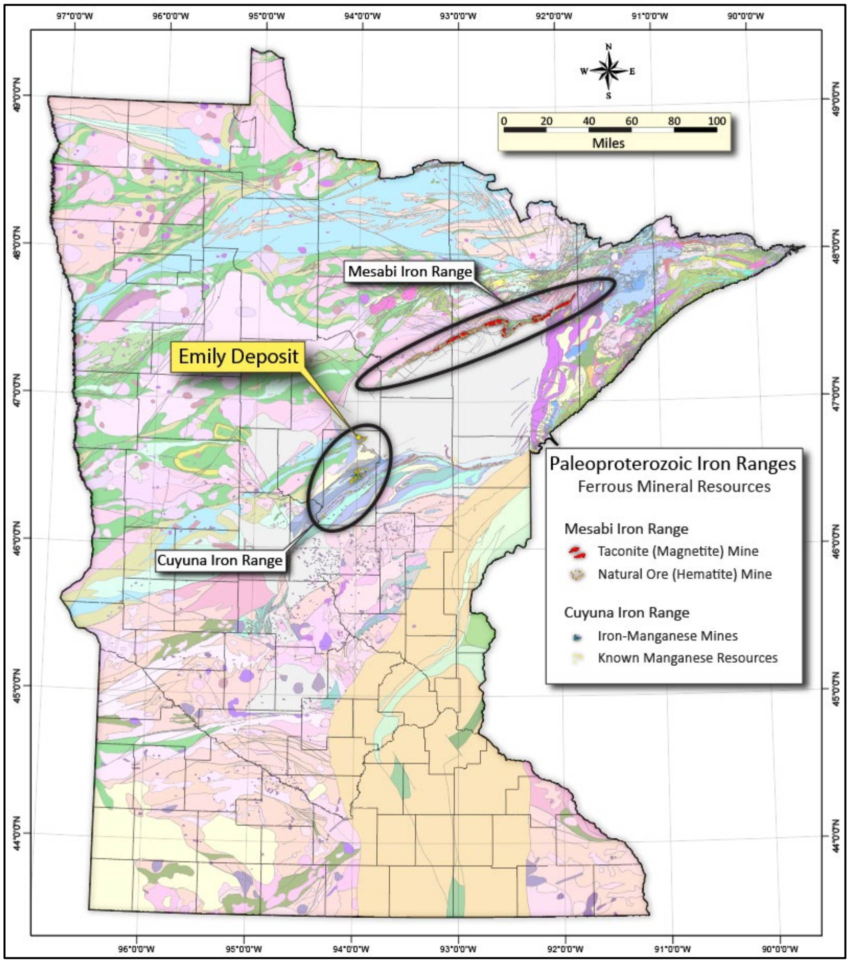



**Figure 7-4: Location Map of Identified Ferrous Mineral Resources in Minnesota**

(Source: Steiner, A., et. al., 2024)

Since the early 20th century, the Biwabik Iron Formation has been subdivided into four informal members referred to as (from bottom to top): Lower Cherty member, Lower Slaty member, Upper Cherty member, and Upper Slaty member (Wolff, 1917). The cherty members are typically characterized by a granular (sand-sized) texture and thick-bedding (beds ≥ several inches thick); whereas the slaty members are typically fine-grained (mud-sized) and thin-bedded (≤1 cm thick beds). The cherty members are largely composed of chert and iron oxides (with zones rich in iron silicate minerals), while the slaty members are composed of iron silicates and iron carbonates with local chert beds. Both cherty and slaty iron-formation types are interlayered at all scales, but one rock type or the other predominates in each of the four informal members, and they are so-named for this dominance Severson et. al. (2009).

Leached and iron enriched direct ores (or 'natural ores' – direct shipping ores, without processing, principally hematite, were the first materials mined, with the first shipments beginning in 1892, from strongly oxidized pockets along fault and fracture zones and the blanket oxidation of the iron formation at the surface. Taconite, which is the material that is mined today using magnetic separation methods, constitutes most of the iron formation and pertains to the hard, non-oxidized portions of the iron-formation. Production has been dominated by vertically integrated steelmakers since 1901, and therefore the mining and utilization of these manganese resources has been dictated largely by U.S. ironmaking capacity and demand.

### *7.3.2 Mn-Fe Resources of the Cuyuna Iron Range*

The Cuyuna Iron Range is about 100 miles (160 km) west-southwest of Duluth in Aitkin, Cass, Crow Wing, and Morrison Counties. It is part of an Early Proterozoic geologic terrane which occupies much of east-central Minnesota. The Cuyuna Iron Range is traditionally divided into three districts, the Emily District, the North Range, and the South Range (Figure 7-5). The Emily District extends from the Mississippi River northward through Crow Wing County and into southern Cass County and comprises an area of about 450 $mi^2$ (1,165 $km^2$). Although exploration drilling was extensive in the Emily District, mining never commenced. The North Range, a much smaller area about 11.8 miles (19 km) long and 5 miles (8 km) wide, is near the cities of Crosby and Ironton, including the former town of Manganese, in Crow Wing County, and the South Range extends approximately 62 miles (100 km) and up to 3 miles (5 km) in width, near Deerwood and Brainerd, in Atkin, Crow Wing and Morrison counties.

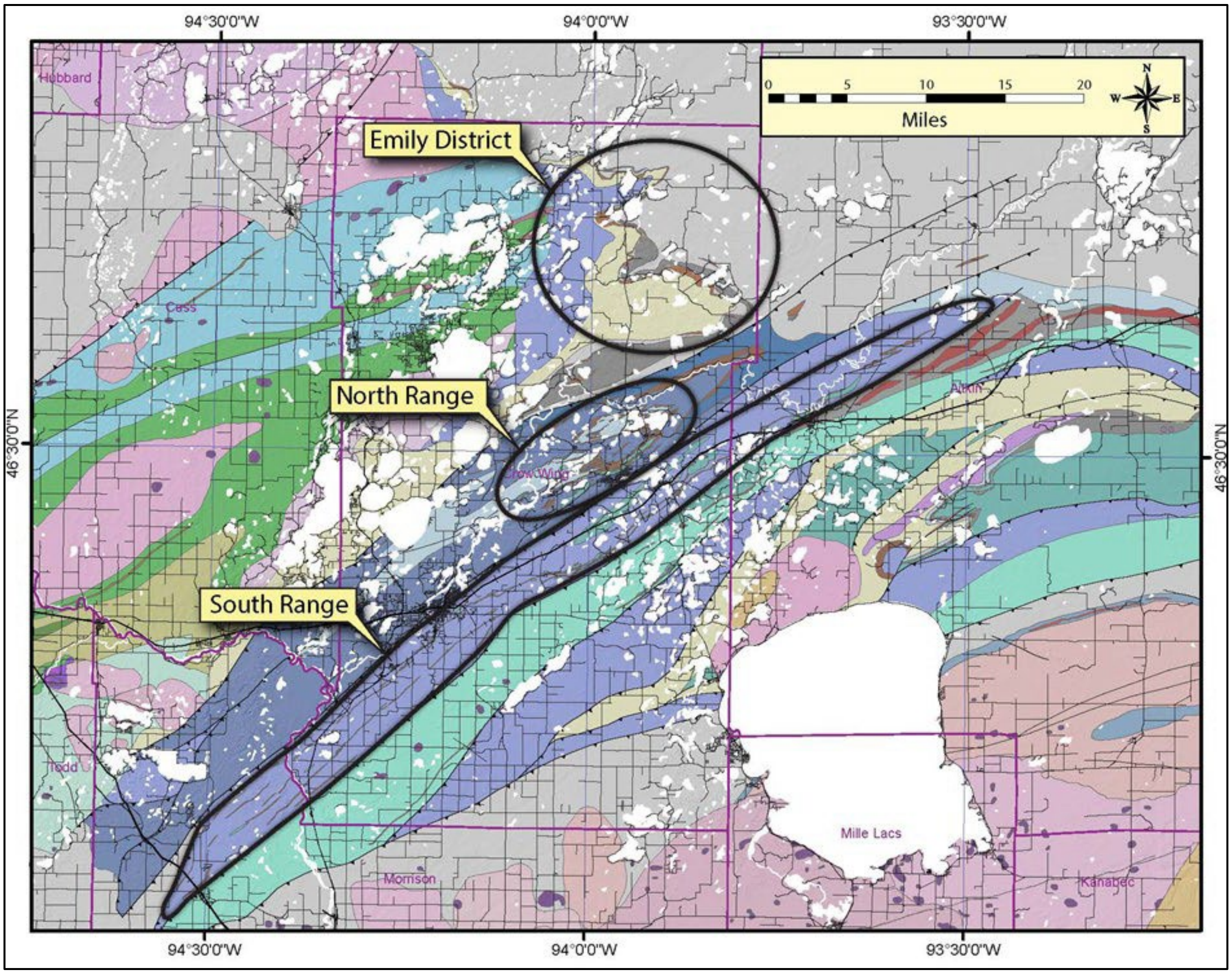



**Figure 7-5: Bedrock Geologic Map of the Cuyuna Iron Range**

(Source: Steiner, A., et. al., 2024)

Since their discovery in 1904, it has been recognized that the iron-formations and associated deposits of the Cuyuna Iron Range in central Minnesota contained appreciable quantities of manganese. The largest quantities of manganese were extracted as manganiferous iron ores from several mines on the North range from 1911 to 1967. The presence of this manganese resource sets the Cuyuna Iron Range apart from other iron-mining districts of the Lake Superior region.

Although relatively small, the North Range was the principal site of mining activity (Figure 7-6), which had largely ceased by 1967. The South Range, principally dominated by open pit mines and limited underground mines, in the 1910s and 20s, comprises an area of northeast-trending, generally parallel belts of iron-formation extending from near Randall in Morrison County northeast for about 62 miles (100 km).

In addition to the three named districts, numerous linear magnetic anomalies occur east of the range proper, and may indicate other, but currently poorly defined, beds of iron-formation. Limited exploration has occurred east of the three districts.

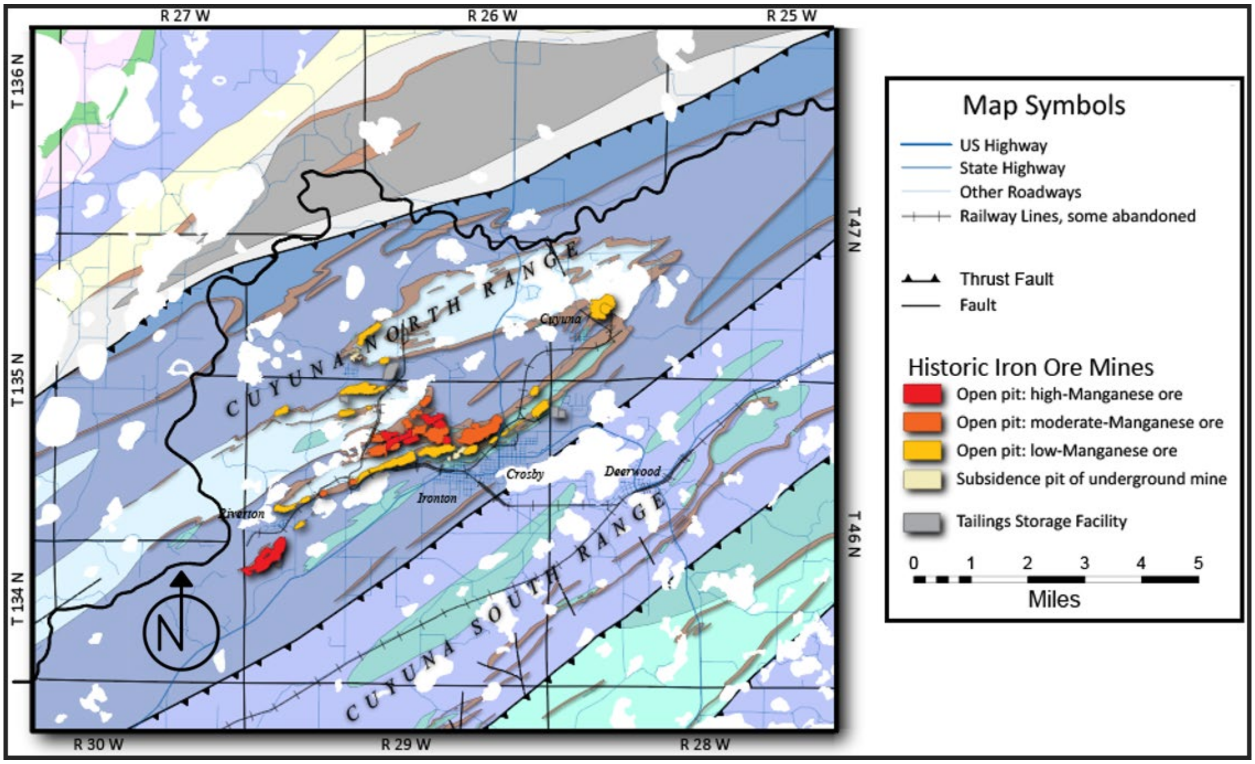



**Figure 7-6: Bedrock Geology and Open Pit Fe-Mn Mine Map of the North Range of the Cuyuna Iron Range**

(Source: Steiner, A., et. al., 2024)

Three major insights regarding the geology of the Cuyuna Iron Range have emerged from the geologic mapping (Schmidt, 1963) and associated studies which utilized geophysical and drilling data (Southwick et al., 1988).

- First, there is clear evidence that iron sedimentation occurred at several different times and under varying geological conditions. This observation invalidates the stratigraphic premises of Morey (1978). Major iron-formations are associated stratigraphically with volcanic rocks in the South Range, with black shale, argillite, and rare volcanic rocks in the North Range, and with shallow-water deposits of sandstone and siltstone in the Emily District.
- Second, the iron-rich strata of the Emily District are correlative with the Biwabik Iron Formation of the Mesabi Range, as inferred by Marsden (1972) and Morey (1978). However, they and the other sedimentary rocks of the well-known Animikie Group occur above a major deformed unconformity that cuts across previously deformed, somewhat older sedimentary and volcanic rocks of the North Range. There, a prominent iron-rich unit named the Trommald Formation, as well as several other units beneath the unconformity, forms part of a locally twice-deformed sequence. Therefore, the rocks of the North Range and the Emily District cannot be correlative but are separate stratigraphic entities. Because the stratigraphic succession of folded sedimentary rocks on the North Range comprises a distinct stratigraphic entity, Southwick et al., (1988) referred to it informally as the North Range group with the understanding that a formal name may be justified later. As defined by Schmidt (1963), the stratigraphic sequence in the North Range consists of a quartz-rich lower unit named the Mahnomen Formation, a middle iron- and locally manganese-rich sequence assigned to the Trommald Formation, and an upper greywacke shale interval called the Rabbit Lake Formation.

- Third, Southwick et al., (1988) recognized several geophysically defined structural discontinuities in the southern part of the Cuyuna Iron Range, within and southeast of the South Range. These discontinuities are marked by demonstrable contrasts in metamorphic grade, by differing structural styles, and by different lithic components. One of the most pronounced of these, the Serpent Lake structural discontinuity, passes along the south edge of the North Range. This discontinuity is interpreted as a tectonic boundary, probably involving major thrust faults between slices of folded rocks. Thus, it seems certain that the iron-rich strata of the South Range are not correlative with either the Trommald Formation of the North Range or the iron-rich strata of the Emily District.

The fact that iron-formation occurs within three different stratigraphic and structural contexts in the Cuyuna Iron Range is of considerable importance to the ultimate development of the manganese resources. Currently the Emily District, the North Range, and the South Range, while geographically taken together as the Cuyuna Iron Range, geologically, the three areas are recognized as separate entities, and regional syntheses cannot extrapolate mineralogical and structural attributes from one entity to another.

### *7.3.3 Cuyuna Iron Range Manganese Resources*

There are additional manganese and manganiferous iron occurrences in the Cuyuna Range. Although attempts have been made, including reports by the U.S. Department of the Interior, the U.S. Geological Survey and the State of Minnesota, there is no credible estimate of the size and potential of the manganese resources withing the Cuyuna Iron Range.

# 8. DEPOSIT TYPES

The depositional sequence at the Emily deposit records two periods of transgression and regression within the chemical sediments of the Emily Iron Formation bracketed by periods of clastic deposition. The Emily Iron Formation is constructed from a sequence of fine- and coarse-grained iron formation subunits that correspond to rise and fall of sea level during deposition (Figure 8-1). The sequence of transgressions and regressions observed at Emily is consistent with similar sequences in the Biwabik Iron Formation on the Mesabi Iron Range. The variations in water depth and corresponding grain size, composition, and morphology have previously been linked to changing sediment sources and input due to regional tectonics driven by the Penokean orogen. The observed changes play a critical role in the initial distribution of manganese and subsequent remobilization during supergene processes highlighting the importance in understanding the sequence.

1. **Pokegama Formation** - The base of the stratigraphic section at the Emily deposit is the Pokegama formation. The Pokegama formation was deposited during a period of high-clastic sediment input into a shallow basin where sediments are sources from the Archean in what is now northern Minnesota and southern Ontario. It has been hypothesized that the transition from clastic sedimentation during the Pokegama formation to chemical sedimentation during the Emily Iron Formation is the result of inundation of Laurentia by a shallow sea.
2. **Emily Iron Formation**
    a. ***Peif1*** - Inundation of the continent cut-off clastic sediment sources and allowed for the accumulation of chemical sediments forming iron formation in the Animikie basin. This transition from clastic to chemical sedimentation is recorded in the interbedded quartzose sands and granular iron formation that characterizes the base of the Peif1 subunit. Deposition of the medium to coarse grained granules and sand grains in Peif1 occurred in the foreshore to shoreface. Granules are composed of ferruginous chert, though there is abundant evidence for dissolution of granules (pock-marked oxidation in granular iron formation) that may be the result of dissolution of granules of varying composition (e.g., Fe-silicates).
    b. ***Peif1r*** - The Peif1r unit, a stromatolitic horizon, indicates a period where the shoreface is exposed allowing for the growth of microbial mats before being inundated again as water levels continue to rise.
    c. ***Peif2*** - Increasing water depth reduced wave and current action on sediments, resulting in the accumulation and preservation of finely laminated banded iron formation as Peif2. The accumulation of Mn- and Fe-carbonates is likely the most important process occurring during deposition of the Emily Iron Formation; this unit is interpreted to be the source of Mn during subsequent supergene enrichment discussed in the following section.
    d. ***Peif3*** – The depositional environment at the Emily deposit returns to the shoreface due to sea level fall during Peif3. Granular iron formation interbedded with finer grained sediments suggest water depth is somewhat deeper than Peif1 but much shallower than Peif2.
    e. ***Peif4*** – A rise in sea level occurred at the onset of massive chert of Peif4. Cherts are commonly deposited in deeper water where iron precipitates formed in the oxic zone dissolve in poorly oxygenated deeper waters. Only silica hydroxides can accumulate in these deeper waters, eventually forming massive chert.

f. ***Peif5*** – The bedded chert in Peif5 is discontinuous making it difficult to confidently assess the depositional environment. However, the abundance of chert suggests a deeper water origin than units Peif1, Peif2, or Peif3.

3. **Virginia Formation** – Water depth continues to increase as does the input of clastic material into the Animikie basin whose provenance may be from the newly formed Penokean highlands. Chemical sedimentation is overwhelmed by clastic input, resulting in greywacke and slates of the Virginia formation.

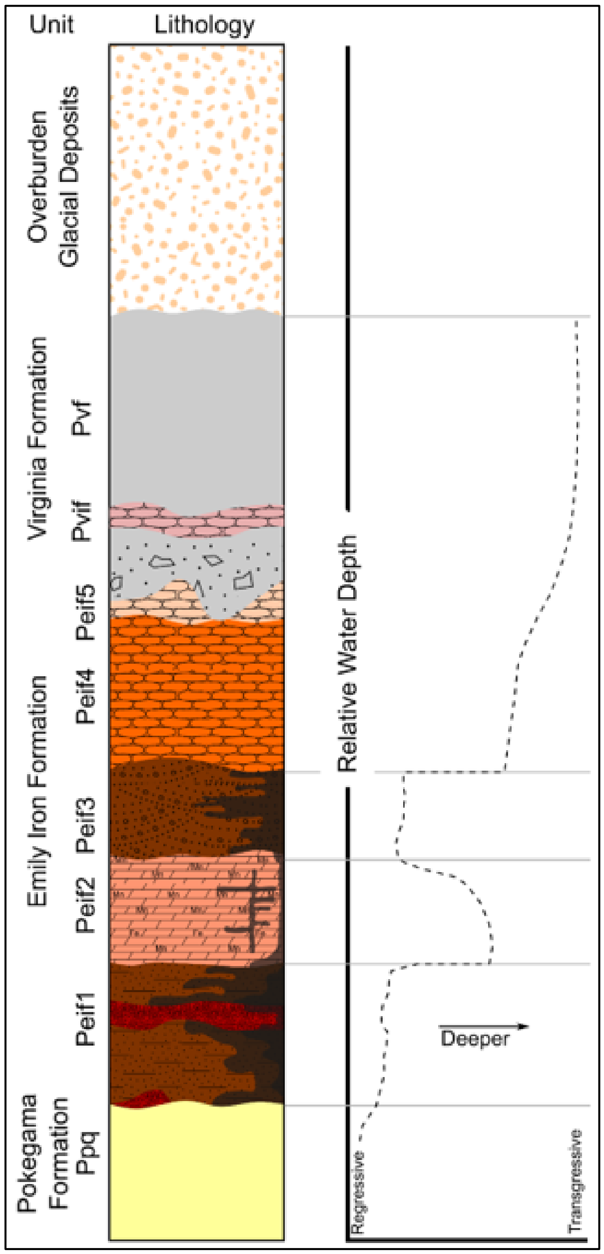



**Figure 8-1: Stratigraphic Units at the Emily Deposit and Relative Water Depth**

(Source: Steiner, A., et. al., 2024)

The Emily Iron Formation is unique among Superior type iron formations in its endowment with manganese. The Biwabik Iron Formation on the Mesabi Iron Range is documented to contain siderite (Fe-carbonate) and more rarely, kutnohorite (Mn-carbonate), but manganese is generally conspicuously absent in any appreciable quantity. However, the manganiferous iron formation of the North Range provides insight into the origin of the heterogeneous distribution of manganese in the Superior Type iron formations in Minnesota.

Algoma-type iron formations, such as those in the manganese-rich Trommald Iron Formation, are deposited in deep water settings while Superior-type are deposited in shallow water. The Cuyuna District records a connection between the deep and shallow water environments through ocean chemistry. Metal-enriched waters exhaled in deep water, perhaps associated with a rifted margin or the Penokean orogen, may initially precipitate some manganese with iron on the sea floor forming Algoma-type iron formations such as the Trommald formation. The remainder of the exhaled manganese migrates as metalliferous waters from the deep ocean to the shoreline bringing manganese into the depositional zone for Superior-type iron formation like the Emily Iron Formation. However, the relative distance from the vents to the shoreline may limit the distribution of manganese such that the much more distant Biwabik iron formation received very little manganese input while the more proximal Emily iron formation received much more.

# 9. EXPLORATION

While there was earlier exploration drilling in the area by various parties beginning in 1913, the deposit was originally discovered by the Pickands Mather Mining Company in the 1940s while exploring for iron. Subsequent historic drilling by U.S. Steel in the 1950s (Strong, 1959), the USBM the University of Minnesota, and the Minnesota Geological Survey and the Minnesota Manganese Resources Company in the 1990s, and Cooperative Minerals Resources in 2011 and 2012 has continued to support the premise that a potentially significant endowment of manganese exists in this area.

The majority of historical drillholes defining the manganese enriched zones were executed in the 1940s-1950s, and record keeping does not meet current industry best practices (such as a lack of downhole surveying, and confirmation of/confidence in sampling protocols). The legacy nature of these data prevent inclusion in current resource modeling, although the data was valuable for exploration drillhole targeting. A formal technical review of all accessible legacy data and a “back of the envelope” bulk mineralization model was produced for NSM in 2022 by BRE (Berg et al., 2022). In the review, BRE identified strong indications of westward and down dip continuation of manganese mineralization from Cooperative Minerals Resources’ 2011-2012 drilling and the subsequent mineral resource estimate published by NSM (2020 and 2022).

In April of 2022, NSM contracted BRE to begin scoping and developing a drill program on NSM’s lands in Sections 20 and 21, T138N, R26W. The goal was to demonstrate the westward and down dip extension of the existing mineral resource estimate on the eastern portions of the property (Berg et al., 2022), demonstrate the presence of similar mineralization to the center and west of the property, and to leverage the program as much as possible to gain additional insight into future project parameters and considerations (e.g., collection where possible of geotechnical, hydrological, and geometallurgical data).

The drill program was initiated in February of 2023 and completed in July of 2023. A total of 13,107 feet of core was drilled from 29 completed drillholes. A finalized bedrock geology and drillhole collar location map of the 29 holes completed in 2023 and all historic drillholes is presented in Figure 10-1. From the new data collected during this drill program, BRE has been able to confirm the lateral and down dip extensions of manganese mineralization on NSM’s eastern land package, as well as its continuation westward approximately 0.7 miles (1.25km) across the recently secured “Frank” and “Guelich” 40-acre parcels (respectively).

# 10. DRILLING

There is sufficient modern drilling to define the mineral resource at Emily. Historically, both U.S. Steel and Pickands Mather drilled within and beyond the current project boundary. While these data cannot be included in the current Mineral Resource Estimate, they are indicative of the potential for future expansion of the mineral resource.

## 10.1 Current Drilling

Figure 10-1 is a map showing historic drillholes and 2023 drillholes. A total of 32 drillholes were drilled in the 2023 program, and 29 were completed to the planned depth. Table 10-1 is a summary of the 2023 drill program, inclusive of failed drillholes, totaling approximately 13,689 linear feet (inclusive of overburden).

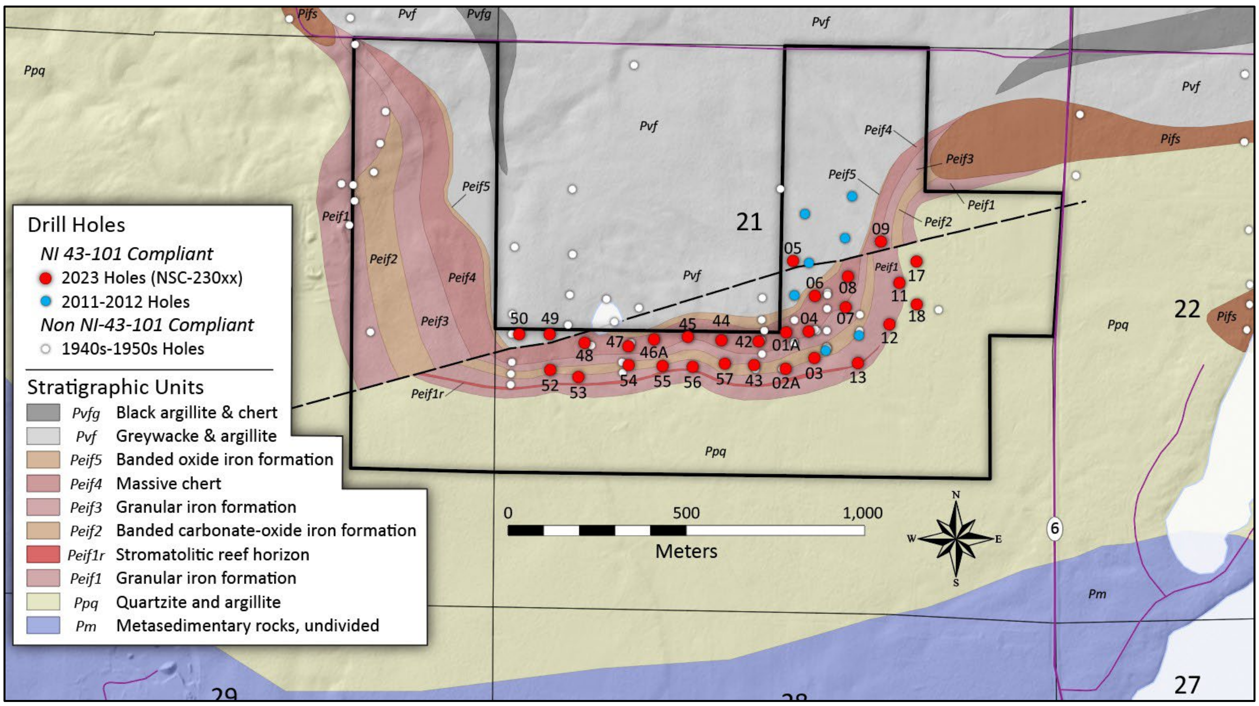



**Figure 10-1: Map of Drillholes and Emily Property Boundary**

(Source: Steiner, A., et. al., 2023)

**Table 10-1: Holes Drilled in 2023 Drill Program**

| # | Hole ID | Pad | Core Size | Start Date | End Date | TD Ft |
|---|---|---|---|---|---|---|
| 1 | NSC-23001 | B | PQ | 2/4/2023 | 2/7/2023 | 133 |
| 2 | NSC-23001A | B | PQ | 2/7/2023 | 2/15/2023 | 553 |
| 3 | NSC-23002 | C | PQ | 2/16/2023 | 2/19/2023 | 239 |
| 4 | NSC-23002A | C | HQ | 2/19/2023 | 2/25/2023 | 456.9 |
| 5 | NSC-23004 | D | PQ | 2/28/2023 | 3/3/2023 | 348 |
| 6 | NSC-23005 | E | PQ | 3/1/2023 | 3/27/2023 | 533 |
| 7 | NSC-23006 | A | PQ | 3/3/2023 | 3/9/2023 | 627 |
| 8 | NSC-23006 | F | PQ | 3/6/2023 | 3/18/2023 | 524 |
| 9 | NSC-23008 | G | PQ | 3/19/2023 | 3/23/2023 | 418 |
| 10 | NSC-23009 | N | PQ | 3/30/2023 | 4/2/2023 | 428 |
| 11 | NSC-23013 | I | PQ | 4/7/2023 | 4/8/2023 | 283 |
| 12 | NSC-23012 | J | PQ | 4/12/2023 | 4/13/2023 | 253 |
| 13 | NSC-23017 | M | PQ | 4/14/2023 | 4/15/2023 | 368 |
| 14 | NSC-23007 | H | PQ | 4/15/2023 | 4/19/2023 | 426 |
| 15 | NSC-23011 | L | PQ | 4/19/2023 | 4/20/2023 | 283 |
| 16 | NSC-23018 | K | PQ | 4/21/2023 | 4/23/2023 | 254 |
| 17 | NSC-23043 | AP | PQ | 4/24/2023 | 4/28/2023 | 484 |
| 18 | NSC-23042 | AO | PQ | 4/28/2023 | 5/4/2023 | 574 |
| 19 | NSC-23044 | AQ | PQ | 5/6/2023 | 5/10/2023 | 599 |
| 20 | NSC-23057 | AR | PQ | 5/11/2023 | 5/14/2023 | 457 |
| 21 | NSC-23056 | AT | PQ | 5/16/2023 | 5/18/2023 | 349 |
| 22 | NSC-23045 | AS | PQ | 5/25/2023 | 5/28/2023 | 529 |
| 23 | NSC-23055 | AV | PQ | 5/29/2023 | 6/1/2023 | 352 |
| 24 | NSC-23046 | AU | PQ | 6/2/2023 | 6/3/2023 | 210 |
| 25 | NSC-23046A | AU | PQ | 6/3/2023 | 6/14/2023 | 469 |
| 26 | NSC-23047 | AW | PQ | 6/14/2023 | 6/23/2023 | 543 |
| 27 | NSC-23048 | AY | PQ | 6/25/2023 | 6/30/2023 | 544 |
| 28 | NSC-23054 | AX | PQ | 7/1/2023 | 7/5/2023 | 424 |
| 29 | NSC-23053 | AZ | HQ | 7/6/2023 | 7/10/2023 | 343 |
| 30 | NSC-23052 | BB | PQ | 7/11/2023 | 7/17/2023 | 433 |
| 31 | NSC-23049 | BA | PQ | 7/18/2023 | 7/25/2023 | 653 |
| 32 | NSC-23050 | BC | PQ | 7/27/2023 | 7/31/2023 | 609 |

## 10.2 Historical Drilling

Historic drilling proximal to the current Emily Project indicates significant opportunity for expansion to the west and north of the current Emily resource. In 2021, Big Rock Exploration LLC compiled and digitized historical drilling data for the Emily Project area shown as green symbols in Figure 10-2, representing early exploratory work conducted by Pickands Mather, US Steel and others (see Section 6). These data comprise

77 historic drillholes and 32,684.5 feet of drilling information, inclusive of lithology and geochemistry where present in publicly accessible data archives and documents.

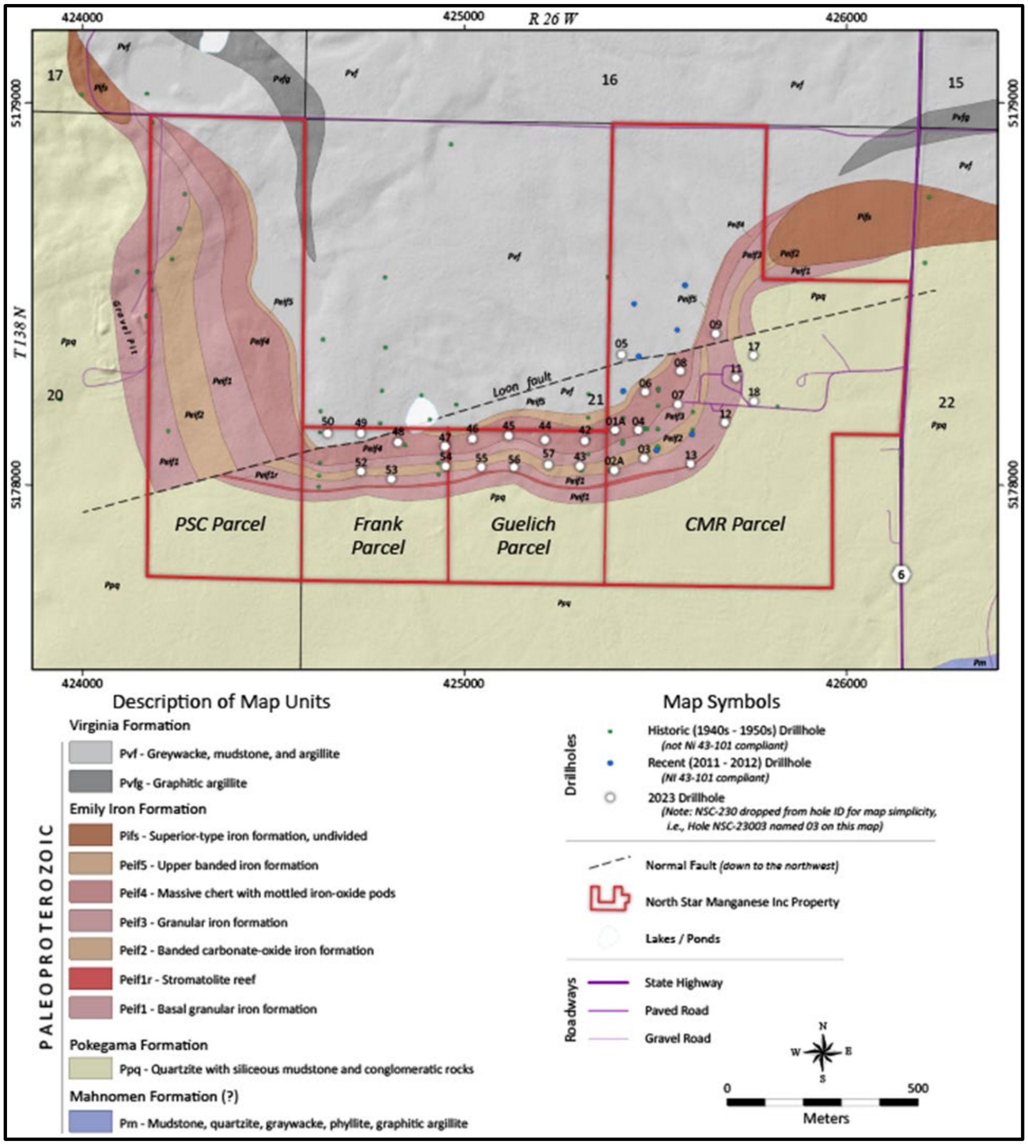



**Figure 10-2: Land Holdings & Pre 2023 Drill Collar Locations**

(Source: Steiner, A., et. al., 2024)

Legacy drilling data indicates the presence of manganese mineralization outboard of the existing mineral resource. It should be cautioned that the data associated with this drilling are historical in nature and are not to be considered NI43-101 compliant.

