



NI 43-101 Technical Report

Minorca Property, Minnesota, USA

Cleveland-Cliffs Inc.

Prepared by:

SLR International Corporation

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Effective Date:

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Signature Date:

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1.0 Summary

1.1 Executive Summary

SLR International Corporation (SLR) was retained by Cleveland-Cliffs Inc. (Cliffs) to prepare an independent Technical Report on the Minorca Property (Minorca or the Property), located in St. Louis County, Northeastern Minnesota, USA. The operator of the Property, Cleveland-Cliffs Minorca Mine Inc. (CCMMI), is a wholly owned subsidiary of Cliffs.

Cliffs is listed on the New York Stock Exchange (NYSE) and currently reports Mineral Reserves of pelletized ore in the United States Securities and Exchange Commission's (SEC) filings. On July 14, 2024, Stelco Holdings Inc. (Stelco), 13421422 Canada Inc. (Purchaser), a wholly owned subsidiary of Cliffs, and Cliffs entered into an Arrangement Agreement, providing for, among other things, the acquisition by Purchaser of all of the outstanding common shares of Stelco. In connection with a special meeting of Stelco shareholders to consider and approve the transactions contemplated by the Arrangement Agreement, Stelco is providing its shareholder with a management information circular (the Stelco Circular) that, given the consideration to be paid to Stelco shareholders pursuant to the terms of the Arrangement Agreement includes Cliffs' common stock, must include disclosure regarding Cliffs in the form of prospectus that Cliffs would be eligible to use immediately prior to the sending and filing of the Stelco Circular. The provision of disclosure related to Cliffs' mineral projects in the Stelco Circular requires Stelco to file this Technical Report.

This Technical Report conforms to National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101). SLR Qualified Persons (QPs) visited the property on April 29, 2021 and prepared an S-K 1300 Technical Report Summary (TRS) dated February 7, 2022. Cliffs has since been updating the Mineral Reserve estimate for the Property based on depletion due to mining, with the latest update at YE 2023. There has been no material change to the information contained in the 2022 TRS and Cliffs considers the TRS to be current.

This Technical Report presents information from the 2022 TRS in compliance with NI 43-101.

The Property includes the Laurentian and East Pit mining areas (collectively the Minorca Mine), between Gilbert and Biwabik, Minnesota and a processing facility (the Plant) in Virginia, Minnesota. The Minorca Mine is a complex of large, operating open-pit iron mines that produces pellets from a magnetite iron ore regionally known as taconite.

The Property commenced operations in 1976 as an asset of Inland Steel Company (Inland Steel). In 1998, ISPAT International (ISPAT) purchased Inland Steel and, in 2004, merged with LNM Holdings N.V. (LNM) and International Steel Group to form Mittal Steel, which in 2007 merged with Arcelor to form ArcelorMittal. The Property has been a wholly owned subsidiary of Cliffs since 2020, when Cliffs purchased the US assets of ArcelorMittal, ArcelorMittal USA (AMUSA).

The open-pit operation at Minorca has a mining rate of approximately 8.6 million long tons (MLT) of ore per year and produces 2.8 MLT of wet flux iron ore pellets, which are shipped by freighter via the Great Lakes to Cliffs' steel mill facilities in the Midwestern USA.

1.1.1 Conclusions

Minorca has been a successful producer of iron pellets for over 44 years. The update to the Mineral Resource and Mineral Reserve does not materially change any of the assumptions from previous operations. An economic analysis was performed using the estimates presented in this



Technical Report and confirms that the outcome is a positive cash flow that supports the statement of Mineral Reserves for a 14-year mine life. There are no significant risks and uncertainties that could reasonably be expected to affect the reliability or confidence in the Mineral Resource or Mineral Reserve estimates or Minorca's continued economic viability.

The QPs (Qualified Person) offer the following conclusions by area.

1.1.1.1 Geology and Mineral Resources

- Above a crude magnetic iron (MagFe) cut-off grade of 16%, Minorca Measured and Indicated Mineral Resources exclusive of Mineral Reserves are estimated to total 801.5 MLT at an average grade of 22.9% MagFe.
- The East, Central, and Laurentian deposits are examples of Lake Superior-type banded iron formation (BIF) deposits. Both the site and corporate technical teams have a strong understanding of the Minorca geology, as well as the processing characteristics of the mineralization.
- Exploration sampling, preparation, analyses, and security processes for both physical samples and digital data are appropriate for the style of mineralization and are sufficient to support the estimation of Mineral Resources.
- Cliffs is developing a program of quality assurance and quality control (QA/QC) that includes standards and duplicates and control-chart analysis. A comprehensive QA/QC program did not exist for the previous 44 years of mine operation. QA/QC results for the 2021 verification study are appropriate for the style of mineralization and are sufficient to generate a drill hole assay database that is adequate for Mineral Resource estimation in compliance with international reporting standards. Based on these results, in conjunction with good agreement between planned and actual product produced over more than 40 years, it is the QP's opinion that procedures are consistent with industry standards.
- The key economic variables (KEV) in the block models for Minorca compare well with the source data. Future estimations should also review the cut-off grade used in reporting.
- The methodology used to prepare the block model is appropriate and consistent with industry standards.
- Validations compiled by the QP indicate that the block model is reflecting the underlying support data appropriately.
- The classification at Minorca is generally acceptable. In the QP's opinion, however, the extension of classified material beyond drilling limits is slightly aggressive, and some post-processing to remove isolated blocks of different classification is warranted. Classified blocks that extend beyond the drilling limits are generally outside the Resource Pit Shell.
- The block model represents an acceptable degree of smoothing at the block scale for prediction of quality variables at Minorca. Visually, blocks and composites in cross-section and plan view compare well.
- 2021 actual versus model-predicted values of crude ore were accurate to within 10%, with the model values slightly lower than actual total ore processed.



1.1.1.2 Mining and Mineral Reserves

- Minorca has been in production since 1976, and specifically under 100% Cliffs operating management since 2020. Cliffs conducts its own Mineral Reserve estimations.
- Total Proven and Probable Mineral Reserves are estimated at 109.7 MLT of crude ore (at a 100% project basis) at an average grade of 23.8% MagFe.
- Mineral Reserve estimation practices follow industry standards.
- The Minorca Mineral Reserve estimate indicates a sustainable project over a 14-year life of mine (LOM).
- The geotechnical design parameters used for pit design are reasonable and supported by previous operations.
- The LOM production schedule is reasonable and incorporates large mining areas and open benches.
- An appropriate mining equipment fleet, maintenance facilities, and manpower are in place, with additions and replacements estimated, to meet the LOM production schedule requirements.
- Sufficient storage capacity for waste stockpiles and tailings has been identified to support the production of the Mineral Reserve.

1.1.1.3 Mineral Processing

- Minorca's product has been wholly consumed by Indiana Harbor #7 blast furnace (IH7) since production began in 1977. In 1987, Minorca began creating flux pellets as opposed to standard pellets. In 1992, Minorca constructed a flotation plant for silica reduction to treat the higher silica, Laurentian Pit ores.
- Minorca performs diamond drilling to characterize the Mineral Resource associated with the mine plan. Blast hole samples are analyzed to validate ore grades and develop blending plans. Minorca also conducts plant sampling for process control and product quality reporting for compliance with Standard Product Parameters (SPPs) established by IH7.
- Ore is blended from the Laurentian and East pits based on MagFe content and silica grade as well as scheduled material movement.
- Crushing, concentrating, and pelletizing processes are conventional. Mined ore is processed in primary, secondary, and tertiary crushers to produce a final product with 100% passing (P_{100}) 5/8 in. that is delivered to the concentrator at a design rate of 1,396 long tons per hour (LT/h).
- The concentrator comprises three lines that include rod milling, primary magnetic separation, ball milling, and secondary magnetic separation closed by cyclones, hydroseparation, and finisher magnetic separation to produce a magnetite concentrate.
- Bentonite and dolomite flux are added to the concentrate, which is agglomerated into balls using balling discs and fired in a straight grate indurating furnace to produce a final, hardened, fluxed pellet product.
- From 2015 to 2020, the Minorca concentrator processed an average of 8.78 MLT per year (MLT/y) of ore with an average MagFe grade of 22.7%. The overall mass recovery



to concentrate averaged 32.5% with an overall MagFe recovery of 95.4%. Final product for the period averaged 2.79 MLT/y of flux pellets and 42,200 LT/y of lump product with grades of 62.6% Fe and 4.2% SiO₂.

- The main process water supply for the concentrator is recycled from the tailings thickener. Other sources include the Upland and Minorca tailings basins, the Missabe Mountain Pit, the Sauntry/Enterprise Pit, and the Plant Site settling basin.

1.1.1.4 Infrastructure

- The Property is located in a historically important, iron-producing region of Northeastern Minnesota. All the infrastructure necessary to mine and process significant commercial quantities of iron ore is in place.
- Cliffs has been operating the Upland Tailings Basin as a disposal site for fine tailings since the mid-1970s and the In-Pit Tailings Basin since 2001, both of which are currently operating under the permit requirements of the Minnesota Department of Natural Resources Dam Safety Unit

1.1.1.5 Environment

- Minorca maintains the requisite state and federal permits and is in compliance with all permits. Environmental liabilities and permitting are further discussed in Section 20.0 of this Technical Report.

1.1.2 Recommendations

1.1.2.1 Geology and Mineral Resources

- 1 Continue to develop and expand the QA/QC program to ensure that the program includes clearly defined limits when action or follow-up is required, and that results are reviewed and documented in a report, including conclusions and recommendations, regularly and in a timely manner.
 - a) Complete ISO certification for the Minorca laboratory.
 - b) Develop a formal QA/QC procedure that includes preparation of a QA/QC campaign report following every annual diamond drilling program.
 - c) Continue to submit a small number of “preparation duplicate” samples to a secondary accredited laboratory to document capability(ies), cost, and time efficiency of alternate provider(s) and confirm that results are comparable to those of Minorca’s internal laboratory.
 - d) Add sample completion date to all diamond drill hole certificates of analysis returned to the mine geologist.
- 2 Apply a minimum of two holes during the first pass estimation for Minorca in future updates.
- 3 In future updates, use local drill hole spacing instead of a distance-to-drill hole criterion for block classification.
- 4 Prepare model reconciliation over quarterly periods and document methodology, results, and conclusions and recommendations.
- 5 Continue to update Minorca Mineral Resource estimates with new drilling.



1.1.2.2 Mining and Mineral Reserves

- 1 Complete additional work at Minorca to support conversion of on-strike Mineral Resources to Mineral Reserves and update mine planning accordingly.
- 2 Review potential comingling of waste rock stockpiles between the Minorca pits for opportunities to reduce the stockpile footprint created external to the open pits and reduce waste haulage profiles.

1.1.2.3 Mineral Processing

- 1 Follow the established procedures for sampling and testing to support ore blending and ensure operational consistency and preventive maintenance.

1.1.2.4 Infrastructure

- 1 Prioritize the completion of an Operations, Maintenance and Surveillance (OMS) Manual for the tailings storage facility (TSF) with the Engineer of Record (EOR) in accordance with Mining Association of Canada (MAC) guidelines and other industry-recognized standard guidance for tailings facilities.
- 2 Document, prioritize, track, and close out in a timely manner the remediation, or resolution, of items of concern noted in TSF audits or inspection reports.

1.2 Economic Analysis

1.2.1 Economic Criteria

An un-escalated technical-economic model was prepared on an after-tax, discounted cash flow (DCF) basis, the results of which are presented in this subsection. Key criteria used in the analysis are discussed in detail throughout this Technical Report. General assumptions used are summarized in Table 1-1 with all physicals reported per wet long ton (WLT) pellet.

Table 1-1: Technical-Economic Assumptions

Description	Value
Start Date	December 31, 2021
Mine Life	14 years
Three-Year Trailing Average Revenue	\$98/WLT pellet
Operating Costs	\$85.53/WLT pellet
Sustaining Capital (after five years)	\$4/WLT pellet
Discount Rate	10%
Discounting Basis	End of Period
Inflation	0.0%
Federal Income Tax	20%
State Income Tax	None – Sales made out of state

Table 1-2 presents a summary of the estimated mine production over the 14-year mine life.



Table 1-2: LOM Production Summary

Description	Units	Value
Run of Mine (ROM) Crude Ore	MLT	109.7
Total Material	MLT	193.2
Grade	% MagFe	23.8
Annual Mining Rate	MLT/y	16

Table 1-3 presents a summary of the estimated plant production over the 14-year mine life.

Table 1-3: LOM Plant Production Summary

Description	Units	Value
ROM Material Milled	MLT	109.7
Annual Processing Rate	MLT/y	8.5
Process Recovery	%	34.2
Total Pellet	MLT	37.4
Annual Pellet Production	MLT/y	2.8

1.2.2 Cash Flow Analysis

The indicative economic analysis results, presented in Table 1-4, indicate an after-tax Net Present Value (NPV), using a 10% discount rate, of \$70 million at an average blended wet pellet price of \$98/WLT. The QP notes that after-tax Internal Rate of Return (IRR) is not applicable, as the processing facility has been in operation for a number of years. Capital identified in the economics is for sustaining operations and plant rebuilds as necessary.

The economic analysis was performed using the estimates presented in this Technical Report and confirms that the outcome is a positive cash flow that supports the statement of Mineral Reserves.

Table 1-4: LOM Indicative Economic Results

Description	\$ Millions	\$/WLT Pellet
Three-Year Trailing Revenue (\$/WLT Pellet)		98
Pellet Production (MWLT)	37.4	
Gross Revenue	3,659	
Mining	631	16.89
Processing	1,701	45.57
Site Administration	82	2.20
Logistics/Dock	403	10.78
General / Other Costs	377	10.10
Total Operating Costs	3,193	85.53
Operating Income (excl. D&A)	465	12.47



Description	\$ Millions	\$/WLT Pellet
Federal Income Tax	(93)	(249)
Depreciation Tax Savings	49	1.31
Accretion Tax Savings	4	0.11
Net Income after Taxes	425	11.39
Capital	210	(5.63)
Closure Costs	29	(0.79)
Cash Flow	186	4.98
NPV 10%	70	

1.2.3 Sensitivity Analysis

The Minorca operation is nominally most sensitive to market prices (revenues) followed by operating cost. For each dollar movement in sales price and operating cost, respectively, the after tax NPV changes by approximately \$18 million.

1.3 Technical Summary

1.3.1 Property Description

The Property is located in St. Louis County, Northeastern Minnesota, USA, on the Mesabi Iron Range, between the towns of Virginia, Gilbert, and Biwabik, Minnesota. The Laurentian Pit is located near the City of Gilbert, Minnesota at latitude 47°30'0"N and longitude 92°26'30"W, East 1 (also termed Lynx) Pit is located at latitude 47°31'30"N and longitude 92°23'30"W, and East 2 (also termed Whiskey) Pit is located just west of the City of Biwabik at latitude 47°32'0"N and longitude 92°22'30"W. The Minorca Plant is located approximately seven miles (mi) to the northeast, near the town of Virginia, Minnesota at latitude 47°33'30"N and longitude 92°31.5'30"W. The Property has the capacity to produce approximately 2.8 MLT of wet flux iron ore pellets annually.

Cliffs controls 16,825 acres of mineral titles and surface rights in the Property through leases and direct ownership through its wholly owned subsidiary CCMML.

1.3.2 Accessibility, Climate, Local Resources, Infrastructure, and Physiography

The Property is easily accessed via paved roads from Virginia, approximately one mile to the west, or the towns of Gilbert and Biwabik, approximately one mile to the west and east, respectively. A rail line operated by Canadian National Railway (CN) extends from the Minorca processing facility to the port of Two Harbors, Minnesota, a major port city on Lake Superior, which is 75 mi southeast of the Property. Duluth, Minnesota is also 69 mi southeast of Virginia via US Highway 53 and 27 mi southwest of Two Harbors via MN Highway 61. Duluth also has a regional airport with several flights daily to major hubs in Minneapolis, Minnesota and Chicago, Illinois.

The climate in northern Minnesota ranges from mild in the summer to winter extremes. The annual average temperature is 36.9°F. The annual average high temperature is 48.6°F, whereas the annual average low temperature is 25.1°F. By month, July is on average the hottest month (77°F), with January being the coldest (-4°F).



The Minorca operation employs 362 personnel who live in the surrounding cities of Virginia, Eveleth, Gilbert, and Hibbing. Personnel also commute from Duluth and the Iron Range. St. Louis County has an estimated population of 200,000 people.

The Property is located in a historically important, iron-producing region of Northeastern Minnesota. All the infrastructure necessary to mine and process significant commercial quantities of iron ore is currently in place. Infrastructure items include high voltage electrical supplies, natural gas pipelines that connect to the North American distribution system, water sources, paved roads and highways, railroads for transporting ROM crude ore and finished products, port facilities that connect to the Great Lakes, and accommodations for employees. Local and State infrastructure also includes hospitals, schools, airports, equipment suppliers, fuel suppliers, commercial laboratories, and communication systems.

The Property is at an elevation of approximately 1,700 feet above sea level (asl). The generally gentle topography in the area is punctuated by hummocky hills and long, gentle moraines, remnants of glacial ingress and egress. The landscape ranges from semi-rugged, lake-dotted terrain with thin glacial deposits over bedrock, to hummocky or undulating plains with deep glacial drift, to large, flat, poorly drained peatlands. The Minnesota Department of Natural Resources characterizes the area as being within the Laurentian Mixed Forest (LMF) Province. In Minnesota, the LMF is characterized by broad areas of conifer forest, mixed hardwood and conifer forests, and conifer bogs and swamps.

1.3.3 History

Exploration for high-grade, direct-shipping iron ore (DSO) deposits in the Virginia area began in the 1890s. Focused exploration for beneficiation-grade magnetite deposits, regionally known as taconite deposits, however, did not begin until the 1940s.

The Minorca Mine and Plant began production in 1977 as an asset of Inland Steel, with an initial production rate of 2.56 MLT/y of standard iron ore pellets. Flux pellet production commenced in 1987, and since then, through a multitude of operational improvements, the Plant has increased production to 2.85 MLT/y of pellets. A flotation plant was added in 1992 so that the Plant could utilize the higher silica ore coming from the Laurentian Pit.

In 1998 the Property was purchased by ISPAT, which subsequently became part of a 2005 merger between ISPAT, LNM Holdings, and International Steel Group to form Mittal Steel. In 2007, Mittal Steel merged with Arcelor to form ArcelorMittal. The Property was idled for six months in 2009 to conserve cash for the parent company during the economic downturn of the period. This represented the only time in the history of the Property that the operation was idled for economic reasons.

In 2020, Cliffs purchased the US-based assets of ArcelorMittal and now holds a 100% interest in the Property through its wholly owned subsidiary CCMML.

1.3.4 Geological Setting, Mineralization, and Deposit

The Minorca deposits are examples of Superior-type BIF deposits, specifically the Biwabik Iron Formation (Biwabik IF), which is interpreted to have been deposited in a shallow, tidal marine setting and is characterized as having four main members (from bottom to top): Lower Cherty, Lower Slaty, Upper Cherty, and Upper Slaty. Cherty units generally have a sandy granular texture, are thickly bedded, and are composed of silica and iron oxide minerals. Slaty units are fine grained, thinly bedded, and comprised of iron silicates and iron carbonates, with local chert beds, and they are typically uneconomic. The mineral of economic interest at Minorca is magnetite. The



nomenclature of the members is not indicative of metamorphic grade; instead, slaty and cherty are colloquial descriptive terms used regionally.

1.3.5 Exploration

Diamond drilling (DD) is the principal method of exploration utilized at Minorca. A combination of historical and current DD core drilled by Cliffs and its predecessors is used in mine planning. Near-mine exploration is conducted on approximately 400-ft centers. In June 2021, Cliffs contracted EDCON-PRJ to fly a high-resolution aeromagnetic survey over its nearby United Taconite operation; the survey extended over the Minorca property and was completed for the purpose of understanding large-scale structural features and BIF oxidation.

1.3.6 Mineral Resource Estimates

Mineral Resource estimates for the Minorca deposit were prepared by Cliffs and audited and accepted by SLR using available data from 1958 to 2021. Mineral Resource estimates are based on 443 DD drill holes totaling 118,809 ft completed since drilling began in 1958.

The 2021 Minorca Mineral Resource estimate was completed using a conventional block modeling approach. The general workflow included the construction of a geological or stratigraphic model representing the Biwabik IF by SLR in Seequent's Leapfrog Geo (Leapfrog Geo) from mapping, drill hole logging, and sampling data, which were used to define discrete domains and surfaces representing the upper contact of each unit of non-iron formation and iron formation subunits. The geologic model was then imported into Maptek's Vulcan™ software (Vulcan) by Cliffs for resource estimation. Sub-blocked model estimates used inverse distance squared (ID^2) and length-weighted, 10-ft uncapped composites to estimate KEVs including magnetic iron, weight recovery, and silica in concentrate in a three-search pass approach, using hard boundaries between subunits, ellipsoidal search ranges, and search ellipse orientation informed by geology. Average density values were assigned by lithological unit.

Mineral Resources were classified in accordance with Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves (CIM (2014) definitions) and disclosed in accordance with NI 43-101. Blocks were classified as Measured, Indicated, or Inferred using distance-based and qualitative criterion. Cliffs classifies the Mineral Resources based primarily on drill hole spacing and influenced by geologic continuity, ranges of economic criteria, and reconciliation. Some post-processing is undertaken to ensure spatial consistency and remove isolated and fringe blocks. The resource area is limited by a polygon and subsequent pit shell based on practical mining limits. A block of ore is classified as Measured if the distance to the nearest drill hole is within 400 ft and estimated with the pass 1 estimate. If the nearest drill hole is between 400 ft and 800 ft and estimated in the pass 2 estimate, it is classified as Indicated. All remaining blocks are classified as Inferred.

Estimates were validated using standard industry techniques including statistical comparisons with composite samples and parallel nearest neighbor (NN) estimates, swath plots, as well as visual reviews in cross-section and plan completed for both deposits. A visual review, comparing blocks to drill holes completed after the block modeling work, was performed to ensure general lithologic and analytical conformance.

To ensure that all Mineral Resource statements satisfy the "reasonable prospects for eventual economic extraction" requirement, Mineral Resources were constrained within an open-pit shell, prepared by Cliffs and based on a US\$90/LT pellet value and a wet 62.5% Fe flux pellet. The Minorca Mineral Resource estimate as of December 31, 2021 is summarized in Table 1-5.



Table 1-5: Summary of Minorca Mineral Resources - December 31, 2021

Class	Resources	MagFe	Process Recovery	Wet Pellets
	(MLT)	(%)	(%)	(MLT)
Measured	484.3	22.9	32.9	159.3
Indicated	317.2	22.9	32.9	104.4
Measured + Indicated	801.5	22.9	32.9	263.7
Inferred	30.1	21.1	30.2	9.1
Notes: 1. Tonnage is reported in long tons equivalent to 2,240 lb. 2. Mineral Resources are reported exclusive of Mineral Reserves and have been rounded to the nearest 100,000. 3. Mineral Resources are estimated at a cut-off grade of 16% crude MagFe. 4. Mineral Resources are estimated using a pellet value of US\$90/LT. 5. Waste within the pit is 986.7 MLT at a stripping ratio of 1.23:1 (waste to crude ore). 6. Saleable product reported as a 62.5% Fe content wet flux pellet, shipped product contains 2% moisture. 7. Classification of Mineral Resources is in accordance with CIM (2014) definitions. 8. Bulk density is assigned based on average readings for each lithology type. 9. Mineral Resources are 100% attributable to Cliffs. 10. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. 11. Numbers may not add due to rounding.				

Resource estimates take account of the minimum block size that can be selectively extracted. Mineral Resources are exclusive of Mineral Reserves and are reported at a 16% MagFe cut-off grade. Mining recovery is typically 100%, although the grade tends to be diluted by 1% MagFe due to geological conditions and mining practices.

The QP is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that could materially affect the Mineral Resource estimate.

1.3.7 Mineral Reserve Estimates

Mineral Reserves in this Technical Report are derived from the current Mineral Resources. The Mineral Reserves are reported as crude ore and are based on open pit mining from the Laurentian, East 1, and East 2 areas. Crude ore is the unconcentrated ore as it leaves the mine at its natural *in situ* moisture content. The Proven and Probable Mineral Reserves for Minorca were estimated as of December 31, 2021, and are summarized in Table 1-6.

Table 1-6: Summary of Minorca Mineral Reserves – December 31, 2021

Category	Crude Ore Mineral Reserves (MLT)	Crude Ore MagFe (%)	Process Recovery (%)	Wet Pellets (MLT)
Proven	102.8	23.7	34.0	35.0
Probable	6.8	25.1	36.1	2.5
Proven + Probable	109.7	23.8	34.1	37.4



Notes:

1. Tonnage is reported in long tons equivalent to 2,240 pounds and has been rounded to the nearest 100,000.
2. Mineral Reserves are reported at a \$90/LT wet flux pellet price free-on-board (FOB) Lake Superior, based on the three-year trailing average of the realized product revenue rate.
3. Mineral Reserves are estimated at a cut-off grade of 16% crude MagFe.
4. Mineral Reserves include mining dilution of 4% and mining extraction losses of 5%.
5. The Mineral Reserve mining stripping ratio (waste units to crude ore units) is at 0.8.
6. Pellets are reported as a 62.5% Fe content wet flux pellet; shipped pellets contain 2.0% moisture.
7. Tonnage estimate based on December 31, 2021 production depletion from surveyed topography on June 28, 2021.
8. Mineral Reserve tons are as delivered to the primary crusher; pellets are as loaded onto lake freighters in Two Harbors, Minnesota.
9. Classification of the Mineral Reserves is in accordance with CIM (2014) definitions.
10. Mineral Reserves are 100% attributable to Cliffs.
11. Numbers may not add due to rounding.

The three-year (2017 to 2019) trailing average of the realized pellet price is US\$98/LT; however, the reserves are evaluated using a pellet price of US\$90/LT based on the corporate guidance issued. The pellet value more closely represents the current economic outlook, and the optimization margins still allow for a robust mine-plan. The costs used in this study represent all mining, processing, transportation, and administrative costs including the loading of pellets into lake freighters in Two Harbors, Minnesota.

The QP is not aware of any mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

1.3.8 Mining Methods

The Laurentian, East 1, and East 2 areas are mined using conventional surface mining methods. The surface operations include:

- Clearing and grubbing
- Overburden (glacial till) removal
- Drilling and blasting (excluding overburden)
- Loading and haulage

The Mineral Reserve is based on the ongoing, annual-average crude ore production of approximately 8.6 MLT from the Laurentian, East 1, and East 2 pits, producing an average of 2.8 MLT/y of wet flux pellets for domestic consumption.

Mining and processing operations are scheduled 24 hours per day, and the mine production is scheduled to directly feed the processing operations.

The current LOM plan has mining scheduled for 14 years and mines the known Mineral Reserve. The average stripping ratio is 0.8 waste units to 1 crude ore unit (0.8 stripping ratio).

The final Laurentian Pit is approximately 1.2 mi along strike, 0.9 mi wide, and up to 640 ft deep. Crude ore averages approximately 24.4% MagFe. The final East 1 Pit is approximately 0.9 mi along strike, 0.5 mi wide, and up to 310 ft deep. Crude ore within the East 1 Pit averages approximately 22.5% MagFe. The final East 2 Pit is approximately 0.7 mi along strike, 0.4 mi wide, and up to 350 ft deep. The East 2 Pit crude ore contains an average grade of 23.7% MagFe.

Primary production for all mine pits includes drilling a combination of 12.25 in. and 16.00-in.-diameter rotary blast holes. Production blast hole depth varies as the pit benches transition from



the footwall contact to a full 35 ft bench height. Burden and spacing varies depending on the material being drilled. The holes are filled with explosive and blasted. A combination of front-end loaders and hydraulic shovels load the broken material into a mixed fleet of 200 ton- and 240 ton-payload mining trucks for transport from the pit.

The Mine follows strict crude ore blending requirements to ensure that the Plant receives a uniform head grade. The two most important characteristics of the crude ore are magnetic iron content and predicted concentrate silica. Generally, two ore horizons are mined at one time to obtain a satisfactory crude ore blend for the plant. Crude ore is hauled to the crushing facility and either direct tipped to the primary crusher or stockpiled in an area adjacent to the primary crusher. The crude ore stockpiles are used as an additional source for blending and production efficiency.

The major pieces of pit equipment include diesel hydraulic shovels, front-end loaders, haul trucks, drills, bulldozers, and graders. Extensive maintenance facilities are available at the mine site to service the mine equipment.

Mining manpower is at 178 persons, which includes personnel in mine operations, mine maintenance, and mine supervisions and technical services. Mine manpower will increase proportionately with the future forecast increase in haul trucks to meet the LOM production schedule.

1.3.9 Processing and Recovery Methods

Minorca's product is wholly consumed by IH7 and has been in production since 1977. In 1987, Minorca began producing flux pellets instead of standard pellets. In 1992, Minorca constructed a flotation plant to recover silica from the Laurentian Pit ores. No recent metallurgical testing has taken place at Minorca.

Minorca performs diamond drilling to obtain drill core samples to characterize the Mineral Resource associated with the mine plan. Blast hole samples are analyzed in the same manner to validate projected ore grades and develop blending plans. Minorca also conducts plant sampling for process control and product quality reporting for compliance with Standard Product Parameters (SPPs) established by IH7.

Mined ore is directly dumped into a primary gyratory crusher, which crushes the ROM material to P_{80} 6 in. The crushed material is conveyed to a coarse ore stockpile. The coarse ore is reclaimed and conveyed to the secondary crushing plant, where it is crushed by open-circuit, secondary cone crushers and tertiary cone crushers operating in closed circuit with screens to produce a final product with a P_{100} 5/8 in. The crushed product is conveyed and stacked on the fine ore stockpile. The material is reclaimed from the fine ore stockpile and conveyed to the rod mill feed bin.

The concentrator comprises three lines. Ore is drawn from the feed bin into one rod mill per line for coarse grinding. The rod mill discharge flows through wet cobber magnetic separators. The cobber non-magnetic tailings flow to the tailings spiral classifier and then to the tailings thickener. The cobber magnetic concentrate is pumped to three parallel ball mills, followed by eight rougher magnetic separators, and the circuit is closed by hydrocyclones. Cyclone underflow slurry returns to the ball-mill feed, and cyclone overflow slurry is pumped to the hydroseparators. Hydroseparator underflow slurry is pumped to eight fine screens per line and then to final-stage (finisher) magnetic separation. The screen oversize material is conveyed to the ball-mill feed. The product from finisher magnetic separators is thickened in the acid concentrate thickener and pumped to the acid concentrate storage tank. The acid concentrate is then pumped to the fluxed concentrate storage tank, where bentonite and dolomite (flux) are



added to create flux concentrate. A flotation plant was added to the process to treat ore from the Laurentian Pit, which contains silica that is more difficult to liberate using standard grinding and magnetic separation. Silica particles are floated from the concentrate, and the magnetic iron concentrate reports to the cell underflow, which is directed to the concentrate thickener.

The concentrate is pumped from the concentrate thickener underflow to the acid concentrate storage tank and then transferred to the fluxed concentrate storage tank, where it is mixed with flux slurry. The fluxed concentrate is pumped to the concentrate filters in the pelletizing plant. The concentrate is filtered and agglomerated into green balls (balled) using balling discs. The green balls are sized using roller screens and then conveyed through a straight-grate pelletizing furnace to produce the final hardened flux pellet.

1.3.10 Infrastructure

The Property is located in a historically important, iron-producing region of Northeastern Minnesota. All the infrastructure necessary to mine and process significant commercial quantities of iron ore is in place.

Infrastructure items includes:

- Minorca Mine and concentrator facilities near Virginia, Minnesota.
- Power supplied by Minnesota Power.
- Natural gas supplied by Northern Natural Gas from pipelines that connect into the North American distribution system.
- The Plant uses several water sources for the concentrator, including the clear water pools of the Upland and Minorca In-Pit Tailings Basins (see description below), the Missabe Mountain Pit, the Sauntry/Enterprise Pit, and the Plant Site settling basin. Water can be pumped from the Missabe Mountain Pit into the Sauntry/Enterprise Pit at a rate of 2,000 gpm. Water can be pumped directly to the Plant from the Sauntry/Enterprise (4,000 gpm), Upland Basin (3,800 gpm), the Minorca Basin (5,400 gpm), and the Plant Site Settling Basin (2,800 gpm).
- Paved roads and highways.
- Finished taconite pellets are transported by Canadian National (CN) Railway to the CN port in Two Harbors, Minnesota, approximately 75 mi from the Plant.
- The port is controlled and operated by CN Railway and includes pellet screening, 1.3 MLT of pellet storage and ship loading either directly from rail cars to ship, or from stockpiles to ship. The vessels are 20,000 LT- to 65,000 LT-capacity lakers that transport pellets to steel mills on the Great Lakes.
- Rail yards and workshops are operated by CN Railway.
- Two TSF basins: the Upland Tailings Basin and the Minorca In-pit Tailings Basin. The Upland Tailings Basin is located approximately three miles northeast of the Plant, and the In-pit Tailings Basin is located approximately one mile south-southwest of the Plant. Minorca began using the Upland Tailings Basin as a disposal site for fine tailings in the mid-1970s, and continued to do so until December 2001, at which time Minorca switched to disposing of fine tailings in the Minorca In-pit Tailings Basin. Minorca switched back to the Upland Tailings Basin near the end of 2011, with intermittent disposal into the Minorca In-pit Tailings Basin.



- Accommodations for employees.
- Local and State infrastructure also includes hospitals, schools, airports, equipment suppliers, fuel suppliers, commercial laboratories, and communication systems.

1.3.11 Market Studies

Cliffs is the largest producer of iron ore pellets in North America. It is also the largest flat-rolled steel producer in North America. In 2020, Cliffs acquired two major steelmakers, ArcelorMittal USA (AMUSA), and AK Steel (AK), vertically integrating its legacy iron ore business with steel production and emphasis on the automotive end market.

Cliffs owns or co-owns five active iron ore mines in Minnesota and Michigan. Through the two acquisitions and transformation into a vertically integrated business, the iron ore mines are primarily now a critical source of feedstock for Cliffs' downstream primary steelmaking operations. Based on its ownership in these mines, Cliffs' share of annual rated iron ore production capacity is approximately 28.0 million tons, enough to supply its steelmaking operations and not have to rely on outside supply.

The importance of the steel industry in North America and specifically the USA is apparent by the actions of the US federal government in implementing and keeping import restrictions in place. It is important for middle-class job generation and the efficiency of the national supply chain. It is also an industry that supports the nation's national security by providing products used for US military forces and national infrastructure. Cliffs expects the US government to continue recognizing the importance of this industry and does not see major declines in the production of steel in North America.

Minorca flux pellets are shipped to Cliffs' steelmaking facilities in the Midwestern USA.

For cash flow projections, Cliffs uses a blended pellet revenue rate of \$98/WLT Free on Board (FOB) Mine based on a three-year trailing average for 2017 to 2019. Based on macroeconomic trends, the QP is of the opinion that Cliffs' pellet prices will remain at least at the current three-year trailing average of \$98/WLT or above for the next five years.

1.3.12 Environmental Studies, Permitting and Plans, Negotiations, or Agreements with Local Individuals or Groups

CCMMI indicated that it presently has the requisite operating permits for the operation of the Mine and Plant and estimates the mine life to be 14 years. These permits include county, state, and federal permits related to air quality, surface water quality, water appropriation, hazardous waste generation, and wetlands. Minorca does not anticipate any future permitting to realize the mine life; however, multiple permits require renewal. Environmental monitoring and reporting during operations primarily include water and air quality monitoring.

Closure plans and other post-mining plans are required to be prepared at least two years prior to the anticipated closure; however, Cliffs conducts an in-depth review every three years to ensure that the ARO legal liabilities are accurately estimated based on current laws, regulations, facility conditions, and cost to perform services. These cost estimates are conducted in accordance with the Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) 410.