# 11. SAMPLE PREPARATION, ANALYSIS AND SECURITY

## 11.1 Sample Preparation and Analysis

For the 2023 drilling campaign, samples within the Emily Iron Formation were marked out by geologists nominally at 4-foot intervals (but range from 0.6 feet to 11.7 feet at the discretion of the geologist) and nominally 10-foot intervals within the hanging wall Virginia Formation and footwall Pokegama Formation. Sample boundaries honor all lithology and mineralization boundaries logged by geologists. Drill core was split (¼ core for PQ size core and ½ core for HQ size core) using a diamond core saw and put into sealed bags for shipping.

Sample preparation and geochemical analyses of drill core from the 2023 drilling program were performed by ALS Laboratories (Reno, Nevada and Vancouver, British Columbia). Drill core was crushed to 2mm (70% passing) then an aliquot of 250g was split and pulverized to 75-micron powder. The powder was mixed with lithium tetraborate flux and fused into a glass disk. Fused disks were analyzed by X-ray fluorescence for major and minor elements including manganese (XRF-21u). Samples that exceed the upper detection limit for manganese (>25% Mn) were analyzed by inductively coupled atomic absorption spectroscopy. Refer to Section 12.2 for more details on sample analysis.

## 11.2 Security

Drill core processing took place on the secure Emily facility site, so samples did not have to leave the property between drilling and logging/sampling. The facility is locked up when no active work is being conducted. Dayton Freight Lines Inc shipped the samples to the lab, picking up the samples at the Emily facility and delivered to ALS in Reno, NV.

# 12. DATA VERIFICATION

## 12.1 Site Visits

Mr. Donald Hulse, SME-RM visited the Emily Project site on June 28, 2023.

During the visit there was extensive review of drill core, and field review of the drill locations and core handling during drilling (Figure 12-1). The core handling meets industry standards, and the core storage and security exceeds most operations.


**Figure 12-1: Core Storage Facility Onsite (Emily)**

(Source: D. Hulse 2023)

Core logging was well organized and systematic (Figure 12-2).

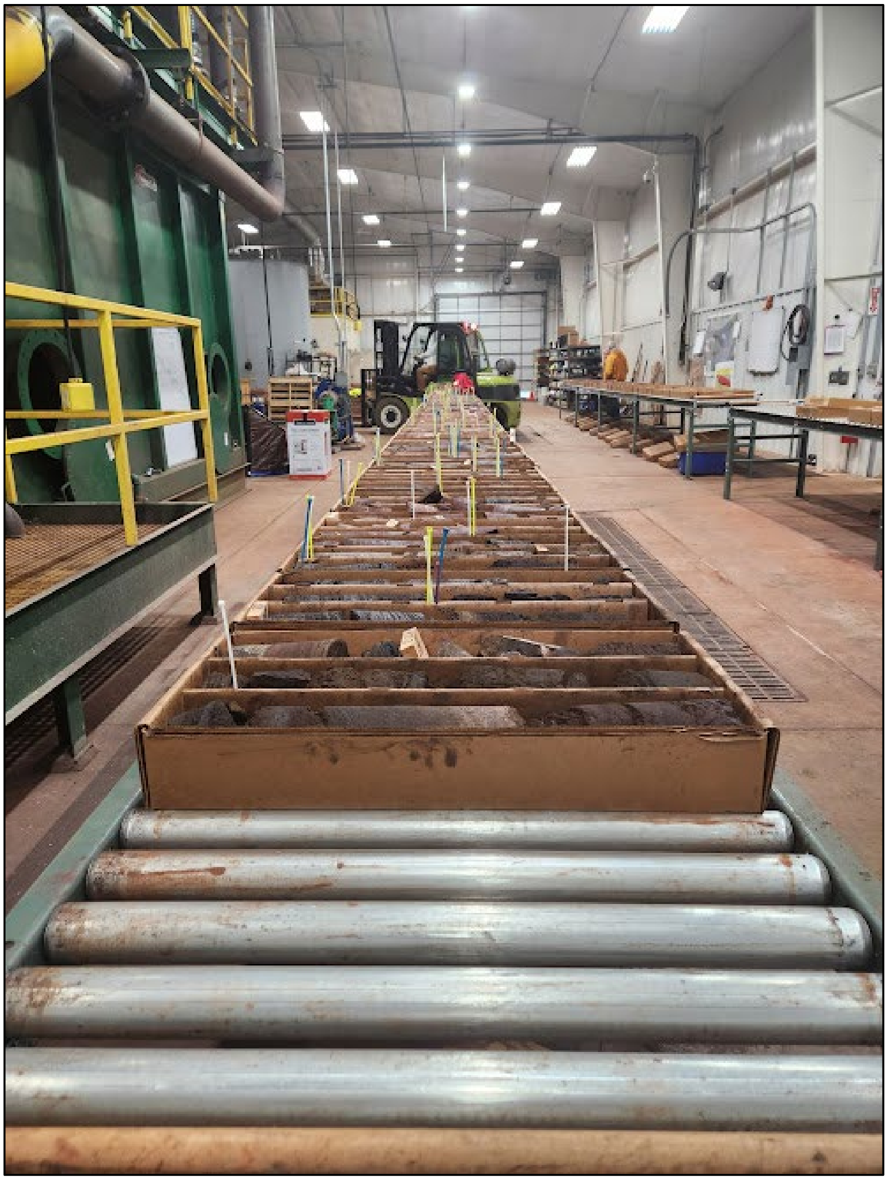


**Figure 12-2: Core Logging Tables (Emily)**

(Source: D. Hulse 2023)

## 12.2 Quality Control Testing

Modern geochemical analyses are available for 29 boreholes drilled during the 2023 campaign and from 7 boreholes drilled during the Barr Engineering campaign in 2011 and 2012. A total of 2274 assays of drill core are included in this dataset.

Quality assurance and control samples were inserted in-line with samples and submitted to the laboratory to assess the quality of the sampling procedures and the accuracy of analyses. Control samples constitute 20% of all sampling and are divided (5% of each) into certified reference materials (CRMs), field duplicates (two samples from the same interval consisting of ¼ core), pulp duplicates (a second split taken from the pulverize stage at the lab), and blanks. The blank material used for the Emily Project was 99% pure silica sand. Descriptions of the four CRMs utilized during the 2023 drilling program include:

- ***Low Grade*** – OREAS 36, OREAS 630B - Where Mn concentrations are expected to be below 10%, loggers should use OREAS 630b (3.49% Mn) and OREAS 36 (1.27% Mn). These two low-grade samples should be used in an alternating pattern, and both should appear in all batches. In the event of systemic failures on one standard, the batch and still be reviewed using the other.
- ***Medium Grade*** – OREAS 173 - Where Mn concentrations are expected to be between 10 and 30%, OREAS 173 (28.3 % Mn) should be used.
- ***High Grade*** – OREAS 175 Where Mn concentrations are expected to exceed 30%, OREAS 175 (41.04 %) should be used.

Graphs of the control sample performance for the four CRMs are given in Figure 12-3 and for the 99% pure silica sand blank in Figure 12-4. Results of ¼ core field duplicates and ground pulp duplicates are presented in Figure 12-5. The summary memos of QAQC data and subsequent BRE recommendations for individual sample batches for this project are drawn from the North Star Manganese Emily Project QAQC report (BRE, 2023).

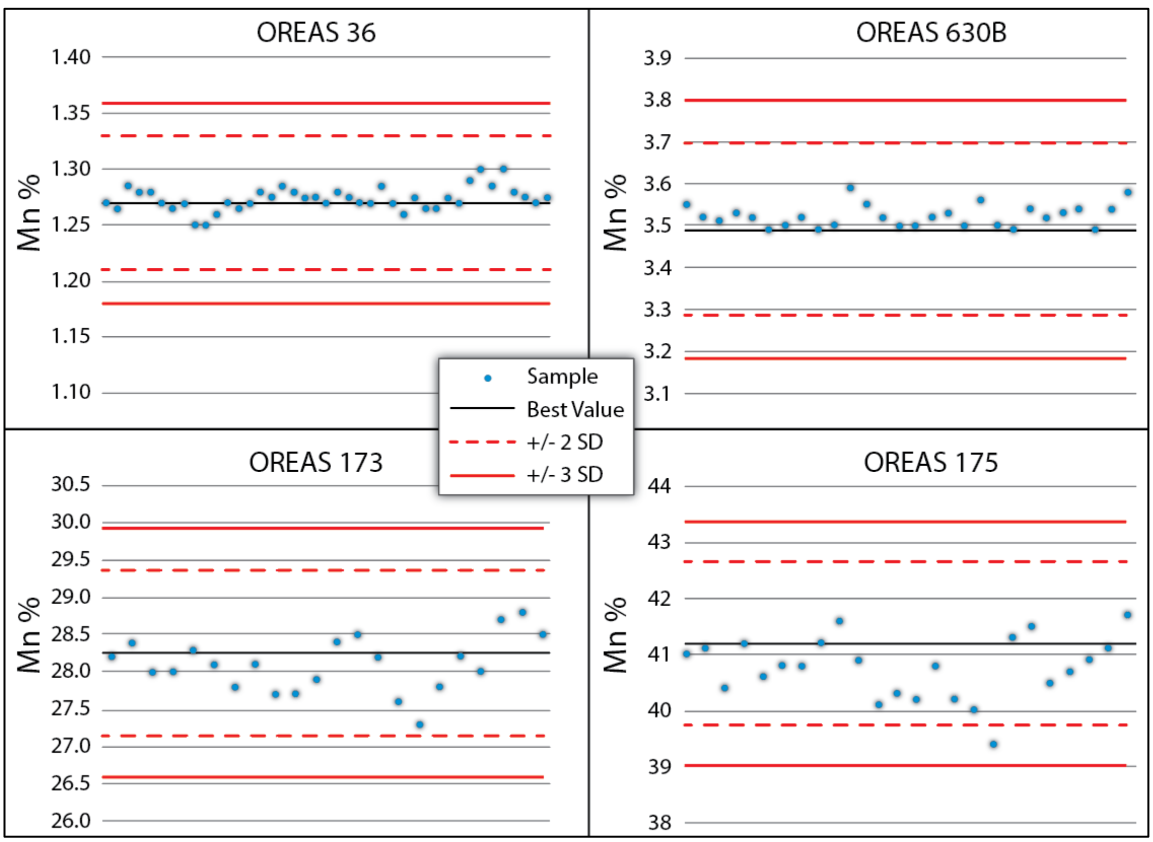



**Figure 12-3: Compiled Results for Certified Reference Materials Analysed In-Line with Drill Core Samples**

(Source: Steiner, A., et. al., 2023)
*Note: One and Two Standard Deviation Gates are Derived from OREAS Certificates.*

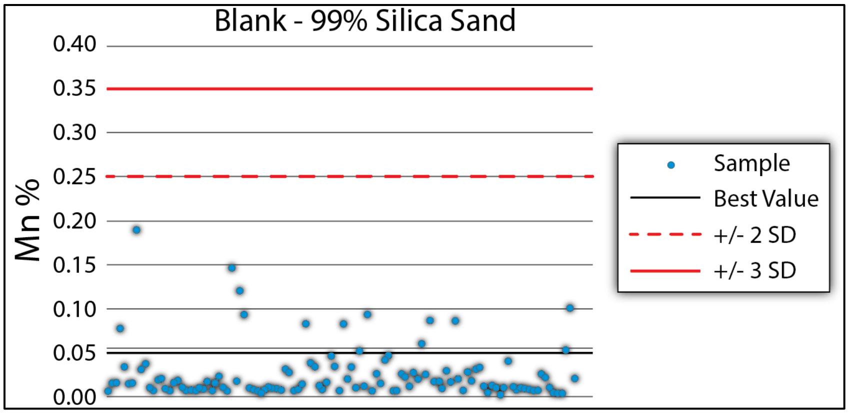



**Figure 12-4: Compiled Results of Blanks Analyzed In-Line with Drill Core Samples**

(Source: Steiner, A., et. al., 2023ADD)

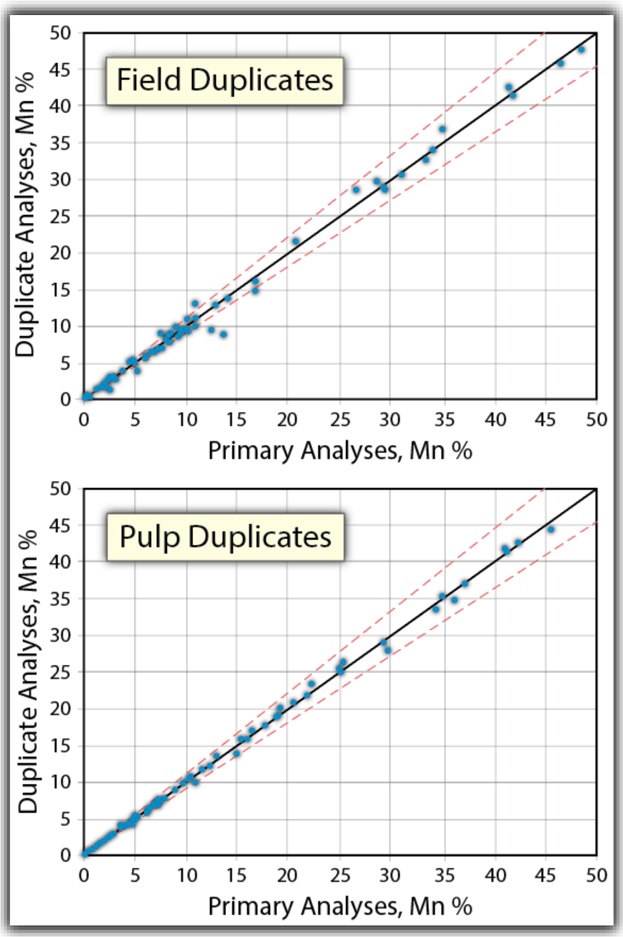



**Figure 12-5: Compiled Results of Field and Pulp Duplicate Analyses**

(Source: Steiner, A., et. al., 2023ADD)
*Note: Gates Represent ±10 from Unity*

# 13. MINERAL PROCESSING AND METALLURGICAL TESTING

## 13.1 Introduction

Testing has been performed in campaigns since the 1990s by a variety of laboratories for a variety of companies. Several laboratories performed scoping level test work for Barr Engineering in 2013 for an earlier technical report. Recently Kemetco Research, Inc. (Kemetco), Richmond, British Columbia, Canada undertook metallurgical test work for the production of HPMSM from the Emily deposit (2023/2024) for Electric Metals. The historical and current test work are summarized below.

## 13.2 Historical Test Work

### *13.2.1 United States Bureau of Mines Test Work (1990 – 1992)*

The United States Bureau of Mines Twin Cities Research Center in Minneapolis, Minnesota undertook extensive research into the extraction of manganese from enriched zones of the Emily Prospect. A paper describing the Emily deposit and discussing an in-situ mining research program is included in the Society of Mining, Metallurgy, and Exploration (SME) 1992 Transactions, Volume 294.

The Bureau conducted site characterization studies on the Emily deposit, including regional stratigraphic relationships from existing geologic databases, deposit geometry, geologic structure, hydrologic conditions, accessibility of the mineralized material to a leach field, surface subsidence potential and data collected from laboratory leaching experiments. This information was used to evaluate the technical, environmental, and economic feasibility of in-situ mining of manganese at the Emily deposit. The Bureau published three reports based on findings from chemical analyses of 47 intervals of drill core collected from Emily in 1996.

### *13.2.2 Coleraine Minerals Research Laboratory (CMRL) Test Work (1995, 2009, and 2011)*

The CMRL in Coleraine, Minnesota obtained manganese samples from Emily in 1995 when a sonic drillhole was completed, as well as samples from a borehole mining pilot test that took place from 2009 to 2011. Approximately 600 short tons of material were forwarded to the CMRL.

In 1995, 2009 and 2011, CMR requested CMRL to evaluate mineral samples collected from Emily. The samples consisted of manganiferous iron ore. The manganese minerals pyrolusite ($MnO_2$), manganite ($MnO(OH)$) and psilomelane ($BaMn^{2+}Mn^{4+}{}_8O_{16}(OH)_4$) were identified. Emily drill core material collected in 1995 was used for process upgrading tests. The manganese sample from the Emily demonstration plant delivered to CMRL in 2011 was dried and loaded into 55-gallon drums. Additional truckloads of the CMR Emily manganese samples were stored at Midland Research, Nashwauk, Minnesota.

Experimental work with the 1995 core samples indicated that the upper level (200-300 ft) of lower grade material (average 8.7% $MnO_2$) was difficult to process using standard mineral processing physical separation methods due both to the large fraction of very fine (minus 500-Mesh; 25 micron) material as well as the association of the manganese grains with iron and silica even at a very fine grind. Work with the lower level (300-400 ft) of higher-grade material (average 23.6% $MnO_2$) indicated that could be physically upgraded to 33.7% $MnO_2$ using gravity concentration methods and high intensity magnetic separation and further upgraded to 43% $MnO_2$ using additional chemical flotation.

Due to the overall poor upgrading ability and recovery of Emily manganese minerals using a combination of gravity and high intensity magnetic separation techniques followed by chemical flotation, $SO_2$ leaching was recommended for additional testing of manganese extraction. This technique is common in manganese mining operations due to low cost and high manganese extraction efficiency. The process is undertaken at ambient temperature and atmospheric pressure in open leaching tanks. Once manganese is leached, it can then be oxidized to form chemical manganese dioxide (CMD [$MnO_2$]) which is one of the more valuable forms of manganese in high demand throughout the world. The CMD can then be converted to lithium manganese dioxide (LMO [$LiMnO_2$]) for use in the rechargeable electric car battery industry.

### *13.2.3 Barr Engineering Process Development (2013)*

Barr Engineering performed a combination of mineralogical analysis, process test work, flowsheet development, and preliminary cost estimation for CMR in 2013. This demonstrated technical feasibility of producing purified electrolytic manganese metal (EMM), purified electrolytic manganese dioxide (EMD) and manganese carbonate ($MnCO_3$).

Based on the results of the mineral liberation analysis (MLA), conceptual process schemes were determined. The steps of these conceptual processes indicated which test work would be required for initial investigation. They included comminution, gravity and magnetic separation for pre-concentration, and chemical leaching. A representative bulk sample was assembled from the available 2011-2012 exploration drill cores and used to undertake testing to clarify and quantify conceptual flowsheets.

#### *13.2.3.1 Comminution*

Comminution tests conducted at Hazen Research, Inc. (Hazen) yielded Bond rod mill and Bond ball mill work indexes of 14.4kWh/mt and 15.8 kWh/mt respectively, indicating relatively hard rock similar to iron ore material currently mined in the Mesabi Iron Range.

#### *13.2.3.2 Gravity Separation*

Hazen tested gravity pre-concentration of the material using both spiral separators and shaking tables. Initial diagnostic tests using heavy liquid separation indicated the potential to remove up to 50% of the quartz while rejecting only 2-5% of the Mn and Fe. Spiral and shaking table experiments, however, proved difficult, and very little gangue material could be removed efficiently from the feed.

#### *13.2.3.3 Mineralogical Analysis*

Based on the 2011-2012 drill cores, the mineralogy of Emily was quantified through MLA, confirming Mn and Fe measurements previous undertaken using whole rock analysis. The MLA analysis indicated fine dissemination of quartz, hematite, and manganese oxides, confirming that the physical beneficiation approaches tested were not sufficient to upgrade the manganese to a saleable product.

#### *13.2.3.4 Magnetic Separation*

High-intensity magnetic separation (SLon technology) was tested by Outotec. Barr provided Outotec with both run of mine (ROM) feed and gravity pre-concentrate material to evaluate the suitability of the SLon to reject quartz while maintaining high recovery of iron and manganese. Outotec investigated several operational variables and found an optimum setting for operation. However, the ability to reject relatively pure quartz and maintain high Fe and Mn recoveries was not established.

#### *13.2.3.5 Leaching*

Barr commissioned Kemetco Research, Inc. (Kemetco) to undertake parametric leach tests to provide an initial determination of leaching conditions and the ultimate Mn recovery potential. $SO_2$-based leaching was selected because it is the most common approach used in commercial upgrading of Mn. Using an $SO_2$-based leaching protocol Kemetco demonstrated that more than 80% of the Mn could be recovered from the feed without requiring pre-concentration. Kemetco also performed a larger batch leach and used the purified leach solution in laboratory-scale electrowinning to produce both EMM, EMD and manganese carbonate products (Figure 13.1).


**Figure 13-1: Manganese Carbonate (MnCO3), Electrolytic Manganese Metal (EMM), and Electrolytic Manganese Dioxide (EMD) produced from Emily Manganese Samples in 2013**

(Source: North Star Manganese, 2022)

## 13.3 North Star Manganese Test Work (2023)

Market conditions currently favor the production of high-purity manganese sulphate monohydrate (HPMSM). The present focus of metallurgical studies on samples from the Emily Deposit are designed to produce HPMSM and other high-purity manganese products.

In September 2023, North Star Manganese (NSM) engaged Kemetco Research Inc. in Richmond, BC, Canada, to perform a laboratory test program on two composites of drill core samples collected from the 2023 drilling campaign. Kemetco was selected because of their extensive experience working on manganese deposits for the EV battery industry and their prior experience with the Emily Deposit samples.

Kemetco commenced work in late 2023 on chemical and mineralogical characterization on the two composites, including physical separation methods and direct leaching of the resource composites using reductive acidic leaching.

Due to the apparent fine dissemination of ore minerals and some similarities in physical properties of the component minerals, physical separation methods that have been tested have not yet been proven effective. However, direct leaching results using sulfurous acid (sulfur dioxide) and sulfuric acid have been successful in achieving high manganese extractions. Leaching conditions have been optimized to produce a Primary Leach Solution (PLS) which is suitable for downstream purification and potential production of high-purity manganese sulphate monohydrate, which is the current preferred product for the EV battery industry. The test work was completed for removal of impurities and production of manganese sulfate monohydrate (Kemetco Research Inc., August 14, 2024).

### *13.3.1 Metallurgical Sample Selection*

Metallurgical samples were selected from the eastern end of the deposit within the area that previous resources were defined by Barr and where the first NSM 2023 drillholes were completed. The selection of samples was coordinated by Dr. Ian Pringle, technical advisor for Electric Metals who used geochemical data for manganese, iron, and silica as well as a range of other elements for the sample selection. The drill core samples were combined into two composites for the current metallurgical tests.

The strategy of the current metallurgical work is to investigate a broad flowsheet approach on a High-Grade (HG; High Mn) composite (Comp 1 HG) and a Low-Grade (LG; Lower Mn, Higher Fe, High $SiO_2$) composite (Comp 2 LG). Table 13-1 summarizes major elements and ratios in the two Kemetco composites.

**Table 13-1: Major Elements in High- and Low-Grade Manganese Composites**

| | Sample | Mass | Mn | Fe | $SiO_2$ | Fe / Mn | $SiO_2$ / Mn | $Al_2O_3$ | $K_2O$ | CaO | MgO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | kg | % | % | % | | | % | % | % | % |
| **Comp 1 HG** | **22** | 107 | 34.0 | 21.5 | 5.7 | 0.63 | 0.17 | 1.6 | 1.0 | 2.1 | 0.26 |
| **Comp 2 LG** | **18** | 121 | 15.6 | 20.5 | 39.0 | 1.32 | 2.51 | 1.5 | 0.4 | 0.9 | 0.15 |
| **Average Grade** | **40** | 228 | 24.2 | 21.0 | 23.3 | 0.87 | 0.96 | 1.6 | 0.7 | 1.4 | 0.20 |

The 40 samples which make up the HG and LG composites were selected from the first 255 drill core intervals (average 1.5m length) from the 2023 drilling and which contain more than 5% manganese. The HG composite (indicated by the green square) has 34% Mn with low $SiO_2$, while the LG sample (indicated by the yellow square) (15.5% Mn) has significantly more quartz and silicates (Figure 13-2 and Figure 13-3).

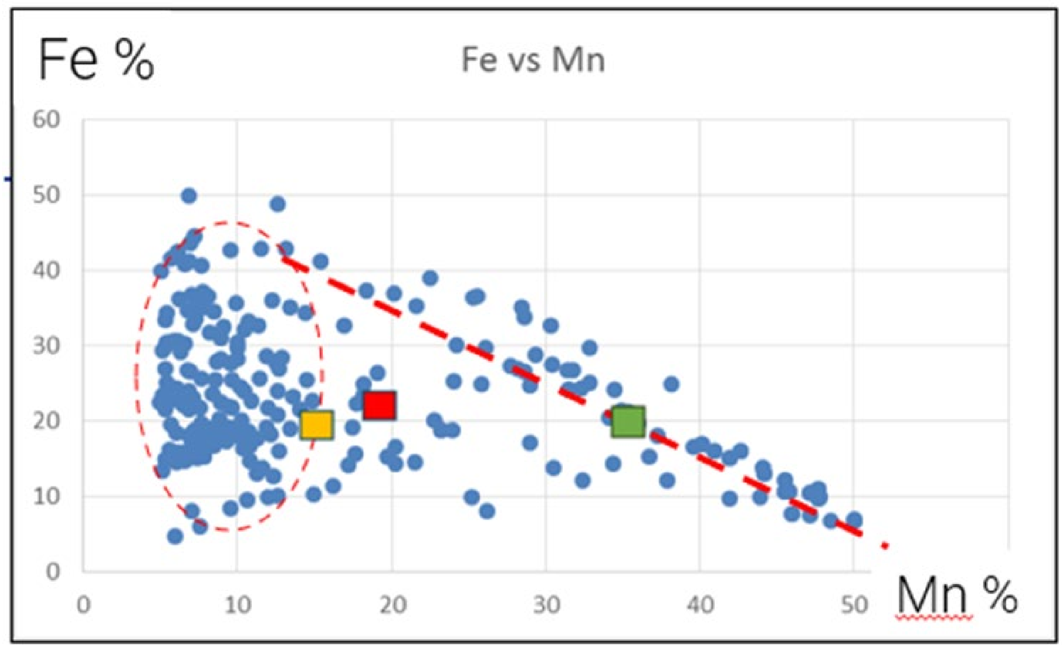



**Figure 13-2: Iron versus Manganese Plot for 2023 Drilling Campaign Comparing Grades in HG and LG Composites**

(Source: Kemetco, 2024)

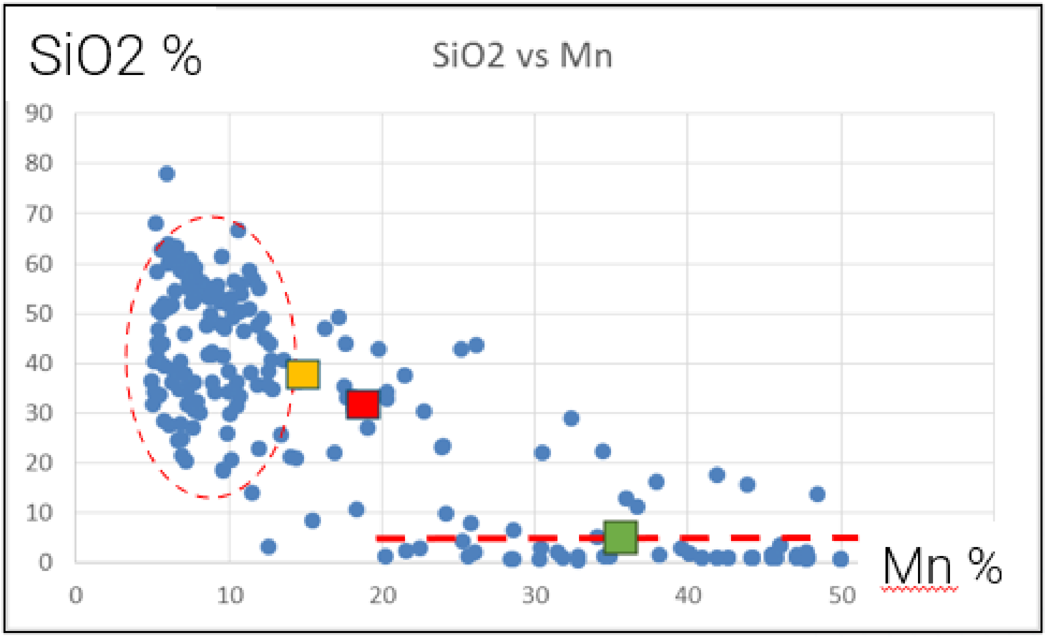



**Figure 13-3: Silica versus Manganese Plot for 2023 Drilling Campaign Comparing Grades in HG and LG Composites**

(Source: Kemetco, 2024)

### *13.3.2 Mineralogical Characteristics*

The two metallurgical composites (HG and LG) were prepared at Kemetco and subjected to Diagnostic Leaching and Mineralogical characterization using X-ray diffraction analysis.

The diagnostic acid leach tests clearly indicated that high manganese extractions would only be achievable using a reductant which increased extraction from 5-12% Mn to more than 95% Mn when compared to an acid-only leach (Table 13-2). Potassium dissolution tracked that of Manganese. Iron extraction also required the action of a reductant; however, overall extraction of iron was limited to 15% (HG) and 9% (LG).

**Table 13-2: Results of Diagnostic Leach Tests**

| Sample | Mn (%) | K (%) | Fe (%) |
|---|---|---|---|
| **HG (Composite 1)** | | | |
| Assay | 36.9 | 0.61 | 17.7 |
| % Extractable with $H_2SO_4$ | 5.1 | 7.8 | 2.2 |
| % Extractable with reductant | 95.6 | 100.0 | 14.8 |
| **LG (Composite 2)** | | | |
| Assay | 15.9 | 0.30 | 17.7 |
| % Extractable with $H_2SO_4$ | 11.6 | 9.9 | 2.8 |
| % Extractable with reductant | 95.5 | 94.1 | 9.2 |

*Note: $SO_2$ is reductant*

X-ray diffraction (XRD) results identified the main manganese-bearing minerals as manganite, braunite and cryptomelane, while hematite and subordinate goethite are the main iron-bearing minerals (Table 13-3).

HG (Composite 1) had significantly lower quartz and silicates and was considered the preferred sample for beneficiation test work.

**Table 13-3: Quantitative XRD Results Identifying Mineral Distribution by Percentage**

| Mineral | Ideal Formula | HG Composite 1 | LG Composite 2 |
|---|---|---|---|
| **Manganese Minerals** | | | |
| Manganite | $Mn^{3+}O(OH)$ | 24.0 % | 12.9 % |
| Cryptomelane | $K(Mn^{4+},Mn^{2+})_8O_{16}$ | 14.1 % | 5.7 % |
| Braunite | $Mn^{2+}Mn^{3+}_6(SiO_4)O_8$ | 15.8 % | 2.3 % |
| Pyrolusite | $MnO_2$ | 3.3 % | |
| Rhodochrosite | $MnCO_3$ | | 1.2 % |
| Birnessite | $(Na,Ca,K)_x(Mn^{4+},Mn^{3+})_2O_4 \cdot 1.5H_2O$ | | 0.4 % |
| **Iron Minerals** | | | |
| Hematite | $\alpha$-$Fe_2O_3$ | 22.7 % | 22.2 % |
| Goethite | $\alpha$-$Fe^{3+}O(OH)$ | 10.9 % | 4.9 % |
| **Gangue Minerals** | | | |
| Quartz | $SiO_2$ | 3.2 % | 38.6 % |
| Aegirine – Augite | $NaFe^{3+}Si_2O_6$ - $(Ca,Na)(Mg,Fe,Al,Ti)(Si,Al)_2O_6$ | | 9.9 % |
| Calcite | $CaCO_3$ | 5.2 % | 1.3 % |
| Rutile | $TiO_2$ | 0.8 % | 0.5 % |
| **TOTAL** | | 100 % | 100 % |

### *13.3.3 Physical Separation Testing*

Kemetco evaluated several physical separation methods to upgrade low-grade composite by rejecting silica and iron. These tests included magnetic, gravity, heavy media, and flotation. None of these processes produced acceptable results and were not pursued any further.

### *13.3.4 Reductive Leach Tests*

A series of scoping reductive leach tests were performed on the two composites to determine the impact of grind size, $SO_2$, and sulfuric acid addition on manganese recovery.

The leach conditions are presented in Table 13-4 and the results are summarized in Table 13-5. These results indicate that manganese is readily extractable in sulfuric acid when a reducing agent is present. Though manganese is leachable at extremely coarse grind, the ore needs to be ground to less than 400 micrometers in order to suspend particles in an agitated leach process.

Manganese extraction of over 95% was obtained at 45% solids for both composites in 5 hours of leach time.