With respect to community agreements, Minorca's mine progression necessitates the drawdown of water levels in the Canton Pit, which is utilized for source water by the city of Biwabik. Minorca entered into a Source Water Change Action Plan with the city of Biwabik (with approval by Minnesota Department of Natural Resources) to transition the city's water source to the



Embarrass Pit in 2021/2022. Through this agreement, Minorca has invested in new infrastructure to be owned and operated by the city of Biwabik, so the municipality will experience a seamless transition to its new water source (which is of similar quality to the Canton Pit).

1.3.13 Capital and Operating Cost Estimates

Productive and sustaining capital expenditure estimates for the remaining LOM are presented in Table 1-7. Starting in 2027, a sustaining capital cost of \$4/WLT pellet, or \$11.2 million annually, is used in the technical-economic model for an additional \$78.4 million for the remaining mine life.

Table 1-7: LOM Capital Costs

Type	Units	Total	2022	2023	2024	2025	2026	2027	2028-2035
Capital Costs									
Total Sustaining	\$ millions	210.2	28.2	25.5	27.8	27.1	23.2	11.2	67.2
Pellet Sales									
Pellet Sales	MWLT	37.4	2.8	2.8	2.8	2.8	2.8	2.8	20.6
Unit Rates									
Total	\$/WLT	5.62	10.00	9.11	9.93	9.69	8.28	4.00	3.26

Operating costs are based on a full run rate of flux pellet production consistent with what is expected for the LOM. A LOM average operating cost of \$85.47/WLT pellet is estimated over the remaining 14 years of the LOM and is shown in Table 1-8.

Table 1-8: LOM Operating Costs

Description	LOM (\$/WLT Pellet)
Mining	16.84
Processing	45.56
Site Administration	2.20
Logistics / Dock	10.78
General / Other	10.10
Operating Cash Cost	85.47

Cliffs' forecasted capital and operating costs estimates are derived from annual budgets and historical actuals over the long life of the current operation. According to the American Association of Cost Engineers (AACE) International, these estimates would be classified as Class 1 with an accuracy range of -3% to -10% to +3% to +15%.



2.0 Introduction

SLR International Corporation (SLR) was retained by Cleveland-Cliffs Inc. (Cliffs) to prepare an independent Technical Report on the Minorca Property (Minorca or the Property), located in St. Louis County, Northeastern Minnesota, USA. The operator of the Property, Cleveland-Cliffs Minorca Mine Inc. (CCMMI), is a wholly owned subsidiary of Cliffs.

Cliffs is listed on the New York Stock Exchange (NYSE) and currently reports Mineral Reserves of pelletized ore in the United States Securities and Exchange Commission's (SEC) filings.

On July 14, 2024, Stelco Holdings Inc. (Stelco), 13421422 Canada Inc. (Purchaser), a wholly owned subsidiary of Cliffs, and Cliffs entered into an Arrangement Agreement, providing for, among other things, the acquisition by Purchaser of all of the outstanding common shares of Stelco. In connection with a special meeting of Stelco shareholders to consider and approve the transactions contemplated by the Arrangement Agreement, Stelco is providing its shareholder with a management information circular (the Stelco Circular) that, given the consideration to be paid to Stelco shareholders pursuant to the terms of the Arrangement Agreement includes Cliffs' common stock, must include disclosure regarding Cliffs in the form of prospectus that Cliffs would be eligible to use immediately prior to the sending and filing of the Stelco Circular. The provision of disclosure related to Cliffs' mineral projects in the Stelco Circular requires Stelco to file this Technical Report.

This Technical Report conforms to National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101). SLR Qualified Persons (QPs) visited the property on April 29, 2021 and prepared an S-K 1300 Technical Report Summary (TRS) dated February 7, 2022. Cliffs has since been updating the Mineral Reserve estimate for the Property based on depletion due to mining, with the latest update at YE 2023. There has been no material change to the information contained in the 2022 TRS and Cliffs considers the TRS to be current.

This Technical Report presents information from the 2022 TRS in compliance with NI 43-101.

The Property includes the Laurentian and East Pit mines (collectively the Minorca Mine), between Gilbert and Biwabik, Minnesota and a processing facility (the Plant) in Virginia, Minnesota. The Minorca Mine is a complex of large, operating open-pit iron mines that produces pellets from a magnetite iron ore regionally known as taconite.

The Property commenced operations in 1976 as an asset of Inland Steel Company (Inland Steel). In 1998, ISPAT International (ISPAT) purchased Inland Steel and in 2004 merged with LNM Holdings N.V. (LNM) and International Steel Group to form Mittal Steel, which in 2007 merged with Arcelor to form ArcelorMittal. The Property has been a wholly owned subsidiary of Cliffs since 2020, when Cliffs purchased the US assets of ArcelorMittal, ArcelorMittal USA (AMUSA).

The open-pit operation at Minorca has a mining rate of approximately 8.6 million long tons (MLT) of ore per year and produces 2.8 MLT of wet flux iron ore pellets, which are shipped by freighter via the Great Lakes to Cliffs' steel mill facilities in the Midwestern USA.

2.1 Site Visits

SLR Qualified Persons (QPs), Mark B. Mathisen, C.P.G., Principal Geologist, Andrew P. Hampton, M.Sc., P.Eng., Principal Metallurgist, and Grant A. Malensek, M.Eng., P.Eng., Senior Principal Mining Engineer, visited the Property on April 29, 2021.

During the site visit, the SLR team toured the tailings basin, plant laboratory, concentrator, and pelletizing facilities, including rail pellet load-out site, and the mine offices and operational areas.



Mark B. Mathisen held discussions on drilling and sampling procedures, as well as reviewed Mineral Resource modeling procedures and parameters with the Cliffs mine geologist staff.

Andrew P. Hampton met with the metallurgical staff for general discussions and performed detailed tours of the concentrator, including crushing, grinding magnetic separation and flotation sections, plant laboratories, flux plant, pellet plant, pellet storage and rail loading facility and tailings facilities. Discussions with operations on plant sampling for process control and quality control, metallurgical testing and quality control procedures.

Grant A. Malensek visited mine production, development, and infrastructure areas in the operating areas. Discussions were carried out on the mining cycle, productivities, dilution, and recovery and fleet maintenance procedures.

Dean K. Korri, P.E., MASCE, Director – Civil Engineering/Tailings Basin Engineering with Cliffs, visits the Property on a regular basis. During the site visits, the tailings storage facilities are viewed.

Brooke A. Lund, CPG, Project Manager of Environmental Permitting & Regulatory with Cliffs, visits the Property on a monthly basis. During the site visits, all environmental aspects on the Property are discussed and reviewed with the site team.

2.2 Sources of Information

This Technical Report was prepared by Mark B. Mathisen, C.P.G., Balaji Subrahmanyam, SME(RM), Principal Mining Engineer, Andrew P. Hampton, M.Sc., P.Eng., Grant A. Malensek, M.Eng., P.Eng., Dean K. Korri, P.E., MASCE, and Brooke A. Lund, C.P.G. The QP responsibilities are indicated in Table 2-1.

Table 2-1: Qualified Persons and Responsibilities

QP, Designation	Company	Responsible for
Mark B. Mathisen, C.P.G.	SLR	Sections 4 to 12, 14, and 23
Andrew P. Hampton, M.Sc., P.Eng.	SLR	Sections 13, 17, and 18 (except 18.4)
Balaji Subrahmanyam, SME(RM)	SLR	Sections 15 and 16
Dean K. Korri, P.E., MASCE	Cliffs	Section 18.4
Brooke A. Lund, C.P.G.	Cliffs	Section 20
Grant A. Malensek, M.Eng., P.Eng.	SLR	Sections 2, 3, 19 to 22, and 24
ALL QPs		Sections 1, 25, 26, and 27

Technical documents and reports on the Property were obtained from Cliffs' personnel. During the preparation of this Technical Report, discussions were held with personnel from Cliffs:

- Kurt Gitzlaff, Director - Mine Engineering, Cliffs Technical Group (CTG)
- Michael Orobona, Principal Geologist, CTG
- Michael Koop, Lead Mine Engineer, CTG
- Garret Eliason, Senior Geologist, CTG
- Scott Gischia, Director - Environmental Compliance
- Dean Korri, Director - Basin and Civil Engineering



- Tushar Mondhe, Senior Manager - Operations and Capital Finance
- Eric Krause, Manager – Mine/Crushing
- Bill Ellingson, Senior Engineer – Mine/Crushing
- Adam Sersha, Manager – Concentrator/Pellet Plant
- Jaime Johnson, Manager – Environmental

The documentation reviewed, and other sources of information, are listed at the end of this Technical Report in Section 27 References.



2.3 List of Abbreviations

The U.S. System for weights and units has been used throughout this report. Tons are reported in long tons (LT) of 2,240 lb unless otherwise noted. All currency in this report is US dollars (US\$ or \$) unless otherwise noted.

Abbreviations and acronyms used in this Technical Report are listed below.

Unit Abbreviation	Definition	Unit Abbreviation	Definition
a	annum	LT/d	long tons per day
A	ampere	LT/h	long tons per hour
acfm	actual cubic feet per minute	M	mega (million); molar
bbl	barrels	Ma	one million years
Btu	British thermal units	MBtu	thousand British thermal units
d	day	MCF	million cubic feet
°F	degree Fahrenheit	MCF/h	million cubic feet per hour
fasl	feet above sea level	mi	mile
ft	foot	min	minute
ft ²	square foot	MLT/y	million long tons per year
ft ³	cubic foot	MPa	megapascal
ft/s	foot per second	mph	miles per hour
g	gram	MVA	megavolt-amperes
G	giga (billion)	MW	megawatt
Ga	one billion years	MWh	megawatt-hour
gal	gallon	MWLT	million wet long tons
gal/d	gallon per day	oz	Troy ounce (31.1035g)
g/cm ³	grams per cubic centimeter	oz/ton	ounce per short ton
g/L	gram per liter	ppb	part per billion
g/y	gallon per year	ppm	part per million
gpm	gallons per minute	psia	pound per square inch absolute
hp	horsepower	psig	pound per square inch gauge
h	hour	rpm	revolutions per minute
Hz	hertz	RL	relative elevation
in.	inch	s	second
in ²	square inch	ton	short ton
J	joule	stpa	short ton per year
k	kilo (thousand)	stpd	short ton per day
kg/m ³	kilogram per cubic meter	t	metric tonne



kVA	kilovolt-amperes	US\$	United States dollar
kW	kilowatt	V	volt
kWh	kilowatt-hour	W	watt
kWLT	thousand wet long tons	wt%	weight percent
L	liter	WLT	Wet long ton
lb	pound	y	year
LT	long or gross ton equivalent to 2,240 pounds	yd ³	cubic yard

Acronym	Definition
AACE	American Association of Cost Engineers
AK	AK Steel
AMUSA	ArcelorMittal USA
ANSI	American National Standards Institute
ARO	asset retirement obligation
ASC	Accounting Standards Codification
ASQ	American Society for Quality
ASTM	American Society for Testing and Materials
BF	blast furnace
BFA	bench face angle
BH	bench height
BIF	banded iron formation
BLS	United States Bureau of Labor Statistics
CBOD5	carbonaceous biochemical oxygen demand, 5 day test
CCD	counter-current decantation
CCP	Conceptual Closure Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Cost and Freight
CN	Canadian National Railway
COA	certificates of analysis
CRIRSCO	Committee for Mineral Reserves International Reporting Standards
D&A	depreciation and amortization
DCF	discounted cash flow
DD	diamond core drilling
DMTT	Davis Magnetic Tube Test



DRI	direct reduced iron
DSO	direct-shipping iron ore
DT	Davis Tube
EAF	electric arc furnace
EAP	Emergency Action Plan
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	environmental management system
EPA	United States Environmental Protection Agency
EPRT	External Peer Review Team
ESOP	Environmental Standard Operating Procedures
EOR	Engineer of Record
FASB	Financial Accounting Standards Board
FEL	front-end loader
FOB	Free on Board
GHG	greenhouse gas
GIM	Geoscientific Information Management
GPS	global positioning system
GSI	Geological Strength Index
GSSI	General Security Services Corporation
HBI	hot-briquetted iron
HRC	hot-rolled coil
ICP	induced couple plasma
ID ²	Inverse distance squared
ID ³	Inverse distance cubed
IF	iron formation
ICFM	inlet air capacity
IIMA	International Iron Metallics Association
IRA	inter-ramp angle
IRR	Internal Rate of Return
ISO	International Standards Organization
KEV	key economic variables
LG	Lerchs-Grossmann
LiDAR	light imaging, detection, and ranging
LMF	Laurentian Mixed Forest



LOM	life of mine
MAC	Mining Association of Canada
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
MLT	million long tons
MPCA	Minnesota Pollution Control Agency
MPUC	Minnesota Public Utilities Commission
MR	moving range
MRCC	Midwestern Regional Climate Center
MSHA	Mine Safety and Health Administration
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGO	non-governmental organization
NGVD	National Geodetic Vertical Datum
NNG	Northern Natural Gas
NOAA	National Oceanic and Atmospheric Administration
NOLA	Nuclear On-Line Analyzer
NPDES	National Pollution Discharge Elimination System
NPV	Net Present Value
NRRI	Natural Resources Research Institute
OMS	Operations, Maintenance and Surveillance
PLC	Programmable Logic Controller
PMF	probable maximum flood
QA/QC	quality assurance and quality control
QP	Qualified Person
RC	rotary circulation drilling
RCRA	Resource Conservation and Recovery Act
ROM	run of mine
RQD	Rock Quality Designation
RTR	risk and technology review
SDS	State Disposal System
SEC	United States Securities and Exchange Commission
SG	specific gravity
SMU	selective mining unit
SQL	Structured Query Language
SPC	statistical process control



TMDL	Total Maximum Daily Load
TRS	Technical Report Summary
TSF	tailings storage facility
TSP	total suspended particulates
UCS	uniaxial compressive strength
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
VIMS	vehicle information management system
XRF	x-ray fluorescence



3.0 Reliance on Other Experts

This Technical Report has been prepared by SLR for Cliffs. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to SLR at the time of preparation of this Technical Report.
- Assumptions, conditions, and qualifications as set forth in this Technical Report.

For the purpose of this Technical Report, SLR has relied on ownership information provided by Cliffs and verified in an email from Gabriel D. Johnson, Cliffs' Senior Manager – Land Administration, dated January 20, 2022 in the Executive Summary and Section 4.0. SLR has not researched property title or mineral rights for Minorca as we consider it reasonable to rely on Cliffs' Land Administration personnel who are responsible for maintaining this information.

SLR has relied on Cliffs for guidance on applicable taxes, royalties, and other government levies or interests, applicable to revenue or income from Minorca in the Executive Summary and Section 22.0. As Minorca has been in operation for almost 50 years, Cliffs has considerable experience in this area.

SLR has relied on information provided by Cliffs pertaining to environmental studies, management plans, permits, compliance documentation, and monitoring reports that were verified in an email from Scott A. Gischia, Cliffs' Director – Environmental Compliance, Mining and Pelletizing, dated January 21, 2022 in the Executive Summary and Section 20.0.

The Qualified Persons have taken all appropriate steps, in their professional opinion, to ensure that the above information from Cliffs is sound.

Except for the purposes legislated under provincial securities laws, any use of this Technical Report by any third party is at that party's sole risk.



4.0 Property Description and Location

4.1 Location

The Property is located in St. Louis County, Northeastern Minnesota, USA, on the Mesabi Iron Range, between the towns of Virginia, Gilbert, and Biwabik, Minnesota. The Laurentian Pit is located near the city of Gilbert, Minnesota at latitude 47°30'0"N and longitude 92°26'30"W, East 1 (also termed Lynx) Pit is located at latitude 47°31'30"N and longitude 92°23'30"W, and East 2 (also termed Whiskey) Pit is located just west of the city of Biwabik at latitude 47°32'0"N and longitude 92°22'30"W. The Minorca Plant is located approximately seven miles to the northeast near the town of Virginia, Minnesota at latitude 47°33'30"N and longitude 92°31.5'30"W. Figure 4-1 presents the locations of the Minorca Mine and Plant.

4.2 Land Tenure

The Minorca Property Boundary comprises approximately 16,825 acres in a combination of mineral leases, surface leases, and owned property.

4.2.1 Mineral Rights

The Property consists of approximately 3,135 acres of mineral leases granted by private landowners and the State of Minnesota as summarized in Table 4-1 and illustrated in Figure 4-2. Mineral leases generally include surface mining rights. Where the mineral leases do not include surface mining rights, Minorca controls the surface through ownership or surface leases with the owner of the surface. Approximately 282 acres of owned property is associated with the mineral lease acreage.

Minorca mineral leases expire between 2035 and 2056, with the State of Minnesota mineral leases expiring in 2035. In order to maintain the mineral leases until expiration, Minorca must continue to make minimum prepaid royalty payments each quarter and pay property taxes. When mining occurs, a royalty is due per long ton of crude ore mined, or long ton of pellets produced from the crude ore mined, and is payable to the respective lessors quarterly. Royalty rates per long ton fluctuate based on industry and economic indexes. Minimum prepaid royalty payments may be credited against royalties due when mining occurs. Specific terms and provisions of the mineral leases are confidential.

There are quarterly royalty payments made on the Minorca mine mineral leases to multiple third parties. The details of the royalties are confidential between Minorca and the lessors.