**Table 13-4: Scoping Leach Tests on Composite 1 and Composite 2**

| | | T01 | T03 | T05 | T07 | T02 | T04 | T06 | T08 |
|---|---|---|---|---|---|---|---|---|---|
| Sample type | | Comp 1 | Comp 1 | Comp 1 | Comp 1 | Comp 2 | Comp 2 | Comp 2 | Comp 2 |
| Sample Mass | | 502 | 508 | 822 | 822 | 500 | 522 | 867 | 867 |
| Ore Composition | | | | | | | | | |
| **Ag** | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **As** | mg/kg | 103 | 103 | 103 | 103 | 26.6 | 26.6 | 26.6 | 26.6 |
| **Ca** | mg/kg | 17412 | 17412 | 17412 | 17412 | 5897 | 5897 | 5897 | 5897 |
| **Cu** | mg/kg | 42 | 42 | 42 | 42 | 23.2 | 23.2 | 23.2 | 23.2 |
| **Fe** | mg/kg | 176791 | 176791 | 176791 | 176791 | 176899 | 176899 | 176899 | 176899 |
| **K** | mg/kg | 6086 | 6086 | 6086 | 6086 | 2994 | 2994 | 2994 | 2994 |
| **Mg** | mg/kg | 1337 | 1337 | 1337 | 1337 | 496 | 496 | 496 | 496 |
| **Mn** | mg/kg | 368973 | 368973 | 368973 | 368973 | 159469 | 159469 | 159469 | 159469 |
| **Na** | mg/kg | 1225 | 1225 | 1225 | 1225 | 496 | 496 | 496 | 496 |
| **Ni** | mg/kg | 45.9 | 45.9 | 45.9 | 45.9 | 18.0 | 18.0 | 18.0 | 18.0 |
| **Sr** | mg/kg | 1464 | 1464 | 1464 | 1464 | 524 | 524 | 524 | 524 |
| **Zn** | mg/kg | 74 | 74 | 74 | 74 | 38.7 | 38.7 | 38.7 | 38.7 |
| Conditions | | | | | | | | | |
| Pulp density | % | 20.1 | 20.0 | 45.0 | 45.0 | 20.0 | 20.0 | 45.0 | 45.0 |
| P80 | µm | 2596 | 381 | 381 | 381 | 2769 | 315 | 315 | 315 |
| $H_2SO_4$ addition | g | 121.4 | 148.4 | 241.2 | 273.9 | 52.9 | 71.6 | 141.9 | 161.5 |
| $H_2SO_4$ addition | kg/t ore | 242 | 292 | 293 | 333 | 106 | 137 | 164 | 186 |
| Average Temp | ºC | 48 | 44 | 50 | 65 | 36 | 39 | 59 | 59 |
| Residence time | hours | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Final pH | | 2.2 | 1.5 | 0.5 | 0.6 | 1.5 | 1.4 | 0.8 | 0.8 |
| $SO_2$ addition | g | 431.6 | 338.3 | 389.5 | 394.0 | 195.2 | 154.7 | 176.6 | 178.8 |
| $SO_2$ flowrate | L/min | 0.68 | 0.42 | 0.62 | 0.62 | 0.29 | 0.18 | 0.28 | 0.28 |
| SO2/Mn ratio | mol ratio | 2.0 | 1.5 | 1.1 | 1.1 | 2.1 | 1.6 | 1.1 | 1.1 |

**Table 13-5: Scoping Leach Results**

| | | T01 | T03 | T05 | T07 | T02 | T04 | T06 | T08 |
|---|---|---|---|---|---|---|---|---|---|
| Sample type | | Comp 1 | Comp 1 | Comp 1 | Comp 1 | Comp 2 | Comp 2 | Comp 2 | Comp 2 |
| Sample Mass | | 502 | 508 | 822 | 822 | 500 | 522 | 867 | 867 |
| PLS | | | | | | | | | |
| **Al** | mg/L | 758 | 845 | 2060 | 2375 | 326 | 307 | 1046 | 1031 |
| **As** | mg/L | 12.6 | 16.1 | 11.4 | 12.3 | <10. | <10. | 12.8 | <10. |
| **Ca** | mg/L | 759 | 719 | 263 | 207 | 943 | 780 | 462 | 473 |
| **Cu** | mg/L | 11.8 | 13.0 | 28.5 | 31.7 | <5. | <5. | 14.7 | 13.6 |
| **Fe** | mg/L | 4617 | 5806 | 7858 | 13730 | 1238 | 1639 | 4518 | 5672 |
| **K** | mg/L | 2186 | 1937 | 4737 | 5000 | 600 | 595 | 2281 | 2204 |
| **Mg** | mg/L | 212 | 225 | 619 | 758 | 100.2 | 114 | 317 | 331 |
| **Mn** | mg/L | 74445 | 75312 | 162727 | 163517 | 34647 | 34144 | 118093 | 112900 |
| **Na** | mg/L | 337 | 336 | 735.5 | 820 | 83.3 | 78.0 | 296.7 | 289 |
| **Ni** | mg/L | 8.0 | 12.1 | 21.5 | 23.8 | 3.3 | 2.7 | 11.9 | 12.1 |
| **Si** | mg/L | 439 | 757 | 1643 | 338 | 162 | 221 | 603 | 598 |
| **Sr** | mg/L | 22.9 | 16.7 | 12.0 | 9.0 | 9.8 | 6.3 | 4.0 | 4.3 |
| **Zn** | mg/L | 13.6 | 14.6 | 37.1 | 40.1 | 8.3 | 8.3 | 56.1 | 28.8 |
| **S2O6** | mg/L | 77964 | 42149 | 60432 | 40746 | 31974 | 16140 | 31592 | 16158 |
| **S2O6/Mn** | | 1.05 | 0.56 | 0.37 | 0.25 | 0.92 | 0.47 | 0.27 | 0.14 |
| **Leach Residue** | | | | | | | | | |
| **Mass** | g | 211 | 200 | 352 | 280 | 340 | 379 | 573 | 569 |
| **Al** | mg/kg | 7991 | 4245 | 7621 | 4074 | 1601 | 6323 | 7232 | 5635 |
| **As** | mg/kg | 62.1 | 78.3 | 174 | 205 | <20. | <20. | 39 | 36.0 |
| **Ca** | mg/kg | 32044 | 25329 | 29537 | 27737 | 2010 | 1196 | 3591 | 3048 |
| **Cu** | mg/kg | <10. | 11.3 | 23.7 | <10. | <10. | <10. | <10. | <10. |
| **Fe** | mg/kg | 344362 | 347791 | 413906 | 392541 | 200784 | 204198 | 247209 | 260074 |
| **K** | mg/kg | 1507 | 998 | 3823 | 874 | 207 | 956 | 939 | 800 |
| **Mg** | mg/kg | 1819 | 1348 | 1933 | 1073 | 236 | 56 | 616 | 433 |
| **Mn** | mg/kg | 49927 | 15745 | 27231 | 13593 | 22042 | 6222 | 5303 | 3329 |
| **Na** | mg/kg | 217 | 88.3 | 204 | 65.1 | 165 | 164 | 2006.5 | 1163 |
| **Ni** | mg/kg | 31.1 | 133.7 | 184 | 197 | 13.5 | 11 | 139.7 | 143 |
| **Sr** | mg/kg | 2989 | 2788 | 2865 | 3130 | 506 | 569 | 782.2 | 756 |
| **Zn** | mg/kg | 43.1 | 19.1 | 59.8 | 28.3 | 11.5 | 8.9 | 12 | 12.8 |
| **Extraction** | | | | | | | | | |
| **Al** | % | 48.1 | 68.3 | 47.6 | 73.8 | 52.3 | 21.2 | 21.2 | 26.9 |
| **Ca** | % | 28.4 | 32.9 | 13.3 | 23.4 | 78.1 | 83.3 | 44.0 | 51.4 |
| **Fe** | % | 11.2 | 15.2 | 6.3 | 15.7 | 3.1 | 4.2 | 3.2 | 4.2 |
| **K** | % | 93.3 | 95.5 | 80.4 | 96.7 | 94.0 | 77.7 | 82.2 | 84.9 |
| **Mg** | % | 52.8 | 64.3 | 52.5 | 77.5 | 70.0 | 92.0 | 49.1 | 60.7 |
| **Mn** | % | 93.5 | 98.1 | 95.5 | 98.7 | 89.4 | 96.8 | 97.6 | 98.6 |

| | | T01 | T03 | T05 | T07 | T02 | T04 | T06 | T08 |
|---|---|---|---|---|---|---|---|---|---|
| **Na** | % | 93.7 | 97.6 | 92.0 | 98.3 | 73.0 | 72.4 | 21.6 | 33.5 |
| **Ni** | % | 91.6 | 78.4 | 28.0 | 36.7 | 82.0 | 59.8 | 13.4 | 14.0 |
| **Sr** | % | 7.7 | 7.0 | 3.6 | 5.2 | 10.7 | 7.9 | 2.7 | 2.8 |
| **Zn** | % | 73.7 | 88.7 | 68.9 | 88.1 | 78.7 | 83.9 | 90.4 | 82.4 |

An additional test was performed with the primary objective to confirm whether the dissolved ferrous iron extracted during the reductive leach could function as a reducing agent for manganese extraction. It was hypothesized that at high temperature, in the presence of ferric ions and excess oxidized manganese species, dithionate would be oxidized to sulfate.

The conclusions of the scoping series of tests were as follows:

- Both composites were leachable using sulfuric acid and $SO_2$, even at particle sizes as large as 2.6-2.8 mm, provided excess $SO_2$ was present.
- Highest manganese extractions (>96%) were achieved using sulfuric acid dosages were 333 kg/t for Composite 1 and 186 kg/t for Composite 2, with an $SO_2$ to Mn molar ratio of 1.1. The manganese concentration in the pregnant leach solution (PLS) reached 163.5 g/L in T07 and 112.9 g/L in T08, indicating highly effective leaching.
- The manganese content in the residue increased with coarser feed particle size, that finer grinding (P80 < 400 µm) is crucial for maximizing manganese recovery.
- Maintaining an excess of acid appeared to be a successful strategy to minimize dithionate formation during the $SO_2$ leach; however, the factors influencing the dithionate formation are not well understood.
- Ferrous iron oxidation using fresh ore was virtually complete and almost instantaneous.

Following the scoping leach testing, a test was performed on a Master Composite sample consisting of equal weight of the two composites with the optimum conditions established in the scoping study. The manganese, iron, and potassium extractions in the test were 98.2%, 7.1%, and 95%, respectively, thereby validating the leach process parameters.

### *13.3.5 Bulk Leach Test*

A 10-kg bulk leach test was performed to generate pregnant solution for purification testing. The test results are summarized in Table 13-6. The test yielded extractions of 99.2% of manganese, 15.2% of iron, and 96.5% of potassium. The pregnant solution assayed 131.1 g/L Mn, 16.1 g/L Fe, 2.9 g/L K, and 391 mg/L Na.

**Table 13-6: Bulk Leach Test Results**

| Sample | Sample wt | Vol | Analysis | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Al | As | Ca | Cu | Fe | K | Mg | Mn | Na | Ni | Si | Sr | Zn |
| | g | mL | mg/kg or mg/L | | | | | | | | | | | | |
| Comp 1 | 5000.0 | | 5714 | 103 | 17412 | 42 | 176791 | 6086 | 1337 | 368973 | 1225 | 45.9 | 4213 | 1464 | 74 |
| Comp 2 | 5000.0 | | 3385 | 26.6 | 5897 | 23.2 | 176899 | 2994 | 496 | 159469 | 496 | 18.0 | 179729 | 524 | 38.7 |
| 1 | | | 224 | <2. | 715 | 2.6 | 1108 | 111 | 286 | 6801 | 53.3 | 3.2 | 203 | 26.0 | 3.4 |
| 2 | | | 754 | <8. | 643 | 7.8 | 5087 | 740 | 394 | 48588 | 159 | 7.9 | 325 | 17.8 | 11.0 |
| 3 | | | 1242 | <8. | 464 | 13.5 | 9777 | 1695 | 464 | 90757 | 272 | 13.4 | 483 | 13.5 | 18.2 |
| 4 | | | 1506 | 17.1 | 330 | 18.0 | 12487 | 2758 | 486 | 123610 | 375 | 15.7 | 847 | 9.6 | 22.9 |
| 5 | | | 1543 | 18.0 | 316 | 18.7 | 14022 | 2835 | 488 | 130558 | 382 | 15.8 | 821 | 7.5 | 23.4 |
| 6 | | | 1564 | 17.3 | 292 | 18.9 | 15076 | 2854 | 488 | 131455 | 381 | 15.9 | 713 | 6.8 | 23.7 |
| Final filtrate | 20860 | 14911 | 1625 | 13.2 | 296 | 31.7 | 16105 | 2902 | 505 | 131355 | 391 | 16.4 | 697 | 6.2 | 28.4 |
| Wash 1 | 2339 | 2166 | 168 | <2. | 507 | 24.3 | 1767 | 364 | 55 | 14620 | 51 | 2.2 | 9 | 4.5 | 20.2 |
| Wash 2 | 17180 | 16223 | 161 | 2.3 | 551 | 12.1 | 1509 | 284 | 49.3 | 12432 | 38.0 | 1.8 | 25.6 | 3.9 | 13.9 |
| Wash 3 | 21200 | 20887 | 25.6 | <2. | 510 | 2.5 | 210 | 60.2 | 9.2 | 2014 | 8.4 | 0.8 | 8.2 | 3.6 | 4.9 |
| Washed cake | 4875 | | 3331 | 132 | 17546 | <10. | 312564 | 375 | 304 | 3773 | 88.6 | 96.4 | 184000 | 2478 | 14.8 |
| **Accountability** | | | **97** | **135** | **95** | **236** | **102** | **114** | **110** | **85** | **83** | **240** | **99** | **124** | **155** |
| **Extraction%** | | | **63.1** | **26.6** | **22.7** | **100.0** | **15.2** | **96.5** | **85.4** | **99.2** | **94.0** | **38.7** | **1.2** | **1.9** | **91.7** |
| Sample | | | Individual content | | | | | | | | | | | | |
| | | | Al | As | Ca | Cu | Fe | K | Mg | Mn | Na | Ni | Si | Sr | Zn |
| | | | mg | mg | mg | mg | mg | mg | mg | mg | mg | mg | | | mg |
| Head | | | 45494 | 649 | 116549 | 327 | 1768448 | 45398 | 9167 | 2642208 | 8606 | 319 | 919710 | 9941 | 561 |
| Final filtrate | | | 24234 | 197 | 4420 | 473 | 240143 | 43274 | 7526 | 1958588 | 5830 | 245 | 10386 | 92 | 423 |
| WD1 | | | 365 | 0 | 1098 | 53 | 3826 | 788 | 120 | 31666 | 110 | 5 | 18 | 10 | 44 |
| WD2 | | | 2614 | 37 | 8946 | 196 | 24488 | 4612 | 800 | 201686 | 617 | 29 | 415 | 63 | 226 |
| WD3 | | | 535 | 0 | 10658 | 52 | 4379 | 1258 | 193 | 42057 | 176 | 18 | 170 | 75 | 103 |
| Washed cake | | | 16240 | 645 | 85534 | 0 | 1523751 | 1829 | 1480 | 18395 | 432 | 470 | 897000 | 12082 | 72 |

### 13.3.6 Pregnant Leach Solution Purification

Impurity removal from the pregnant leach solution (PLS) was accomplished in three stages as follows:

1. Ferrous iron was oxidized to its ferric form and precipitated along with potassium and sodium as jarosite. This was achieved by maintaining the slurry pH at 1.8 to 2 and 90°C by adding $Ca(OH)_2$ or $CaCO_3$ for a period of 4 hours.
2. In the second stage, aluminum, arsenic, and silicon were precipitated by adding lime to increase the pH to 5.
3. Once the targeted pH was achieved, $H_2S$ gas was introduced into the slurry to precipitate impurities such as zinc, copper, and nickel.

The fine precipitates formed during the three stages were then filtered, yielding a purified PLS that predominately contained manganese sulfate ($MnSO_4$) and manganese dithionate ($MnS_2O_6$). Additionally, a purification technique using barium fluoride ($BaF_2$) to precipitate calcium and magnesium was tested, but it achieved limited success.

### 13.3.7 Manganese Sulfate Crystallization

A single crystallization test was conducted in four stages, utilizing the purified solution from the purified PLS (Figure 13-4).


**Figure 13-4: Sample of Manganese (II) Monohydrate from the Emily Manganese Deposit**

(Source: Kemetco, 2024)

The assays of the crystals after each crystallization stage are summarized in Table 13-7. The crystal products were compared against the Chinese battery grade specifications published by Fastmarkets in 2022 and presented in Table 13-8. The results indicated that calcium and magnesium were the primary impurities of concern. These can be mitigated with the addition of reagents and filtration. The third stage crystallization met nearly all the specifications except calcium, while the fourth stage crystallization reduced calcium below 100 mg/kg, achieving the targeted specification.

**Table 13-7: Crystal Analysis During 4-Stage Crystallization**

| | CRZ-1 Crystals | CRZ-2 Crystals | CRZ-3 Crystals | CRZ-4 Crystals |
|---|---|---|---|---|
| **Element** | **mg/kg** | **mg/kg** | **mg/kg** | **mg/Kg** |
| **Ag Silver** | <2.5 | <2.5 | <2.5 | <2.5 |
| **Al Aluminum** | <5. | <5. | <5. | <5. |
| **As Arsenic** | <10. | <10. | <10. | <10. |
| **B Boron** | <25. | <25. | <25. | <25. |
| **Ba Barium** | <1. | <1. | <1. | 7.2 |
| **Be Beryllium** | <1. | <1. | <1. | <1. |
| **Bi Bismuth** | <10 | <10. | <10. | <10. |
| **Ca Calcium** | 978 | 793 | 212 | 86.2 |
| **Cd Cadmium** | <1. | <1. | <1. | <1. |
| **Co Cobalt** | <2.5 | <2.5 | <2.5 | <2.5 |
| **Cr Chromium** | <2.5 | <2.5 | <2.5 | <2.5 |
| **Cu Copper** | <5. | <5. | <5. | <5. |
| **Fe Iron** | 5.1 | <5. | 6.2 | <5. |
| **K Potassium** | <25. | <25. | <25. | 33.7 |
| **Li Lithium** | 29.8 | 21.8 | 16.7 | 8.3 |
| **Mg Magnesium** | 473 | 209 | 45.9 | <5. |
| **Mn Manganese** | 336133 | 333087 | 331625 | 332142 |
| **Mo Molybdenum** | <5. | <5. | <5. | <5. |
| **Na Sodium** | 68.5 | 45.6 | 29.8 | 28.7 |
| **Ni Nickel** | 4.5 | <2.5 | <2.5 | <2.5 |
| *** P Phosphorus** | <25. | <25. | N/A | <25. |
| **Pb Lead** | <15 | <16 | <10. | <15. |
| *** S Sulfur** | 195945 | 196925 | 186977 | 197605 |
| **Sb Antimony** | <10. | <10. | <10. | <10. |
| **Se Selenium** | N/A | N/A | N/A | N/A |
| **Si Silicon** | <10. | <10. | <10. | <10. |
| **Sn Tin** | <10. | <10. | <10. | <10. |
| **Sr Strontium** | 1.5 | 1.2 | <1. | <1. |
| **Ti Titanium** | <5. | <5. | <5. | <5. |
| **Tl Thallium** | <10. | <10. | <10. | <10. |
| **U Uranium** | <25. | <25. | <25. | <25. |
| **V Vanadium** | <5. | <5. | <5. | <5. |
| **Zn Zinc** | <2.5 | <2.5 | <2.5 | 8.3 |

**Table 13-8: HPMSM Specifications**

| Element | Min – Max % | Chinese Standard |
|---|---|---|
| Mn | min % | 32 |
| Fe | max % | 0.001 |
| Zn | max % | 0.001 |
| Cu | max % | 0.001 |
| Pb | max % | 0.001 |
| Cd | max% | 0.0005 |
| K | max% | 0.01 |
| Na | max% | 0.01 |
| Ca | max% | 0.01 |
| Mg | max% | 0.01 |
| Ni | max% | 0.01 |
| Co | max% | 0.005 |
| Insoluble residue | max% | 0.01 |

## 13.4 Iron and Silica Recovery

No testing was undertaken at this time on the recovery of iron and the recovery of silica as commercial products. Testing for the commercial production of both iron products and silica will be included in future metallurgical work.

## 13.5 Conclusion

The test program performed by Kemetco Research Inc. demonstrated the potential feasibility of producing high-purity manganese sulfate from the ore of the Emily deposit with significant leaching and purification efficiencies.

## 13.6 Future Test Work

The results provide a robust foundation for optimization of the process flowsheet in the next phase of testing for the commercial production of high purity manganese chemicals, including HPMSM. Future test work will also include the recovery of iron and silicate potentially produce additional commercial products.

# 14. MINERAL RESOURCE ESTIMATES

The mineral resource estimate was updated by Donald Hulse SME-RM and a Qualified Person under the NI43-101.

## 14.1 Geologic Model

A three-dimensional geological model was produced in LeapFrog Geo by BRE to incorporate all data into a coherent and comprehensive illustration of the current interpretation of stratigraphy and structure of the Emily manganese deposit upon completion of the 2023 drilling campaign. This model primarily utilizes diamond drilling data from 2023, as well as information from the 2011 and 2012 NI 43-101 Reports. Historic non-compliant drilling data were also used to guide the interpretation to aid in overall geological understanding and potential future work. A plan view of the model is presented in Figure 14-1 with the glacial overburden removed. The Forte QP undertook a detailed review of the model and agrees with the interpretations.

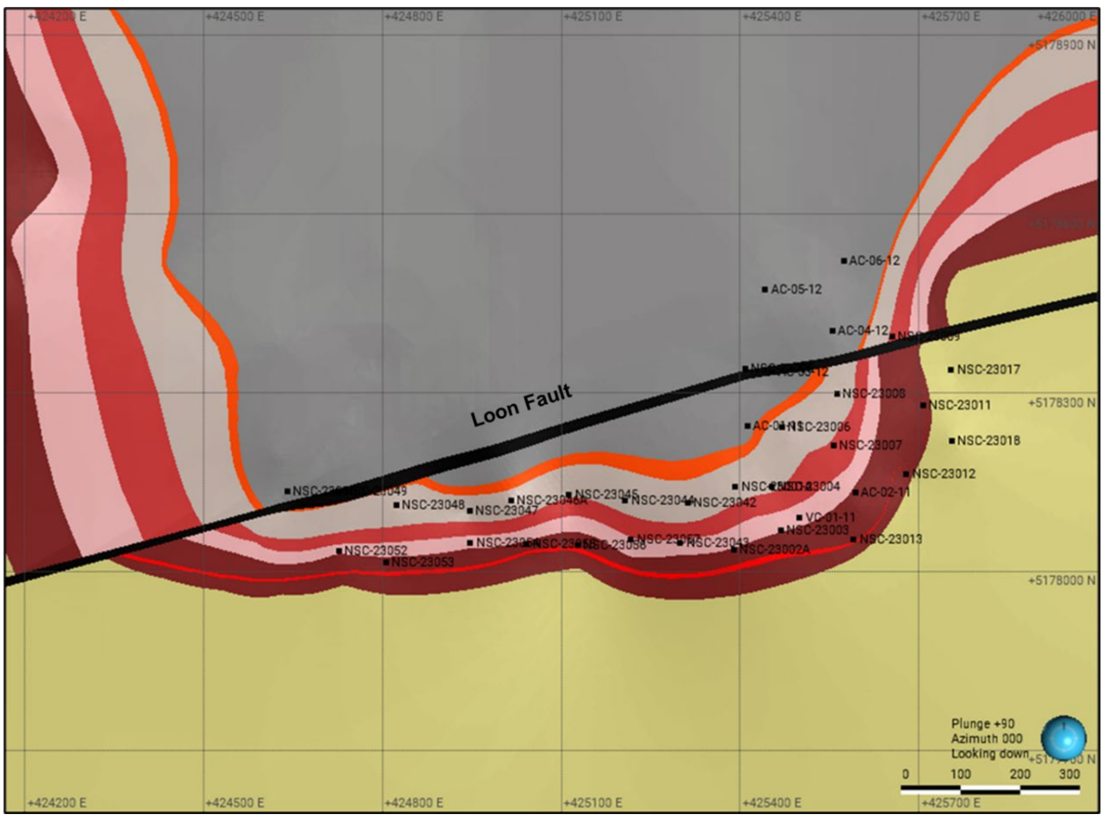



**Figure 14-1: Plan View of the Bedrock Geology and Drillholes used in Resource Estimate**

(Source: Steiner, A., et. al., 2024)

## 14.2 Lithological Domains

All available historic drilling data in the area was compiled and reviewed by BRE to assign basic lithology codes to each interval, breaking out the Virginia, Emily Iron, and Pokegama formations (Pvf, Peif, and Ppq). The Emily Iron Formation (Peif) was better defined and separated into five subunits (Peif1-Peif5).

During and after the drilling campaign of 2023, data from the new drillholes was incorporated into the geological model, and ongoing refinements to the interpretation of the individual subunits were made. At this time, a sixth subunit was identified that is entirely contained within the Peif1 subunit. This is the Peif1 'reef' unit (Peif1r), which appears to have significant control over the concentration of manganese oxide mineralization.

Overburden and an interpreted fault (the Loon Fault) were also incorporated within the model. The lithological domains and corresponding codes are seen in Table 14-1 below.

**Table 14-1: Interpreted Lithological Domains and Corresponding Codes used in Geologic Model**

| Interpreted Lithology | Code |
|---|---|
| OB | 0 |
| Peif1 | 1 |
| Peif1r | 10 |
| Peif2 | 2 |
| Peif3 | 3 |
| Peif4 | 4 |
| Peif5 | 5 |
| Ppq | 6 |
| Pvf | 7 |
| Loon Fault | 100 |

## 14.3 Geostatistics

As an initial step, the QP has evaluated the descriptive statistics of the logged lithologies. Statistics are shown in Table 14-2 and a comparative Box and Whisker plot is shown in Figure 14-2.

**Table 14-2: Length-Weighted Statistics of Mn% within Interpreted Lithologies**

| Lith | Count | Length | Mean | Standard Deviation | Coefficient of Variation | Variance | Min | Lower Quartile | Med | Upper Quartile | Max |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OB | 0 | 0 | | | | | | | | | |
| Peif1 | 968 | 975.02 | 11.50 | 12.44 | 1.08 | 154.85 | 0.02 | 3.04 | 6.72 | 14.75 | 50.14 |
| Peif2 | 286 | 281.54 | 5.86 | 5.67 | 0.97 | 32.17 | 0.04 | 1.91 | 4.56 | 8.02 | 35.50 |
| Peif3 | 314 | 304.49 | 9.11 | 9.74 | 1.07 | 94.91 | 0.02 | 1.37 | 5.60 | 14.30 | 43.90 |
| Peif4 | 275 | 309.95 | 0.15 | 0.43 | 2.96 | 0.19 | 0.01 | 0.03 | 0.05 | 0.10 | 5.98 |
| Peif5 | 27 | 24.84 | 0.51 | 1.38 | 2.71 | 1.90 | 0.01 | 0.02 | 0.05 | 0.09 | 5.26 |
| Peif1r | 84 | 74.46 | 8.96 | 7.33 | 0.82 | 53.69 | 0.22 | 4.24 | 6.90 | 11.45 | 38.50 |
| Ppq | 304 | 509.89 | 0.14 | 0.52 | 3.78 | 0.27 | 0.00 | 0.02 | 0.03 | 0.07 | 13.40 |
| Pvf | 123 | 145.39 | 0.07 | 0.34 | 4.96 | 0.12 | 0.01 | 0.01 | 0.01 | 0.02 | 3.45 |
| Loon Fault | 109 | 115.76 | 1.26 | 4.50 | 3.58 | 20.23 | 0.01 | 0.05 | 0.13 | 0.24 | 25.83 |

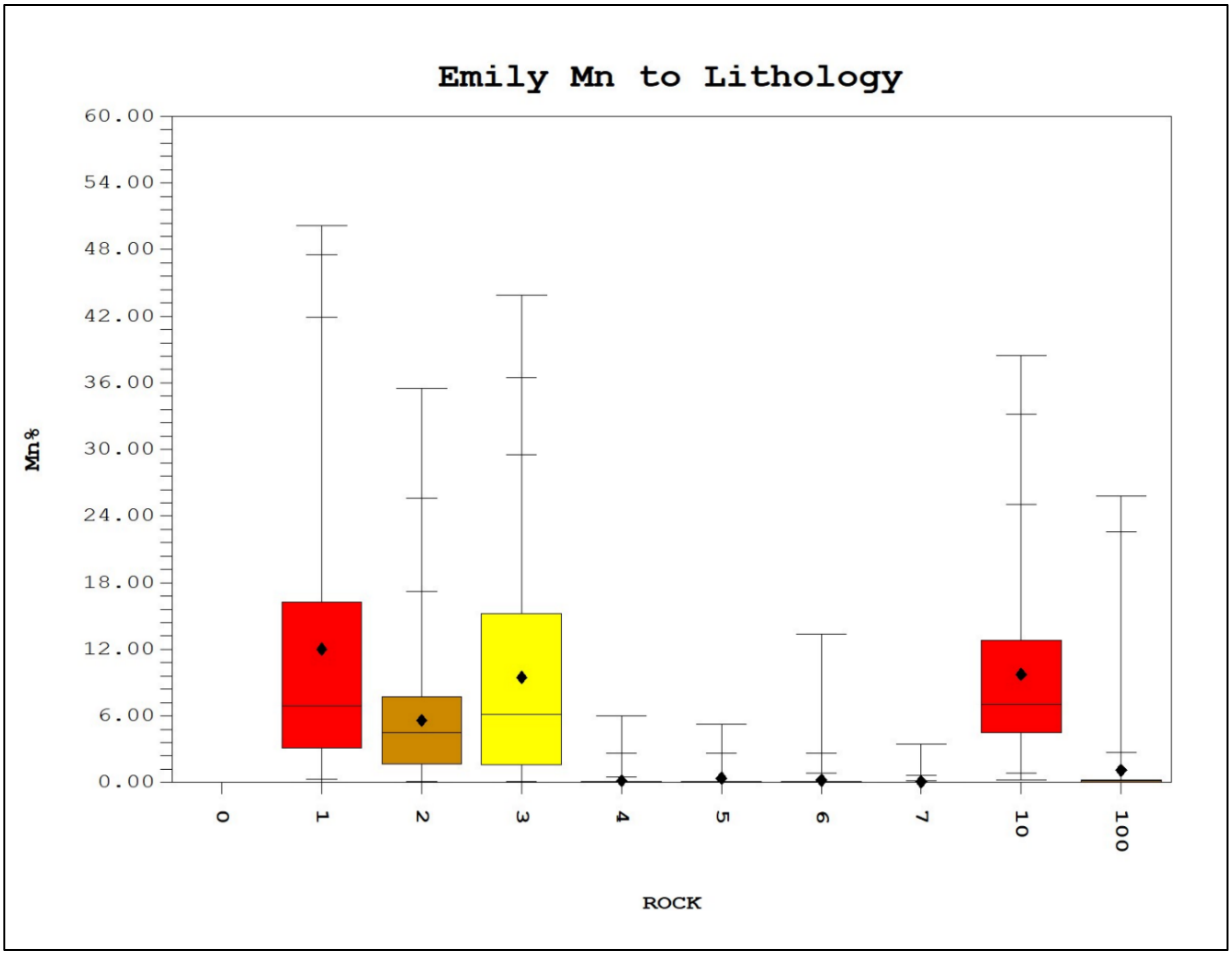



**Figure 14-2: Box and Whisker Plot of Mn% and Lithological Domains**

(Source: Forte)

The numerical codes refer to Table 14-1. Based on the statistics provided, the Forte QP determined the domains to be used within the resource are Peif1, Peif1r, Peif2, and Peif3.

Cumulative frequency plots showed the distribution of Mn within each lithological domain. Peif1 and Peif1r show close correlation and therefore were combined to one domain (Figure 14-3). Peif1-1r and Peif3 display a significant change in distribution of higher grades at approximately 10% Mn, while Peif2 displayed lower grades (Figure 14-4).