Table 4-1: Mineral Tenures and Rights

Lease Name	Owners' Name	Start Date	Expiration Date	Compliance Status
Allen-Ulland Lease	Multiple parties	1/1/1981	1/1/2056	YES
Beckman Lease	Susan Beckman	4/24/2012	12/31/2040	YES
Laurentian - Red Cross	Laurentian LLC and American Red Cross	1/1/1997	12/31/2040	YES
Manthey et al.			12/31/2040	
McClintock-Kirby			5/28/2056	
Ordean et al.	Cowen et al.	6/1/1968	6/1/2043	YES



Lease Name	Owners' Name	Start Date	Expiration Date	Compliance Status
Penobscot et al. Lease	Multiple Owners	1/1/1989	12/31/2041	YES
Rendrag	Rendrag, Inc.; DRM Minerals Corp.; KMK Dunka, Inc.; Optimal Mining, Inc.; Taconite Lessors	7/1/2010	12/31/2040	YES
RGGS 1966			12/19/2041	
RGGS 1994	USX Corporation (now U.S. Steel)	7/1/1994	12/31/2043	YES
RGGS 2005	RGGS Land & Materials Ltd.	10/1/2005	10/1/2035	YES
Sidney Mine Lease	Wilber et al.	10/1/1967	10/1/2042	YES
State T-5090-N	State of Minnesota	11/9/2008	12/31/2035	YES
State T-5104-N	State of Minnesota	1/1/2013	12/31/2035	YES
Wayland Lease	Wayland Land LLC	1/1/2007	12/31/2036	YES
Wiese Lease	Ferdinand J. Wiese Trust	11/7/2011	12/31/2040	YES

4.2.2 Surface Rights

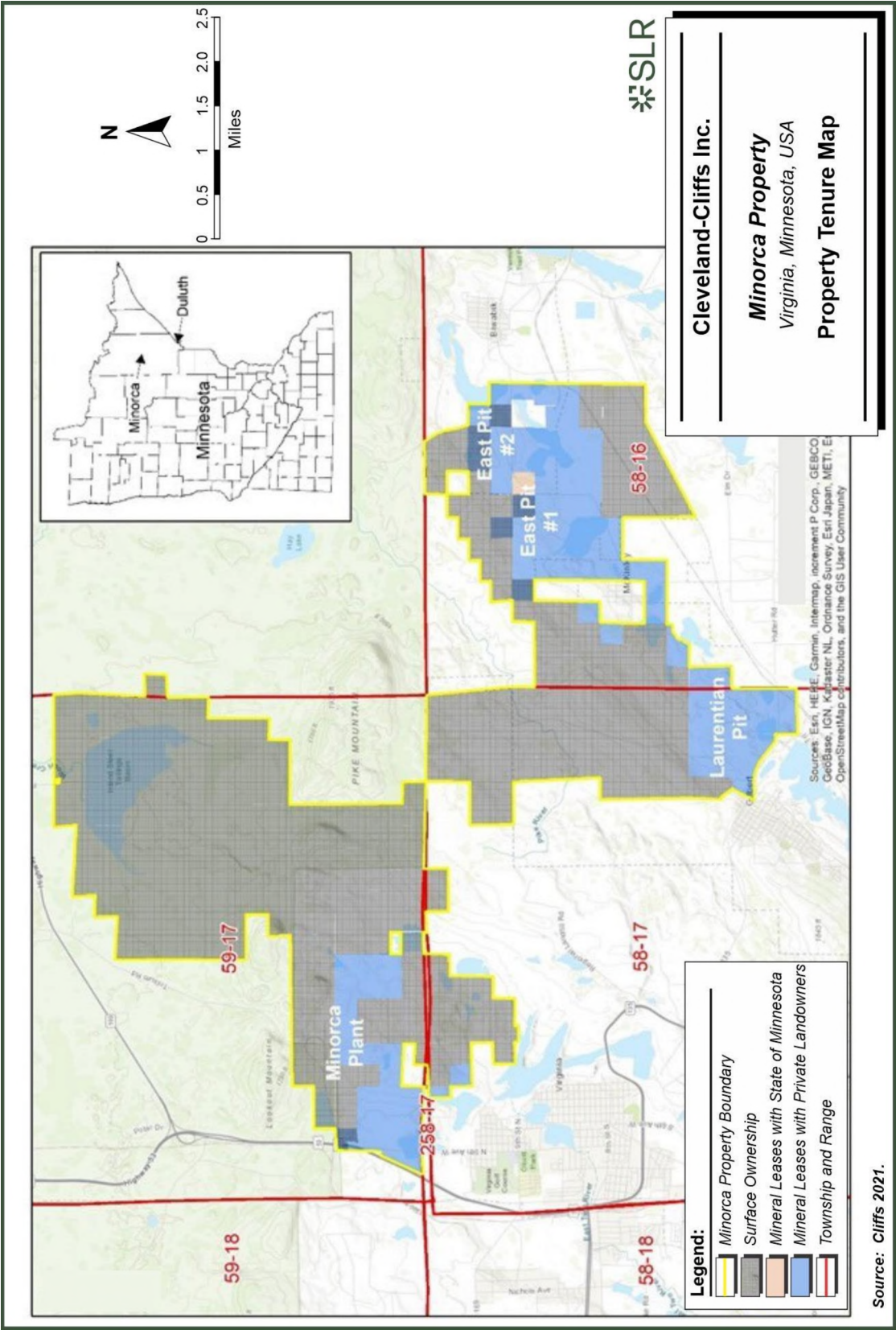
The Property consists of approximately 13,690 acres of owned property (282 acres associated with mineral leases) in and around the Property as illustrated in Figure 4-2. To maintain ownership, the property taxes must be paid to St. Louis County, Minnesota.



Figure 4-1: Property Location Map



Figure 4-2: Property Tenure Map



4.3 Encumbrances

CCMMI grants leases, licenses, and easements for various purposes, including miscellaneous community land uses, utility infrastructure, and other third-party uses that encumber the Property but do not inhibit operations. Certain assets of CCMMI serve as collateral as part of Cliffs' asset-based lending (ABL) facility. Cliffs has outstanding standby letters of credit, which were issued to back certain obligations of CCMMI, including certain permits and certain tailings basin projects. Additionally, CCMMI has and may continue to enter into lease agreements for necessary equipment used in the operations of the mine.

4.4 Royalties

Reference section 4.2 for royalty information. No overriding royalty agreements are in place.

4.5 Environmental Liabilities and Permitting

The QP is not aware of any environmental liabilities on the Property. Cliffs. has all required permits to conduct the proposed work on the Property (see Table 20-1 in Section 20 of this Technical Report).

4.6 Other Significant Factors and Risks

The QP is not aware of any other significant factors and risks that may affect access, title, or the right or ability to perform the proposed work program on the Property.



5.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Accessibility

The Property is easily accessed via paved roads from Virginia, Minnesota, approximately one mile to the west, or the towns of Gilbert and Biwabik, Minnesota, approximately one mile to the west and east, respectively. A rail line operated by Canadian National Railway (CN) extends from the Minorca processing facility to the port of Two Harbors, Minnesota, a major port city on Lake Superior, which is 75 mi southeast of the Property. Duluth, Minnesota is also 69 mi southeast of Virginia via US Highway 53 and 27 mi southwest of Two Harbors via MN Highway 61. Duluth also has a regional airport with several flights daily to major hubs in Minneapolis, Minnesota and Chicago, Illinois. Refer to Section 4.0 of this Technical Report and Figure 4-2 for the location of roads providing access to the Property.

5.2 Climate

The climate in Northern Minnesota ranges from mild in the summer to winter extremes. The annual average temperature is 36.9°F. The annual average high temperature is 48.6°F, whereas the annual average low temperature is 25.1°F. By month, July is on average the hottest month (77°F), with January being the coldest (-4°F) (National Oceanic and Atmospheric Administration [NOAA], 1991-2020). Table 5-1 lists complete climate data for the area for 1991 to 2020.

Table 5-1: Northern Minnesota Climate Data (1991-2020)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high (°F)	16.9	22.5	35.4	49.5	63.4	72.2	76.7	74.9	65.7	50.8	34.3	21.4	48.6
Daily mean (°F)	6.2	10.5	23.8	37.1	49.5	58.9	63.5	61.6	53	40.2	25.6	12.3	36.9
Average low (°F)	-4.4	-1.4	12.2	24.8	35.7	45.7	50.3	48.3	40.3	29.7	16.9	3.1	25.1
Precipitation (inches)	0.51	0.53	0.91	1.61	2.76	4.36	3.85	3.09	3.06	2.35	1.09	0.64	24.76
Snowfall (inches)	15	7.1	7.8	3.7	0	0	0	0	0	1.2	13.2	12.3	60.3

Source: NOAA 2021.

Precipitation as rain in the Northern Minnesota area ranges from less than one inch in December, January, and February, to approximately three to four inches per month during the summer, averaging approximately 25 in. annually. Annual snowfalls average 60 in. during November through March. Approximately half of the precipitation occurs during the summer months.

The Property is in production year-round.

5.3 Local Resources

Labor is readily available in the Property area. Medical facilities with trauma centers are located in the cities of Virginia, Hibbing, and Duluth, Minnesota. Table 5-2 presents a list of the major population centers and their distance by road to the Property entrance near Virginia.



Table 5-2: Near-by Population Centers

City/Town	Medical Center	Population 2010 Census	Mileage to Property
Gilbert, MN	n/a	1,799	10
Eveleth, MN	n/a	3,718	11
Virginia, MN	Level IV	8,712	4
Duluth, MN	Level I and II	85,884	69
Hibbing, MN	Level III	16,361	27
Source: US Census Bureau, Google Maps			

The Minorca operation employs 362 personnel as of Q4 2021 who live in the surrounding cities of Virginia, Eveleth, Gilbert, and Hibbing. Personnel also commute from Duluth and the Iron Range. St. Louis County has an estimated population of 200,000 people.

5.4 Infrastructure

The Property is located in a historically important, iron-producing region of Northeastern Minnesota. All infrastructure necessary to mine and process significant commercial quantities of iron ore is currently in place. Infrastructure items include high-voltage electrical supplies, natural gas pipelines that connect to the North American distribution system, water sources, paved roads and highways, railroads for transporting run of mine (ROM) crude ore and finished products, port facilities that connect to the Great Lakes, and accommodations for employees. Local and State infrastructure also includes hospitals, schools, airports, equipment suppliers, fuel suppliers, commercial laboratories, and communication systems. Additional information regarding Minorca supporting infrastructure can be found in Section 18.0 of this Technical Report.

5.5 Physiography

The Property is located in St. Louis County, Northeastern Minnesota at an elevation of approximately 1,700 feet. The generally gentle topography in the area is characterized by hummocky hills and long, gentle moraines, remnants of glacial ingress and egress. The landscape ranges from semi-rugged, lake-dotted terrain with thin glacial deposits over bedrock, to hummocky or undulating plains with deep glacial drift, to large, flat, poorly drained peat lands. Topography includes rolling till plains, moraines, and flat outwash plains formed by the Rainy Lobe glacier. The Giants Range, a narrow bedrock ridge rising 200 ft to 400 ft above the surrounding area, is the most striking feature on the Property. Bedrock is locally exposed near terminal moraines, but is generally rare.

The Minnesota Department of Natural Resources (MDNR) characterizes the area as being within the Laurentian Mixed Forest (LMF) Province, which covers over 23 million acres of Northeastern Minnesota. In Minnesota, the LMF is characterized by broad areas of conifer forest, mixed hardwood and conifer forests, and conifer bogs and swamps. Vegetation is a mixture of deciduous and coniferous trees. White pine-red pine forest and jack pine barrens are common on outwash plains. Aspen-birch forest and mixed hardwood-pine forest are present on moraines and till plains. Wetland vegetation includes conifer bogs, lowland grasses, and swamps. Prior to settlement, the area consisted of forest communities dominated by white pine, red pine, balsam fir, white spruce, and aspen-birch.



Brown glacial sediments form the parent material for much of the soils in the area. Soils are varied and range from medium to coarse textures. Soils are formed in sandy to fine-loamy glacial till and outwash sand. Soils on the Nashwauk Moraine have a loamy cap with dense basal till below at depths of 20 in. to 40 in. These soils are classified as boralfs (cold, well-drained soils developed under forest vegetation) (MDNR, 2011).



6.0 History

6.1 Prior Ownership

The Property has been owned by several companies since it started operation in 1977. The ownership changes and milestones in the development of the Property are as follows:

- 1974 Construction began on the Minorca taconite plant by Inland Steel.
- 1977 Mining began in the Minorca Pit.
- 1987 Commenced production of flux pellets.
- 1992 Construction of float plant for silica reduction of the new Jones and Laughlin Steel Company (J&L) Reserve (the Laurentian, East, and Central deposits).
- 1992 Mining began in the Laurentian Pit.
- 1998 Minorca was purchased by ISPAT.
- 2005 ISPAT International merged with LNM to form Mittal Steel.
- 2007 Mittal Steel merged with Arcelor to form ArcelorMittal.
- 2008 Mining began in the East Pit.
- 2017 Minorca total production of iron ore pellets reaches 100,000,000 tons.
- 2019 Mining began in the Laurentian Western Pushback.
- 2020 Cliffs purchased the US assets of ArcelorMittal, AMUSA, and now owns Minorca.

6.2 Exploration and Development History

Initial observations of iron-bearing rocks in the Mesabi Iron Range are attributed to Henry H. Eames, the first state geologist of Minnesota, in 1866. Mr. Eames mentioned that “enormous bodies of iron ore occurred” in the northern part of the state (Eames, 1866).

Exploration for high-grade, direct-shipping iron ore (DSO) deposits in the Virginia area began in the 1890s. Test pitting, later diamond core and churn drilling, and dip-needle surveys were used to delineate DSO deposits. The understanding of this work in the immediate Property area is limited, with poor documentation of activities maintained on site. Coincident with early exploration activity, the aerial extent of the unenriched Biwabik Iron Formation (Biwabik IF) sub-crop was delineated, and the magnetite-bearing iron formation was documented. Focused exploration for beneficiation-grade magnetite deposits, regionally known as taconite deposits, however, did not begin until the 1940s. At that time exploration activity consisted largely of diamond core drilling on regular-spaced grids designed to delineate taconite and characterize its weight recovery and metallurgical properties. A brief history of the initial regional exploration can be found in the Field Trip 2 Guidebook (Severson et al., 2016) and references therein.

Exploration activity at the Minorca deposits consisted solely of diamond core drilling campaigns commencing in the late 1950s. Drilling since the 1960s has primarily consisted of infill diamond drilling for operational purposes. Cliffs and Minorca have not evaluated detailed records or results of early, non-drilling prospecting methods used during initial exploration activities such as geophysical surveys, mapping, trenching, and test pits conducted prior to Cliffs’ ownership of Minorca.



Exploration at the Property by previous owners, consisting of primarily diamond drilling, is described in Section 9.0 of this Technical Report.

6.3 Historical Reserve Estimates

Cliffs acquired the Property during the 2020 purchase of AMUSA. Mineral Reserves reported to the SEC for the past ten years are summarized in Table 6-1. These Mineral Reserves are relevant and reliable as they indicate the grade and size of these large deposits which is being confirmed during production. These estimates were not prepared under the recently adopted SEC guidelines; however, they followed SEC Guide 7 requirements for public reporting of Mineral Reserves in the US and conform to the CIM (2014) definition standards. These historical estimates have been superseded by the Mineral Reserve estimates in Section 15.0 of this Technical Report.

In 2019, the Laurentian Pit was expanded, resulting in a significant increase from the previously reported reserves.

The change in Mineral Reserves from 2019 to current is primarily attributable to mining depletion.

Table 6-1: Historical Reserve Estimates

Year	Crude Ore		Product	
	Total Proven & Probable (MLT)	Grade (% MagFe)	Process Recovery (%)	Flux Pellets Wet (MLT)
2011 ¹	156.5	23.1	31.9	49.9
2012 ²	148.6	23.3	32.2	47.8
2013 ³	140.7	23.4	32.3	45.5
2014 ⁴	131.9	23.4	32.3	42.6
2015 ⁵	124.0	23.6	32.6	40.4
2016 ⁶	116.1	23.7	32.7	38
2017 ⁷	108.3	23.8	32.9	35.6
2018 ⁸	99.4	23.5	32.5	32.3
2019 ⁹	127.9	23.7	32.7	41.9
2020 ¹⁰	120.0	23.7	32.8	39.3

Notes:

1. As of December 31, 2011; Source: ArcelorMittal 20-F Filing
2. As of December 31, 2012; Source: ArcelorMittal 20-F Filing
3. As of December 31, 2013; Source: ArcelorMittal 20-F Filing
4. As of December 31, 2014; Source: ArcelorMittal 20-F Filing
5. As of December 31, 2015; Source: ArcelorMittal 20-F Filing
6. As of December 31, 2016; Source: ArcelorMittal 20-F Filing
7. As of December 31, 2017; Source: ArcelorMittal 20-F Filing
8. As of December 31, 2018; Source: ArcelorMittal 20-F Filing
9. As of December 31, 2019; Source: ArcelorMittal 20-F Filing
10. As of December 31, 2020; Source: Cleveland-Cliffs, Inc. 10-K Filing



6.4 Past Production

Production from the Property is presented in Table 6-2, while production by owner/operator is provided in Table 6-3.

Table 6-2: Historical Production

Year	Stripping (kLT)	ROM Ore (kLT)	Process Recovery (%)	Wet Flux Pellet (kWLT)
2000	9,760	8,771	33.3	2,918
2001	10,509	8,346	33.8	2,817
2002	9,096	8,284	34.8	2,886
2003	9,233	8,374	33.6	2,812
2004	8,638	8,653	33.6	2,907
2005	8,867	8,803	31.9	2,806
2006	8,759	8,537	33.9	2,895
2007	7,288	8,548	31.3	2,677
2008	7,879	9,519	29.0	2,765
2009	4,686	5,144	29.2	1,502
2010	7,274	8,968	30.7	2,755
2011	6,772	8,664	32.1	2,782
2012	7,490	8,900	32.2	2,870
2013	7,267	9,003	32.5	2,927
2014	6,132	8,852	31.0	2,744
2015	5,959	8,896	30.8	2,742
2016	4,570	8,844	32.1	2,836
2017	6,465	8,711	32.8	2,853
2018	7,932	8,646	33.2	2,872
2019	7,489	8,392	33.2	2,783
2020	7,293	8,518	33.2	2,824
2021	7,567	8,801	32.4	2,855
Total	166,925	188,174	32.3	60,828

Table 6-3: Historical Production by Owner

Years	Ownership	Wet Flux Pellets (kWLT)
1976-1999	Inland Steel/ISPAT	NA
2000-2021	AMUSA and Predecessors	60,828
Total through 2021		60,828



7.0 Geological Setting and Mineralization

7.1 Regional Geology

Essential aspects of the regional geology in the Lake Superior region have been understood since the early 1900s, and the geologic understanding of the area has remained relatively unchanged over the years.