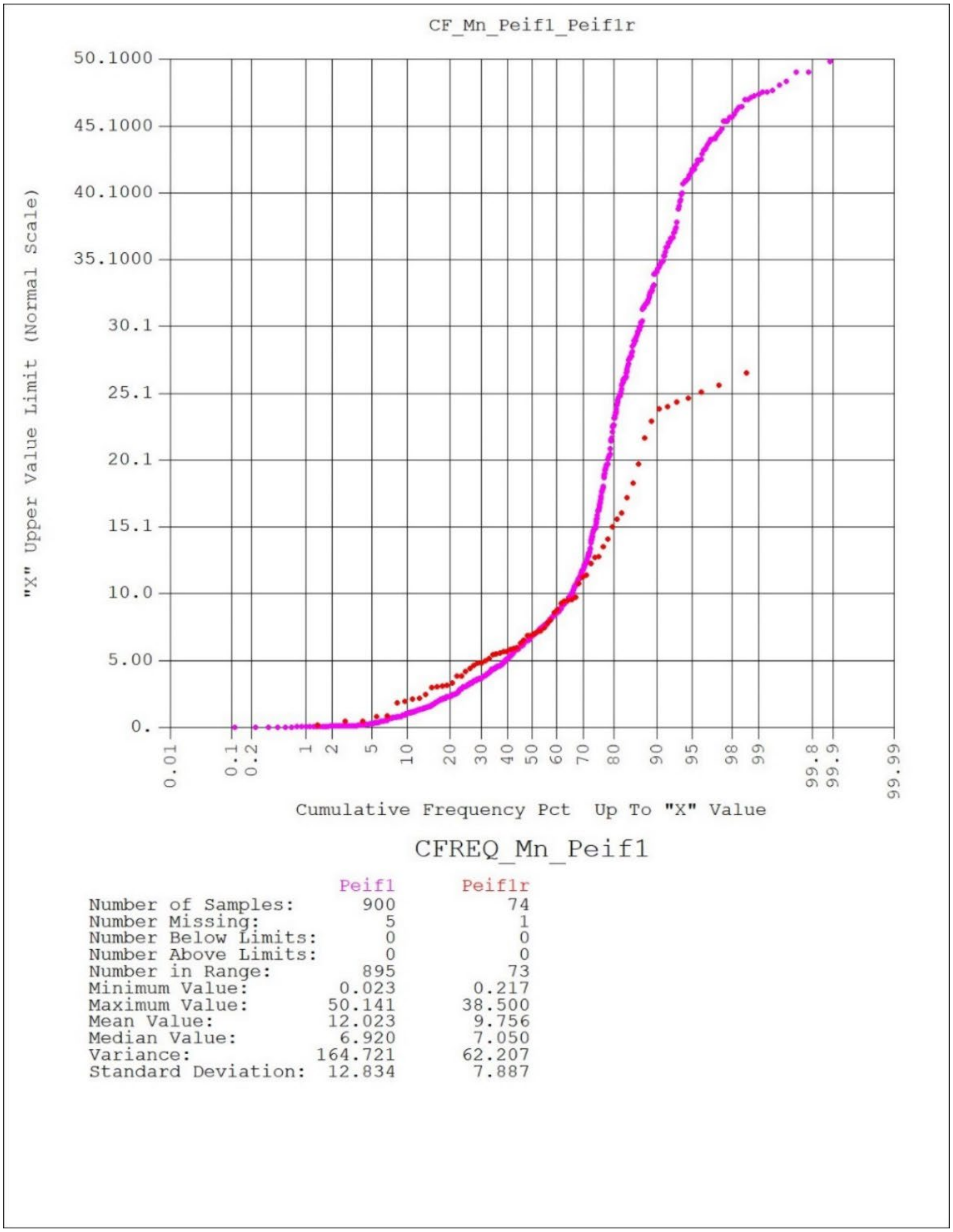
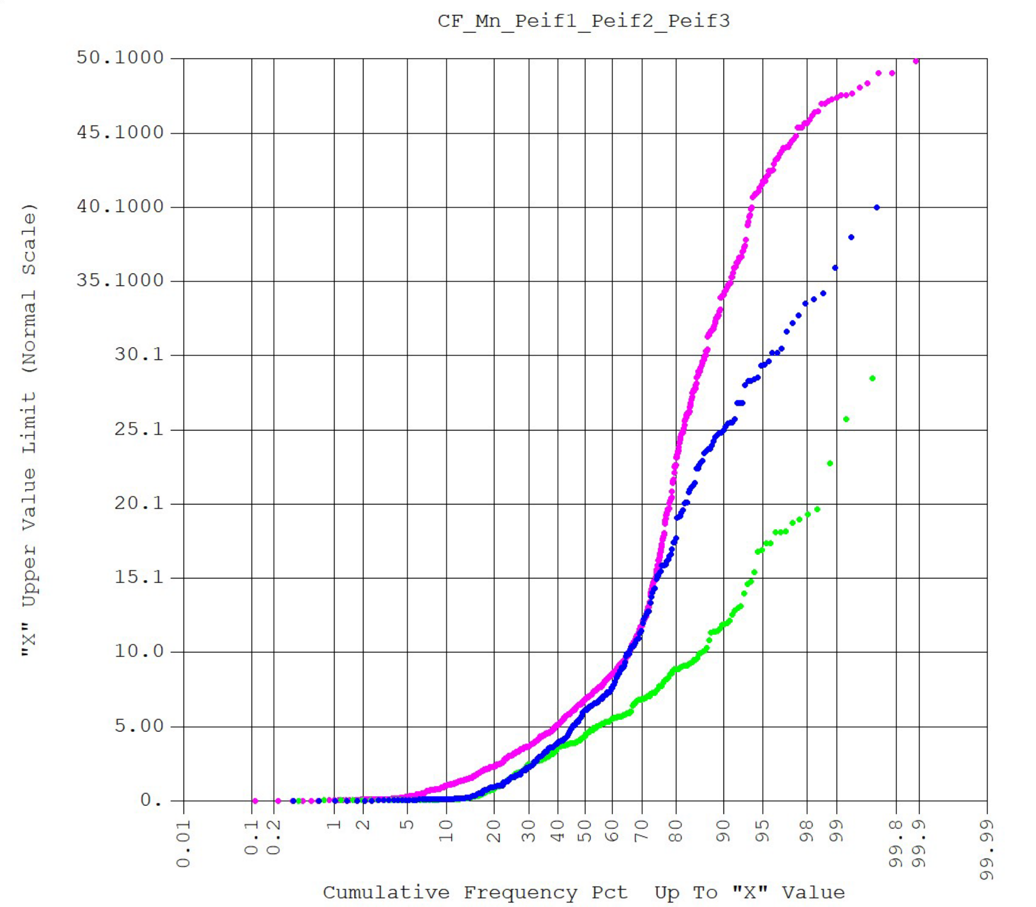



**Figure 14-3: CF Plot of Mn within Peif1 and Peif1r**

(Source: Forte)




CFREQ_Mn_Peif1

| | Peif1 | Peif2 | Peif3 |
|---|---|---|---|
| Number of Samples: | 900 | 261 | 297 |
| Number Missing: | 5 | 7 | 8 |
| Number Below Limits: | 0 | 0 | 0 |
| Number Above Limits: | 0 | 0 | 0 |
| Number in Range: | 895 | 254 | 289 |
| Minimum Value: | 0.023 | 0.039 | 0.024 |
| Maximum Value: | 50.141 | 35.500 | 43.900 |
| Mean Value: | 12.023 | 5.596 | 9.479 |
| Median Value: | 6.920 | 4.480 | 6.160 |
| Variance: | 164.721 | 28.879 | 96.747 |
| Standard Deviation: | 12.834 | 5.374 | 9.836 |

**Figure 14-4: CF Plot of Mn within Peif1, Peif2 and Peif3**

(Source: Forte)

## 14.4 Domaining

High grade Mn mineralization was modeled by creating indicator shells at a 10% cut-off within the Peif1-1r and Peif3 lithologic domains. Drillholes were coded with “lithologies” corresponding to intervals of >10% manganese within each lithological domain. BRE identified four unique horizons as containing significant lateral continuity of manganese mineralization greater than 10%. The uppermost is contained within the Peif3 subunit, below which is a somewhat less continuous mineralization horizon within the Peif2. The main mineralized horizon is found straddling the Peif1r fully contained within the Peif1 subunit, and the lower zone is found within the Peif1 at or near the contact with the Ppq (Figure 14-5).

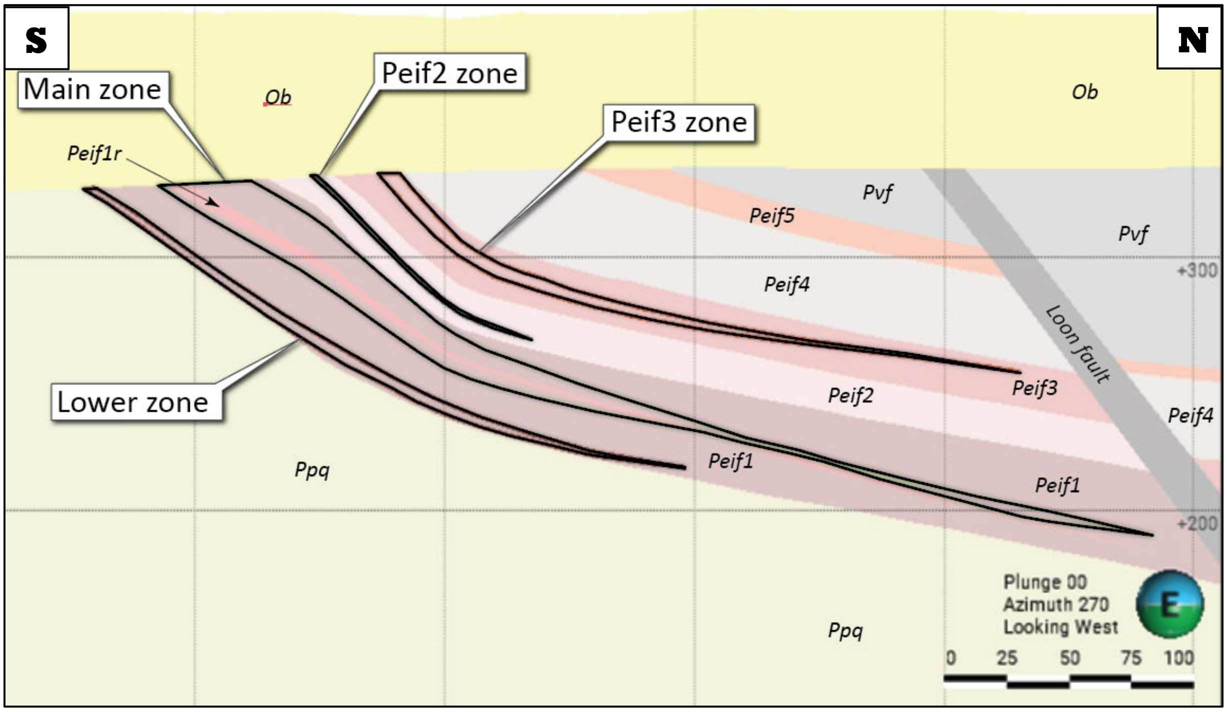



**Figure 14-5: Cross Section Showing Lithological Domains and 10% Indicator Shells Interpreted by BRE**

(Source: Steiner, A., et. al., 2024)

The Forte QP combined the main and lower horizon within the Peif1 and Peif1r as one high-grade domain and used the uppermost horizon from Peif3 as another high-grade domain. Everything outside of the Peif1-1r and Peif3 10% indicator shells and within the lithological domains were labeled as “low-grade” Mn. Figure 14-6 shows an example of the change in distribution at 10% for Peif1-1r. The lithological domain for Peif2 was all labeled as low-grade.

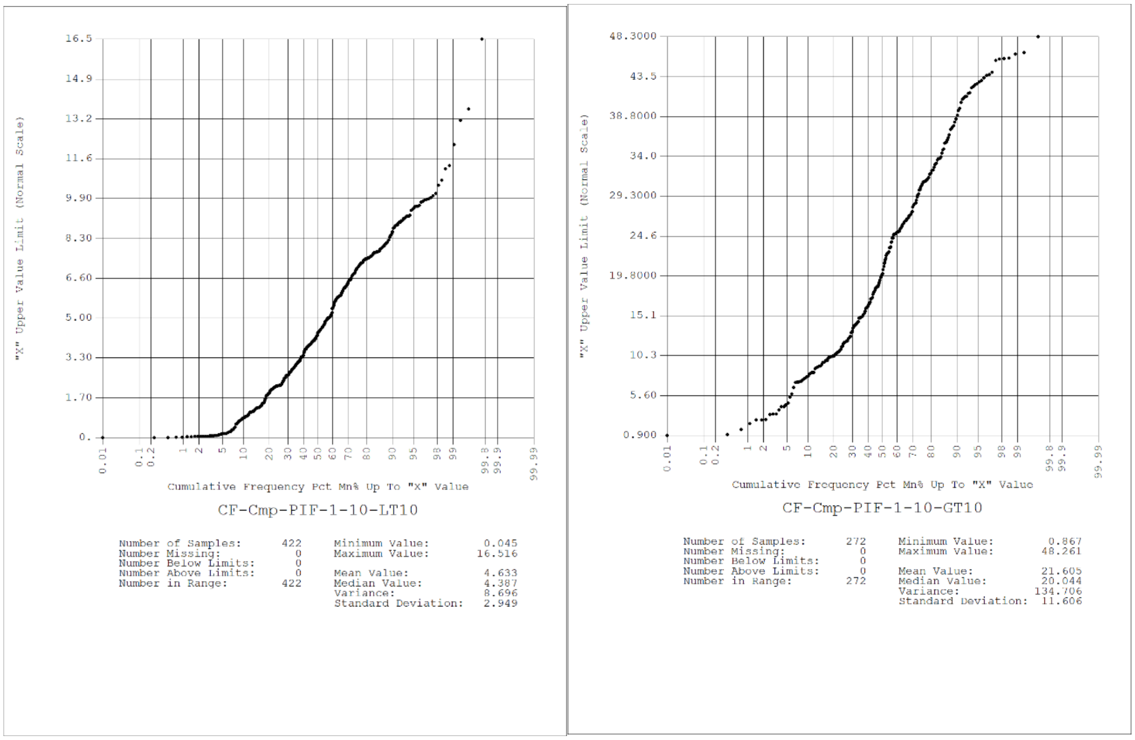



**Figure 14-6: CF Plots of Peif1-1r Less than 10% Mn (Left), and Greater than 10% Mn (Right)**

(Source: Forte)

The domains used for estimating Fe and $SiO_2$ were not limited to an indicator model and are just within the Peif1-1r, Peif2, and Peif3 lithological domains.

## 14.5 Compositing

A composite study was performed to analyze the effects of dilution and variance reduction on composites of various lengths. The objective was to smooth random variance while retaining the intrinsic variability of the grades and the resolution of the mineral contacts. The analysis suggests a length of 1.4m, as the average sample length is 5 ft or 1.524 meters, this was selected as the composite length. 1.5 meters corresponds to one half of the vertical block size providing adequate vertical resolution to the estimate.

Rather than using the lithology domain boundaries to physically control the compositing at contacts, compositing was done to the entire drillhole. The grades composited include Mn, Fe, and $SiO_2$.

### *14.5.1 Grade Capping*

The cumulative distribution plots that were developed for the domain groupings of Mn determined the capping of outlier high grades. Plots were also for Fe within each domain, without any high-grade/low-grade separation. The analyses show that there were small distributions of samples at very high grades. To mitigate any risk potential, Mn and Fe grades in the composite files were capped. Table 14-3 shows the capping of both Mn and Fe within each domain. Capping on $SiO_2$ was only done in the Peif1-1r domain at 80%.

**Table 14-3: Mn and Fe Capping Values**

| Domain | Mn % | Fe % |
|---|---|---|
| Peif1-1r HG | 47 | 36 |
| Peif1-1r LG | 16 | |
| Peif2 | 20 | 36 |
| Peif3 HG | 30 | 50 |
| Peif3 LG | 16 | |

## 14.6 Specific Gravity

BRE provided Forte with specific gravity (S.G.) results of 730 samples from the 2023 drilling campaign. S.G. measurements were collected at regular intervals from all logging units and mineralization styles on core samples approximately 10-15cm in length. Samples were weighed using a high-precision scale with a hanging basket suspended in a water bath. The weight of the dry core sample was recorded from the top plate of the scale, and a wet weight was collected with the sample fully submerged in water using the suspended basket. S.G. was calculated using Archimedes method via equation 1 below. Porous rock was occasionally encountered, requiring the sample to be left in the water bath to fully saturate before recording the wet measurement.

$$\text{eqn. 1} \quad \frac{wt_{dry}}{wt_{dry}-wt_{wet}} = S.G.$$

Duplicate S.G. samples were collected and sent to ALS Laboratories. S.G. results for the entire dataset range from ~2 to 4.7 and average 2.85. The averages for individual logging units vary from the overall average by as much as 15%. The weighted average S.G. values by formation is given in Table 14-4 and the distribution of sample S.G. values for map units are presented in Figure 14-7. Logging subunits of the Emily Iron Formation Peif3 and Peif1r have the highest average S.G. at 3.29 and 3.12, respectively, while the Virgina (Pvf) and Pokegama formation (Ppq) have the lowest specific gravities at 2.48.

**Table 14-4: S.G. Values by Iron Formation**

| Low Grade | | | | | |
|---|---|---|---|---|---|
| **Domain** | **Number** | **Min** | **Max** | **Mean** | **Std Dev** |
| Peif1 | 179 | 2.15 | 4.00 | 2.77 | 0.33 |
| Peif2 | 75 | 2.36 | 4.08 | 3.06 | 0.37 |
| Peif3 | 52 | 2.43 | 4.78 | 3.11 | 0.47 |
| **High Grade** | | | | | |
| **Domain** | **Number** | **Min** | **Max** | **Mean** | **Std Dev** |
| Peif1 | 147 | 2.07 | 4.30 | 3.01 | 0.49 |
| Peif2 | N/A | | | | |
| Peif3 | 36 | 2.5 | 4.49 | 3.54 | 0.52 |

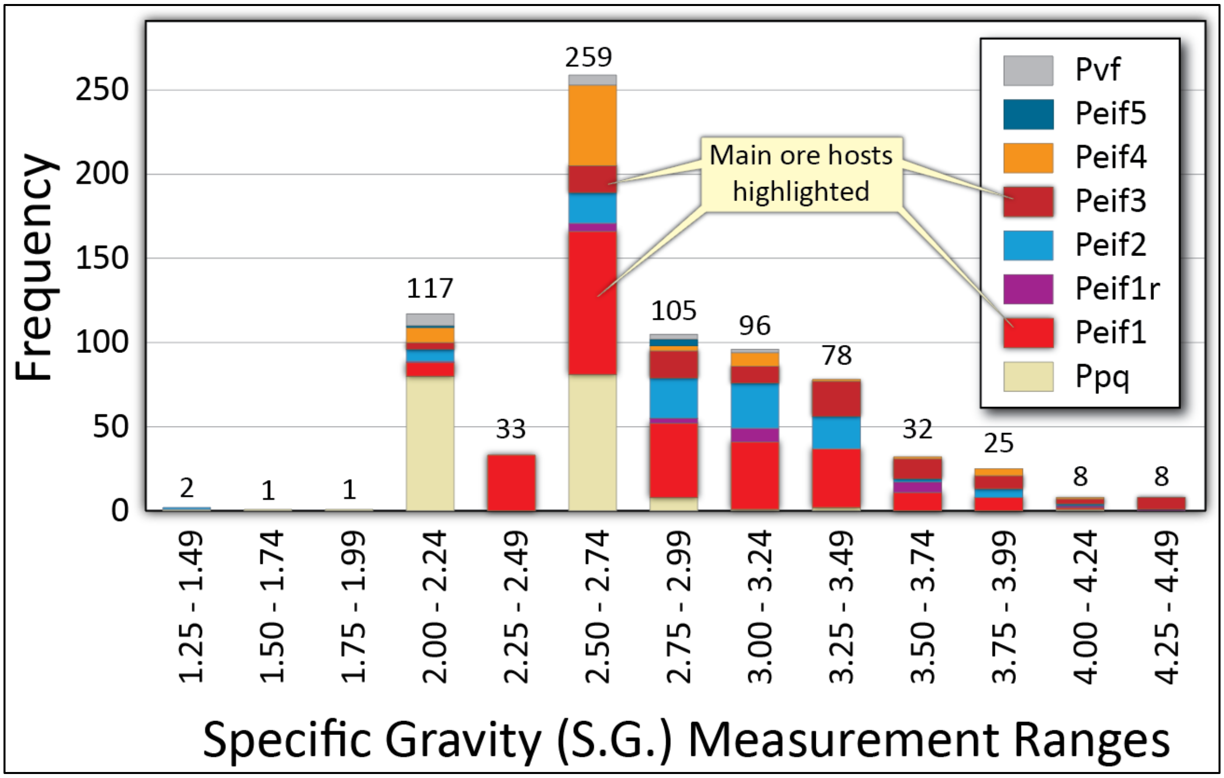



**Figure 14-7: Histogram Showing the Distribution of Specific Gravity Data from the 2023 Drilling Program at the Emily Deposit**

(Source: Steiner, A., et. al., 2024)

## 14.7 Variography

Variograms were developed in LeapFrog Edge software for composites within each domain based on the capped 1.525 meters composites used in the grade estimation. The variograms results were initially used to help confirm the interpreted directional controls on mineralization, however, a variable orientation of each domain was used to direct the orientation of the search. The variograms were used to set the search limits within each domain.

## 14.8 Block Model Parameters

The block model used for resource estimation is a 4m x 2m x 1.5m, orthogonal, non-rotated block model. Smaller blocks are used to better emulate the strike and dip of the mineralized zones.

## 14.9 Block Grade Estimation Methodology

Block grade estimation was completed using LeapFrog Edge software. Grade estimates use inverse distance to the second power (ID2), within each domain. Blocks were estimated with a single pass search at about 1.5 variogram ranges for the Mn domains, and 1.5 of the variogram ranges for the Fe and $SiO_2$ domains. Search ranges are shown in Table 14-5.

**Table 14-5: Grade Estimation Search Parameters**

| Domain | Search Parameters (meters) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mn | | | Fe | | | $SiO_2$ | | |
| | Major | Inter | Minor | Major | Inter | Minor | Major | Inter | Minor |
| Peif1-1r HG | 150 | 150 | 25 | 150 | 150 | 15 | 150 | 150 | 6 |
| Peif1-1r LG | 150 | 225 | 12 | | | | | | |
| Peif2 | 150 | 450 | 6 | 150 | 225 | 6 | 150 | 225 | 6 |
| Peif3 HG | 150 | 150 | 50 | 150 | 150 | 8 | 150 | 150 | 8 |
| Peif3 LG | 150 | 225 | 12 | | | | | | |

Each grade estimate uses a single pass, with a minimum of 6 and a maximum of 14 composite samples used to estimate grades. A maximum of 3 composites are used per drillhole, thus requiring at least two drillholes to contribute to each block estimate.

### *14.9.1 Specific Gravity / Density Estimation*

A large isometric search was run to be certain that specific gravity was estimated in each block within the high-grade and low-grade domains.

## 14.10 Resource Classification

The classification technique utilizes the average distance of the closest samples around the blocks. To best interpret the correlation of the deposit, experimental variograms were computed parallel to the vertical center of Peif1. The center of Peif3, is nearly parallel to Peif1. This measured the continuity parallel to the bedding of the iron formations. This extended the variogram range with 2 structures to 222m. An example of the variogram used is shown in Figure 14-8.

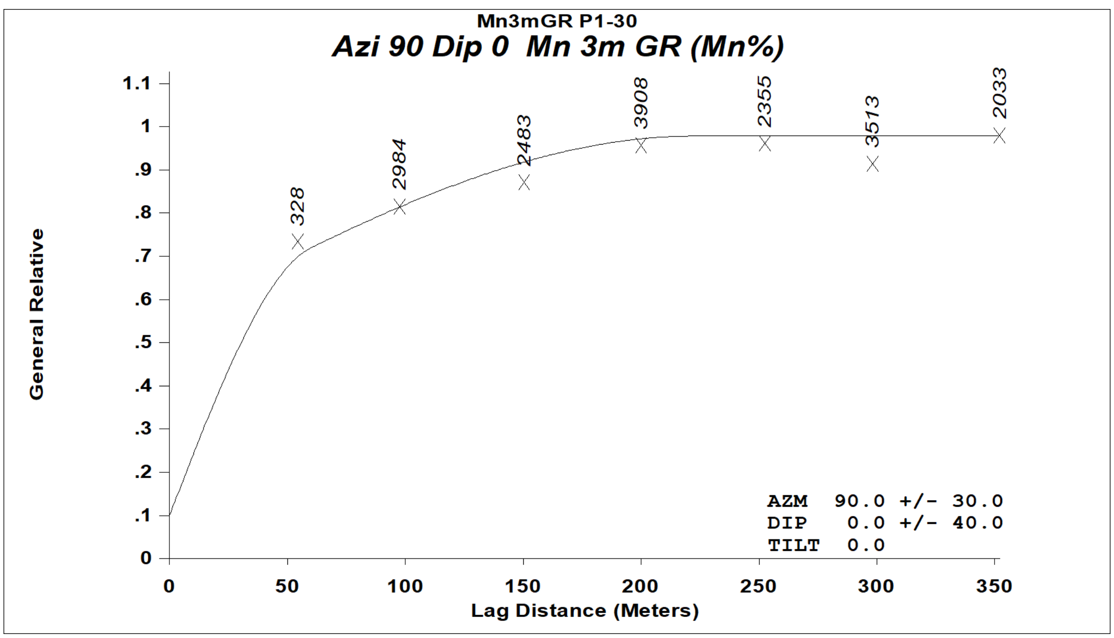



**Figure 14-8: Variogram Parallel to Peif 1**

(Source: Forte)

Classification was done by comparing the average distance of the three closest samples to the distance where the variogram reached 80% of the total sill for indicated, and 90% of the total sill for inferred. Prior studies used the average distance of all holes in the estimate which dilutes the focus from the closest three, which carry most of the weight in the estimation.

A distance limit of 90 meters to the nearest three holes was used to classify indicated material, and a distance of 125m was used to classify blocks as inferred. (Table 14-6). Indicated and inferred resources were also constrained to NSM's property boundary. Figure 14-9 displays a histogram of the average distance for the combined High-Grade and Low-Grade Mn domains with the selected classification distances. All classifications were based on the Mn estimates, as Mn is the dominant economic metal.

**Table 14-6: Resource Classification**

| Domains | Classification | Average Distance (m) |
|---|---|---|
| Peif1 and Peif3 | Indicated | <90 |
| | Inferred | <125 |

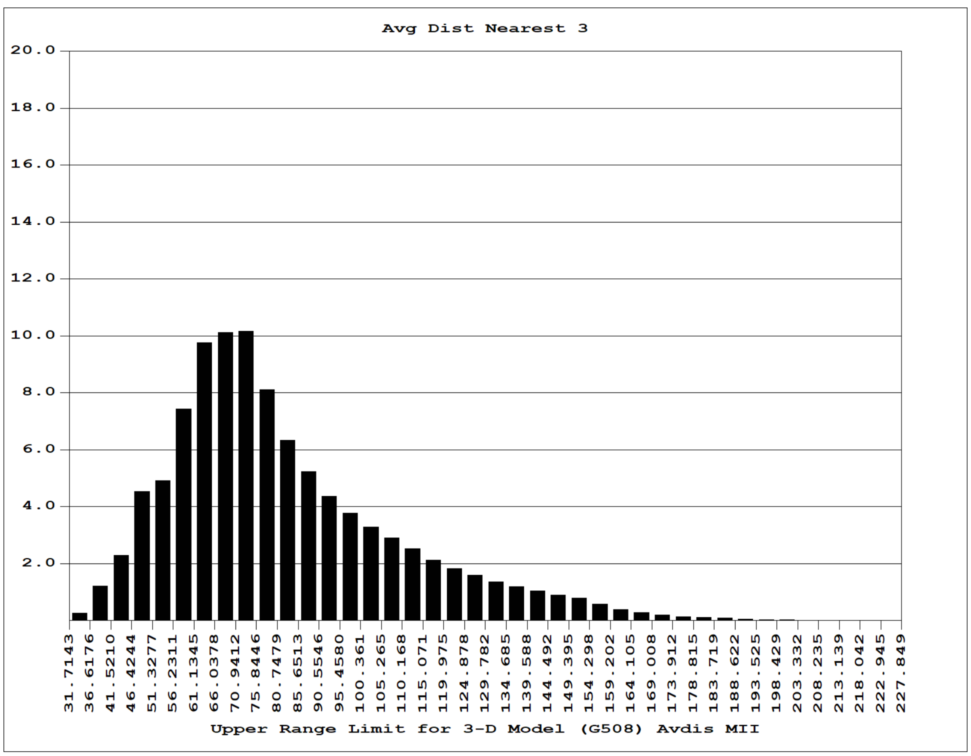



**Figure 14-9: Histogram Showing Avg. Distance to Sample in Combined High-Low-Grade Mn Domains**

(Source: Forte)

## 14.11 Cut-Off Grade

Cut-off grade is one measure used to meet the test of 'reasonable prospects for economic extraction'. Accordingly, the cut-off grade is estimated based on price and recovery assumptions of the payable metal, as discussed herein.

The parameters for the processing cost are based on comminution, iron/manganese separation, leaching and crystallization of the manganese sulfate. Further testing to refine the flow sheet will be needed. The mine operating costs were estimated based on the underhand cut and fill mining method using cemented fill at a production rate of 1,140 tonnes per day; this mining method is highly adaptable to ore bodies of differing geometries and dip and is highly selective. Operating costs for the Emily Project are discussed in Section 21.2.

The Company's price assumption for battery-grade HPMSM is $2,500 per tonne, based on a 2030 forecast by CPM Group of New York. This price has been held constant for the life of the project, notwithstanding CPM Group's projection of rising prices beyond 2030.

Based on this metal price and price variation, the QP estimates the economic cut-off grades in percent contained manganese at 5.7%Mn as shown in Table 14-7. Although there is a sizable mineral resource above 5% manganese, the mineral processing consultants have indicated that certain efficiencies are possible with higher feed grades. Due to the nature of the deposit, there is a continuous core of material greater than 10% that results in an average grade of >17%, potentially bringing these efficiencies to the operation. While the current mineral resource reports at 10% Manganese, the QP suggests that the impact of other cut-off grades be evaluated.

**Table 14-7: Cut-Off Grade Estimate**

| Concept | Units | $/tonne |
|---|---|---|
| Mining Cost | $/t ore | $94.30 |
| Processing | $/t ore | $200.00 |
| Truck Transport $/t ore | **$/t ore** | $12.00 |
| Rail Transport $/t ore | **$/t ore** | $68.55 |
| Last Mile Transport | **$/t ore** | $10.00 |
| G&A | $/t ore | $15.00 |
| **TOTAL** | | **$399.85** |
| | | |
| Price | $/t HPMSM | $2,500.00 |
| Revenue | $/%Mn/t | $70.31 |
| | | |
| **Cut-off** | **%Mn** | **5.69** |

## 14.12 Reasonable Prospects for Economic Extraction

To complete the justification for potential economic extraction, the QP analyzed the overall thickness of the orebody. Based on an underhand cut and fill method the QP assumed that the minimum thickness for effective mining was 4 meters. This permits adequate working height, potentially leaving a crown pillar and minimizing dilution.

The QP believes that the cut-off grade as presented combined with a minimum mining height constitutes reasonable prospects for potential economic extraction. Mineral resources are not mineral reserves and have not been demonstrated to have economic viability.

## 14.13 Validation of Resource Estimate

The resource estimate has been validated by visual review of the block model by global statistical review.

### *14.13.1 Visual Review of Block Model*

Visual review of the block model shows good agreement between block and composite grades. Mineralization appears to be well constrained to areas of drilling. An example section of the model is shown in Figure 14-10.

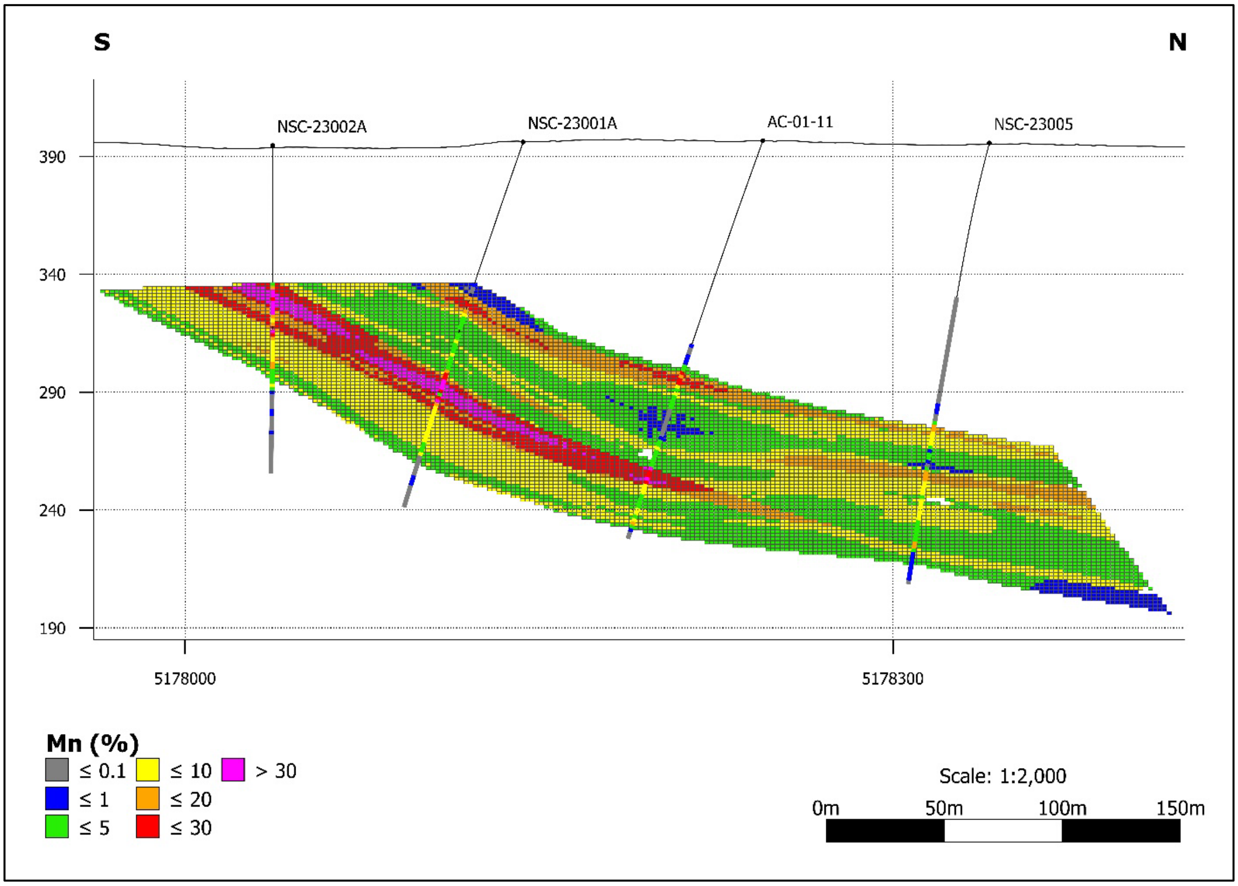
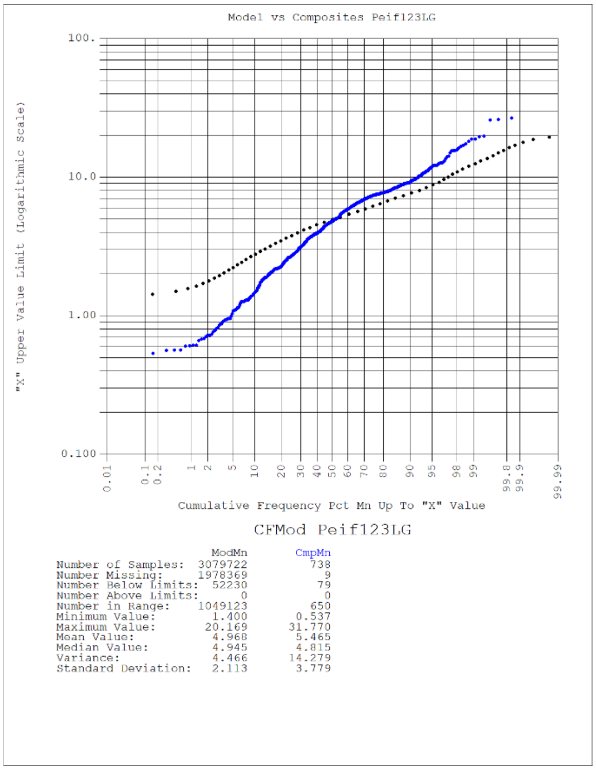



**Figure 14-10: Cross Section of Block Model and Composite DHs Looking West**

(Source: Forte)

### *14.13.2 Global Statistical Review*

The global statistics of the low-grade and high-grade zones was reviewed, and the cumulative frequency graphs are shown in Figure 14-11. The volume variance reduction shows that they are slightly oversmoothed, however the mean grades are similar, and the general performance of the model is appropriate for the deposit style.



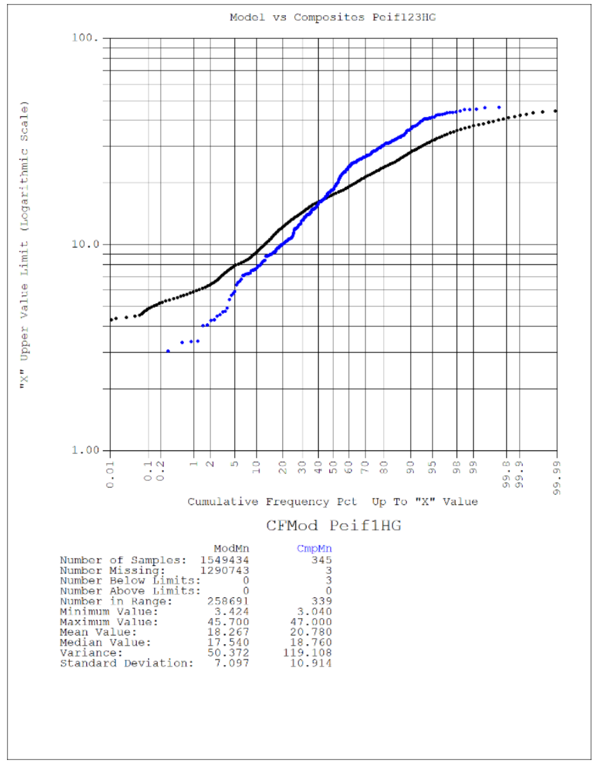




**Figure 14-11: Statistical Comparison of Grade Distribution Low and High Grade**

(Source: Forte)

## 14.14 Mineral Resource Tabulation

The mineral resource has been tabulated at three cut-off grades, 5%, 10%, and 15% Mn, and limited to an area with a thickness greater than 4 meters, as discussed above. The resources are reported as Indicated Mineral Resource and as Inferred Mineral Resource based on the parameters described in Section 14.11, a sales price of U.S. $2,500/t HPMSM, and the morphology of the higher-grade zones of the Emily iron formations.

The classified mineral resources with potential for economic extraction are shown in Table 14-8.

**Table 14-8: NSM Emily Classified Mineral Resource Estimate**

| Domain | Class | Cut-off (Mn%) | Metric Tons (kt) | Density (g/cm³) | Mn (%) | Fe (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|
| High Grade | Indicated | 15 | 5,176.30 | 3.11 | 22.07 | 22.00 | 27.70 |
| | | **10** | **7,104.07** | **3.14** | **19.55** | **22.80** | **30.84** |
| | | 5 | 7,932.89 | 3.14 | 18.37 | 22.95 | 32.53 |
| | Inferred | 15 | 2,244.26 | 3.07 | 20.05 | 19.26 | 26.83 |
| | | **10** | **3,611.36** | **3.10** | **17.19** | **18.99** | **29.97** |
| | | 5 | 4,149.80 | 3.09 | 16.00 | 18.69 | 30.68 |

| Domain | Class | Cut-off (Mn%) | Metric Tons (kt) | Density (g/cm³) | Mn (%) | Fe (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|
| Low Grade | Indicated | 15 | 54.94 | 3.05 | 16.74 | 7.73 | 29.43 |
| | | **10** | **496.37** | **2.99** | **12.32** | **15.65** | **32.31** |
| | | 5 | 7,527.56 | 2.88 | 6.82 | 20.97 | 44.75 |
| | Inferred | 15 | 12.86 | 3.15 | 16.73 | 11.20 | 25.35 |
| | | **10** | **113.91** | **3.06** | **12.30** | **20.78** | **32.18** |
| | | 5 | 5,229.69 | 2.88 | 6.41 | 20.25 | 34.67 |

| Domain | Class | Cut-off (Mn%) | Metric Tons (kt) | Density (g/cm³) | Mn (%) | Fe (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|
| **TOTAL** | Indicated | 15 | 5,231.23 | 3.11 | 22.02 | 21.85 | 27.72 |
| | | **10** | **7,600.44** | **3.13** | **19.07** | **22.33** | **30.94** |
| | | 5 | 15,460.44 | 3.01 | 12.75 | 21.99 | 38.48 |
| | Inferred | 15 | 2,257.11 | 3.07 | 20.04 | 19.21 | 26.83 |
| | | **10** | **3,725.28** | **3.10** | **17.04** | **19.04** | **30.03** |
| | | 5 | 9,379.49 | 2.97 | 10.65 | 19.56 | 32.91 |

Mineral Resources are not Mineral Reserves and have not been demonstrated to have economic viability. Inferred resources are too speculative geologically to have modifying factors applied. There are currently no mineral reserve estimates for the project. There is no certainty that the Mineral Resource will be converted to Mineral Reserves. The quantity and grade or quality is an estimate and is rounded to reflect the fact that it is an approximation. Quantities may not sum due to rounding.

# 15. MINERAL RESERVE ESTIMATES

There are no Mineral Reserve Estimates for the NSM Emily Manganese Deposit.

# 16. MINING

## 16.1 Introduction and Summary

Due to the strength of mineralized rock and geometry at Emily, the underground mining method of underhand cut and fill has been chosen with delayed cemented rock fill. Underhand cut and fill (also referred to as "cut and fill") excavates ore from top to bottom then backfills the void with cemented rock fill (CRF). Stairstep room and pillar was also considered as an alternative mining method, but was dropped due to the dip of the mineralization (varying from 20 to 40 degrees).

Using this method, mineralized material is excavated in five horizontal slices from each mining level, starting from the top of the mining level and advancing downwards in 3-meter-high slices; once the horizontal slice has been completely extracted, cemented rock fill is emplaced in the void and allowed to cure before mining directly beside or below the drift is begun. The cemented rock fill serves both to support the drift walls and act as a stable roof from which additional mineralized material can be extracted in a lateral and downward direction. Additionally, the cemented rock fill prevents any surface subsidence from manifesting itself, controls any underground water (which is not thought to be significant) and could allow larger spans to be taken under the cemented rock fill.

When no mining is planned beside or below a drift, the fill material can consist of waste rock from mine development, such as the spiral ramp, muck bays or raises. However, in Emily's case, quarried, clean rock fill mixed with water and cement will be engineered to provide support for future mining, once the cemented rock fill has cured an appropriate time. Hydraulic tailings may also be used composed of fine-grained mill tailings, mixed on surface with water and cement and distributed underground through pipelines to mined out drifts, assuming it meets engineering specifications and is available.

Figure 16-1 illustrates underhand cut and fill with cemented rock fill in the top or "A" cut.

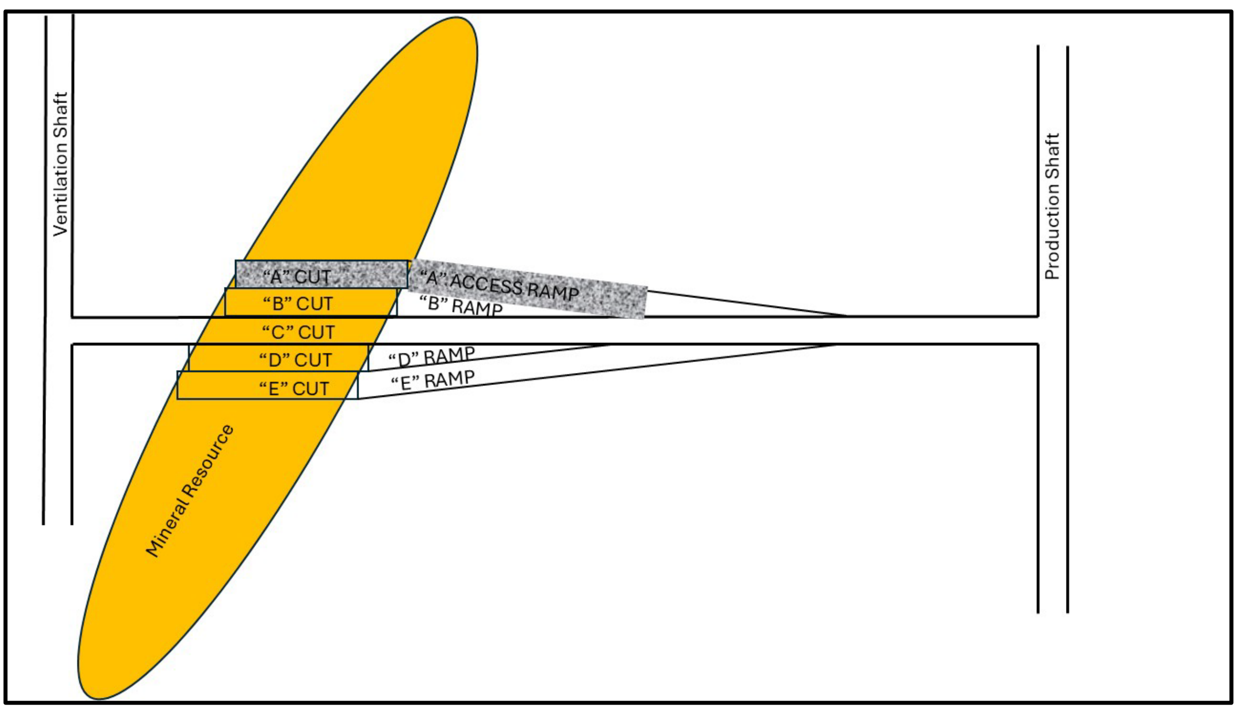



**Figure 16-1: Underhand Cut and Fill Mining at Emily (long section)**

(Source: Forte)

Based on Forte's geotechnical investigations, the placement of cemented rock fill and a 10-meter-thick crown pillar separates the topmost mining level from bottom extent of the glacial till and offers protection for both the workings (and workers) and the ground water above the iron ore formations.

## 16.2 Mineable Resources

As part of Forte's work, mineable resources were estimated from the above mineral resource estimate constrained by a 10% Mn grade shell based on the cut-off grade calculation discussed in this report. Due to the inclined nature of the zone, Forte has applied 12% ore loss and 6% dilution to the in-place mineral resource.

Using recommendations from Forte's geotechnical investigation and interpretation of existing hydrological data on the Emily deposit, underhand cut and fill mining was chosen to be exploit the mineralization. Stable drift dimensions between 3 to 5 meters in cross section formed the basis of a detailed mine design for two mining levels that typified the mineralization's thickness and attitude.

The tonnes and grade of these designed areas were compared to the mineral resource of the same elevations and cut-off grade to determine the extraction ratio of the mineral resource. These percentages of mineral resource extraction were then applied to the entirety of the mineralized inventory above the 10% Mn grade. Estimates in the low grade area are not considered in the minable resource estimate; should these prove up in production, they will add a small amount to the mineral resource.

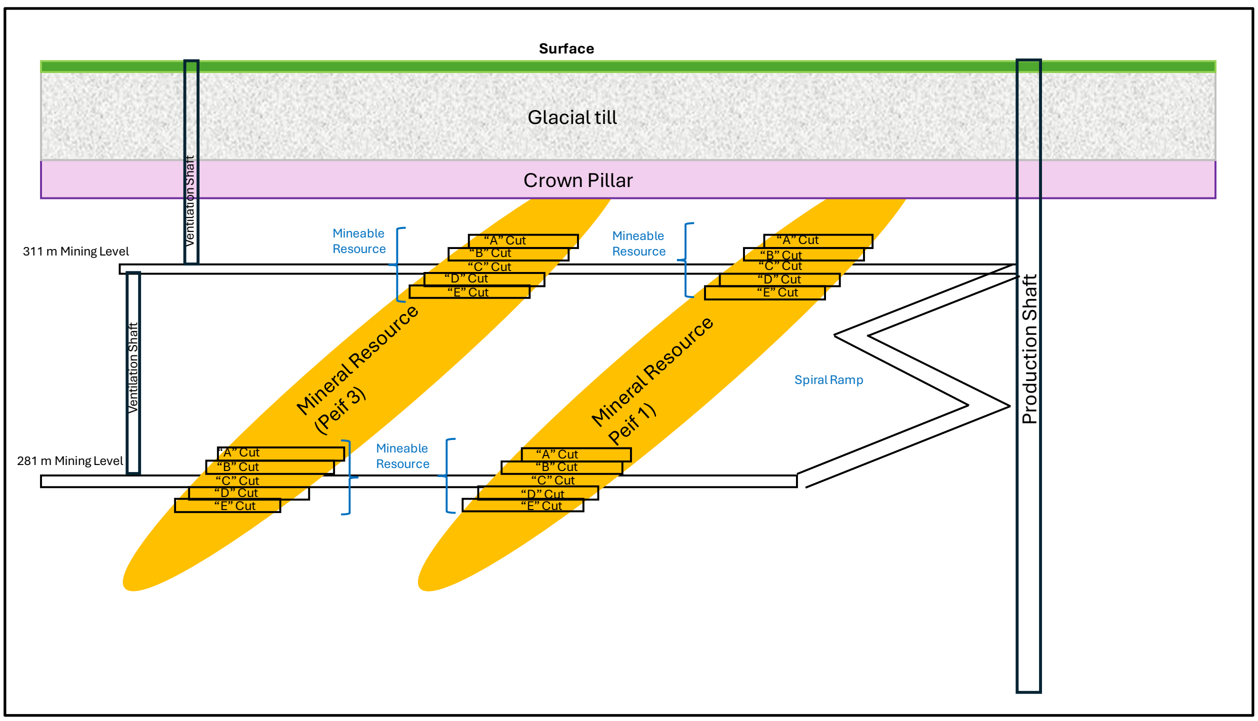



**Figure 16-2: Two Mining Levels Designed in Detail to Determine the Mineable Resource**

(Source: Forte)

**Table 16-1: Minable Resource Estimate**

| Domain | Class | Cut-off (Mn%) | Metric Tons (kt) | Density (g/cm³) | Mn (%) | Fe (%) | $SiO_2$ (%) |
|---|---|---|---|---|---|---|---|
| High Grade | Indicated | 15 | 4,176.85 | 2.91 | 20.46% | 20.35% | 34.17% |
| | | **10** | **5,703.93** | **2.94** | **18.16%** | **20.93%** | **37.97%** |
| | | 5 | 6,394.31 | 2.93 | 17.04% | 21.01% | 40.15% |
| | Inferred | 15 | 1,940.49 | 2.88 | 18.79% | 18.00% | 31.89% |
| | | **10** | **3,122.26** | **2.90** | **16.11%** | **17.85%** | **35.90%** |
| | | 5 | 3,524.17 | 2.90 | 15.13% | 17.60% | 36.59% |

## 16.3 Design Parameters

Table 16-2 summarizes the parameters that were used in the underground mine design. Forte's hydrological investigation determined water inflows into the mine would be manageable and would not negatively impact the safety nor productivity of the operation. Similarly, Forte's geotechnical investigation determined stable mining drifts would be realized using 3 by 5-meter openings. The position of the drifts can be adjusted to minimize planned dilution.

**Table 16-2: Underground Mine Design Parameters**

| Description | Parameter | Units |
|---|---|---|
| **Underground Mining Parameters** | | |
| Specific gravity | 2.85 | Unitless |
| Mine Production Rate | 1,140 | tonnes/day |
| Waste Production Rate | 250 | tonnes/day |
| **Mining method: Underhand Cut and Fill** | | |
| Drift dimensions | 5 m wide x 3 m high | |
| Mining cost | 94.30 | $/tonne |
| Cut-off grade | 10 | % Mn |
| Mining Recovery | 90% | |
| Unplanned mine dilution | 0.00% | |
| Ramp Gradient (maximum) | +/- 15% | |
| Underground material handling | (a) Rubber tired truck and loader from face/muck bay to shaft skip pocket<br>(b) Cemented rock fill from underground plant | |
| **Hydrology** | | |
| Water inflow to mine (high end) | Drifts: 5.4 to 9.4 gpm/LF | |
| **Geotechnical** | | |
| Drift dimensions (cross section) | 3 m to 5 m openings | |
| Crown Pillar thickness (m) | 10 meters thick from bottom of glacial till | |
| **Pertinent Mine Elevations** | | |
| Surface elevation | 395 | masl |
| Bottom of glacial till | 330 | masl |
| Crown Pillar | 330-320 | masl |
| Mineralized Resource Extent | 320-221 | masl |

## 16.4 General Description

Based on the above mine design parameters, Forte designed an underground mine using the underhand cut and fill mining method. Due to the saturated glacial till above the mineralized zone, access to the mineralized zone is by two vertical shafts, a 5.5 m diameter Production Shaft, capable of skipping 1,500 t/d of mineralized material and 250 t/d of waste. The second shaft is a 4.6 m diameter Ventilation Shaft, fitted with a Chippy Hoist to remove underground personnel in the event of an emergency. Due to the dip of the mineralization, the Ventilation Shaft should be developed during the mine life internally to avoid sterilizing any mineable resource.

Mine air will intake through the production shaft at a rate of 165 m3/second (350,000 cubic feet per minute) and exhaust through the Ventilation Shaft. Air flow is based on the amount of underground diesel equipment operating in the mine at any one time. Electric underground mine equipment should be considered in future technical studies and would significantly reduce the amount of ventilation needed to operate the mine and reduce the overall power consumption of the operation.

Secondary access to the mineralized zone, spaced every 30 meters vertically, is through a spiral ramp from the top mining level (311 m level) to the 221 m level at a gradient of 15%, which reasonable for an operation employing rubber-tired underground mining equipment.

Figure 16-3 is an isometric drawing looking northeast illustrating the mine layout, showing the two mining levels designed in detail (the 311 and 281 m level) which were used to determine the mineable resource discussed above; a total of 7 levels are accessed from the spiral ramp, on 15 m vertical spacings; they are the 311, 296, 281, 266, 251, 236 and 221 m levels. The mineralized grade shell is at a grade of 10% Mn.

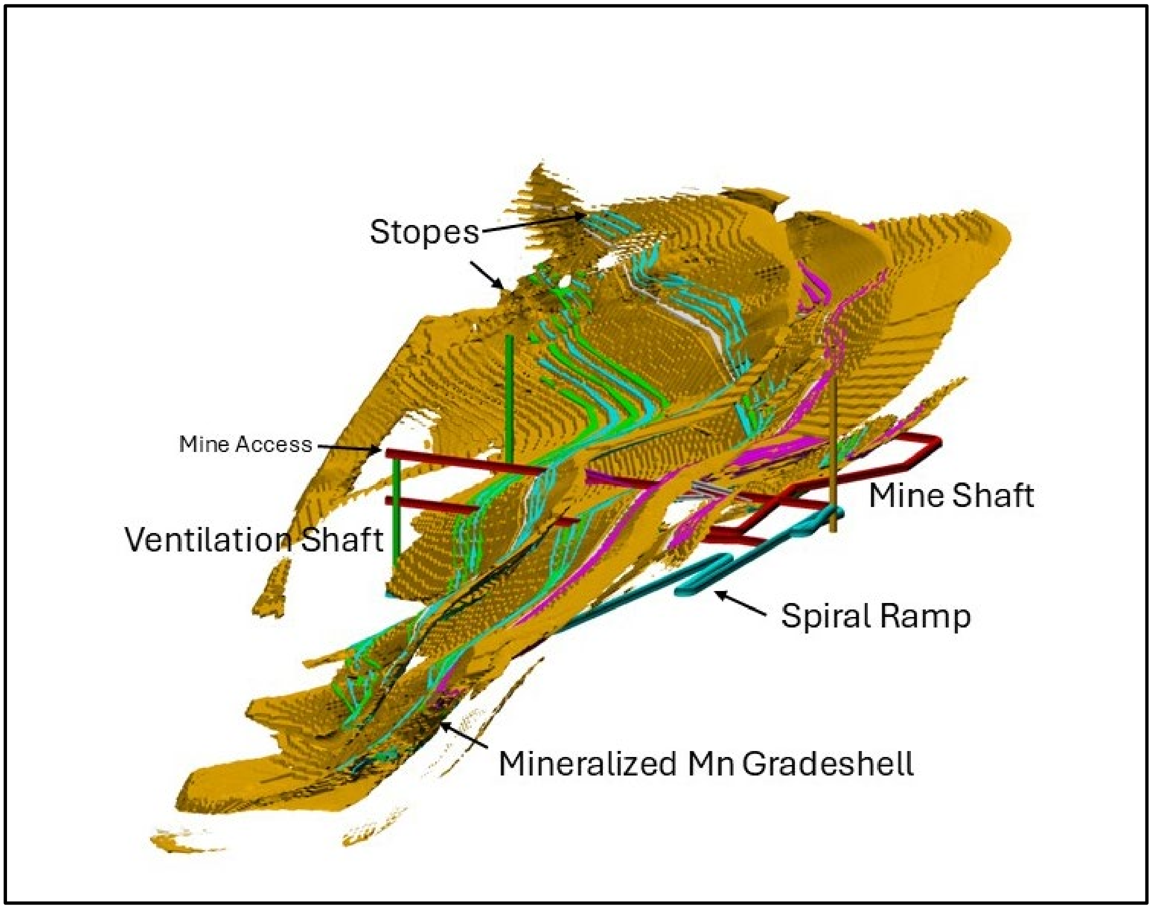



**Figure 16-3: Isometric View Looking Northeast of the Emily Underground Design (Not to Scale)**

(Source: Forte)

### *16.4.1 Development Schedule*

Forte completed an engineering, construction and production schedule for the Emily mine project as shown in Table 16-3 below. The work includes those tasks needed to take the mining project from the PEA status into production, including exhausting the life of mine mineable resources.

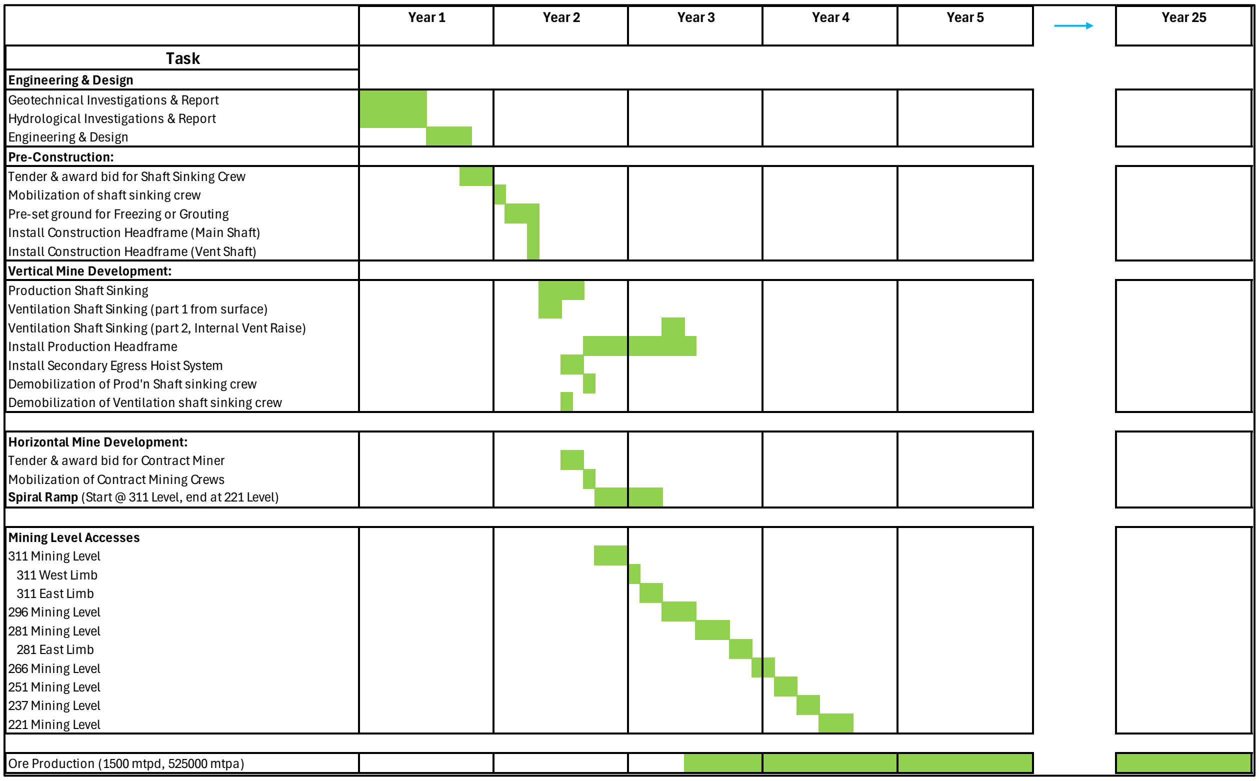
Forte made the following assumptions in creating the mining project schedule:

- Environmental permitting is excluded from consideration.
- Technical work would begin with developing geotechnical engineering and hydrological matters from the current PEA level and support the engineering and design work to the final Engineering/Construction phase.
- Production and Ventilation Shaft development assumes Ground Freezing or Grouting ahead of shaft sinking through the glacial till.
- All shaft and pre-production development would be done by Contractors.

The mine would require 2 ½years of engineering, construction and pre-production mine development to realize Manganese production, and operate from Year 2 ½ to Year 25 at a rate of 400,000 mtpa.

Table 16-3 shows a preliminary project construction and production schedule for the Emily mine.

**Table 16-3: Emily Mine Project Construction and Production Schedule**




### *16.4.2 Production Schedule*

The assumption summary is:

- Year 1 through 2 ½ – Engineering and construction
- Year 2 ½ – half year, half productivity Peif1 (100kt)
- Year 3 – full year, half productivity Peif1 (200kt); half year, full productivity Peif3 (50kt)
- Year 4 – full year, full productivity on both, 857 t/d Peif1, 286 t/d Peif3

The ore mining schedule for the Emily project was created using a maximum 1,140 ore tonnes per day at 350 operating days in a year. An underhand cut and fill method was selected for this project. A fill schedule was not built for this PEA and is recommended for future studies. A cut-off grade of 10% Manganese is used, along with a 12% ore loss factor, and 6% dilution factor (conservatively considered as pure silica). Peif1 is prioritized due to its higher grade to maximize NPV. Peif3 is assumed to begin one operating year after Peif1 to allow for additional operating faces. Years 1 and the first half of Year 2 are assumed to be construction stages. Production begins in the latter half of Year 2, and this schedule includes a ramp up until full production commences in Year 4.

Peif1 starts in Year 2 at half production rate (570 ore tonnes per day) and operates for half the year (175 days). In Year 3, this continues at half its full production rate, but for a full year (350 days). In Year 4, Peif1 is in full production at 860 ore tonnes per day for 350 days until Year 23, when Peif3 finishes. Being the remaining active mining area, Peif1 is then completed at 1,140 ore tonnes per day until Year 25. Overall, Peif1 contains 6.79M ore tonnes, 1.24M Manganese tonnes at an average grade of 18.27%, 1.28M Iron tonnes at an average grade of 18.88%, and 2.71M Silica tonnes at an average grade of 39.92%.

Peif3 starts in Year 3 at 290 ore tonnes per day for 175 operating days. In Year 4, it reaches its maximum production at 290 ore tonnes per day for 350 days. This continues until this zone is mined out in Year 23. Overall Peif3 contains 2.03M ore tonnes, 298k Manganese tonnes at an average grade of 14.63%, 468k Iron tonnes at an average grade of 23.02%, and 575k Silica tonnes at an average grade of 28.28%.

In total, this schedule has 8.83M ore tonnes, 1.54M tonnes of Manganese at 17.43% grade, 1.75M tonnes of Iron at 19.84% grade, and 3.29M tonnes of Silica at 37.24% grade. The detailed production schedule by zone is shown in Appendix A.

### *16.4.3 Haulage-Underground and Surface*

Broken rock from the muck face will be hauled by rubber-tired load, haul dump (LHD) equipment and trucks to either a local muck bay or dumped directly into the primary crusher, feeding into the measuring flask and skipped via the Production Shaft to surface where it will be dumped into an ore or waste pile. Material in the muck bay will be identified as either mineralized or waste by ore control technicians prior to haulage.

An underground backfill plant will be located between the mineralized zone and production shaft; water, aggregate (or tailings) and cement will be individually transported via pipeline from surface to underground storage containers with CRF batched and dumped into trucks returning from the shaft skip pocket. The cemented rock fill will be emplaced to fully fill the mined-out voids of drifts.

Depending on the path taken on mineral processing, aggregate or fill for the rock fill will be supplied by surface borrow pits in the glacial till or from preconcentrate rejects on the mine site. Further test work on mineral processing, rock fill, and paste will need to be completed in future studies.

### *16.4.4 Mine Labor and Equipment*

Table 16-4, Table 16-5, and Table 16-6 show the labor, both hourly and salary, and underground mining equipment needed to operate an underhand cut and fill mine producing 1,140 tonnes per day of ore and 250 tonnes per day of waste, skipped to surface. The mine is assumed to operate on two 8-hour shifts, with four rotating crews working 350 days per year. Underground mining equipment chosen assumes a mining cycle consisting of drilling, blasting, mucking, and ground support.

**Table 16-4: List of Salary Employees at Emily**

| (I) SALARY | # People |
|---|---|
| Mine Manager | 1 |
| Superintendent | 1 |
| General Foremen (Mine) | 1 |
| General Foremen (Maint.) | 1 |
| Engineers | 2 |
| Geologists | 2 |
| Environmental Specialist | 1 |
| Shift Bosses | 4 |
| Technicians | 2 |
| Accountants | 2 |
| Purchasing/Warehouse | 3 |
| Human Resources | 1 |
| Secretaries | 1 |
| Clerks | 2 |
| **Total Salaried Personnel** | 24 |

**Table 16-5: List of Hourly Employees per Day at Emily**

| (II) HOURLY LABOR | # People/day |
|---|---|
| Stope Miners | 10 |
| Development Miners | 4 |
| Equipment Operators | 4 |
| Hoist Operators | 2 |
| Support Miners | 4 |
| Diamond Drillers | 4 |
| Backfill Plant Operators | 2 |
| Electricians | 2 |
| Mechanics | 8 |
| Maintenance Workers | 0 |
| Helpers | 0 |
| Underground Laborers | 4 |
| Surface Laborers | 4 |
| **Total Hourly Personnel/day** | 48 |

**Table 16-6: Underground Mining Equipment at Emily**

| Type | Specification | # Units | Make | Model |
|---|---|---|---|---|
| Production Drill | 3.81 cm drill bit, 106 HP diesel eng. (Single Boom Jumbo) | 6 | Sandvik | DD311 |
| Development Drill | 3.81 cm drill bit, 106 HP diesel eng. (Single Boom Jumbo) | 2 | Sandvik | DD311 |
| Production Scoop Tram | 6.3 m3 bucket, 345 HP diesel eng. | 6 | Sandvik | LH515i |
| Development Scoop Tram | 6.3 m3 bucket, 345 HP diesel eng. | 2 | Sandvik | LH515i |
| Rock Bolter | 3.81 cm drill bit, 97 HP diesel eng. | 1 | Sandvik | DS311 |
| Service Vehicles | 50 HP diesel eng. | 3 | Kubota Tractor | L4802 |
| Shotcrete Machine | Wet shotcrete, truck mounted, remote control, nozzle on robotic arm | 1 | | |
| Service Vehicles | 173 HP diesel eng. | 3 | Getman Utility Veh. | A64 |
| Exploration Drills (UG) | 101 HP diesel eng. | 2 | Boart Longyear | LM75 |

## 16.5 Mine Services and Underground Infrastructure

Mine services required to operate the mine include electricity, fresh water, and compressed air. The water management system will include pumps, sumps, and piping systems to bring in fresh water to support drilling, backfilling, and discharging water the mine makes to the surface.

Underground facilities to support the operation include a backfill plant, several refuge stations, a maintenance shop, and a primary crusher with a grizzly for removing tramp iron located near the shaft station. The maintenance shop will support all mechanical and electrical maintenance in the operation and will also include a lunchroom and warehouse. The shop facility will be modest in size and will be supported by a larger unit on surface. A water management system, consisting of pumps and sumps, will manage fresh water into the mine and discharge any water produced by the mining operation to the surface for any treatment required by the environmental permits.

The mine ventilation system will also have primary and secondary electric fans to intake fresh air and discharge mine air to the surface, and will be supported by air ducting, air doors, and brattice cloth as necessary to direct air in the underground workings.

### *16.5.1 Geotechnical Engineering and Ground Support System*

Forte worked with Electric Metals' geotechnical contractor, RESPEC, to complete compressive and tensile destructive test work on cylindrical cores from the Emily 2023 exploration drilling program.

Table 16-7 summarizes the RESPEC test results in support of Forte's geotechnical engineering work.

Forte's determination of the critical span rock in the mineralized zone at Emily was based on data from exploration cores and hydrologic investigations performed by Barr Engineering (2009-2010). Forte used the Rock Quality Designation (RQD) and Rock Mass Rating (RMR) systems with this data, which are empirical methods for assessing rock-mass competence and support requirements. RQD is the percentage of pieces of drill core more than 4 inches long in a length of core, usually the length of recovered core in a core barrel. RMR is a rock mass classification system developed by Dick Bieniawski for mines and tunnels in the early 1970s and consists of ratings for the following parameters:

- Uniaxial compressive strength of intact rock
- RQD
- Discontinuity spacing
- Discontinuity conditions –length, aperture, roughness, infilling and weathering
- Groundwater flow rate and/or porewater pressure

**Table 16-7: Geotechnical Test Results on Emily Core (RESPEC)**

| Specimen I.D. | Density (g/cc) | Indirect Tensile Strength (psi) | Young's Modulus (psi) | Poisson's Ratio | Unconfined Compressive Strength (psi) | Point Load UCS (psi) |
|---|---|---|---|---|---|---|
| Emily/23001A-1 | 2.71 | 93 | 7,342,000 | 0.29 | 11,380 | 32,647 |
| Emily/23001A-2 | 2.78 | 1,615 | 6,964,000 | 0.32 | 10,220 | 10,169 |
| Emily/23001A-3 | 3.32 | 182 | No Specimen | | | 2,489 |
| Emily/23006-1 | 2.88 | 125 | 411,000 | 0.2 | 680 | 1,771 |
| Emily/23006-2 | 3.77 | 5,370 | 9,533,000 | 0.14 | 37,860 | 2,033 |
| Emily/23007-3 | 3.16 | 194 | 5,986,000 | 0.08 | 2,920 | 15,764 |
| Emily/23044-1 | 2.69 | 2,793 | 7,611,000 | 0.04 | 26,440 | 25,913 |
| Emily/23044-2 | 2.99 | 326 | 4,265,000 | 0.21 | 4,140 | 2,997 |
| Emily/23044-3 | 3.39 | 1,345 | 4,913,000 | 0.05 | 21,080 | 17,834 |
| Emily/23044-4 | 3.32 | 2,085 | 8,986,000 | 0.16 | 28,680 | 42,421 |
| Emily/23044-5 | 2.97 | 1,505 | 987,000 | 0.05 | 1,200 | 6,486 |
| Emily/23047-1 | 2.89 | 4,659 | 11,154,000 | 0.07 | 57,020 | 41,246 |
| Emily/23047-2 | 3.59 | 4,735 | 9,871,000 | 0.08 | 53,690 | 48,816 |
| Emily/23047-3 | 2.34 | 2,511 | No Specimen | | | 1,388 |
| Emily/23047-4 | 3.39 | 4,402 | 6,271,000 | 0.12 | 41,340 | 22,151 |
| Emily/23047-5 | 2.77 | 2,805 | 7,205,000 | 0.09 | 25,590 | 4,314 |
| Emily/23049-1 | 2.72 | 412 | 3,105,000 | 0.07 | 15,330 | 21,554 |
| Emily/23049-2 | 2.79 | 1,115 | 1,650,000 | 0.12 | 8,700 | 1,325 |
| Emily/23049-3 | 2.2 | 46 | 352,000 | 0.11 | 800 | 501 |
| Emily/23049-4 | 2.43 | 111 | 960,000 | 0.13 | 1,360 | 786 |
| Emily/23049-5 | 2.77 | 1,528 | 1,142,000 | 0.03 | 2,080 | 29,388 |
| Emily/23052-1 | 3.56 | 1,392 | 6,471,000 | 0.12 | 7,980 | 7,295 |
| Emily/23052-2 | 2.74 | 4,496 | 2,995,000 | 0.07 | 3,310 | 18,854 |
| Emily/23052-3 | 2.62 | 1,124 | 3,754,000 | 0.09 | 6,910 | 14,442 |
| Emily/23052-4 | 1.96 | 37 | No Specimen | | | 425 |

Forte derived roof support/reinforcement requirements from RMR calculations discussed above to determine drift spans, bolt types, lengths, and patterns for each rock type at Emily. Based on the geotechnical work, drift spans should be stable up to 5 meters in width. Despite the wide range of RMR values, the recommended bolt lengths and spacings are relatively constant. Using Split Sets™ rock bolts, Forte recommends a bolt length of 7.5 (2.3 m) to 8 ft (2.4 m) on a 5-ft (1.5-m) spacing. With Swellex™ or equivalent, the spacing becomes approximately 6 ft (1.8 m).