Iron ores produced within the region range from high-grade, structurally controlled ore bodies amenable to direct shipping to more disseminated, stratigraphically controlled, low-grade iron ores locally termed taconite. Taconite is observed in a sequence of Paleoproterozoic metasedimentary rocks overlying Archean granitic rocks in the Lake Superior region. A fold and thrust belt attributed to the Penokean orogeny (1,880 Ma to 1,830 Ma) developed a northward migrating foreland basin known as the Animikie Basin (Ojakangas, 1994, Figure 7-1). Sedimentary rocks within this basin include the basal Pokegama Quartzite, the overlying Biwabik Iron Formation (Biwabik IF), and argillite and graywacke of the Virginia Formation (Jirsa and Morey, 2003).

The Mesabi Iron Range is a term used to designate the outcrop of the Animikie Group, defining a northeast-trending homocline dipping 5° to 15° to the southeast. The Biwabik IF is sectioned by a number of post-Penokean orogeny, high-angle normal and reverse faults associated with near-vertical reactivated faults in the Archean basement (Morey 1999). The most notable structural feature of the Biwabik IF is located east of Hibbing, between Virginia and Eveleth, where the paired Virginia syncline and Eveleth anticline result in an S-curve surface trace of the Biwabik IF (Jirsa and Morey 2003, Figure 7-2).



Figure 7-1: Location of the Animikie Basin and Diagrammatic Cross-section Showing Development of the Basin

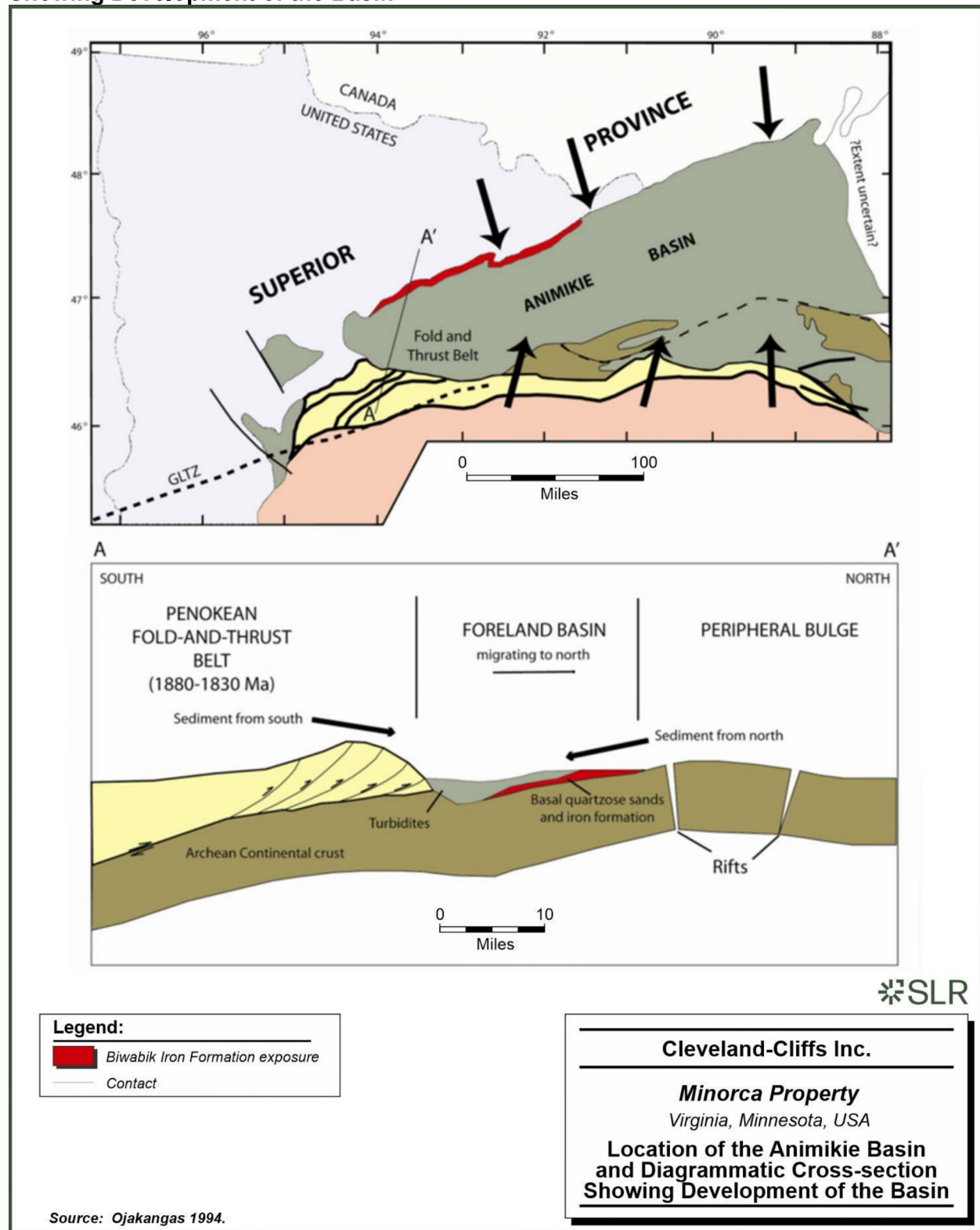
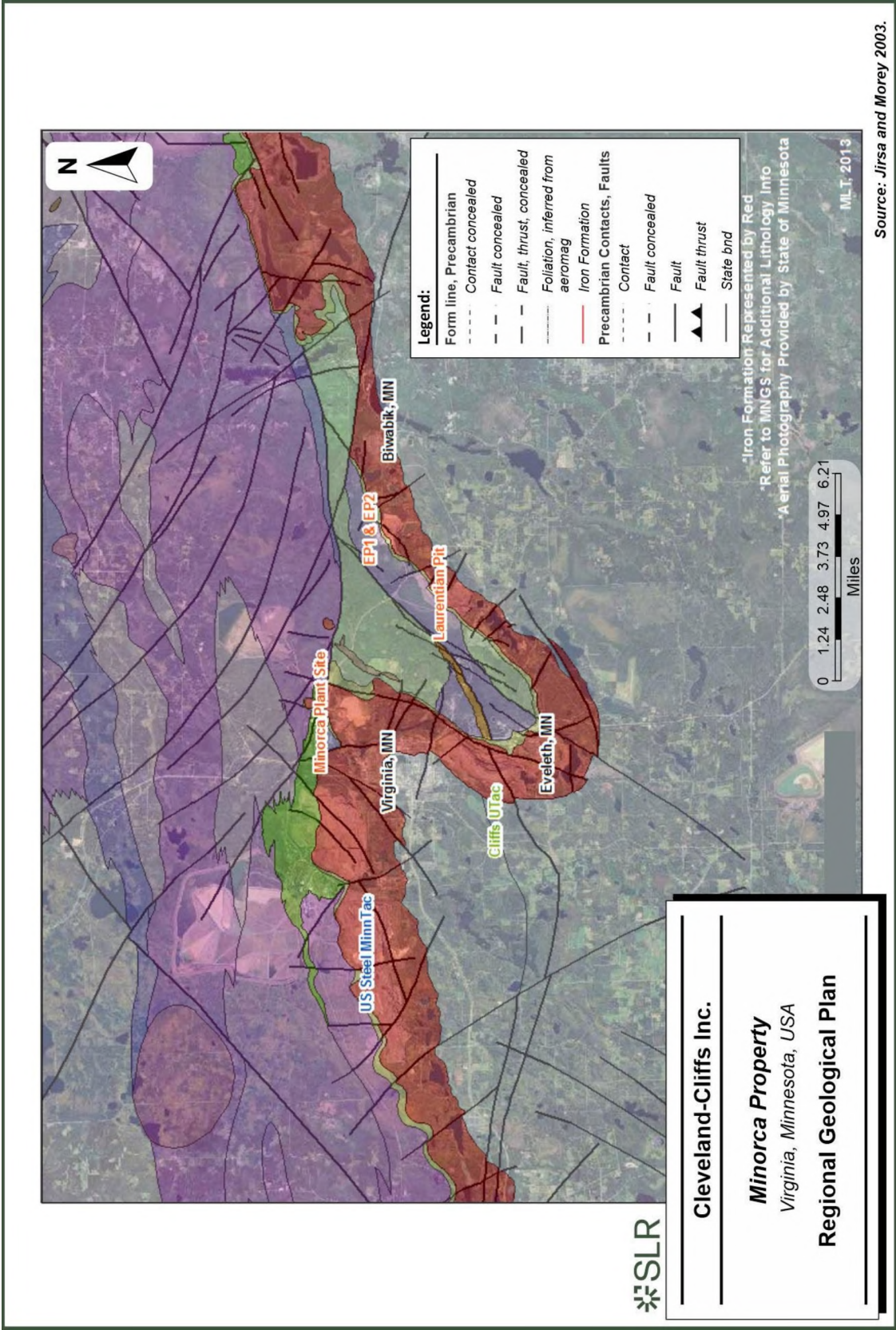


Figure 7-2: Regional Geological Plan



Source: Jirsa and Morey 2003.



7.2 Local Geology

The Early Proterozoic Biwabik IF is a narrow belt of iron-rich strata varying in width from 1,300 ft to 3.2 mi and extending approximately 125 mi from Grand Rapids eastward past Babbitt, Minnesota. The true thickness varies from approximately 150 ft to 700 ft. The Biwabik IF is interpreted to have been deposited in a shallow, tidal marine setting and is characterized as having four separate lithostratigraphic members (from bottom to top: Lower Cherty, Lower Slaty, Upper Cherty, and Upper Slaty (Severson, Heine, and Patelk2009). “Cherty” members have a sandy, granular texture, are thickly bedded, and are composed of silica and iron oxide minerals. The “slaty” members are fine grained, thinly bedded, and comprise iron silicates and iron carbonates, with local chert beds. The cherty members are representative of deposition in a high-energy environment, whereas the slaty members were probably deposited in a muddy, lower-energy environment below the wave base. Interbedding is ubiquitous, and contacts are generally gradational. The iron content for the cherty members is approximately 31%, while the iron content of the slaty members is approximately 26%. It is important to note that nomenclature of the units is not indicative of metamorphic grade; instead, “slaty” and “cherty” are colloquial descriptive terms used regionally.

The four members of the Biwabik IF are further divided into nine subunits within the Minorca Mine area. Figure 7-3 and Figure 7-4 illustrate the stratigraphy of these subunits and their general descriptions. Nomenclature for these subunits is based on their relative location within the four members. They are subdivided based on geologic characteristics observed in diamond drill core. Many of the contacts between subunits are gradational and do not provide a sharp geologic contact. Geologic contacts are occasionally adjusted to fit assay data once received. A local geology cross-section for each deposit is provided in Figure 7-6, Figure 7-7, Figure 7-8, and Figure 7-9.

Isolated DSO material exists within the lower-grade taconite ores, the origins of which have been debated for many years. Some of the more recent publications suggest a genesis linked to crustal-scale groundwater convection related to igneous activity. Much of the evidence supporting this conclusion comes from the isotopic analysis of leached and replaced silicate and carbonate minerals (Morey 1999). Within the Biwabik IF, metamorphic processes produced assemblages diagnostic of greenschist facies to the west, increasing in grade to the east. Mineralogy in unaltered taconite is dominated by quartz, magnetite, hematite, siderite, ankerite, talc, chamosite, greenalite, minnesotaite, and stilpnomelane (Perry et al. 1973).

The Minorca deposits are located in the Virginia Horn region, noted for the drastic change in the general northeast trend of the Biwabik IF (Figure 7-2). To the west of Virginia, Minnesota, the Biwabik IF dips approximately 6° to the southeast. To the east of Gilbert, Minnesota, the dip is approximately 12° to the southeast. Still further east, the Biwabik IF is essentially flat lying. Between Virginia and Eveleth, however, the Biwabik IF strikes to the southwest and dips to the northwest. In this area, the Biwabik IF forms the paired Virginia syncline and Eveleth anticline (Jirsa and Morey 2003). A number of publications suggest that the occurrence of isolated DSO material is related to the structural complexity in this region and the movement of fluids along faults that remobilized and concentrated iron.