### 16.5.2 Hydrology

Barr Engineering has completed several hydrologic studies on the Emily deposit, however, these investigations did not analyze the entire mineralized zone and therefore Forte is not able to assess the hydrologic properties of the host iron formation. Forte does expect the water inflows in the mineral will be significantly less than those of the glacial till.

### 16.5.3 Ventilation

Forte calculated the amount of mine ventilation needed to support the rubber-tired diesel equipment needed to support the operation, based on MSHA's guidance. This value, 350,000 cubic feet per minute (cfm), of fresh air, coupled with the length and size of openings within the mine design, determined that a 350-horsepower primary fan was needed to intake sufficient fresh air to support the operation. Smaller, secondary fans would be needed to adequately ventilate the working headings.

Forte has completed a preliminary ventilation design, as shown in Figure 16-4, where a 350 HP fan, located at the top of the Ventilation Shaft will pull sufficient air to support the mine operation.

Forte recommends a detailed ventilation study be completed once the mine plan has been advanced in future studies.

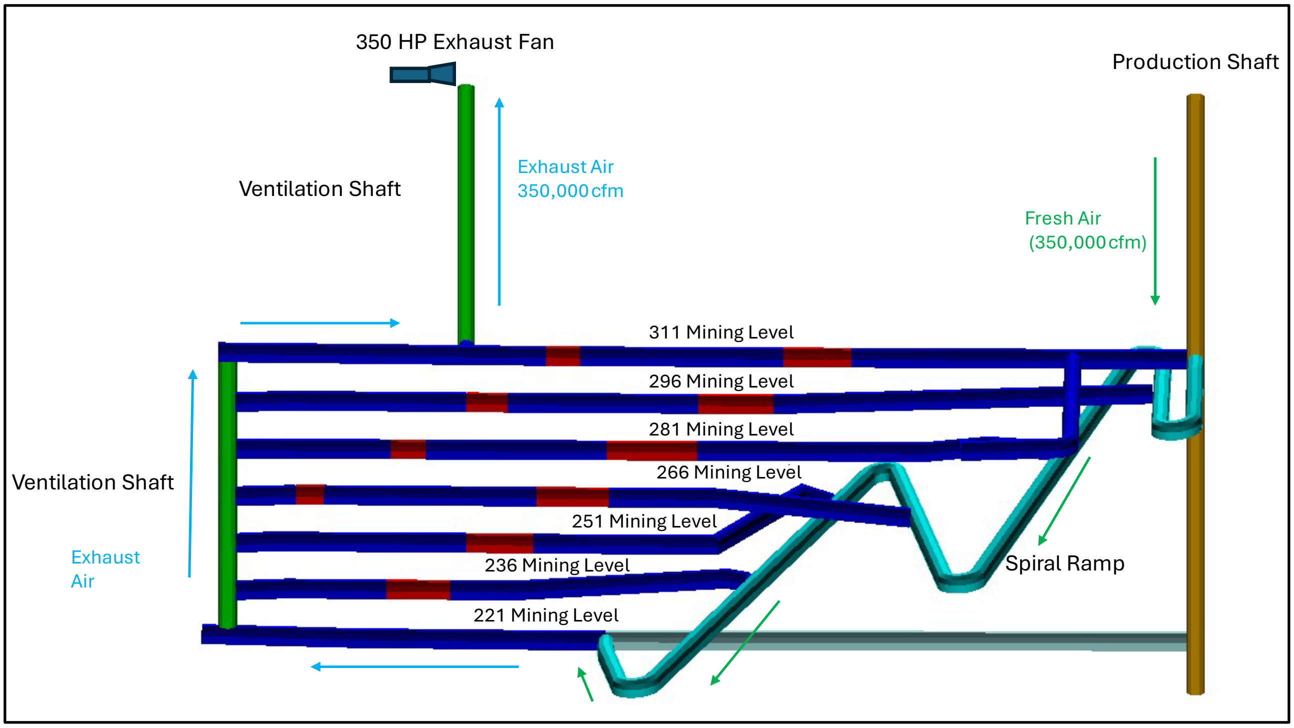



**Figure 16-4: Mine Ventilation at Emily**

(Source: Forte)

# 17. RECOVERY METHODS

A conceptual process flowsheet was developed for the production of HPMSM from the manganese ore based on the scoping metallurgical testing performed by Electric Metals (Flowsheet No. 1). Electric Metals plans to build the chemical plant away from the Emily deposit. Multiple potential chemical plant sites are currently under review and consideration. The ore will be shipped by rail from a load-out station in central Minnesota, near the Emily site. To minimize the transportation costs, an alternative process flowsheet, which assumes a beneficiation stage prior to transportation, is also proposed for further evaluation (Flowsheet No. 2).

The primary flowsheet is presented in Figure 17-1. Flowsheet No. 1 assumes whole ore processing, which has been tested in the Scoping level study. Pre-treatment and beneficiation to increase the grade of material shipped for further processing will be addressed in future test work.

## 17.1 Process Description

The ROM ore will be shipped to a remote location, yet to be decided, and will be stockpiled for processing. The process will consist of the following unit operations:

- Two to three stage crushing to $P_{80}$ of 12.5 mm (0.5 inch)
- Ball mill grinding to ± 400 micrometers
- Agitated leach circuit at 45% solids for 5 hours with sulfuric acid and sulfur dioxide
- Removal of iron, aluminum, sodium, potassium, and silica by the addition of calcium carbonate and calcium hydroxide
- Base metals (copper, nickel, cobalt, zinc sulfides) removal by the addition of hydrogen sulfide
- Removal of calcium and magnesium by the addition of reagents and filtration
- Crystallization of HPMSM

The leaching of the ore recovered 95% to 98% of the manganese into the pregnant solution. Removal of impurities and crystallization of the HPMSM will result in loss of some manganese. Hence, the overall recovery of manganese is conservatively estimated at 90%.

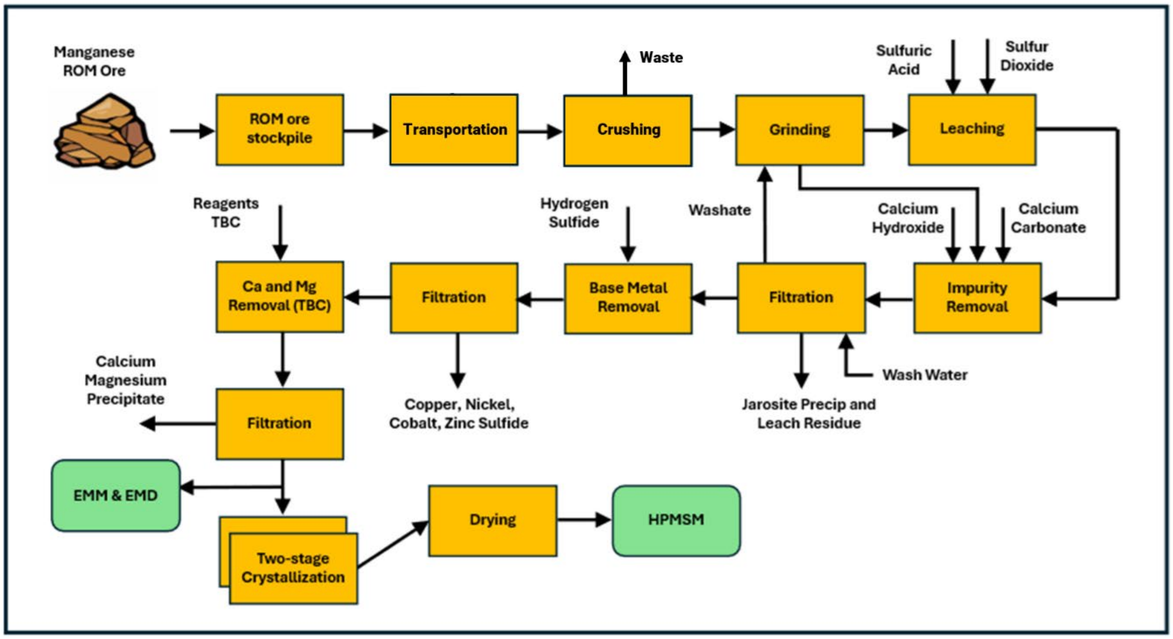



**Figure 17-1: Simplified Flowsheet No. 1**

(Source: Electric Metals)

Flowsheet No. 2 (Figure 17-2) represents a crushing and ore beneficiation stage prior to transport, which would result in the shipment of lower volume, higher-grade manganese feedstock to the HPMSM processing facility, with lower transport and reagent costs. NSM will be working on continued ore beneficiation optimization systems in its future metallurgical work.

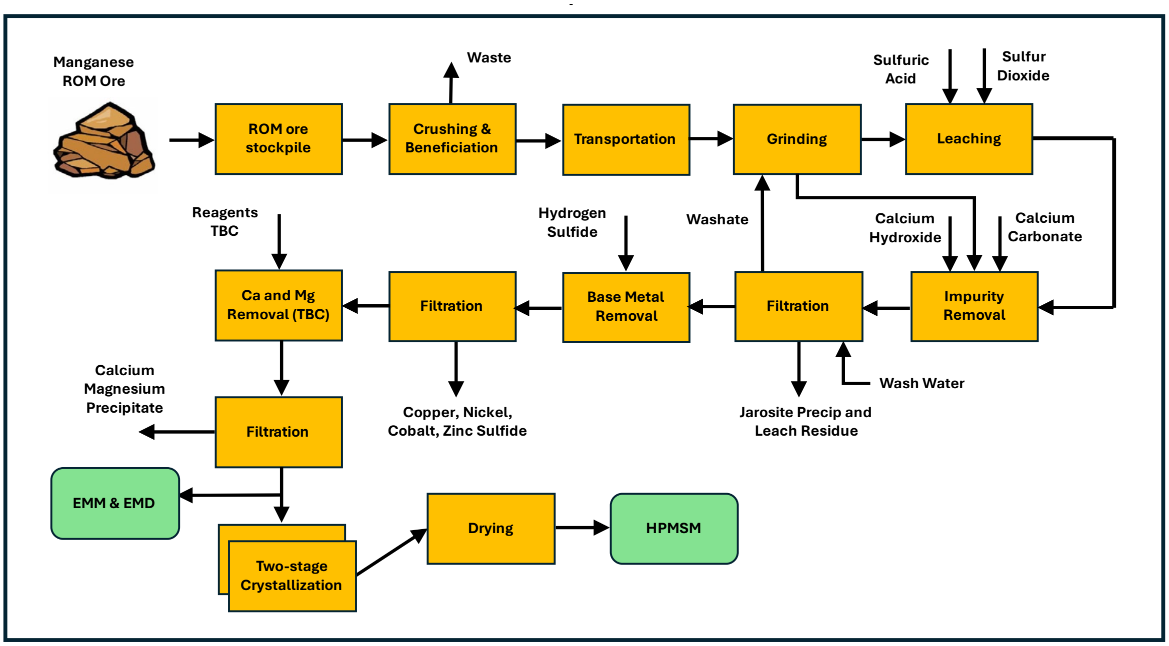



**Figure 17-2: Alternative Simplified Flowsheet No. 2**

(Source: Electric Metals)

# 18. PROJECT INFRASTRUCTURE

## 18.1 Emily Project Site Facilities and Services

As part of the CMR surface leases, NSM has the right to use the structures and facilities located in the SW ¼ of the NE ¼ of Section 21, Township 138 North, Range 26 West, Crow Wing County, Minnesota.

Existing infrastructure at Emily includes a heated core shed and storage facility, pump station, electric utility plant, and water holding and clarifier tanks, and asphalt roads and parking areas present on the property (Figure 18-1). The facilities also include electric power and running water.

**Figure 18-1: Storage Facilities and Core Shed**

(Source: Electric Metals)

Future facilities to operate the underground mine will include the following:

- Administration/Technical Services Office
- Change House
- Warehouse
- Maintenance Shop
- Hoist Building
- Ponds to support surface water containment
- Firefighting and Ambulance equipment, housed in an appropriate building

Forte did not consider repurposing some of the existing infrastructure; however, this should be done to reduce capital construction costs.

Rubber tired equipment on surface will support underground operations and will include:

- Front end loader (to load ore and waste from the shaft stockpile)
- Telehandler and Forklift
- Road Grader
- Skid Steer Loader

## 18.2 Chemical Facility Project Site Facilities and Services

Since the chemical facility site has not yet been selected, there is no information on the associated site facilities and services. However, part of the site selection criteria includes:

- Electrical connections
- Rail service
- Major highway / road access
- Availability of chemical supplies
- Availability of chemical workers and other appropriate specialists

# 19. MARKET STUDIES AND CONTRACTS

## 19.1 Introduction

EML engaged CPM Group, an independent commodities research and consulting firm, to provide an updated assessment of the high-purity manganese market, with particular focus on High-Purity Manganese Sulphate Monohydrate (HPMSM). The purpose of this assessment is to support the economic assumptions used in the Preliminary Economic Assessment (PEA) for the North Star Manganese Project.

Manganese sulphate is widely used in agriculture as a micronutrient fertilizer that enhances the productivity of arable land, and it also serves as a catalyst in water treatment for the removal of organic pollutants[2]. This form is commonly referred to as agricultural-grade manganese sulphate. However, despite these applications, the primary driver of future demand is expected to come from electric vehicle batteries, which require high-purity manganese sulphate monohydrate (HPMSM), where manganese contributes to greater energy storage density.

The CPM study focused on the battery markets, reviewing demand drivers, developments in battery chemistries, current supply and pricing, and long-term projections for HPMSM. The Qualified Person has relied on this study, supplemented with public information, for the assumptions contained in this section.

## 19.2 Manganese in Batteries

Manganese has been used in batteries for over a century. Its role in lithium-ion batteries has increased significantly over the past decade as HPMSM has become a preferred precursor for cathode active materials (CAM).

Nickel-Manganese-Cobalt (NMC) cathodes continue to represent a major class of electric vehicle (EV) chemistries. Projections reviewed by CPM indicate that manganese-bearing chemistries will increase from approximately 37% of global lithium-ion output in 2023 to approximately 61% by 2034. Emerging cathodes such as LNMO spinels, BASF's NMC-370, and high-manganese LMFP formulations consume substantially higher quantities of manganese per kilowatt-hour relative to legacy NMC chemistries.

Lithium-Manganese-Iron-Phosphate (LMFP) is expected to be the fastest-growing chemistry. By 2034, LMFP is projected to represent ~32% of global lithium-ion battery output and to account for nearly 70% of high-purity manganese consumption in batteries. Sodium-ion batteries, currently in early stages of commercialization, are projected to contribute additional manganese demand of ~300–400 g Mn per kWh by 2032.

The transportation sector accounts for approximately 85% of rechargeable battery demand and is expected to remain the primary driver of manganese consumption. The combination of political and market forces has affected the market recently, although as adoption of EV technology increases, CMP's forecast shows a deficit if LMFP adoption continues to increase as predicted (Figure 19-1).

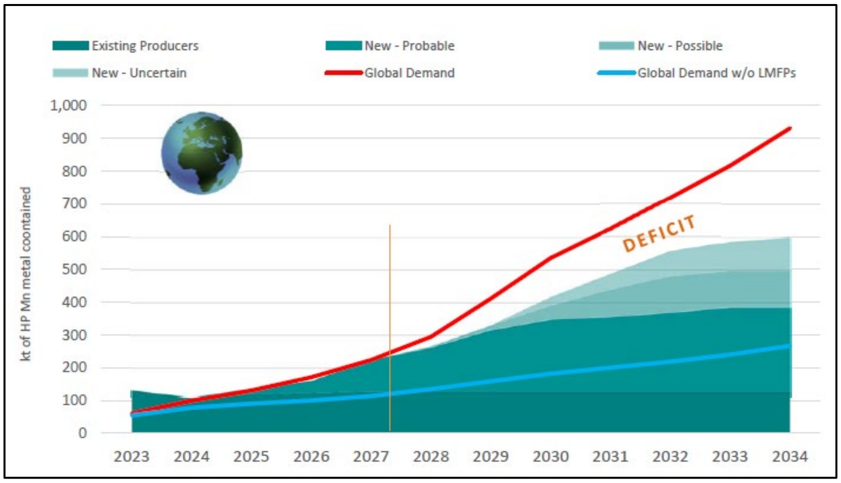



**Figure 19-1: HP Mn Supply Demand Balance to 2034**

(Source CPM)

## 19.3 Supply, Pricing, and Market Balance

At present, approximately 90% of the world's high-purity manganese production is in China. Only two commercial HPMSM refineries are currently operating outside China (in Japan and Belgium). Several projects have been proposed in Western jurisdictions; however, most are not fully financed and are not expected to reach production within this decade.

HPMSM prices reached a low of ~US$622/t (Ex-Works China) in March 2024 before rebounding to ~US$860/t later in the year. In February 2025, PW Consulting, a market research firm, reported in February 2025 that "HPMSM spot prices fluctuated between $1,200 and $2,400 per metric ton from 2021 to 2023."

The CPM forecast projects U.S. HPMSM prices of approximately US$2,500/t by 2030, increasing to approximately US$3,000/t by 2035. Due to tariffs and transportation costs this includes a price premium for US production. For the purpose of this PEA, the Company has adopted a price assumption of US$2,500/t (32% Mn HPMSM, DDP North America) held constant for the life of the project.

Total global demand for high-purity manganese in batteries is projected to reach approximately 965,000 tonnes per year by 2034. Deficits are expected to arise beginning in 2028–2029 unless substantial new supply outside of China is developed. Alternative feedstocks such as trimanganese tetraoxide ($Mn_3O_4$) and manganese carbonate ($MnCO_3$) are under evaluation but are not expected to displace HPMSM as the primary precursor material.

## 19.4 Iron and Silica Products

No work was undertaken in this Study to produce or assess the market potential of iron and/or silica by-products that could be produced in association to the recovery and production of high-purity manganese products.

## 19.5 Conclusions

The independent market study supports the assumption that manganese will remain an essential component of lithium-ion and emerging sodium-ion battery chemistries. Demand growth is expected to be led by LMFP cathodes, supported by continuing use of NMC and other manganese-bearing formulations.

The forecast demand increase, combined with the current concentration of supply in China and limited refining capacity elsewhere, suggests that supply deficits are likely to occur without new production. The PEA therefore assumes a constant HPMSM price of US$2,500/t for economic modelling, while recognizing that independent forecasts indicate higher long-term prices.

# 20. ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

All activities associated with exploration, mining, mineral processing, product production and facility closing will be required to meet the County and State requirements, as well as Federal conditions where applicable, as appropriate for the type of operation being proposed and operated.

There are currently no environmental liabilities pending on the Emily Project site.

## 20.1 Environmental Studies

For the 2023 exploration program, the following environmental studies were undertaken by Barr Engineering:

- Integrated Emily Project Schedule Development (Q3/Q4 2022), including major engineering, environmental review, & permitting milestones
- Environmental Support for Drilling Program (Q3 2022 to present), including drill site and access review for wetlands, sensitive species, and cultural resources
- Permitting and Compliance Activities (Q3 2022 to present), including construction stormwater (permit, compliance plan, inspections) and water appropriations (permit, tracking)
- Hydrogeology Background Information Review & Summary (Q1 2023)

North Star Manganese (North Star) has initiated a comprehensive assessment for the future baseline environmental studies required for the Emily Project with WSP Global, New York. This work will be ongoing throughout 2025, and as required going forward.

## 20.2 Current Permits

The only ongoing permits that have been issued are at the Emily site, and are:

- The Minnesota Construction Stormwater General Permit MNR100001 – Permit ID # C00065734, associated with final drill site and road reclamation from the 2023 exploration program. The associated reclamation work was completed and signed off by the Minnesota Department of Natural Resources and the Minnesota Department of Health on July 11, 2025.
- The City of Emily issued an Interim Use Permit (IUP) for the structures and facilities located in the SW ¼ of the NE ¼ of Section 21, Township 138 North, Range 26 West, Crow Wing County, Minnesota. This is a renewable 5-year permit with the next renewable date of March 2, 2026.

## 20.3 Future Permitting for the Emily Mine Operation

Unlike other States, Minnesota has specific regulations for ferrous mining operations and for non-ferrous mining operations. Ferrous operations are regulated under Minnesota Rules, Chapter 6130, and Minnesota Rules, Chapter 6132 regulate non-ferrous operations. Most of the regulations under Minnesota Rules, Chapter 6130 and Chapter 6132 are similar. A Scoping Environmental Assessment Worksheet (SEAW) / Environmental Assessment (EA) and an Environmental Impact Statement (EIS) are mandatory for the development of a metallic mining operation in Minnesota.

Because the Emily mine operation will extract manganiferous iron ore (an iron ore containing manganese), North Star will be working with the lead Minnesota agencies, Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Natural Resources (MDNR), to determine the appropriate Minnesota

Rules that it will be subject to for permit applications and operations. North Star has initiated these discussions.

The following permits and requirements are part of the broader environmental review and permitting process mandated by the MPCA and the MDNR, among other agencies. Significant permits anticipated for the Emily mine project include the Permit to Mine from the MDNR, the National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) Permits (which includes a Stormwater Pollution Prevention Plan (SWPPP)) from the MPCA, the Air Permit from the MPCA, and a Section 404 Permit (if required – yet to be determined) from the U.S. Army Corps of Engineers (USACE). A list of the principal permits are in Table 20-1.

**Table 20-1: Principal Permits Potentially Required for the Emily Mine Project**

| Permit / Requirement | Agency / Authority | Citation | Summary Description |
|---|---|---|---|
| Scoping Environmental Assessment Worksheet (SEAW) | Minnesota Department of Natural Resources (MDNR) and Environmental Quality Board (EQB) | MN Rules Ch 4410 | Ch 4410 rules require an EIS for a metallic mining project; the initial stage is the preparation of an SEAW. |
| Environmental Assessment (EA) | U.S. Army Corps of Engineers (USACE) | 40 Code of Federal Regulations (CFR) Sec. 1500-1518 | National Environmental Policy Act (NEPA) is triggered by a proposal to any Federal agency for a major Federal action.<br>Data needs for an EA are similar to the SEAW. |
| Environmental Impact Statement (EIS) | MDNR, EQB and USACE | MN Rules Ch 4410, 40 Code of Federal Regulations (CFR) Sec. 1500 | Completion of EIS is mandatory for development of a metallic mining facility. |
| Permit to Mine (mineral category in negotiation)<br>Ferrous Metallic Mining or Non-Ferrous Metallic Mining | MDNR | Ferrous – MN Rules Ch 6130<br>Non-Ferrous – MN Rules Ch 6132 | Requirements for type of mineral (ferrous vs non-ferrous), mine type (surface, underground, other, and all other operational criteria. |
| Underground Injection Control (UIC) Permit | U.S. Environmental Protection Agency (EPA) and Minnesota Department of Health (MDH) | 40 CFR 144, 146; MN Rules Ch 4725 | Applicable to injection of fluids containing contaminants into underground drinking water and that violate primary drinking water standards. If a Class V injection well (non-hazardous materials) is planned for mine backfill, a variance is needed. |
| Explosive Handling and Usage Permit | Fire Marshal and MDNR | MN Rules Ch 299, 7500 | Control, storge and use of explosives. |
| Air Permit | Minnesota Pollution Control Agency (MPCA) | MN Rules Ch 7007 | All facilities with sources of air emissions are required to obtain an air permit in MN. |

| Permit / Requirement | Agency / Authority | Citation | Summary Description |
|---|---|---|---|
| Water Appropriation Permit | MDNR | MN Rules Ch 6115 | Permit regulating water withdrawals of more than 10,000 gallons per day or 1M gallons per year from waters of the state. |
| Individual NPDES and State Disposal Systems (SDS) Permits | MPCA | MN Rules Ch 7001 | NPDES permit is required for wastewater discharge containing any pollutants to Waters of the US. The SDS may be applied to the project through seepage. |
| Section 404 of the Clean Water Act Permit | USACE | CWA 40 CFR 230 | Filling, excavating or placing materials into either MN waters or Waters of the US, may require wetlands permits. |
| Dam Safety Permit | MNDR | MN Rules Ch 6115 | Rules apply to dams or impoundment areas that pose potential threat to public safety or property. |
| Section 106 Review, National Historic Preservation Act Compliance | USACE and Minnesota State Historical Preservation Office (SHPO) | 36 CFR Section 800 | Requires the review of historic properties and provide the Advisory Council on Historic Preservation a comment opportunity. |
| Endangered Species Consultation | U.S. Fish and Wildlife Service (USFWS) | Endangered Species Act, Section 7 | Determination of impacts of federally endangered species. |
| Noise Pollution Permit | MNDNR | MN Rules, Ch 7030 | Determination and regulation of site noise pollution. |
| Hazardous Waste Generator License | MPCA | MN Rules Ch 7045 | Hazardous waste generators must obtain a license for each generation site. |
| Aboveground Storage Tank Permit Notification | MPCA | MN Rules Ch 7001 | Facilities storing less than 1M gallons of industrial products need to notify MPCA of tanks storing 1,100 gallons or more. |
| Conditional Use Permits | Crow Wing County | Multiple ordinances | Multiple ordinances will be required, including building and operating. |
| Conditional Use Permits | City of Emily | Multiple ordinances | Multiple ordinances will be required, including building and operating. |

Local permitting and approvals will also be required, including those that are site-specific, such as construction permits and local operational permits. County and municipal units of government have building and zoning requirements to address. The local communities and their representatives will have opportunities to provide input, understand the Emily mine project, and negotiate on relevant issues. North Star has not yet defined social or community-related requirements and plans for the Emily mine project.

Formal negotiations and agreements with local communities for the Emily mine project have not been initiated.

Permitting requirements may change if additional permitting requirements are identified within the environmental review process and/or during the Emily mine project and the chemical processing plant project siting and designs progress. Typically, significant permits are identified and obtained through a process that includes a public comment period. North Star has not initiated permitting efforts to date.

While there will be federal involvement in the permitting process, it will be less than in most other U.S. mining operations, primarily because the project lands are private and adjacent to State lands; no federal lands are involved in the Emily mine project.

## 20.4 Future Permitting for the HPMSM Chemical Processing Facility

Development of the proposed HPMSM plant in the United States will require multiple environmental permits and regulatory approvals before construction and operation. These approvals fall under the jurisdiction of the U.S. Environmental Protection Agency (EPA), state environmental regulatory agencies, the U.S. Army Corps of Engineers (USACE), Occupational Safety and Health Administration (OSHA), local fire and building authorities, and other relevant agencies.

The scope of permitting is comparable to other specialty chemical manufacturing projects in the United States. The potential co-location of the HPMSM facility near an existing sulfuric acid source introduces additional considerations related to air emissions, chemical process safety, and emergency planning. Additionally, the final site selected will be subject to State and local rules and requirements, and site-specific rules and requirements.

A list of the principal permits include:

**Air Emissions Permits**

- **New Source Review (NSR) / Prevention of Significant Deterioration (PSD):** A pre-construction permit is required for new emission units, including potential dryers, boilers, and process lines associated with sulfate production. The presence of an adjacent sulfuric acid facility increases the need for cumulative impact modeling for sulfur dioxide ($SO_2$), sulfur trioxide ($SO_3$), and sulfuric acid mist.

- **Title V Operating Permit**: If the plant qualifies as a “major source” of criteria pollutants or hazardous air pollutants, a Title V permit will be required.

**Water and Wastewater Permits**

- **Construction Stormwater General Permit:** Coverage under the state’s stormwater general permit will be required before site grading or earth disturbance greater than one acre. A Stormwater Pollution Prevention Plan (SWPPP) must be developed and implemented.

- **Industrial Stormwater General Permit (MSGP):** During operations, ongoing stormwater discharges from industrial activities must be permitted. In some cases, a “no exposure” certification may be used if stormwater does not come into contact with industrial materials.

- **Process Wastewater Discharge:** Process streams containing manganese and sulfate will require either (i) an individual National Pollutant Discharge Elimination System (NPDES) permit for direct discharge to surface waters, or (ii) an industrial pretreatment permit for discharge to a publicly owned treatment works (POTW).

- **USACE Section 404 / Section 401 Certification:** If wetlands or waters of the United States are impacted by site development, utility corridors, or outfalls, a Section 404 permit and corresponding Section 401 water quality certification will be required.

**Waste Management**

- **Hazardous Waste Generator ID (RCRA):** The project will generate limited volumes of hazardous wastes (laboratory residues, spent solvents). Registration under the Resource Conservation and Recovery Act (RCRA) hazardous waste generator program is required.

- **Industrial Solid Waste Registration:** State law typically requires registration or notification for non-hazardous industrial solid wastes.

**Risk and Safety Permits**

- **EPA Risk Management Plan (RMP):** If threshold quantities of sulfuric acid, $SO_2$, or $SO_3$/oleum are exceeded, an RMP must be prepared, including off-site consequence analysis and emergency response coordination.

- **OSHA Process Safety Management (PSM):** If quantities of highly hazardous chemicals listed in OSHA Appendix A are present above thresholds, the facility will be subject to PSM standards, requiring hazard analyses, operating procedures, and mechanical integrity programs.

- **Emergency Planning and Community Right-to-Know (EPCRA):** The facility will be required to submit annual Tier II reports and, if thresholds are exceeded, comply with Section 302 emergency planning provisions. Sulfuric acid has a reportable threshold of 500 lb for Tier II and 1,000 lb for emergency planning.

**Other Permits and Operating Requirements**

- **Spill Prevention, Control, and Countermeasure (SPCC):** An SPCC plan will be required if petroleum storage exceeds 1,320 gallons in above-ground tanks.

- **Toxics Release Inventory (TRI):** Annual TRI reporting will apply if the facility meets employee thresholds and processes or uses listed substances above reportable quantities.

- **DOT/PHMSA Hazardous Materials Registration:** The project will require hazardous materials transportation registration for shipment of sulfuric acid, HPMSM, and other regulated substances.

- **Local Building and Fire Code Approvals:** Local building permits, fire marshal reviews, and hazardous materials operational permits will be mandatory before construction.

- **EPA Greenhouse Gas Reporting:** If facility emissions exceed 25,000 metric tonnes $CO_2$ annually, reporting under EPA's Greenhouse Gas Reporting Program will be required.

## 20.5 Summary

The North Star Manganese Project, both the mine and the HPMSM chemical processing facility, will require critical air, water, solids and safety permits specific to the type of operation being proposed at the specific operational sites. While the mine site at Emily is known, and North Star has initiated preliminary environmental analysis, additional work is required to fully identify all permits and requirements for the Minnesota mining operation, and engagement with regulatory agencies and community stakeholders is required. To date, no environmental fatal flaws have been identified.

The permitting requirements for the HPMSM plant are consistent with those typically required for U.S. specialty chemical facilities. While no fatal flaws have been identified, the project schedule will be contingent upon the timely issuance of critical air, water, and safety permits, and on proactive engagement with regulatory agencies and community stakeholders.

# 21. CAPITAL AND OPERATING COSTS

Initial, sustaining, and closure capital cost estimates were prepared for the NSM Project in accordance with PEA standards, with an accuracy range of -50% to +50%. The total initial capital cost for the NSM Project base case is US$634 million as detailed in Table 21-1.

It is expected that the initial capital program will be managed on an engineering, procurement, construction management (EPCM) basis with support from the Electric Metals owner's team, and other professionals, as appropriate.

## 21.1 Capital Costs

### *21.1.1 Introduction*

Capital costs for the mine and facilities were estimated by interpolating published data from CostMine™. Surface and underground mine equipment are grouped separately. Shaft sinking and completion costs were provided by Miller Contracting Services, LLC of Carrier Mills, IL, who have recent experience in sinking shafts with freeze collars. Mining equipment capital cost includes both the construction and operation phases. The initial capital cost, which includes process, preproduction, and facilities, is estimated at USD $634 million with a 25% contingency in Mining and Processing. There is an estimate of sustaining capital and closing costs of $276 million for this Project.

Table 21-1 provides a breakdown of initial capital costs for the NSM Project. Additional details are included below.

**Table 21-1: Initial Capital Cost**

| Category | Total Cost (Millions $US) |
|---|---|
| Vertical Development: Shafts and Raises | $34.00 |
| Horizontal Development (Drifts & Spiral) | $6.86 |
| Underground Rubber Tired Mobile Equipment | $22.68 |
| Underground Auxiliary Equipment | $1.13 |
| Underground Infrastructure | $7.30 |
| Surface Infrastructure | $57.44 |
| Project Engineering | $9.12 |
| Surface Rubber Tired Mobile Equipment | $1.32 |
| Mineral Process Plant | $360.00 |
| Working Capital | $10.00 |
| Contingency | $124.96 |
| **GRAND TOTAL** | **$634.81** |

Surface Infrastructure will include offices, change-house, shops, ponds and water control, as well as other necessary components.

### *21.1.2 Mining*

Mining capital expenditures are divided into two parts, construction and development of the underground mine and surface facilities. The mine access includes an access shaft, a ventilation shaft, sub-level accesses, and a spiral ramp to lower mine levels for the movement of equipment between production levels.

Surface facilities will include offices, repair shops, a warehouse, a change house, hoisting facilities, and ore load out facilities for transportation of the manganese-iron ore to a processing site. Due to the water contained in the glacial overburden, the QP has assumed that a freeze collar will be needed to sink the shaft and main ventilation raise through the till into bedrock. The QP has assumed that once the shaft is lined and firmly anchored with suitable retaining, normal inflows can be handled by pumping. Water handling is under a separate budget.

In addition to the primary vent raise, a winze will connect the production levels 221m – 331m (Figure 16-4). for improved flow in the workings. Initial geotechnical work on the bedrock indicates that it is competent and has low permeability, thus the bedrock portion of the access as well as the winze are assumed to be normally developed workings

**Table 21-2: Mine Access and Ventilation**

| (IA) Vertical Development: Shafts and Raises | # Meters | Cost/m | Total Cost |
|---|---|---|---|
| Mine Shaft (glacial till) | 81 | $164,000 | $11,000,000 |
| Mine Shaft (Bedrock) | 109 | $49,200 | $5,000,000 |
| Ventilation Shaft (Glacial till) | 81 | $146,749 | $8,000,000 |
| Ventilation Shaft (Bedrock) | 109 | $44,025 | $5,000,000 |
| Ventilation Winze (Bedrock) | 109 | $44,025 | $5,000,000 |
| **TOTAL VERTICAL DEVELOPMENT COST** | | | **$34,000,000** |

### *21.1.3 Underground Infrastructure & Development*

Underground development consists of a spiral ramp to move equipment between levels, as well as access crosscuts on each sublevel, with a ramp system to each level of the underhand cut and fill (Figure 16-1). Capital development costs are estimated by meter of access drift and are presented in Table 21-3. The development is assumed to be completed by year 5 of production allowing full access to the mining levels.

**Table 21-3: Underground Development**

| Horizontal Development (Drifts) | # Meters | Cost/m | Total Cost |
|---|---|---|---|
| **Spiral Ramp** (Start @ 311 Level, end at 221 Level) | 612 | $2,556 | $1,600,000 |
| **Mining Levels** | | | |
| 311 m asl | 217.5 | $2,556 | $555,900 |
| West Limb | 98 | $2,556 | $250,500 |
| East Limb | 191 | $2,556 | $488,100 |
| 296 m asl | 273 | $2,556 | $697,700 |
| 281 m asl | 244.5 | $2,556 | $624,900 |
| East Limb | 188 | $2,556 | $480,500 |
| 266 m asl | 199 | $2,556 | $508,600 |
| 251 m asl | 204 | $2,556 | $521,400 |
| 236 m asl | 152 | $2,556 | $388,500 |
| 221 m asl | 290 | $2,556 | $741,100 |
| **TOTAL MINING LEVELS COST** | | | **$6,857,200** |

### 21.1.4 Mine Production Equipment

The production fleet consists of rubber-tired equipment suitable for the underhand cut and fill mining operation. The QP has assumed that 80% of the production fleet will be acquired in Year 1 and the final 20% during the first year of production and ramp up.

**Table 21-4: Production Fleet**

| (II) Underground Rubber Tired Mobile Equipment | Unit Cost | # Units | Total Cost |
|---|---|---|---|
| Production Drill | $794,300 | 3 | $2,382,900 |
| (Single boom Jumbo, 3.81 cm drill bit, 106 HP motor) | | | |
| Development Drill | $794,300 | 1 | $794,300 |
| (Single boom Jumbo, 3.81 cm drill bit, 106 HP motor) | | | |
| Production Scoop Tram (6.3 m3 bucket) | $1,484,500 | 3 | $4,453,500 |
| Development Scoop Tram (6.3 m3 bucket) | $1,484,500 | 1 | $1,484,500 |
| Backfill Jammer | $2,400,000 | 2 | $2,400,000 |
| UG Haul Truck (30 tonne) | $975,000 | 6 | $5,850,000 |
| Rock Bolter (3.81 cm drill bit, 97 HP) | $1,065,000 | 2 | $2,130,000 |
| Service Vehicles (Kubota Tractor) | $225,000 | 3 | $675,000 |
| Shotcrete Machine | $652,100 | 1 | $652,100 |
| Service Vehicles (Getman Utility Veh., model A64) | $576,200 | 3 | $1,728,600 |
| Exploration Drills (Boart Longyear, model LM75) | $125,000 | 1 | $125,000 |
| **TOTAL** | | | **$22,676,000** |

The auxiliary equipment specified for underground is generally skid mounted and will advance with the production faces. The estimated capital of this equipment is shown in Table 21-5. No specific allowance has been made for hand tools such as jackleg drills, bars, etc. as they are included in the mining cost.

**Table 21-5: Underground Auxiliary Equipment**

| (III) Underground Auxiliary Equipment | Unit Cost | # Units | Total Cost |
|---|---|---|---|
| Drain Pumps | $25,000 | 2 | $50,000 |
| Fresh Water Pumps | $10,000 | 6 | $60,000 |
| Refuge Station | $157,900 | 3 | $473,700 |
| Secondary Fan | $150,000 | 2 | $300,000 |
| Auxiliary Fans | $25,000 | 10 | $250,000 |
| **TOTAL** | | | **$1,133,700** |

### 21.1.5 Surface Equipment and Facilities

Surface mobile equipment is estimated in Table 21-6, and is estimated from similar operations to be adequate for materials handling, site maintenance, and warehousing. Surface infrastructure will consist of a dry or change-house, water management of both meteoric and mine water, and a load-out facility for trucks transporting the ore for further processing.

**Table 21-6: Surface Equipment and Infrastructure**

| (VI) Surface Rubber Tired Mobile Equipment | Unit Cost | # Units | Total Cost |
|---|---|---|---|
| Front End Loader (4 m3) | $461,300 | 1 | $461,300 |
| Telehandler | $190,000 | 1 | $190,000 |
| Forklift | $37,000 | 1 | $37,000 |
| Grader | $541,000 | 1 | $541,000 |
| Skid Steer Loader | $92,200 | 1 | $92,200 |
| **TOTAL** | | | **$1,321,500** |

| (V) Surface Infrastructure | Unit Cost | # Units | Total Cost |
|---|---|---|---|
| Surface Facilities | $17,438,505 | 1 | $17,438,505 |
| Material Load Out | $10,000,000 | 1 | $10,000,000 |
| Mined Rock Storage | $10,000,000 | 1 | $10,000,000 |
| Ponds, Water Management Systems | $20,000,000 | 1 | $20,000,000 |
| **TOTAL** | | | **$57,438,500** |

### *21.1.6 Mineral Processing*

Run of Mine (ROM) ore will be crushed on the surface, either on site or at a remote location. Final hydrometallurgical processing of the manganese/iron ore is envisioned at a remote location near the Gulf of Mexico for access to a supply of sulfuric acid from the refineries there.

The total mineral processing capital cost was estimated from published technical reports of similar manganese projects, 25% contingency is added. There is potential that the 1,500t/d crushing system may also be constructed underground. The equipment cost will be about the same, and a tradeoff study will be needed to define underground excavation and installation costs.

**Table 21-7: Process Plant Capital**

| Process Plant Capital | US$/ t of Capacity | Capacity t/a | Total Cost |
|---|---|---|---|
| First process line 100,000 t/a HPMSM | $2,400 | 100,000 | $240,000,000 |
| Second process line 100,000 t/a HPMSM | $1,200 | 100,000 | $120,000,000 |
| **TOTAL** | | | **$360,000,000** |

Miscellaneous capital costs are estimated by percentages of the total capital budget and by experience from similar projects. These are summarized in Table 21-8.

**Table 21-8: Miscellaneous Capital Costs**

| Miscellaneous Capital Costs | Unit Cost | # Units | Total Cost |
|---|---|---|---|
| Working Capital | $10,000,000 | 1 | $10,000,000 |
| Engineering & Management | $9,120,000 | 1 | $9,120,000 |
| Contingency (all CAPEX) | | 25% | $124,960,000 |
| **TOTAL** | | | **$145,080,000** |

## 21.2 Operating Costs

Operating costs for the NSM Project are estimated over its lifespan using a first-principles buildup based on mine schedule quantities, unit costs, equipment operating hours, labor, and projected consumables.

The table provides a detailed breakdown of operating costs, presenting them in both millions of US dollars and US dollars per metric tonne. The total operating cost is $3,529 million, $400/t ore and $ 815/t HPMSM. Costs are summarized in Table 21-9.

Mineral processing to produce battery grade HPMSM is the key cost driver, with transportation and mining nearly equal. Due to the preliminary nature of the test work, the mineral processing cost has a contingency of 25% applied. The other three cost lines have more detail and have not been escalated.

Transportation is assumed from Emily to the US Gulf Coast for access to sulfur and sulfuric acid supply. Public sentiment for industrial installations would make it challenging to process the ore at Emily. Decreasing the transportation costs through and on-site concentration will be the focus of further test work.

General and administrative costs, which include transportation along with the administration and management requirements of both the mine and processing plant, are estimated at $15.00/tonne of ore.

**Table 21-9: NSM Project Operating Cost Summary**

| Concept | Total (Millions $US) | $/t ore | $/t HPMSM |
|---|---|---|---|
| Mining Cost | $832.31 | $94.30 | $192.31 |
| Transportation | $799.21 | $90.55 | $184.66 |
| Processing | $1,765.24 | $200.00 | $407.87 |
| G&A | $132.39 | $15.00 | $30.59 |
| **TOTAL** | **$3,529.15** | **$399.85** | **$815.44** |

Operating costs for all NSM Project areas inclusive of the estimated number of employees and their annual, burdened wages were sourced from CostMine™ models. Validation was conducted with actual cost data from a comparable operation and the previous experience of qualified professionals in the region. Staffing levels are aligned with the size of the equipment fleet or scaled from similar operations.

### *21.2.1 Administration*

The general and administration cost is based on a factor from CostMine™ estimated from the cost/tonne in similar operations.

### *21.2.2 Mining*

Our methodology for establishing underground mining cost for NSM Project involved first generating detailed production models sourced from the CostMine™ Cost Service. This foundation data was subsequently cross-referenced and adjusted based on Forte's experience with similar operations, ensuring a realistic and well-supported cost structure.

### *21.2.3 Processing*

It is currently assumed that the ore will be crushed on site, trucked to a rail head, loaded onto bulk carriers and shipped to another location for manganese extraction and HPMSM production. The current expectation is that the processing location will be near the Gulf Coast, where refineries produce sulfuric acid as a byproduct. The Total Processing Cost at the plant facility is $200/tonne as shown in Table 21-9 above.

# 22. ECONOMIC ANALYSIS

## 22.1 Introduction

Forte performed an economic analysis for the NSM Project PEA study. Cash inflows are based on annual production and revenue projections of salable HPMSM, Fe, and Si, while cash outflows consist of capital costs (mining, processing, infrastructure), sustaining capital costs (mining, processing, infrastructure), and operating costs. The modeling period covers the 23-year life of mine (LOM), incorporating a 2.5-year construction phase and a one-year ramp-up to full production following plant commissioning. In total, the planned project life is 25 years.

The NSM Project PEA includes an economic analysis that is based, in part, on Inferred Mineral Resources. Inferred Mineral Resources are considered too speculative geologically to have the economic considerations applied to them that would allow them to be categorized as Mineral Reserves, and there is no certainty that the results will be realized. Mineral Resources are not Mineral Reserves as they do not have demonstrated economic viability. The results of the NSM Project PEA represent forward-looking information. The forward-looking information includes metal price assumptions, cash flow forecasts, projected capital and operating costs, metal recoveries, mine life and production rates, and other assumptions used in the PEA. Readers are cautioned that actual results may vary from those presented. The factors and assumptions used to develop the forward-looking information, and the risks that could cause the actual results to differ materially, are presented in the body of this report under each relevant section.

## 22.2 Principal Assumptions

Manganiferous iron ore will be mined underground using underhand cut and fill technique for higher selectivity. In certain thicker parts of the deposit, stope and fill may be used resulting in a significant savings. Mined ore will be shipped, via rail, to a manganese chemical processing plant, where it will be crushed, ground, and hydrometallurgically extracted, producing HPMSM and sold to lithium-ion battery manufacturers in the United States.

## 22.3 Discounted Cash Flow Model

The annual cash flow for both pre- and after-tax cases is shown in Appendix A.

The before tax NPV analysis is presented in Table 22-1.

**Table 22-1: Discounted Cash Flow Analysis - Pre-Tax**

| Discount Rate | DCF Millions $US |
|---|---|
| **(Cumulative Cash Flow) NPV @ 0%** | **$6,317.03** |
| NPV @ 8% | $2,131.54 |
| **NPV @ 10%** | **$1,679.77** |
| NPV @ 12% | $1,337.19 |
| NPV @ 15% | $964.61 |
| **IRR** | **49.1%** |

The after-tax discounted cash flows at several interest rates are shown in Table 22-2.

**Table 22-2 Discounted Cash Flow Analysis - After Tax**

| Discount Rate | DCF Millions $US |
|---|---|
| **(Cumulative Cash Flow) NPV @ 0%** | **$5,354.96** |
| NPV @ 8% | $1,776.10 |
| **NPV @ 10%** | **$1,390.15** |
| NPV @ 12% | $1,097.75 |
| NPV @ 15% | $780.22 |
| **IRR** | **43.5%** |

## 22.4 Sensitivity Analysis

A sensitivity analysis was conducted on the parameters of capital cost, operating cost, and metal price, all assessed on a pre-tax basis. Figure 22-1 and Figure 22-2 graphically show the sensitivity of NPV and IRR relative to metal price increases, and Table 22-3 and Table 22-4 present the sensitivity results.

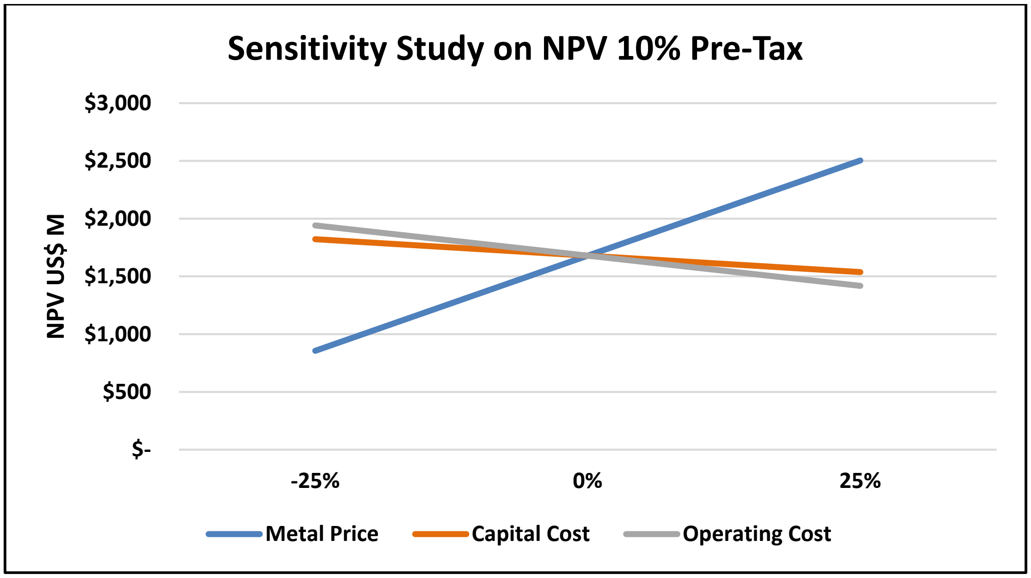



**Figure 22-1: Sensitivity Analysis on NPV 10% Pre-Tax**

**Table 22-3: Sensitivity Analysis on NPV 10% Pre-Tax**

| Sensitivity Study on NPV 10% Pre-Tax | | | |
|---|---|---|---|
| | **-25%** | **0%** | **25%** |
| **Metal Price** | $855.89 M | $1,679.77 M | $2,503.65 M |
| **Capital Cost** | $1,822.13 M | $1,679.77 M | $1,537.42 M |
| **Operating Cost** | $1,941.36 M | $1,679.77 M | $1,418.19 M |

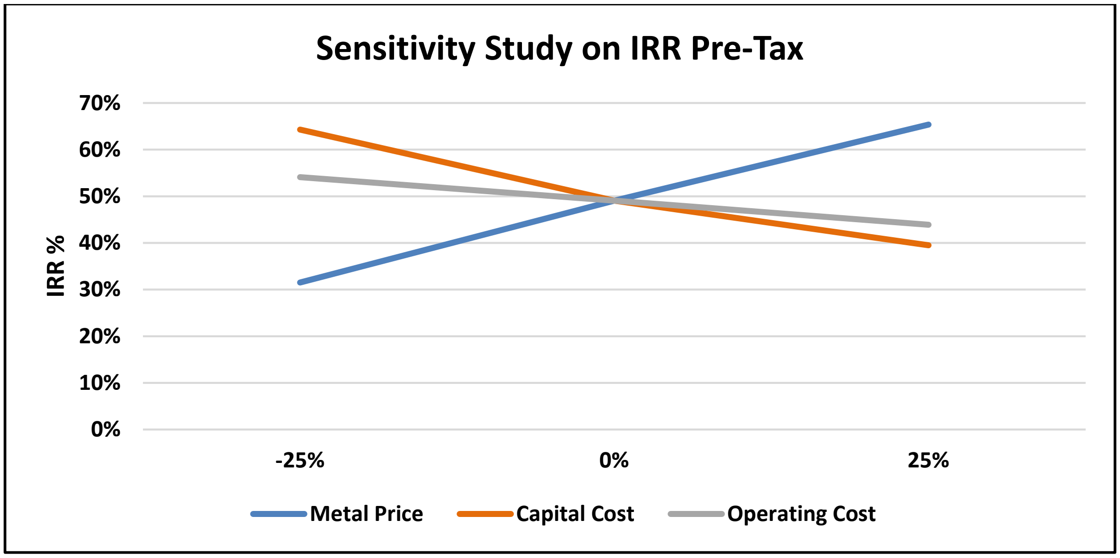



**Figure 22-2: Sensitivity Analysis on IRR 10% After-Tax**

**Table 22-4: Sensitivity Analysis on IRR 10% Pre-Tax**

| Sensitivity Study on IRR Pre-Tax | | | |
|---|---|---|---|
| | **-25%** | **0%** | **25%** |
| **Metal Price** | 31.5% | 49.1% | 65.4% |
| **Capital Cost** | 64.3% | 49.1% | 39.5% |
| **Operating Cost** | 54.1% | 49.1% | 43.9% |

An after-tax analysis of the sensitivity impacts is shown graphically in Figure 22-3 and Figure 22-4, and Table 22-5 and Table 22-6, respectively.

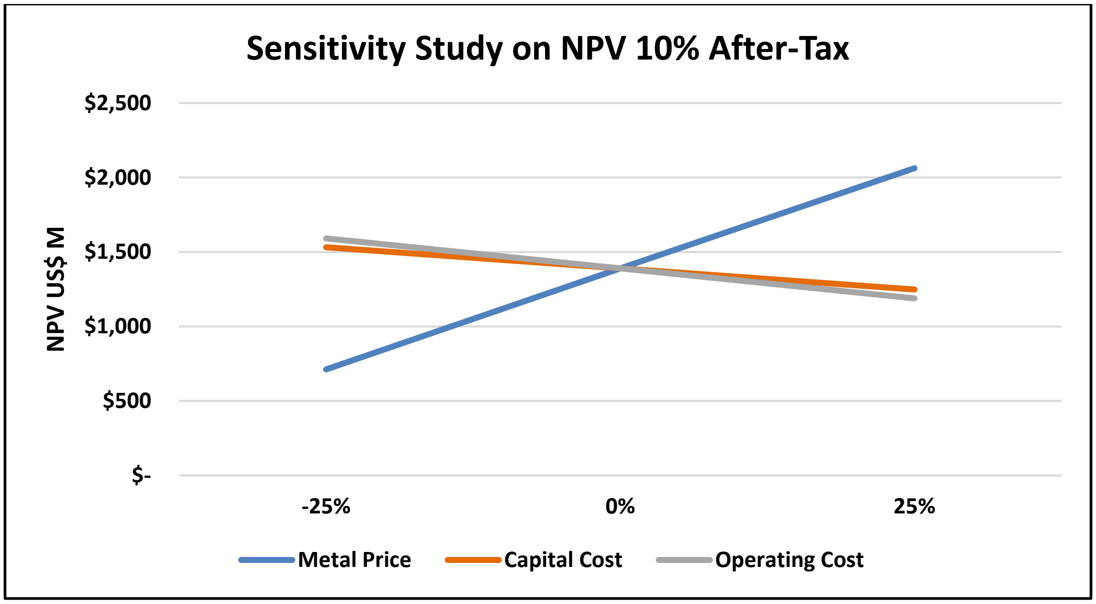



Figure 22-3: Sensitivity Analysis on NPV 10% After-Tax

Table 22-5: Sensitivity Analysis on NPV 10% After-Tax

| Sensitivity Study on NPV 10% After-Tax | | | |
|---|---|---|---|
| | -25% | 0% | 25% |
| **Metal Price** | $712.03 M | $1,390.15 M | $2,062.66 M |
| **Capital Cost** | $1,531.93 M | $1,390.15 M | $1,248.37 M |
| **Operating Cost** | $1,591.38 M | $1,390.15 M | $1,188.60 M |

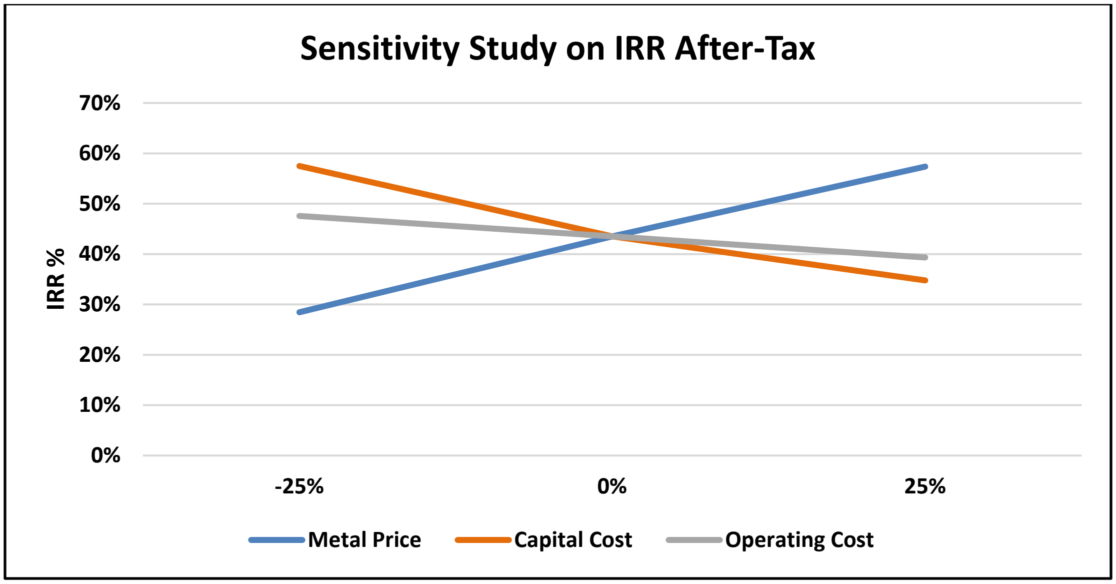



**Figure 22-4: Sensitivity Analysis on IRR 10% After-Tax**

**Table 22-6: Sensitivity Analysis on IRR 10% After-Tax**

| Sensitivity Study on IRR After-Tax | | | |
|---|---|---|---|
| | **-25%** | **0%** | **25%** |
| **Metal Price** | 28.4% | 43.5% | 57.4% |
| **Capital Cost** | 57.5% | 43.5% | 34.8% |
| **Operating Cost** | 47.6% | 43.5% | 39.3% |

Based on the economic sensitivity study, the NSM Project is very robust regarding both capital and operating costs. It is most sensitive to metal price and by direct correlation, to metal recovery. Product prices include high-purity manganese sulfate monohydrate (HPMSM) only. Potential revenue from the recovered iron (Fe) and/or silica (Si) are not included as there is currently insufficient test work to establish the process flow, associated costs, and markets.

# 23. ADJACENT PROPERTIES

There are no other mineral properties adjacent to the Emily Project site.

# 24. OTHER RELEVANT DATA AND INFORMATION

The QPs are not aware of any other relevant data concerning the NSM Project.

# 25. INTERPRETATION AND CONCLUSIONS

## 25.1 Interpretation & Conclusions

The Emily Project demonstrated good continuity of mineralization, with a large low-grade mineral resource and a significantly higher-grade core more amenable to beneficiation and processing to saleable high-grade manganese chemicals.

It is assumed that Emily minerals would be extracted by underground mining, thus avoiding a large open pit. Based on the analysis herein, and the expected market prices for manganese sulfate, Emily carries manganese grades sufficient to support such an operation.

Initial metallurgical testing has shown the potential to produce high-purity manganese products including battery-grade HPMSM. Evaluation of other co-products or by products will require additional study. Ore beneficiation prior to transport would be economically beneficial to the Project but will also require further test work. Energy requirements for crushing and grinding, as well as optimal reagent dosage can be improved, and work will be required for a more definitive determination of the total production costs and process circuits needed to produce the final products.

Review of historical data and exploration by former mining companies has shown potential to grow the mineral resource outside of the current property limits. The potential for this is discussed in Section 10.2 and in project Recommendations below.

## 25.2 Risks and Uncertainties

There has never been any mining in the Emily District and mining ceased in the Cuyuna Iron Range in the 1960s.

To date there have been no difficulties with the permitting for exploration drilling. Because Minnesota is a significant mining state, ranking fifth in non-fuel production value for 2024, it has a well-defined permitting approach for mining operations. Crow Wing County has not recently been a mining area, accordingly, maintaining government relations and community outreach is vital to ensuring an efficient and effective permitting process for both construction and operations.

There is an incomplete understanding of the hydrogeology of the area, and successful underground mine construction and operations will require a detailed understanding of the technical and economic hurdles imposed by the saturation of the glacial tills overlying the deposit.

Metallurgical test work has shown that manganese can be recovered from the Emily resource, but a process flow chart that will produce high-value manganese products has yet to be optimized. The principal manganese mineral, manganite, a high-grade manganese mineral, is not the lower grade pyrolusite more commonly found in current operations around the world.

# 26. RECOMMENDATIONS

The QPs recommend that ongoing exploration continue to refine the geological model, the domain model, and the resource classification. This will improve the reliability of the model for project decision-making. As discussed in Section 10.2, earlier drilling by U.S. Steel and others, there are extensions to the Emily deposit for which current data are not available for inclusion in the mineral resource estimate. North Star Manganese should drill to the west and north-west on lands it controls and endeavor to acquire more surface and mineral rights, surrounding the current mineral resource.

Metallurgical test work should focus on refining the process to produce HPMSM and any potential co-products. Composites of various Mn grades and Mn/Fe ratios will be needed to optimize plant performance. The Fe/Mn separation process and the required reagents and feed materials are not currently. Production of marketable HPMSM, as well as finding more definitive markets or market partners, will be key to a smooth market entry. Completing flowsheet development to allow a more definitive determination of the economic cut-off grade will be an important next step.

As a major contributor to production cost, there is potential to optimize transportation, a siting study for both the truck rail transfer in Minnesota as well as the leaching and purification facility. The focus will be on efficient material handling, readily available consumable supplies, and lower-cost energy. This may enhance transportation, reagent, and energy costs.

Additional study should be given to self-manufacture of both sulfuric acid and $SO_2$ from raw sulfur. This may offer savings over the purchase and transport of commercial acids.

Geotech and geo-hydrology will be key to understanding pumping requirements for the underground mining, and to understanding the most appropriate mining method for Emily. Ore loss and dilution have been assumed, both may be reduced and optimized with the full development of a detailed mine plan.

The estimated budget for the next stage of work is shown in Table 26-1. The focus will be on resource improvement, geological confidence, mineral processing, plant location, and permitting considerations.

**Table 26-1: Budget for Future Work**

| Budget Item | Estimated Cost |
|---|---|
| Resource Definition & Expansion Drilling | $2,500,000 |
| Structural, Geotechnical & Hydrological Activities | $500,000 |
| Metallurgical Test Work | $1,000,000 |
| Transport, Logistics & Sighting Studies | $500,000 |
| Environmental, Water & Cultural Studies | $1,000,000 |
| **TOTAL US$** | **$5,500,000** |

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# 28. CERTIFICATES OF QUALIFIED PERSONS

**CERTIFICATE OF QUALIFIED PERSON**

**Donald E. Hulse, P.E., SME-RM**
Director of Mining Resources Forte Dynamics, Inc.
12600 W Colfax Ave, Ste A-540
Lakewood, CO 80215
Email: dhulse@fortedynamics.com

This certificate applies to the report entitled: "Preliminary Economic Assessment of the Electric Metals' North Star Manganese Project, Crow Wing County, Minnesota, USA", effective date August 15, 2025, issued on September 30, 2025.

I, **Donald E. Hulse P.E., SME-RM**, do hereby certify that:

1) I am the Director of Mining Resources for Forte Dynamics, Inc., with a business address of 12600 W Colfax Ave, Ste A-540, Lakewood, Colorado 80215 USA.
2) I graduated with a degree in Mining Engineering, Bachelor of Science in 1982 from the Colorado School of Mines in Golden, Colorado. I have worked as a mining engineer for 42 years with specific expertise in mine design, mine strategic planning, mineral resource estimation in a variety of deposits including iron ore deposits. I am a Registered Member of the Society of Mining Engineers.
3) I have read the definition of "qualified person" set out in National Instrument 43-101- Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" within the meaning of NI 43-101.
4) I have personally inspected the property that is a subject of this Mineral Resource Estimate on June 28, 2023.
5) I am the QP responsible for Sections 1-6, 14-15, 18-25, parts of 26, and a contributor of the overall content of this report.
6) I am independent of the issuer, Electric Metals (USA) Limited, according to Section 1.5 of NI 43-101.
7) I was a QP on the Technical Report, titled "Electric Metals (USA) Limited Emily Manganese Project NI 43-101 Technical Report", December 31, 2023 .
8) I have read NI 43-101, Form 43-101 F1 -Technical Report, 43-101 CP-Standards of Disclosure for Mineral Projects, and confirm that the Technical Report has been prepared in compliance with such instrument, form, and companion policy.
9) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the portions of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
10) I consent to the filing of the Technical Report with any securities regulatory authority, stock exchange and other regulatory authority and any publications by them, including electronic publication in the public company files on their websites accessible by the public.

**Dated this 30th day of September 2025.**

// s // Donald E. Hulse

______________________________________________

Donald E. Hulse P.E., SME-RM

**CERTIFICATE OF QUALIFIED PERSON**

**Deepak Malhotra, Ph.D., SME-RM**
Director of Metallurgy Forte Dynamics, Inc.
12600 W Colfax Ave, Ste A-540
Lakewood, CO 80215
Email: dmalhotra@fortedynamics.com

This certificate applies to the report entitled: "Preliminary Economic Assessment of the Electric Metals' North Star Manganese Project, Crow Wing County, Minnesota, USA", effective date August 15, 2025, issued on September 30, 2025.

I, **Deepak Malhotra, Ph.D., SME-RM**, do hereby certify that:

1) I am the Director of Metallurgy for Forte Dynamics, Inc., with a business address of 12600 W Colfax Ave, Ste A-540, Lakewood, Colorado 80215 USA.
2) I graduated with a degree in Metallurgical Engineering, Master of Science in 1973 from the Colorado School of Mines in Golden, Colorado. In addition, I graduated with a degree in Mineral Economics, Ph.D. in 1978 from the Colorado School of Mines in Golden, Colorado. My relevant experience includes working as a metallurgist and mineral economist for 50+ years since my graduation with specific expertise in mineral processing, metallurgical testing, and recovery methods. I am a member of the Society of Mining Engineers.
3) I have read the definition of "qualified person" set out in National Instrument 43-101- Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" within the meaning of NI 43-101.
4) I have not personally inspected the property that is a subject of this Mineral resource Estimate.
5) I am the QP responsible for Sections 13, 17, and parts of 26.
6) I am independent of the issuer, Electric Metals (USA) Limited, according to Section 1.5 of NI 43-101.
7) I was a QP on the Technical Report, titled "Electric Metals (USA) Limited Emily Manganese Project NI 43-101 Technical Report", December 31, 2023 .
8) I have read NI 43-101, Form 43-101 F1 -Technical Report, 43-101 CP-Standards of Disclosure for Mineral Projects, and confirm that the Technical Report has been prepared in compliance with such instrument, form, and companion policy.
9) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the portions of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
10) I consent to the filing of the Technical Report with any securities regulatory authority, stock exchange and other regulatory authority and any publications by them, including electronic publication in the public company files on their websites accessible by the public.

**Dated this 30th day of September 2025.**

// s // Deepak Malhotra

Deepak Malhotra, Ph.D., SME-RM

**CERTIFICATE OF QUALIFIED PERSON**

**James Gordon Sobering, P.E, SME-RM**
Senior Mining Engineer Forte Dynamics, Inc.
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Email: gsobugminer@gmail.com

This certificate applies to the report entitled: "Preliminary Economic Assessment of the Electric Metals' North Star Manganese Project, Crow Wing County, Minnesota, USA", effective date August 15, 2025, issued on September 30, 2025.

I, **James Gordon Sobering P.E, SME-RM.**, do hereby certify that:

1) I am a Senior Mining Engineer with Forte Dynamics, Inc., with a business address of 12600 W Colfax Ave, Ste A-540, Lakewood, Colorado 80215 USA.
2) I graduated with a degree in Mining Engineering, Bachelor of Science in 1990 from the Montana Technological University in Butte, Montana. I have worked as a mining engineer for 35 years with specific expertise in mine design, mine strategic planning, cost estimation in a variety of deposits including iron ore deposits. I am a Registered Member of the Society of Mining Engineers.
3) I have read the definition of "qualified person" set out in National Instrument 43-101- Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" within the meaning of NI 43-101.
4) I have not visited the property that is a subject of this technical study.
5) I am the QP responsible for Section 16, parts of 20 and 26, and a contributor to the overall content of this report.
6) I am independent of the issuer, Electric Metals (USA) Limited, according to Section 1.5 of NI 43-101.
7) I have read NI 43-101, Form 43-101 F1 -Technical Report, 43-101 CP-Standards of Disclosure for Mineral Projects, and confirm that the Technical Report has been prepared in compliance with such instrument, form, and companion policy.
8) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the portions of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
9) I consent to the filing of the Technical Report with any securities regulatory authority, stock exchange and other regulatory authority and any publications by them, including electronic publication in the public company files on their websites accessible by the public.