Figure 7-3: Stratigraphic Column - East Pit

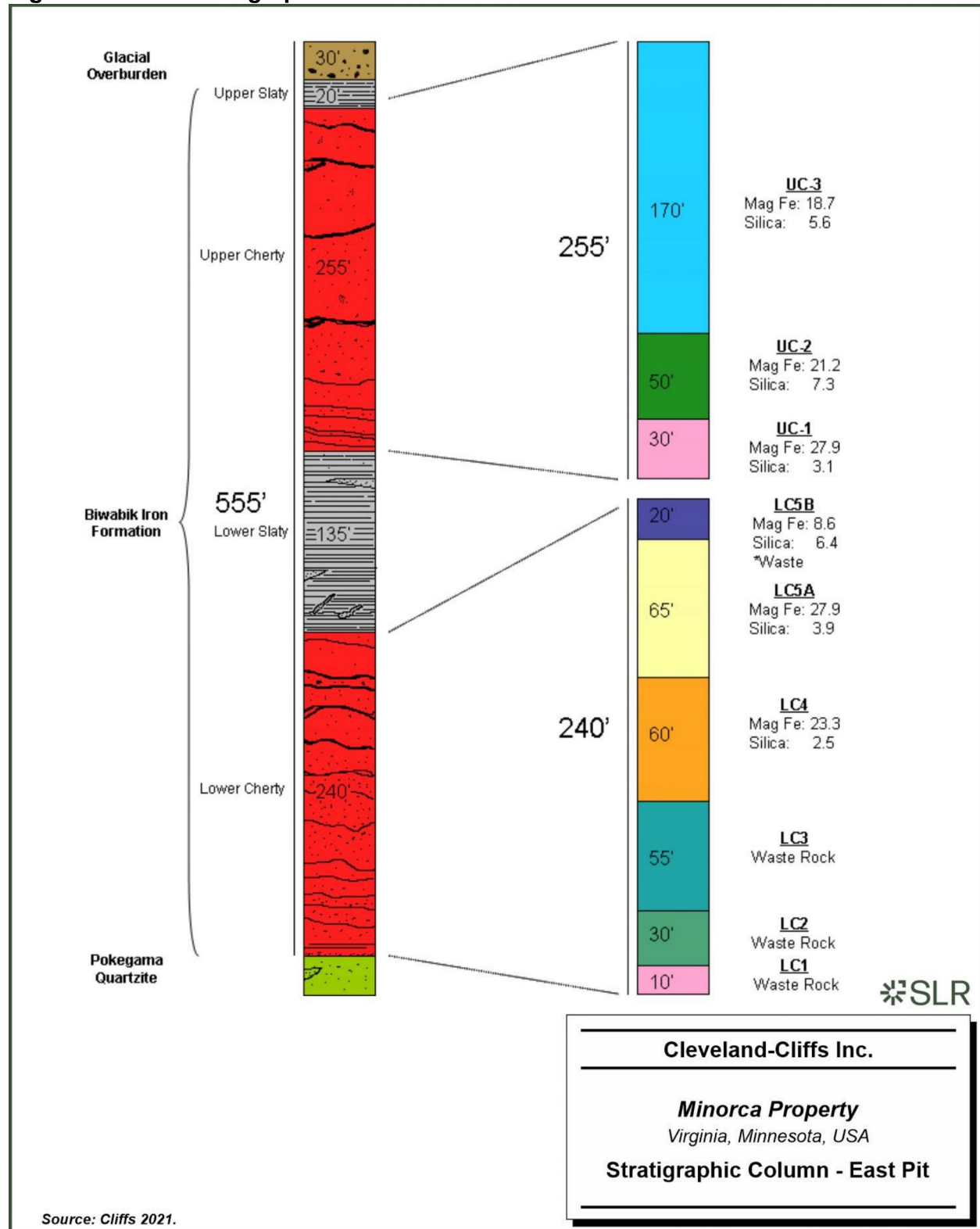


Figure 7-4: Stratigraphic Column - Laurentian Pit

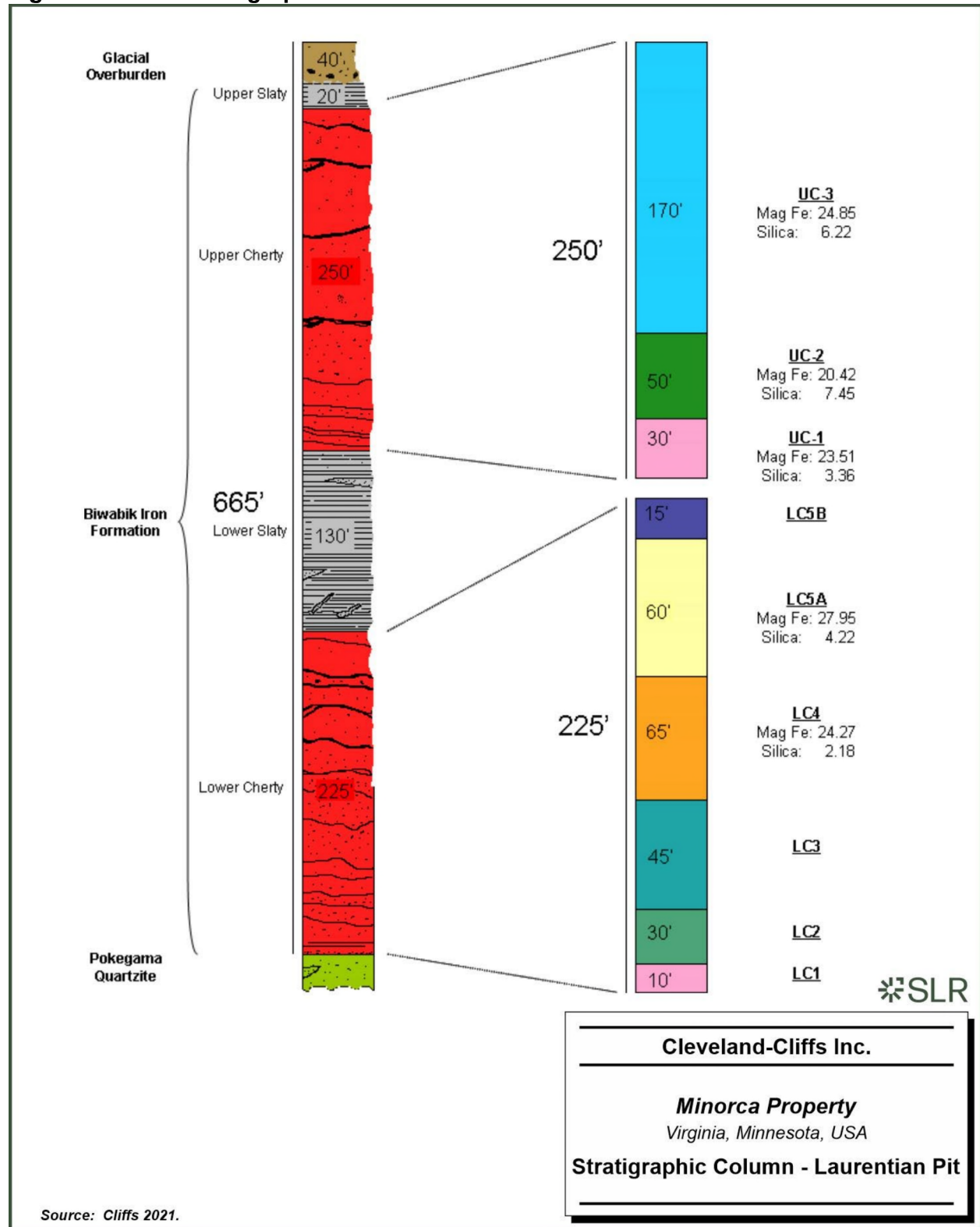


Figure 7-5: Section Plan View

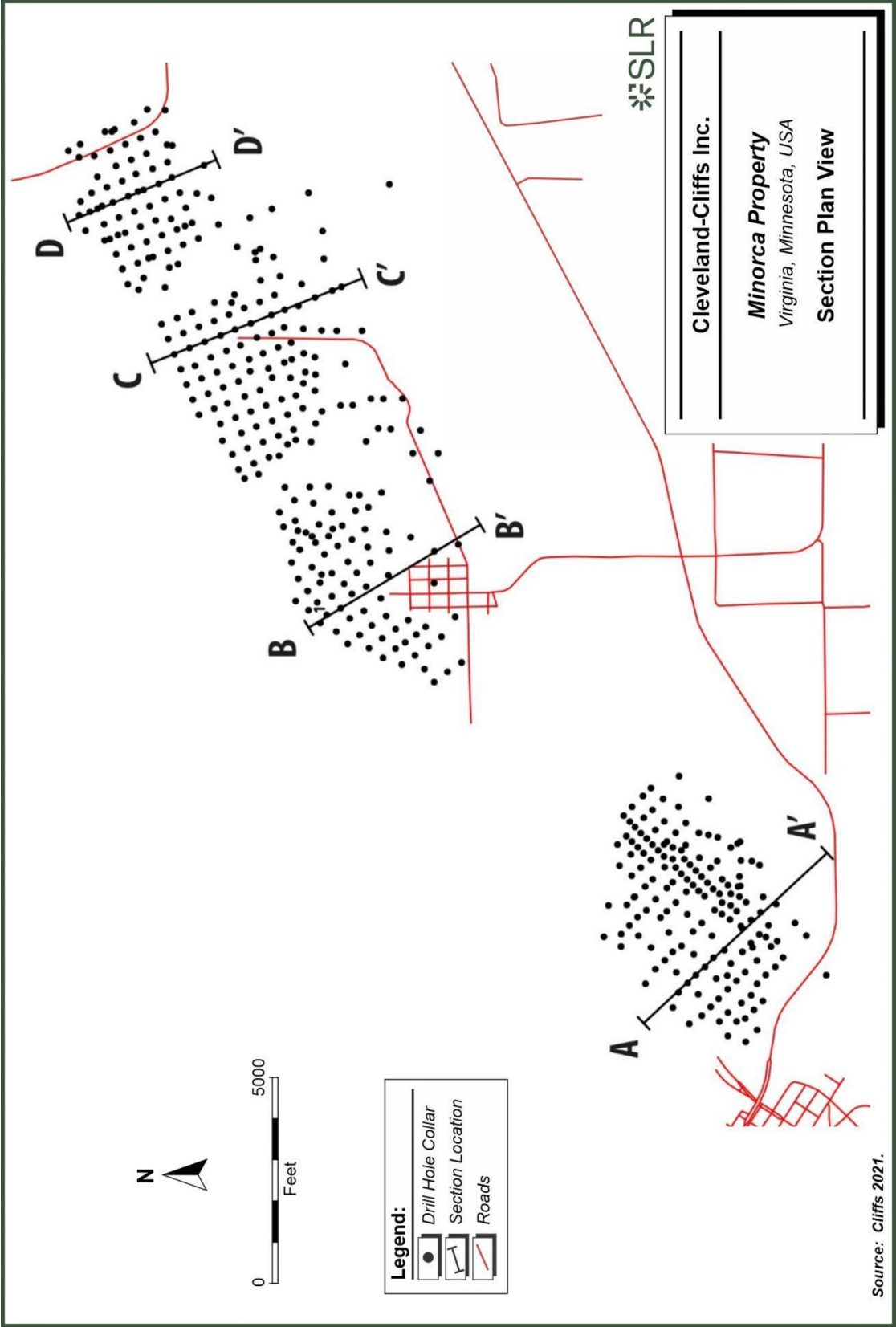


Figure 7-6: Laurentian Geological Cross-section

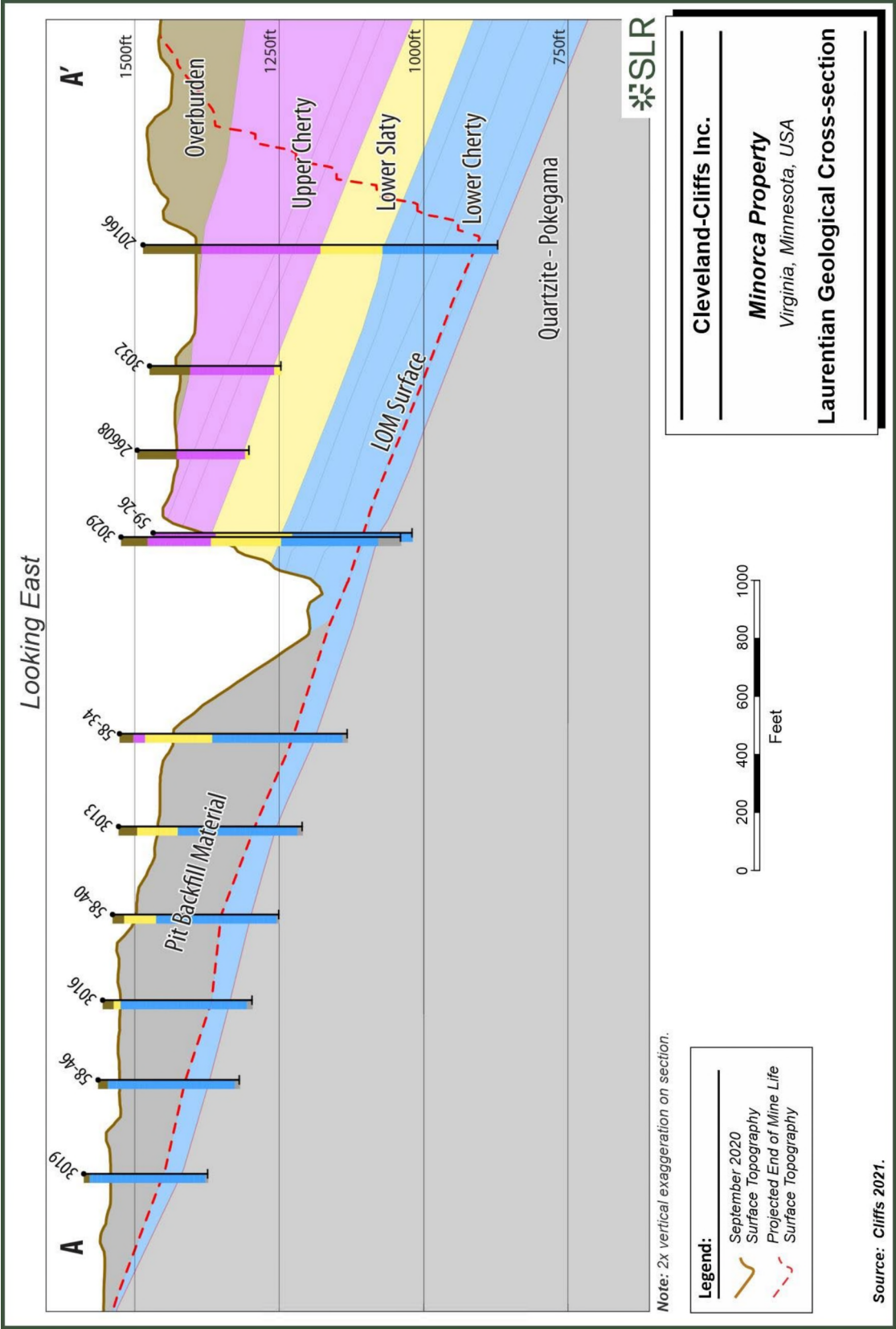


Figure 7-7: Central Geological Cross-section

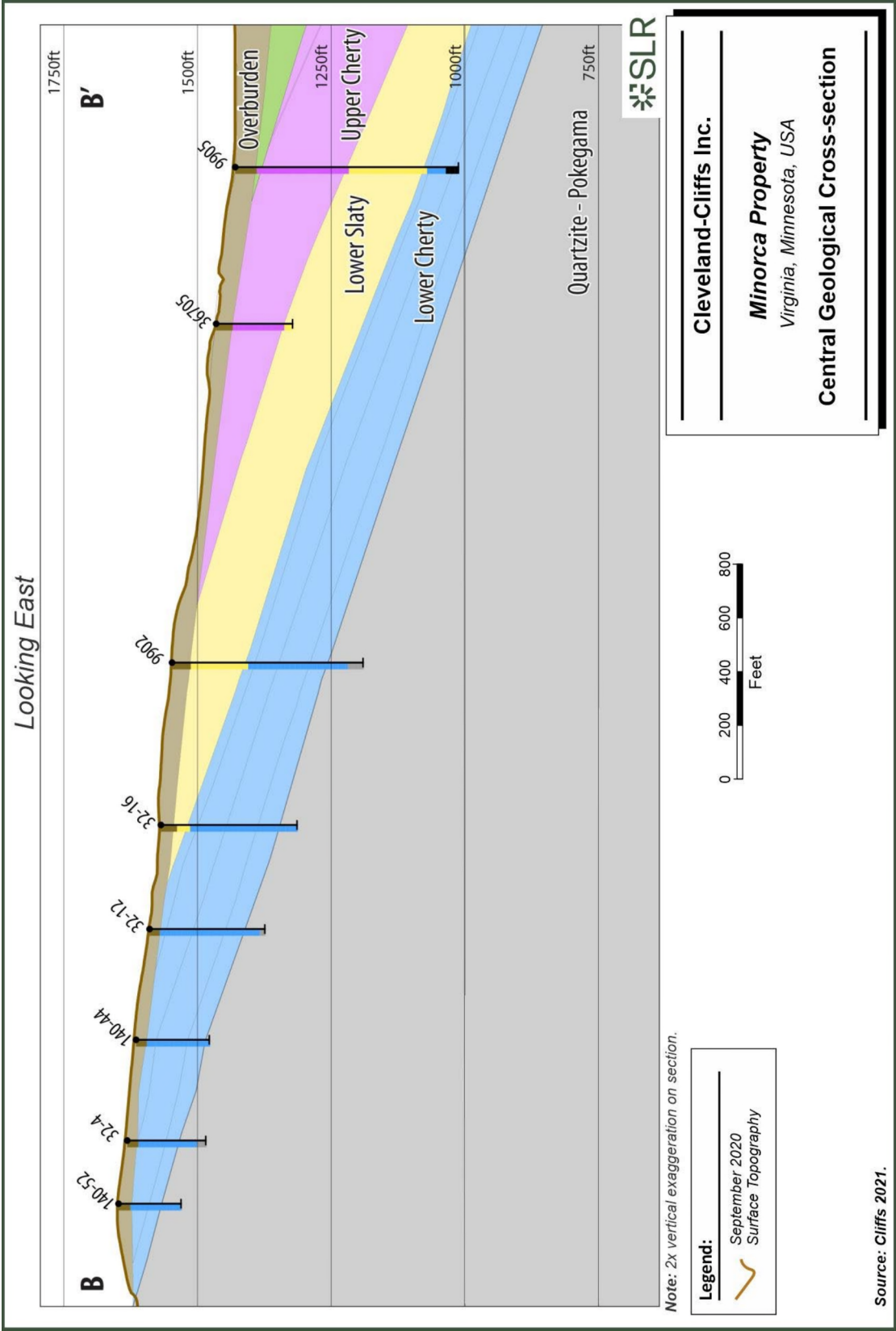


Figure 7-8: East Geological Cross-section

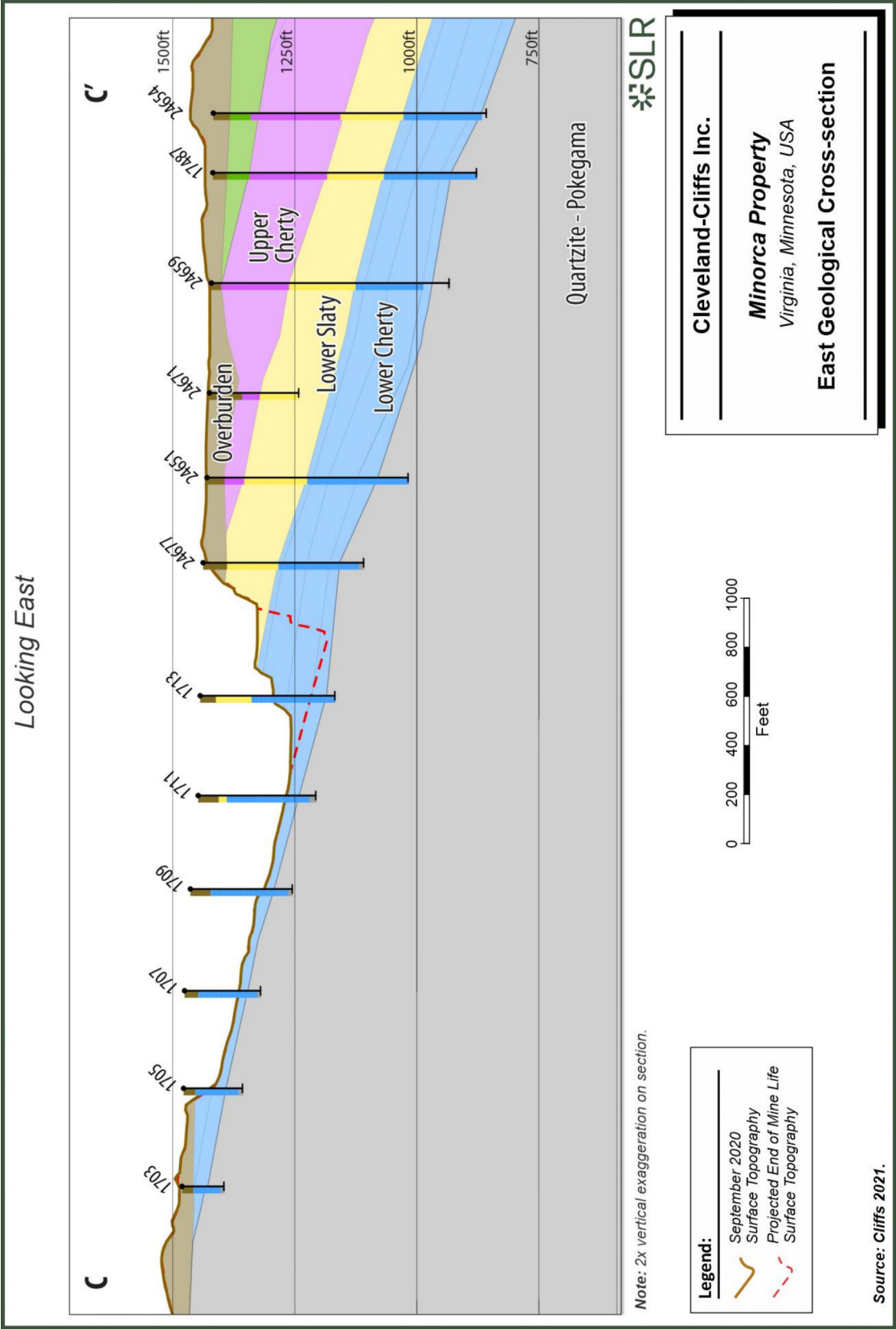
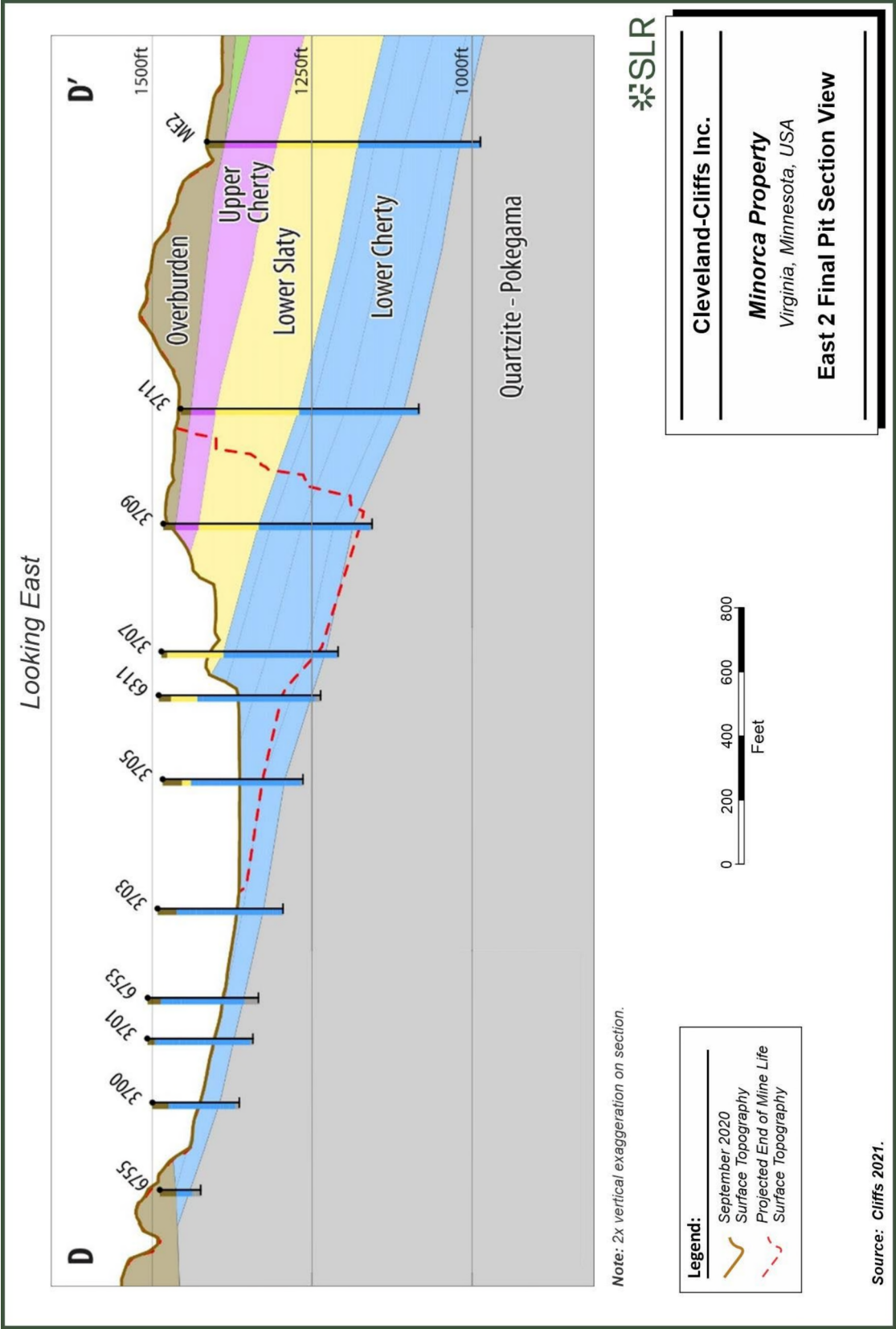


Figure 7-9: East 2 Final Pit Section View



7.3 Property Geology

The Biwabik IF at Minorca consists primarily of carbonates, iron silicates, fine-grained quartz, and iron oxides. These layers are visually distinct, locally separated into slaty beds and cherty beds. The ratio of slaty to cherty beds and distance between these beds are key indicators used during logging, as well as bedding style, texture, color, and magnetic strength. Slaty beds are dark gray in nature, consisting primarily of magnetite in mineralized zones, and range from one millimeter (0.04 in.) to upwards of two centimeters (0.78 in.) in thickness. Cherty beds range from gray to green in color depending on the ratio of fine-grained quartz (gray color) to iron silicates (green color). These beds vary in thickness to upwards of 10 cm (3.9 in.) and may or may not contain disseminated magnetite. Carbonates typically occur as granular, re-crystallized grains of varying size and commonly occur in late-stage, quartz-carbonate-filled fractures, which run variably (orientation, length, width, continuity) throughout the iron formation. The Upper Slaty and Lower Slaty members are visually distinctive as they are dominated by slaty beds; however, these beds rarely contain any notable iron oxide content.

The Lower Cherty and Upper Cherty members of the Biwabik IF host the economic mineralization at Minorca. These members are subdivided into LC1-LC5B and UC1-UC3. Waste rock units (Lower Slaty and Upper Slaty members) cap the Lower Cherty and Upper Cherty members and are distinctively fissile and weakly magnetic as compared to the ore-bearing units. The Pokegama quartzite, which underlies the Biwabik IF, is not exposed in the pit but is intersected at the base of the iron formation in diamond drilling. The Virginia Formation caps the Biwabik IF and is found predominantly in historical holes drilled south of the current pit extents. Table 7-1 lists the lithological units found at the Mine.

Table 7-1: Table of Lithological Units

Lithological Unit Name	Unit Text	Unit Code	Description
Glacial Till	OVB	2	The iron formation is overlain by mostly clayey, reddish-brown glacial till. Thickness in the mining areas varies from 0 ft to 100 ft with an average depth to bedrock of 24 ft.
Upper Slaty	US	11	The Upper Slaty is weathered and thinly bedded. Average thickness is less than 20 ft where it has been intersected by diamond drilling (19.7 ft).
Upper Cherty	UC	6	The Upper Cherty zone is generally gray or dark gray to black in color. It is usually a thinly bedded zone interbedded with green, thicker-bedded, cherty intervals containing a high-angle quartz vein. It has an average thickness of 250 ft. In the East Pit deposit area, this subunit is lean to non-magnetic, with very little of the material meeting ore grade thresholds. Unit Text = UC, Code=6 (note: this code is applied in the East model where the Upper Cherty has not been divided). In the Laurentian Pit, the Upper Cherty member is split into three subunits: UC3, UC2, and UC1 from top to bottom.
Upper Cherty 3	UC3	8	East of section 7000, in the Laurentian Pit, the UC3 is gray in color, massive, and has a salt-and-pepper to blotchy texture with disseminated magnetite. West of section 7000, it has a reddish color; it is still massive but leaner and less magnetic. Average thickness is 170 ft.



Lithological Unit Name	Unit Text	Unit Code	Description
Upper Cherty 2	UC2	7	The UC2 is reddish in color, bedded, with scattered white bands of quartz and carbonates and buff- to green-colored silicates. Average thickness is 50 ft.
Upper Cherty 1	UC1	6	The UC1 is pinkish-gray in color. It is bedded to massive and contains an abundance of pink carbonates. Average thickness is 30 ft.
Lower Slaty	LS	5	The Lower Slaty member averages 130 ft in thickness. It is black to green in color, laminated to thinly bedded, and nodular in places.
Lower Cherty 5B	LC5B	10	Greenish-gray in color, with thin-bedded bands alternating with thick, chert-rich bands. Average thickness is 15 ft.
Lower Cherty 5A	LC5A	4	Gray in color with a bedded to mottled texture in places. The top of the subunit is rich in pink carbonates. Average thickness is 60 ft.
Lower Cherty 4	LC4	3	The LC4 is brownish-gray in color, with wispy bands of magnetite. It has some disseminated magnetite in the chert bands. It contains ovate clasts of carbonate and silicates rimmed with magnetite. Average thickness is 65 ft.
Lower Cherty 3	LC3	530	Pinkish- to reddish-gray color, blotchy texture, primary hematite, green silicates, and straight bedding.
Lower Cherty 2	LC2	1	Reddish-gray color with green silicate bands, primary hematite.
Lower Cherty 1	LC1	1	Reddish-gray color, basal.
Quartzite	QTZ	Q1	Green color, conglomeratic at top, and chloritic.

The QP notes that due to the dip of the Biwabik IF, portions of the units were eroded and do not exist uniformly across the mining area. Thickness of the Upper Slaty member is an average of drilled thickness for the relatively few holes that have intersected the unit. All other member thicknesses are summations of the subunit thicknesses tabulated in Table 7-1. Slaty members (US, LS) are always considered to be waste at Minorca. All other subunits are mined and processed if they meet the cut-off grade criteria (Section 14.9).

7.4 Mineralization

The mineral targeted at Minorca is magnetite, bound in rock regionally referred to as taconite. The recoverable magnetic iron in ore ranges from 16% to 30%. Quartz, carbonates, and iron silicates are the common gangue minerals. The deposit is layered and consistent. The Mine targets taconite of the Upper Cherty and Lower Cherty members in its Laurentian Pit. The Upper Cherty ore is higher in concentrate silica and more difficult to process. It needs to be blended with lower concentrate silica ore to make it economic. In the East Pit, only the Lower Cherty ore is processed; the Upper Cherty lithologic subunits do not contain enough magnetic iron in this area.

Common carbonates include ankerite and siderite, which carry a definitive milky white to slightly red appearance. These carbonates occur variably throughout the iron formation and are most apparent at the base of the LC5A subunit and in the UC1 and UC3 subunits. Kutnohorite is present, but requires Scanning Electron Microscopy (SEM) or X-ray diffraction (XRD) to separate it from ankerite. Iron silicates are visibly distinguishable from carbonates, quartz, and iron oxides; however, SEM or XRD is required to discern specific iron silicate minerals from



each other. Talc, stilpnomelane, and minnesotaite are the common iron silicates present in the iron formation (Totenhagen et al., 2011).

In the East Pit area, the formation strikes west and dips to the south at approximately 8°. Ore-grade material is found primarily within the Lower Cherty member of the formation. The iron formation along the north edge of the deposit is overlain to the south by the Virginia Formation. At the Laurentian Pit, the formation strikes west and dips to the south at approximately 18°. Ore-grade material is found in both the Lower Cherty and Upper Cherty members of the formation.

The lithology units (as described in Table 7-1) are typically similar between East 1 and East 2 pits of the East Pit and the Laurentian Pit, with the exception being the Upper Cherty member in the East model area. The difference lies primarily in the UC1 and UC2 units, which carry minor visual variations in bedding thickness and color while also containing more inconsistent MagFe grades. Due to this, the Upper Cherty member is currently undivided in the East model, where additional drilling is required to define ore/waste subunits in this member. The Upper Cherty member is primarily outside of the permitted limits of the East deposit.

The Central deposit appears similar to the East deposit based on exploratory drilling and subsequent logging in 2011, 2012, and 2018 as well as modeling in 2013 and 2019. The dip ranges from 10° to approximately 15° as this deposit lies between the Laurentian and East pits. Similar to the East Pit area, the Upper Cherty member in the Central deposit will require further definition through exploratory drilling, logging, and modeling to differentiate ore/waste subunits.

Table 7-2 summarizes the length, depth, dip, and average grades of the three Minorca deposits.



Table 7-2: Deposit Characteristics

	Laurentian						East						Central					
	LC4	LC5A (4)	LC5B (10)	UC1 (6)	UC2 (7)	UC3 (8)	LC3 (530)	LC4 (3)	LC5A (4)	LC5B (10)	UC (6)	LC3 (530)	LC4 (3)	LC5A (4)	LC5B (10)	UC (6)		
Outcrop (YES/NO)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		
Average Deposit Length – along strike (ft)	7,800	7800	7,800	7,800	7,800	7,800	7,200	7,200	7,200	7,200	7,200	9,600	9,600	9,600	9,600	9,600		
Minimum Depth from Surface (ft)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10		
Maximum Depth from Surface (ft)	520	480	450	345	275	110	450	390	340	324	210	330	275	255	255	50		
Angle of Dip (°)	11.0	11.0	11.0	11.0	11.0	11.0	8.0	8.0	8.0	8.0	8.0	10.0	10.0	10.0	10.0	10.0		
Azimuth (°)	45 SofW	45 SofW	45 SofW	45 SofW	45 SofW	45 SofW	22 SofW	22 SofW	22 SofW	22 SofW	22 SofW	35 SofW	35 SofW	35 SofW	35 SofW	35 SofW		
% MagFe	23.6	26.4	15.6	23.4	18.8	18.6	13.3	22.4	21.8	6.9	14.2	8.1	19.0	18.9	5.4	16.0		
% SiO ₂	2.2	4.7	5.7	3.4	6.9	5.8	4.0	2.8	4.4	6.6	5.2	3.8	3.0	4.4	8.3	5.6		



8.0 Deposit Types

8.1 Mineral Deposit

The Minorca iron ore deposit is an example of a Lake Superior-type banded iron formation (BIF) deposit. Lake Superior-type BIFs occur globally and are exclusively Precambrian, deposited from approximately 2,400 Ma to 1,800 Ma. Although the genesis of iron formations has been debated over the years, it is certain that they were deposited more or less contemporaneously and in similar marine depositional environments. Some of the most prolific iron districts in the world are hosted in these rocks, such as those found in the Pilbara district of Australia and the Animikie Group of Minnesota. Theories regarding their formation center on the hypothesis that at stages in the Earth's history, the oceans were acidic and contained tremendous amounts of dissolved iron. The conventional explanation for the majority of these deposits is that oxygen-producing life forms such as stromatolites, found fossilized in BIFs, began to produce sufficient oxygen to oxidize the sulfide or free ion forms of iron within seawater. The iron content in seawater rose and fell for over a billion years, and the last of the Precambrian BIFs is thought to have been deposited around 1800 Ma (Guilbert and Park 1986).

While there are some remaining high-grade iron deposits in the area, the majority of the iron ore is regionally referred to as taconite. Taconite is a type of BIF that is characterized as an iron-bearing sedimentary rock with greater than 15% Fe, where the iron minerals are interbedded with silicates or carbonates. Iron content ($\text{FeO} + \text{Fe}_2\text{O}_3$) in taconites is generally 25% to 30%. Higher-grade DSO ores are believed to have formed from the leaching and dissolution of silica found in the taconites, resulting in smaller zones that can contain greater than 60% iron (Morey 1999). These high-grade deposits are predominantly related to the high-angle, steeply dipping faults common along the Mesabi Iron Range.

Geological classification of BIFs is based on mineralogy, tectonic setting, and depositional environment. The original facies concept provided for oxide-, silicate-, and carbonate-dominant iron formations that were thought to relate to the environment of deposition (James 1954), as follows:

- Oxide-rich BIF typically consists of alternating bands of hematite [$\text{Fe}_2^{3+}\text{O}_3$] with or without magnetite [$\text{Fe}^{2+}\text{Fe}_2^{3+}\text{O}_4$]. Where the iron oxide is dominantly magnetite, siderite [$\text{Fe}^{2+}\text{CO}_3$] and iron silicate are usually also present.
- Silicate-rich BIF is usually dominated by the minerals greenalite, minnesotaite, and stilpnomelane. Greenalite [$(\text{Fe}^{2+}, \text{Mg})_6\text{Si}_4\text{O}_{10}(\text{OH})_8$] and minnesotaite [$(\text{Fe}^{2+}, \text{Mg})_3\text{Si}_4\text{O}_{10}(\text{OH})_2$] are ferrous analogues of antigorite and talc respectively, while stilpnomelane [$\text{K}_{0.6}(\text{Mg}, \text{Fe}^{2+}, \text{Fe}^{3+})_6\text{Si}_8\text{Al}(\text{O}, \text{OH})_{27} \cdot 2\text{-}4\text{H}_2\text{O}$] is a complex phyllosilicate.
- Carbonate-rich BIF is usually dominated by the minerals ankerite [$\text{CaFe}^{2+}(\text{CO}_3)_2$] and siderite, both of which display highly variable compositions. Similar proportions of chert and ankerite (and/or siderite) are typically expressed as thinly bedded or laminated alternating layers (James 1966).

These classification schemes commonly overlap within Lake Superior-type deposits, defying classification by this method. Almost all of the minerals described in the three classifications can be found in many of the deposits of the Mesabi Iron Range. Lake Superior-type deposits are generally classified based on their size and depositional environments (Guilbert and Park 1986). These deposits are typically large and are associated with other sedimentary rocks. Deposition of the Lake Superior-type deposits occurred in shallow marine conditions, with transgressive sequences commonly observed in the regional stratigraphy (Simonson and Hassler 1996). It is



common to observe shallow marine bedforms and sedimentary depositional textures in these deposits.



9.0 Exploration

Cliffs does not maintain detailed records or results of early, non-drilling prospecting methods used during initial exploration activities, such as geophysical surveys, mapping, trenching, test pits, and sampling conducted prior to Cliffs' ownership of Minorca. Most exploration work by Cliffs has been and continues to be near-mine diamond core drilling (DD) conducted using a 400 ft x 400 ft grid. Exploration other than drilling included a high-resolution aeromagnetic survey.

Details of drilling campaigns at Minorca are provided in Section 10.0.

9.1 High-Resolution Aeromagnetic Survey

EDCON-PRJ, Inc., of Lakewood, Colorado conducted a fixed-wing aeromagnetic survey over the Virginia Horn area (the Virginia South Survey), in St. Louis County, Minnesota in May 2021 (EDCON-PRJ, 2021) with the purpose of understanding large-scale structural features and oxidation of the BIF. The surveys were undertaken for Cliffs and its subsidiary, United Taconite LLC of Eveleth, Minnesota, under the direction of Mr. Garret Eliason, Project Geologist and Mr. Michael Orobona, Principal Geologist.

The Virginia South Survey covers 232 km² (90 mi²) in St. Louis County, Minnesota. It includes the towns of Eveleth, Virginia, Gilbert, McKinley, and Biwabik. The survey area is centered over the faulted and folded zone of the Biwabik IF known as the Virginia Horn. Current and historical mine workings are scattered throughout the area.

A total of 1,767 line-miles of aeromagnetic data was acquired, flown at 100 m (328 ft) spacings and oriented north-south. The resultant airborne magnetic survey map is shown in Figure 9-1 and Figure 9-2.