**Dated this 30th day of September 2025.**

// s // James Gordon Sobering

James Gordon Sobering, P.E, SME-RM.

**CERTIFICATE OF QUALIFIED PERSON**

**Ronald A. Steiner, Ph.D., C.P.G. with AIPG**
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This certificate applies to the report entitled: "Preliminary Economic Assessment of the Electric Metals' North Star Manganese Project, Crow Wing County, Minnesota, USA", effective date August 15, 2025, issued on September 30, 2025.

I, **Ronald A. Steiner, Ph.D., C.P.G., AIPG**, do hereby certify that:

1) I am Senior Geologist with Big Rock Exploration, LLC with a business address of 2505 West Superior Street, Duluth MN, 55806 USA.
2) I graduated with a Bachelor of Science degree in Geology in 2012 from the Indiana State University, a Master of Science in Geology from the University of Minnesota – Duluth in 2014, and a Doctor of Philosophy in Geology and Geochemistry from Michigan State University in 2022. I have worked as a geologist, in both academia and industry, for 12 years with specific expertise in geochemistry, petrogenesis, minerals exploration, and field geology in a range of base metal deposits. I am a Certified Professional Geologist with the American Institute of Professional Geology.
3) I have read the definition of "qualified person" set out in National Instrument 43-101- Standards of Disclosure for Mineral Projects ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" within the meaning of NI 43-101.
4) I am the QP responsible for Sections 7 through 12.
5) I am independent of the issuer, Electric Metals (USA) Limited, according to Section 1.5 of NI 43-101.
6) I have had no prior involvement with the property that is the subject of the Technical Report.
7) I have read NI 43-101, Form 43-101 F1 -Technical Report, 43-101 CP-Standards of Disclosure for Mineral Projects, and confirm that the Technical Report has been prepared in compliance with such instrument, form, and companion policy.
8) As of the effective date of the Technical Report, to the best of my knowledge, information and belief, the portions of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
9) I consent to the filing of the Technical Report with any securities regulatory authority, stock exchange and other regulatory authority and any publications by them, including electronic publication in the public company files on their websites accessible by the public.

**Dated this 30th day of September 2025.**

// s // Ronald A. Steiner

Ronald A. Steiner, Ph.D., C.P.G., AIPG

Statement of Certification

I, Douglas F. Hambley, Ph.D., P.E., P.Eng., P.G., RM-SME, as coauthor of the Technical Report titled NI 43-101 Technical Report Preliminary Econimic Assessment of the Electric Metals North Star Manganese Project, Crow Wing County, Minnesota, USA Effective Date: August 15, 2025 (the Technical Report) do hereby certify that:

1. I am a Mining Engineer and Geologist/Hydrogeologist, and Principal of DFH Geoscience & Engineering LLC located at 1990 Applewood Drive, Lakewood, Colorado, USA. I am jointly responsible for Sections 1.8, 16.3, and 16.5 of this Technical Report.
2. I am a member in good standing of Professional Engineers Ontario, being registered as a Professional Engineer (No. 18026013) since July 1975, of the Association of Professional Engineers and Geoscientists of Saskatchewan, being registered as a Professional Engineer (No. 16124) since January 2009 and of the Association of Professional Engineers and Geoscientists of Alberta, being registered as a Professional Engineer (No. 291409) since May 2022.
3. I am also licensed as a Professional Engineer in the states of Colorado, Illinois, Michigan, and Ohio and as a Professional Geologist in Illinois, Indiana and Louisiana. I served on the Board of Licensing for Professional Geologists of Illinois during its initial four years (1996 to 2000).
4. I have practiced my profession as a mining engineer and geologist since 1972. I have been practicing as a consulting engineer and geologist since May 1980.
5. I am a graduate of the Faculty of Applied Science at Queen's University at Kingston, Ontario, and earned a Bachelor of Science with Honours degree in Mining Engineering in May 1972. I earned a Doctor of Philosophy in Earth Sciences from the University of Waterloo in May 1991.
6. I am a Life Member of the Canadian Institute of Mining, Metallurgy, and Petroleum (CIM), a Legion of Honor Registered Member (No. 1299100RM) of the Society for Mining, Metallurgy, and Exploration (SME) and a member of the American Association of Petroleum Geologists (AAPG) and the Society of Economic Geologists (SEG). I am a member of the Resources and Reserves Committee and Ethics Committee of SME.
7. I have been involved with geology and mining of sedimentary iron formation deposits in Quebec and Labrador from December 1971 to 1973 and in the Mesabi in Minnesota in 1986-87, and with rock strength, hydrogeology and ground support for the Emily Project from mid-2024 to present. I was the Rock Engineer at Denison Mines Limited in Elliot Lake, Ontario from 1977 to 1980 and have been a rock engineering consultant since 1980. My narrow vein or tabular deposit experience also includes 9 months working underground at Falconbridge and East Mines in Falconbridge, Ontario and 4 months performing

underground surveying at Crean Hill Mine near Lively, Ontario. My hydrogeology experience includes analyzing potential inflows at several stone mines in Illinois and Indiana, a lead-zinc prospect in Wisconsin and a uranium prospect in Colorado in addition to the Emily Project. As Pit Engineer at an iron mine in 1972 and 0173, my responsibilities included monthly checking of the water levels at the perimeter dewatering wells and of outflows from the water discharge pipe. I have also designed a water supply system for parts of the Denison Mine in Elliot Lake and a dewatering system for a surface coal mine in Colorado. I have performed construction management and project cost estimation for mines and related facilities since 1977.

8. As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43-101.
9. I have no involvement with Electric Metals beyond my involvement with the preparation and writing of the Technical Report. I am independent of the issuer according to the definition of independence presented in Section 1.5 of National Instrument 43-101.
10. As at the effective date of the Technical Report, to the best of my knowledge, information, and belief, those sections or parts of the Technical Report for which I was responsible contain all scientific and technical information that is required to be disclosed to make those sections or parts of the Technical Report not misleading.
11. I have read National Instrument 43-101 and Form 43-101 F1. This report has been prepared in compliance with these documents to the best of my understanding.
12. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their web sites accessible by the public, of the Technical Report.

Dated this 25th day of September 2025

"Signed and Sealed" Professional Seal

______________________________________________

Dr. Douglas F. Hambley, P.E. (Colorado), P.Eng. (Saskatchewan), P.G. (Illinois), RM-SME

# 29. GLOSSARY

## Mineral Resources

The mineral resources and mineral reserves have been classified according to the "CIM Definition Standards for Mineral Resources and Mineral Reserves" (May 10, 2014). Accordingly, the Resources have been classified as Measured, Indicated or Inferred, any Reserves have been classified as Proven, and Probable based on the Measured and Indicated Resources as defined below.

A **Mineral Resource** is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling.

An **Inferred Mineral Resource** is that part of a Mineral Resource for which quantity and grade or quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade or quality continuity. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

An **Indicated Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing and is sufficient to assume geological and grade or quality continuity between points of observation. An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Mineral Reserve.

A **Measured Mineral Resource** is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade or quality continuity between points of observation. A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proven Mineral Reserve or to a Probable Mineral Reserve.

## Mineral Reserves

Modifying Factors are considerations used to convert Mineral Resources to Mineral Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social, and governmental factors.

A **Mineral Reserve** is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

The reference point at which Mineral Reserves are defined, usually the point where the ore is delivered to the processing plant, must be stated. It is important that, in all situations where the reference point is different, such as for a saleable product, a clarifying statement is included to ensure that the reader is fully informed as to what is being reported.

The public disclosure of a Mineral Reserve must be demonstrated by a Pre-Feasibility Study or Feasibility Study.

A **Probable Mineral Reserve** is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. The confidence in the Modifying Factors applying to a Probable Mineral Reserve is lower than that applying to a Proven Mineral Reserve. The Qualified Person(s) may elect to convert Measured Mineral Resources to Probable Mineral Reserves if the confidence in the Modifying Factors is lower than that applied to a Proven Mineral Reserve.

Probable Mineral Reserve estimates must be demonstrated to be economic, at the time of reporting, by at least a Pre-Feasibility Study.

A **Proven Mineral Reserve** is the economically mineable part of a Measured Mineral Resource. A Proven Mineral Reserve implies a high degree of confidence in the Modifying Factors. Application of the Proven Mineral Reserve category implies that the Qualified Person has the highest degree of confidence in the estimate with the consequent expectation in the minds of the readers of the report. The term should be restricted to that part of the deposit where production planning is taking place and for which any variation in the estimate would not significantly affect the potential economic viability of the deposit.

Proven Mineral Reserve estimates must be demonstrated to be economic, at the time of reporting, by at least a Pre-Feasibility Study. Within the CIM Definition standards the term Proved Mineral Reserve is an equivalent term to a Proven Mineral Reserve.

# APPENDIX A

## Table A29-1: Mine Production Plan

| # days/year | | | 175 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 67 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PEIF1** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** | **Year 11** | **Year 12** | **Year 13** | **Year 14** | **Year 15** | **Year 16** | **Year 17** | **Year 18** | **Year 19** | **Year 20** | **Year 21** | **Year 22** | **Year 23** | **Year 24** | **Year 25** | **TOTAL** |
| Ore Tonnes (K tonnes) | | | 100.0 | 200.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 300.0 | 315.5 | 400.0 | 76.2 | 6,792 |
| Contained Mn (K tonnes) | | | 20.2 | 40.4 | 60.1 | 59.7 | 59.2 | 58.6 | 57.7 | 56.7 | 55.6 | 54.9 | 54.6 | 55.0 | 55.5 | 56.0 | 56.4 | 56.6 | 56.3 | 55.0 | 53.3 | 51.6 | 48.6 | 48.5 | 60.2 | 10.3 | 1,241 |
| Contained Fe (K tonnes) | | | 18.4 | 36.9 | 55.7 | 55.9 | 56.0 | 56.2 | 56.6 | 56.9 | 57.1 | 57.0 | 56.8 | 56.5 | 56.5 | 56.5 | 56.7 | 57.3 | 57.9 | 58.5 | 57.9 | 57.8 | 59.8 | 59.3 | 71.6 | 12.6 | 1,282 |
| Contained SiO2 (K tonnes) | | | 35.1 | 70.7 | 107.1 | 107.4 | 109.2 | 110.4 | 111.9 | 114.4 | 117.6 | 120.4 | 122.5 | 122.1 | 121.0 | 120.9 | 120.7 | 118.6 | 113.0 | 111.1 | 114.1 | 122.0 | 131.4 | 150.7 | 203.6 | 35.7 | 2,712 |
| Mn (%) | 0.00% | 0.00% | 20.23% | 20.19% | 20.04% | 19.92% | 19.75% | 19.54% | 19.23% | 18.89% | 18.54% | 18.30% | 18.20% | 18.34% | 18.50% | 18.67% | 18.79% | 18.87% | 18.76% | 18.33% | 17.77% | 17.19% | 16.19% | 15.39% | 15.04% | 13.57% | 18.27% |
| Fe (%) | 0.00% | 0.00% | 18.42% | 18.46% | 18.55% | 18.64% | 18.68% | 18.74% | 18.86% | 18.98% | 19.02% | 18.99% | 18.92% | 18.85% | 18.84% | 18.83% | 18.91% | 19.10% | 19.28% | 19.49% | 19.30% | 19.26% | 19.95% | 18.80% | 17.89% | 16.58% | 18.88% |
| SiO2 (%) | 0.00% | 0.00% | 35.14% | 35.33% | 35.69% | 35.82% | 36.40% | 36.79% | 37.28% | 38.15% | 39.20% | 40.14% | 40.85% | 40.72% | 40.32% | 40.28% | 40.23% | 39.53% | 37.66% | 37.02% | 38.05% | 40.66% | 43.81% | 47.77% | 50.90% | 46.80% | 39.92% |

| # days/year | | | | 175 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 296 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PEIF3** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** | **Year 11** | **Year 12** | **Year 13** | **Year 14** | **Year 15** | **Year 16** | **Year 17** | **Year 18** | **Year 19** | **Year 20** | **Year 21** | **Year 22** | **Year 23** | **Year 24** | **Year 25** | **TOTAL** |
| Ore Tonnes (K tonnes) | | | | 50.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 84.5 | | | 2,034 |
| Contained Mn (K tonnes) | | | | 7.5 | 15.1 | 15.3 | 15.4 | 15.6 | 15.8 | 15.8 | 15.7 | 15.5 | 15.2 | 14.9 | 14.6 | 14.3 | 14.0 | 13.7 | 13.6 | 13.6 | 13.9 | 14.1 | 14.4 | 10.0 | | | 298 |
| Contained Fe (K tonnes) | | | | 14.4 | 28.8 | 28.5 | 27.9 | 27.9 | 28.2 | 28.1 | 28.0 | 28.0 | 27.7 | 26.8 | 25.8 | 24.6 | 23.7 | 23.0 | 21.2 | 19.2 | 17.5 | 12.9 | 5.6 | 0.6 | | | 468 |
| Contained SiO2 (K tonnes) | | | | 12.8 | 25.5 | 25.3 | 25.2 | 25.3 | 25.5 | 26.0 | 26.6 | 27.5 | 28.9 | 31.3 | 34.0 | 35.9 | 37.2 | 38.7 | 39.8 | 38.9 | 34.8 | 24.8 | 10.4 | 0.8 | | | 575 |
| Mn (%) | 0.00% | 0.00% | 0.00% | 14.97% | 15.07% | 15.26% | 15.41% | 15.57% | 15.76% | 15.76% | 15.67% | 15.49% | 15.17% | 14.87% | 14.61% | 14.33% | 14.01% | 13.72% | 13.57% | 13.63% | 13.86% | 14.08% | 14.41% | 11.82% | | | 14.63% |
| Fe (%) | 0.00% | 0.00% | 0.00% | 28.79% | 28.81% | 28.51% | 27.88% | 27.90% | 28.17% | 28.11% | 27.99% | 28.00% | 27.75% | 26.81% | 25.77% | 24.61% | 23.67% | 22.96% | 21.20% | 19.19% | 17.50% | 12.90% | 5.65% | 0.69% | | | 23.02% |
| SiO2 (%) | 0.00% | 0.00% | 0.00% | 25.64% | 25.53% | 25.33% | 25.23% | 25.27% | 25.46% | 26.03% | 26.62% | 27.47% | 28.88% | 31.25% | 34.04% | 35.89% | 37.23% | 38.72% | 39.83% | 38.92% | 34.78% | 24.75% | 10.38% | 0.97% | | | 28.28% |

| **TOTAL** | **Year 0** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** | **Year 7** | **Year 8** | **Year 9** | **Year 10** | **Year 11** | **Year 12** | **Year 13** | **Year 14** | **Year 15** | **Year 16** | **Year 17** | **Year 18** | **Year 19** | **Year 20** | **Year 21** | **Year 22** | **Year 23** | **Year 24** | **Year 25** | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ore Tonnes (K tonnes) | 0.0 | 0.0 | 100.0 | 250.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 76.2 | 8,826 |
| Contained Mn (K tonnes) | 0.0 | 0.0 | 20.2 | 47.9 | 75.2 | 75.0 | 74.7 | 74.2 | 73.4 | 72.4 | 71.3 | 70.4 | 69.8 | 69.9 | 70.1 | 70.3 | 70.4 | 70.3 | 69.8 | 68.6 | 67.2 | 65.6 | 63.0 | 58.5 | 60.2 | 10.3 | 1,539 |
| Contained Fe (K tonnes) | 0.0 | 0.0 | 18.4 | 51.3 | 84.5 | 84.4 | 83.9 | 84.1 | 84.8 | 85.1 | 85.0 | 85.0 | 84.5 | 83.4 | 82.3 | 81.1 | 80.4 | 80.3 | 79.1 | 77.7 | 75.4 | 70.7 | 65.5 | 59.9 | 71.6 | 12.6 | 1,751 |
| Contained SiO2 (K tonnes) | 0.0 | 0.0 | 35.1 | 83.5 | 132.6 | 132.8 | 134.4 | 135.6 | 137.3 | 140.5 | 144.2 | 147.9 | 151.4 | 153.4 | 155.0 | 156.7 | 157.9 | 157.3 | 152.8 | 150.0 | 148.9 | 146.7 | 141.8 | 151.6 | 203.6 | 35.7 | 3,287 |
| Mn (%) | 0.00% | 0.00% | 20.23% | 19.14% | 18.80% | 18.75% | 18.66% | 18.55% | 18.36% | 18.11% | 17.82% | 17.60% | 17.44% | 17.47% | 17.53% | 17.58% | 17.60% | 17.58% | 17.46% | 17.15% | 16.80% | 16.41% | 15.75% | 14.63% | 15.04% | 13.57% | 17.43% |
| Fe (%) | 0.00% | 0.00% | 18.42% | 20.52% | 21.12% | 21.10% | 20.98% | 21.03% | 21.19% | 21.26% | 21.26% | 21.24% | 21.13% | 20.84% | 20.57% | 20.28% | 20.10% | 20.06% | 19.76% | 19.42% | 18.85% | 17.67% | 16.37% | 14.97% | 17.89% | 16.58% | 19.84% |
| SiO2 (%) | 0.00% | 0.00% | 35.14% | 33.39% | 33.15% | 33.19% | 33.61% | 33.91% | 34.33% | 35.12% | 36.05% | 36.97% | 37.85% | 38.35% | 38.75% | 39.19% | 39.48% | 39.33% | 38.21% | 37.49% | 37.23% | 36.68% | 35.45% | 37.89% | 50.90% | 46.80% | 37.24% |

# Table A29-2: Pre-Tax Cash Flow

| Emily Project | | Period | Yr 0 | Yr 1 | Yr 2 | Yr 3 | Yr 4 | Yr 5 | Yr 6 | Yr 7 | Yr 8 | Yr 9 | Yr 10 | Yr 11 | Yr 12 | Yr 13 | Yr 14 | Yr 15 | Yr 16 | Yr 17 | Yr 18 | Yr 19 | Yr 20 | Yr 21 | Yr 22 | Yr 23 | Yr 24 | Yr 25 | Yr 26 | Yr 27 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Economic Model | | Years | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | |
| | | Days | 0 | 0 | 175 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 350 | 68 | | | |
| Total/Average | | ore t/day | | | 571 | 714 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,143 | 1,120 | | | |
| **Total Ore** | **ktonnes** | **8,826** | **0** | **0** | **100** | **250** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **400** | **76** | **0** | **0** | **8,826** |
| Ore | | 8,826 | 0 | 0 | 100 | 250 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 76 | 0 | 0 | 8,826 |
| Ore tons per day | **ktonnes** | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Mn kt Mined | **ktonnes** | 1,539 | 0 | 0 | 20 | 48 | 75 | 75 | 75 | 74 | 73 | 72 | 71 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 69 | 67 | 66 | 63 | 59 | 60 | 10 | 0 | 0 | 1,539 |
| Grade Mined, %Mn | | 17.4% | - | 0.0% | 20.2% | 19.1% | 18.8% | 18.8% | 18.7% | 18.6% | 18.4% | 18.1% | 17.8% | 17.6% | 17.4% | 17.5% | 17.5% | 17.6% | 17.6% | 17.6% | 17.5% | 17.2% | 16.8% | 16.4% | 15.7% | 14.6% | 15.0% | - | - | - | |
| Total Fe kt Mined | **ktonnes** | 1,751 | 0 | 0 | 18 | 51 | 84 | 84 | 84 | 84 | 85 | 85 | 85 | 85 | 85 | 83 | 82 | 81 | 80 | 80 | 79 | 78 | 75 | 71 | 65 | 60 | 72 | 13 | 0 | 0 | 1,751 |
| Grade Mined, Fe% | | 19.8% | - | 0.0% | 18.4% | 20.5% | 21.1% | 21.1% | 21.0% | 21.0% | 21.2% | 21.3% | 21.3% | 21.2% | 21.1% | 20.8% | 20.6% | 20.3% | 20.1% | 20.1% | 19.8% | 19.4% | 18.8% | 17.7% | 16.4% | 15.0% | 17.9% | - | - | - | |
| Total Si kt Mined | **ktonnes** | 3,287 | 0 | 0 | 35 | 83 | 133 | 133 | 134 | 136 | 137 | 140 | 144 | 148 | 151 | 153 | 155 | 157 | 158 | 157 | 153 | 150 | 149 | 147 | 142 | 152 | 204 | 36 | 0 | 0 | 3,287 |
| Grade Mined, Si% | | 37.2% | - | 0.0% | 35.1% | 33.4% | 33.1% | 33.2% | 33.6% | 33.9% | 34.3% | 35.1% | 36.1% | 37.0% | 37.9% | 38.3% | 38.8% | 39.2% | 39.5% | 39.3% | 38.2% | 37.5% | 37.2% | 36.7% | 35.4% | 37.9% | 50.9% | - | - | - | 9 |
| Recovered Mn ktonnes | **ktonnes** | 1,385 | | 0 | 18 | 43 | 68 | 68 | 67 | 67 | 66 | 65 | 64 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 62 | 60 | 59 | 57 | 53 | 54 | 9 | | | |
| Recovered Fe ktonnes | **ktonnes** | 1,401 | | 0 | 15 | 41 | 68 | 68 | 67 | 67 | 68 | 68 | 68 | 68 | 68 | 67 | 66 | 65 | 64 | 64 | 63 | 62 | 60 | 57 | 52 | 48 | 57 | 10 | | | |
| Tonnes HPMSM (K tonnes) | **ktonnes** | 4,328 | | 0 | 57 | 135 | 211 | 211 | 210 | 209 | 207 | 204 | 200 | 198 | 196 | 197 | 197 | 198 | 198 | 198 | 196 | 193 | 189 | 185 | 177 | 165 | 169 | 29 | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Revenue ($M)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mn revenue | | $10,820 | $0 | $0 | $142 | $337 | $529 | $527 | $525 | $522 | $516 | $509 | $501 | $495 | $491 | $491 | $493 | $495 | $495 | $494 | $491 | $482 | $472 | $462 | $443 | $412 | $423 | $73 | | | $10,820 |
| Fe Revenue | | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | | | $0 |
| Royalties & Fees | | $73 | $0 | $0 | $1 | $2 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $3 | $1 | | | $73 |
| **Total** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Total Revenue** | | $10,747 | $0 | $0 | $141 | $334 | $525 | $524 | $522 | $518 | $513 | $506 | $498 | $492 | $487 | $488 | $490 | $491 | $492 | $491 | $488 | $479 | $469 | $458 | $440 | $408 | $420 | $72 | $0 | $0 | $10,747 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | - |
| **Operating Costs ($M)** | | $/ton | | | | | | | | | | | | | | | | | | | | | | | | | | | | | - |
| Ore Production | $832 | $ 94.30 | $0 | $0 | $9 | $24 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $38 | $7 | $0 | $0 | $832 |
| Transportation | $799 | $ 90.55 | $0 | $0 | $9 | $23 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $36 | $7 | $0 | $0 | |
| Processing | $1,765 | $ 200.00 | $0 | $0 | $20 | $50 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $80 | $15 | $0 | $0 | $1,765 |
| G&A | $132 | $ 15.00 | $0 | $0 | $2 | $4 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $6 | $1 | $0 | $0 | $132 |
| Closure & Reclamation | $8 | | | | | | | | | | | | | | | | | | | | | | | | | | | $8 | | | $8 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Total Operating Costs ($M)** | | **$3,537** | $0 | $0 | $40 | $100 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $160 | $38 | $0 | $0 | $3,537 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | - |
| **Operating Margin ($M)** | | **$7,210** | $0 | $0 | $101 | $235 | $365 | $364 | $362 | $359 | $353 | $346 | $338 | $332 | $327 | $328 | $330 | $331 | $332 | $331 | $328 | $319 | $309 | $298 | $280 | $248 | $260 | $34 | $0 | $0 | $7,210 |
| Cash Cost $/t HPMSM | | 817.28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | - |
| **Capital Costs ($M)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | - |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Engineering & Design** | | $9 | $1.60 | $7.52 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | | | | | | | | | | | | $7.52 |
| **Vertical Mine Development:** | | $34 | $0.00 | $29.00 | $5.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | | | | | | | | | | | | $34.00 |
| **Horizontal Mine Development:** | | $7 | $0.00 | $1.36 | $3.85 | $1.65 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | | | | | | | | | | | | $6.86 |
| **Process Plant Capital** | | $360 | $0.00 | $120.00 | $120.00 | $120.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | | | | | | | | | | | | $360.00 |
| **Surface Infrastructure** | | $57 | $0.00 | $38.29 | $19.15 | $0.00 | $0.00 | $0.00 | | | | | | | | | | | | | | | | | | | | | | | $57.44 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | $0.00 |
| **SubTotal Fixed Capital** | | | $1.60 | $196.17 | $155.29 | $121.65 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $473.11 |
| **Contingency** | | 25% | $0.40 | $49.04 | $38.82 | $30.41 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | $118.28 |
| **Total Fixed Capital (15 years)** | | $593 | $2.00 | $245.21 | $194.12 | $152.06 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $591.39 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Sustaining Capital** | | 3% | | | | | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | | | | | | $205.20 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Underground Rubber Tired Mobile Equipment** | | | | $18.14 | $4.54 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $18.14 | $4.54 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $18.14 | $4.54 | $0.00 | $0.00 | $0.00 | | | | | | | | | $68.03 |
| **Underground Auxillary Equipment** | | | | $0.91 | $0.23 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.91 | $0.23 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.91 | $0.23 | $0.00 | $0.00 | $0.00 | | | | | | | | | $3.40 |
| **Surface Rubber Tired Mobile Equipment** | | | | $1.06 | $0.26 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $1.06 | $0.26 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $1.06 | $0.26 | $0.00 | $0.00 | $0.00 | | | | | | | | | $3.97 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Mine equipment capital** | | | $0.00 | $20.11 | $5.03 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $20.11 | $5.03 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $20.11 | $5.03 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | $75.40 |
| **Contingency** | | 25% | $0.00 | $5.03 | $1.26 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $5.03 | $1.26 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $5.03 | $1.26 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $18.85 |
| **Total Mobile Capital** | | | $0.00 | $25.13 | $6.28 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $25.13 | $6.28 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $25.13 | $6.28 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | $94.25 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Working Capital** | | | $10.00 | | | | | | | | | | | | | | | | | | | | | | | | | ($10.00) | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Total Capital Cost** | | $893 | $12.00 | $270.34 | $200.40 | $152.06 | $10.80 | $10.80 | $10.80 | $10.80 | $35.93 | $17.08 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $35.93 | $17.08 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $10.80 | $0.00 | $0.00 | ($10.00) | $0.00 | $0.00 | $892.84 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | - |
| **Net Cash Flow ($M)** | | 0% | ($12.00) | ($270.34) | ($98.93) | $82.44 | $354.58 | $353.34 | $350.86 | $347.74 | $317.20 | $329.00 | $327.13 | $320.97 | $316.50 | $317.34 | $319.01 | $295.39 | $314.54 | $320.41 | $317.05 | $308.41 | $298.35 | $287.52 | $268.86 | $248.32 | $259.74 | $43.62 | $0.00 | $0.00 | $6,317 |

## Table A29-3: After-Tax Cash Flow

| | Units | Yr 0 | Yr 1 | Yr 2 | Yr 3 | Yr 4 | Yr 5 | Yr 6 | Yr 7 | Yr 8 | Yr 9 | Yr 10 | Yr 11 | Yr 12 | Yr 13 | Yr 14 | Yr 15 | Yr 16 | Yr 17 | Yr 18 | Yr 19 | Yr 20 | Yr 21 | Yr 22 | Yr 23 | Yr 24 | Yr 25 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Ore | K Tonnes | | .0 | 100.0 | 250.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 76.2 | **8826** |
| Total | K Tonnes | | .0 | 100.0 | 250.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 400.0 | 76.2 | **8826** |
| Total Recovered Mn tonnes | K Tonnes | | .0 | 18.2 | 43.1 | 67.7 | 67.5 | 67.2 | 66.8 | 66.1 | 65.2 | 64.1 | 63.4 | 62.8 | 62.9 | 63.1 | 63.3 | 63.3 | 63.3 | 62.9 | 61.8 | 60.5 | 59.1 | 56.7 | 52.7 | 54.1 | 9.3 | **1385** |
| Total HPMSM | K Tonnes | | .0 | 56.9 | 134.6 | 211.4 | 211.0 | 210.0 | 208.7 | 206.5 | 203.7 | 200.5 | 198.0 | 196.2 | 196.6 | 197.2 | 197.8 | 197.9 | 197.8 | 196.4 | 193.0 | 189.0 | 184.6 | 177.2 | 164.6 | 169.2 | 29.1 | **4328** |
| Revenue | $M | $0.00 | $0.00 | $141.45 | $334.47 | $525.32 | $524.08 | $521.60 | $518.48 | $513.07 | $506.02 | $497.87 | $491.71 | $487.24 | $488.08 | $489.75 | $491.26 | $491.56 | $491.15 | $487.79 | $479.15 | $469.09 | $458.26 | $439.60 | $408.26 | $419.68 | $72.09 | $10,747 |
| Operating Costs | $M | $0.00 | $0.00 | ($39.99) | ($99.96) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($159.94) | ($38.46) | **($3,537)** |
| Depreciation | $M | | ($19.94) | ($42.34) | ($54.26) | ($57.07) | ($55.84) | ($52.79) | ($50.45) | ($51.98) | ($52.92) | ($51.38) | ($49.75) | ($48.67) | ($48.48) | ($48.48) | ($51.57) | ($44.42) | ($30.16) | ($14.98) | ($5.38) | ($3.59) | ($2.79) | ($1.40) | ($0.21) | $0.00 | $0.00 | ($839) |
| Depletion | $M | $0.00 | $0.00 | ($29.56) | ($76.93) | ($120.82) | ($120.54) | ($119.97) | ($119.25) | ($118.01) | ($116.39) | ($114.51) | ($113.09) | ($112.07) | ($112.26) | ($112.64) | ($112.99) | ($113.06) | ($112.96) | ($112.19) | ($110.20) | ($107.89) | ($105.40) | ($101.11) | ($93.90) | ($96.53) | $0.00 | ($2,452) |
| Amortization | $M | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | | | | | | | | | | | | | | $0 |
| State Tax | 2.85% | | $0.00 | ($2.89) | ($6.68) | ($10.41) | ($10.38) | ($10.31) | ($10.22) | ($10.06) | ($9.86) | ($9.63) | ($9.46) | ($9.33) | ($9.35) | ($9.40) | ($9.44) | ($9.45) | ($9.44) | ($9.34) | ($9.10) | ($8.81) | ($8.50) | ($7.97) | ($7.08) | ($7.40) | ($0.96) | ($205) |
| Loss Carry Forward (Corporate) | $M | | | | | | | | | | | | | | | | | | | | | | | | | | | $0 |
| Interest Expense | $M | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | | | | | | | | | | | $0 |
| Tax Loss Carry Forward | $M | $0.00 | $0.00 | ($19.94) | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | | | | | | | | | | | | | | | ($20) |
| **Taxable Income** | $M | **$0.00** | **($19.94)** | **$6.73** | **$96.63** | **$177.08** | **$177.39** | **$178.59** | **$178.62** | **$173.08** | **$166.91** | **$162.41** | **$159.47** | **$157.24** | **$158.05** | **$159.29** | **$157.31** | **$164.70** | **$178.64** | **$191.34** | **$194.53** | **$188.86** | **$181.63** | **$169.18** | **$147.14** | **$155.81** | **$32.67** | $3,693 |
| Federal Tax | 21% | $0.00 | $0.00 | ($1.41) | ($20.29) | ($37.19) | ($37.25) | ($37.50) | ($37.51) | ($36.35) | ($35.05) | ($34.11) | ($33.49) | ($33.02) | ($33.19) | ($33.45) | ($33.04) | ($34.59) | ($37.51) | ($40.18) | ($40.85) | ($39.66) | ($38.14) | ($35.53) | ($30.90) | ($32.72) | ($6.86) | **($780)** |
| **Net Income** | | **$0.00** | **($19.94)** | **$5.32** | **$76.34** | **$139.89** | **$140.13** | **$141.09** | **$141.11** | **$136.73** | **$131.86** | **$128.30** | **$125.98** | **$124.22** | **$124.86** | **$125.84** | **$124.28** | **$130.11** | **$141.13** | **$151.16** | **$153.68** | **$149.20** | **$143.49** | **$133.66** | **$116.24** | **$123.09** | **$25.81** | $2,914 |
| Depreciation | $M | $0.00 | $19.94 | $42.34 | $54.26 | $57.07 | $55.84 | $52.79 | $50.45 | $51.98 | $52.92 | $51.38 | $49.75 | $48.67 | $48.48 | $48.48 | $51.57 | $44.42 | $30.16 | $14.98 | $5.38 | $3.59 | $2.79 | $1.40 | $0.21 | $0.00 | $0.00 | $839 |
| Depletion | $M | $0.00 | $0.00 | $29.56 | $76.93 | $120.82 | $120.54 | $119.97 | $119.25 | $118.01 | $116.39 | $114.51 | $113.09 | $112.07 | $112.26 | $112.64 | $112.99 | $113.06 | $112.96 | $112.19 | $110.20 | $107.89 | $105.40 | $101.11 | $93.90 | $96.53 | $0.00 | $2,452 |
| Amortization | $M | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | | | | | | | | | | | | | | | $0 |
| Capital Expenditures (Less Interest) | $M | ($12.00) | ($270.34) | ($200.40) | ($152.06) | ($10.80) | ($10.80) | ($10.80) | ($10.80) | ($35.93) | ($17.08) | ($10.80) | ($10.80) | ($10.80) | ($10.80) | ($10.80) | ($35.93) | ($17.08) | ($10.80) | ($10.80) | ($10.80) | ($10.80) | $10.80 | $10.80 | $0.00 | $0.00 | ($10.00) | ($870) |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | $0 |
| **After Tax Cash Flow (ATCF)** | $1,724 | ($12.00) | ($270.34) | ($103.24) | $55.46 | $306.98 | $305.71 | $303.05 | $300.01 | $270.79 | $284.09 | $283.39 | $278.03 | $274.15 | $274.79 | $276.16 | $252.91 | $270.50 | $273.46 | $267.52 | $258.46 | $249.87 | $262.47 | $246.96 | $210.35 | $219.62 | $15.81 | $5,355 |
| **Cumulative ATCF** | $M | ($12) | ($282) | ($386) | ($330) | ($23) | $283 | $586 | $886 | $1,156 | $1,441 | $1,724 | $2,002 | $2,276 | $2,551 | $2,827 | $3,080 | $3,350 | $3,624 | $3,891 | $4,150 | $4,400 | $4,662 | $4,909 | $5,120 | $5,339 | $5,355 | $62,578 |


*120 Commerce Drive., Units 3 & 4, Fort Collins, CO 80524*

# APPENDIX B

## Table B29-4: Development Schedule