Figure 9-1: High-Resolution Aeromagnetic Survey Lines

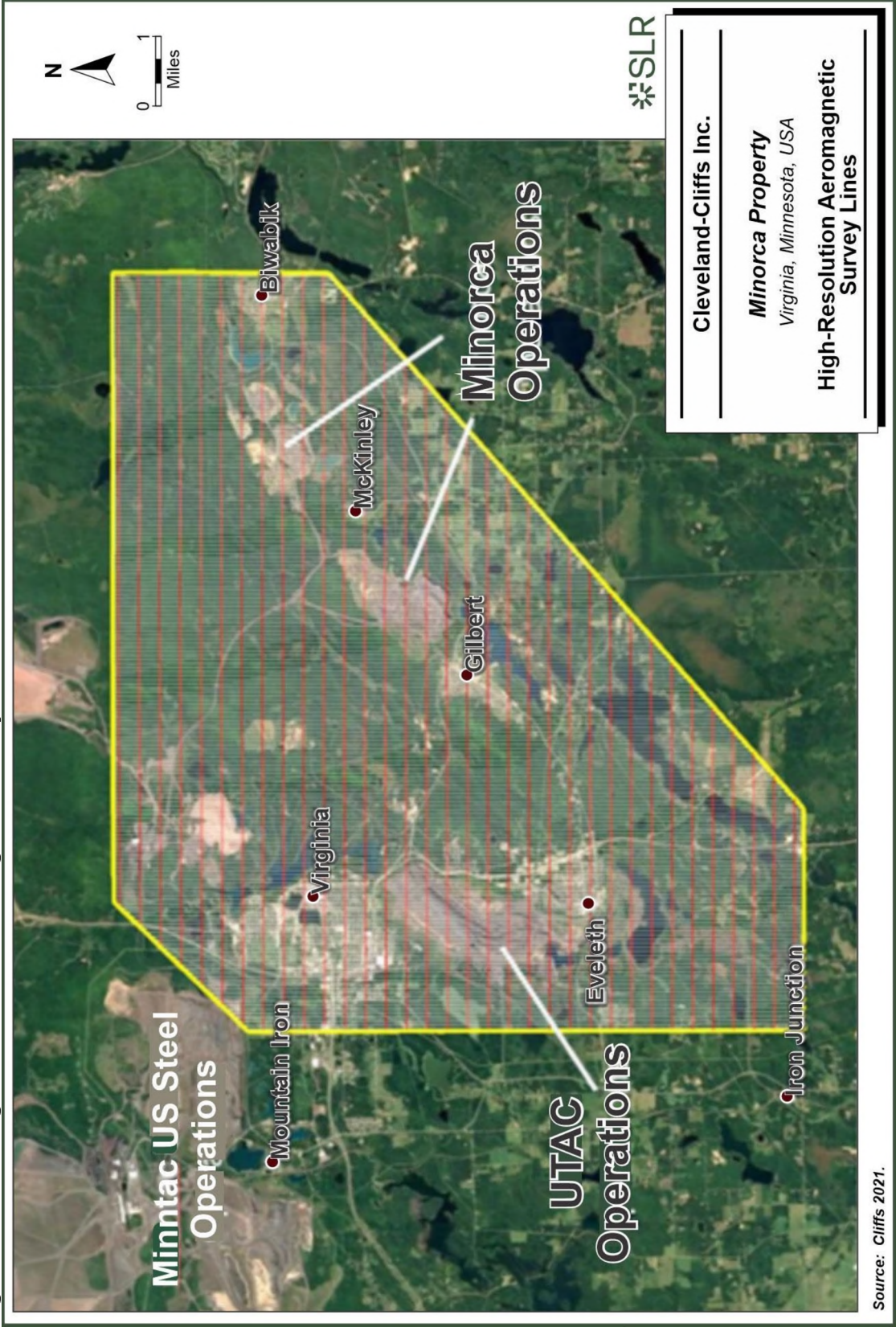
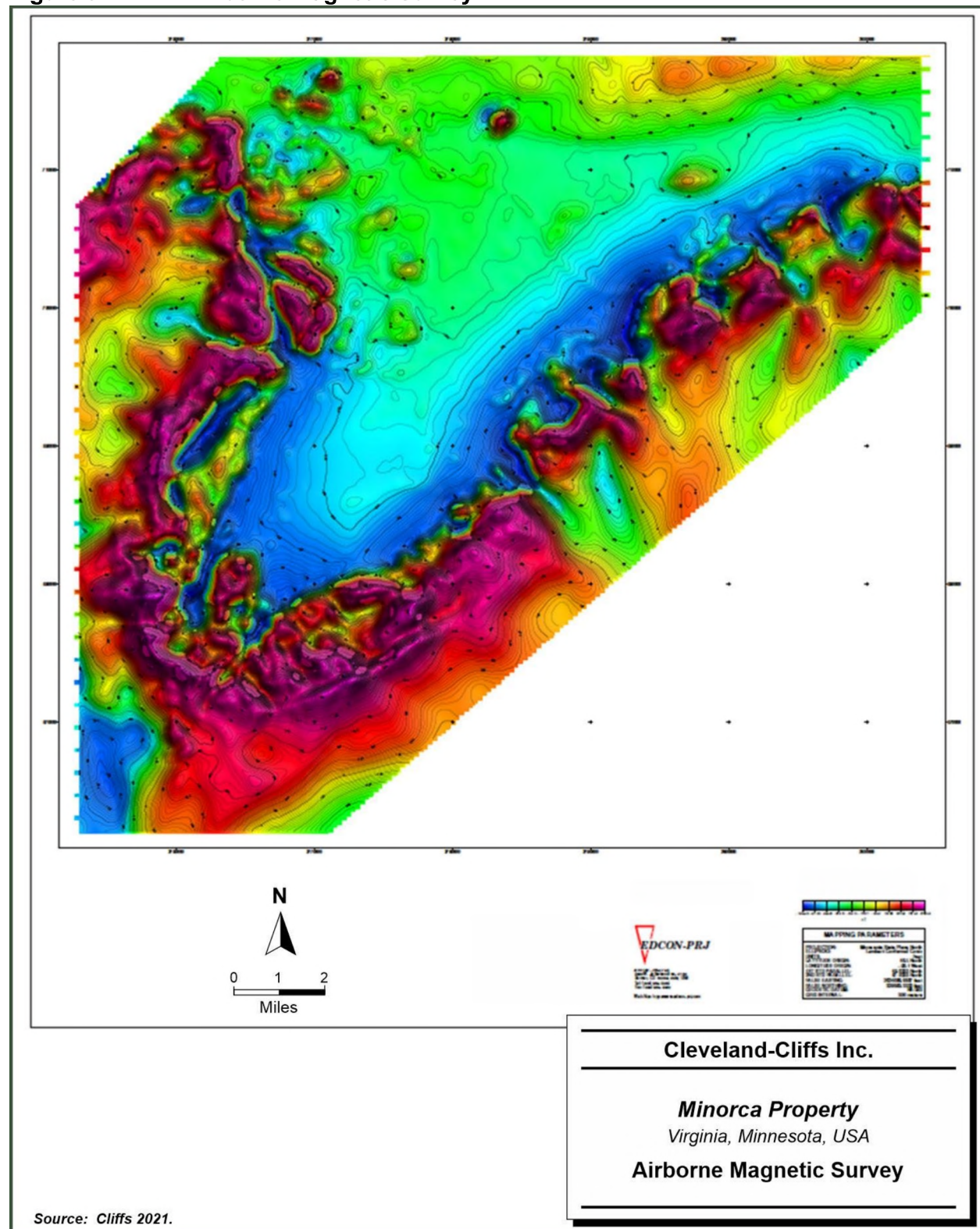


Figure 9-2: Airborne Magnetic Survey



10.0 Drilling

10.1 Type and Extent

Diamond core drilling is the principal method of exploration utilized at Minorca. Both historical and current DD core drilled by Cliffs and its predecessors (ArcelorMittal and others) are used in mine planning. Information on the annual number of holes and drill footage completed prior to 2006 could not be validated by the QP from the drilling records, and this information has been extracted from the ArcelorMittal Technical Reports completed in 2020 (ArcelorMittal 2020a, 2020b).

Between the years of 1958 and 1978, it is reported a total of 228 drill holes totaling 62,676 feet of drill core was taken from the J&L Reserve (the Laurentian, East, and Central deposits). These holes were drilled by U.S. Steel, Pickands Mather and Co. (Pickands-Mather), and J&L. All this drilling was tested by the Davis Tube (DT). During this time, 1,131 tons of taconite were removed from a test pit and run through various pilot tests.

Between 1989 and 2006, a total of 118 diamond drill holes totaling 32,104 were completed in the J&L Reserve (the Laurentian, East, and Central deposits). There was no drilling completed between 2007 and 2010.

Additional drilling campaigns across the Property were completed in 2011 (18 holes for 5,282ft), 2012 (15 holes for 4,225 ft), and 2015 (15 holes for 3,083 ft) totaling 12,590 ft of drilling.

In 2016, 10 holes (one in the East Pit and nine in the Laurentian Pit) totaling 2,798 ft were completed. No drilling was completed in 2017.

In 2018, ArcelorMittal completed 30 holes for a total of 5,881 ft of diamond drilling in the Central deposit (26 holes) and Laurentian Pushback area (four holes) just west of the Laurentian Pit, to infill existing drill data. There was no drilling completed in 2019.

Nine diamond drill exploration holes totaling 2,762 ft were completed by Cliffs in 2020 (four holes for 1,257 ft) and 2021 (five holes for 1,505 ft). These exploration holes consist of five holes in the Central area, two holes south of the East 2 Pit, and two holes northeast of the Laurentian Pit.

Future exploration will continue to focus on the Central and East resource areas with possible drilling on the south end of the Laurentian Pushback and south/east sides of the Laurentian Pit.

Exploration holes at Minorca are used to determine lithology, MagFe content, and concentrate SiO₂ content, and identify any offsetting or oxidized structures within the deposit and/or surrounding rock. These lead to factors for determining economic viability based on stripping ratio, cut-off grade, and ability for the plant site to process the ore. Exploration also helps identify areas that will need to be avoided or mined around due to geological or structural anomalies.

As of the effective date of this report, Cliffs and its predecessors have completed 443 DD drill holes totaling 118,809 ft on approximately 400 ft centers (Table 10-1, Table 10-2 and Figure 10-1).



Table 10-1: Drilling Summary

Tenement	Holes	Total Footage
Central	85	19,084
East	197	53,159
Laurentian	161	46,566
Total	443	118,809

Table 10-2: Yearly Drilling Summary

Year	Tenement	Holes	Total Footage
1958-1978	Central	19	5,118
	East	154	41,862
	Laurentian	55	15,696
1989	Central	2	494
	Laurentian	13	3,770
1994	Laurentian	15	4,139
1995	Laurentian	21	5,033
1996	Laurentian	24	5,563
1997	Laurentian	2	500
1998	Laurentian	7	4,741
1999	Laurentian	3	1,047
2004	Laurentian	1	144
2006	East	30	6,673
2011	Central	13	3,443
	East	5	1,839
2012	Central	10	2,264
	East	5	1,961
2015	Central	10	1,801
	Laurentian	5	1,282
2016	East	1	59
	Laurentian	9	2,739
2018	Central	26	4,484
	Laurentian	4	1,397
2020	Central	2	491
	East	2	766

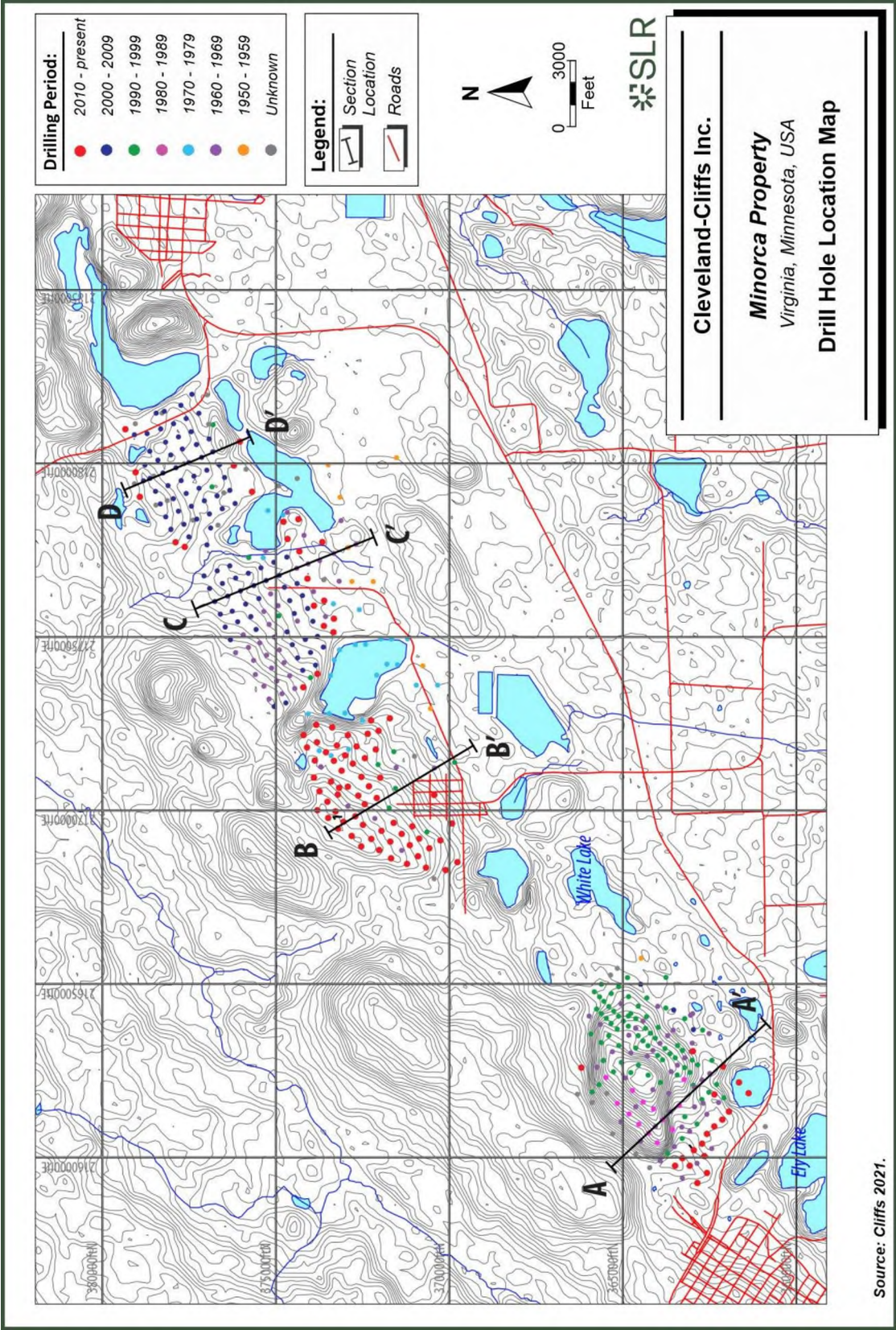


Year	Tenement	Holes	Total Footage
2021	Central	3	989
	Laurentian	2	516
Total		443	118,809

From these holes, 7,239 samples were assayed for MagFe and concentrate silica, which are the main assay data gathered, complementing geologic observations from lithologic logs.



Figure 10-1: Drill Hole Location Map



10.2 Procedures

Drilling practices have remained consistent over the history of the Property. The core size has varied over the years but is currently drilled with BTW-sized tools (1.656 in. core diameter).

10.2.1 Collar Coordinates and Surveying

DD collar locations are recorded on the original drill logs created at the time of drilling, including easting and northing coordinates in local grid or modified Minnesota State Plane (NAD 27 datum) and elevation of collar in feet above sea level National Geodetic Datum of 1929 (NGVD29). The site maintains a conversion file between local grids and Minnesota State Plane (NAD 27 datum) for incorporation into Vulcan software.

Surveying methods have evolved over the years with advancements in technology, moving from optical methods to electronic distance measurement and to global positioning system (GPS), which is currently in use. The QP is of the opinion that, for the deposit type, all survey methods used for the collar locations would be expected to provide adequate accuracy for the drill hole locations. All drilling follows applicable Minnesota Department of Health (MDH) and MDNR regulations and requirements.

The collar of each completed drill hole is surveyed by the CCMMI operation's surveyor. The collar coordinates (XYZ - preferably Minnesota State Plane Coordinates) are verified by the project geologist. Final survey data are validated in the office by the project geologist and plotted on an appropriate map and incorporated into the acQuire drill hole database.

Currently, the location of the drill hole is set by the geologist, with collars marked and surveyed using a Trimble R10 GNSS receiver and a TC7 data collector. Drill hole locations are staked in the field and marked with a lath. Maps of staked hole locations as well as field tours of hole locations are provided to drilling contractors, who, upon completion of a hole, place the lath into the drill hole, which is subsequently surveyed with a GPS, marking the final location.

Due to the relatively shallow depth and vertical nature of all drill holes, no downhole deviation survey is conducted. Drill holes pierce the generally flat-lying Biwabik IF at near perpendicular angles.

10.2.2 Drill Site Reclamation

During Cliffs' ownership of the Property, the majority of exploration drill holes have been inside the Minorca Permit to Mine; therefore, under applicable regulations, no drill site reclamation has been required. For exploratory borings outside the Minorca Permit to Mine, all applicable regulations concerning MDH and Environmental Protection Agency (EPA) regulations including: notification, drilling, abandonment, Storm Water Pollutant Prevention Plan (SWPPP) inspections, and site reclamation are followed.

10.2.3 Drill Core Sample Collection

During drilling, core samples are boxed with depths marked in feet using wooden run blocks. The core is transported from the drill site by the mine geologist/engineer or by the drilling company and taken to a core logging facility. The mine geologist confirms procedures for packaging and handling of core in the boxes, such as the inclusion of footage markers at the end of core runs and labeling core boxes with sequential numbering and footage of core included in the box.



Drilling footages are verified visually, as taconite is a very competent rock. Core recovery is generally very good. Core is sometimes lost in zones of intense oxidation, which is very rare.

10.2.4 Drill Core Logging

Logging includes rock types (lithologic member and subunit), magnetic characteristics, taconite type, degree of oxidation, mineralogy, textures, alteration, structural information, and a general geologic description. Boundaries of geologic subunits are often gradational (e.g., more slaty than cherty versus more cherty than slaty, thin beds becoming more prevalent than thick beds) and may not provide a sharp geologic contact. As magnetite is the primary mineral of interest, a hand magnet is utilized for core logging and indicates relative magnetic iron content of a sample interval prior to assaying (e.g., slight, moderate, or strong).

Core logging is done by geologic zones, which are separated by visual and physical characteristics, including relative magnetism, to determine subunit stratigraphy. Drilling footages are verified visually by the mine engineer/geologist. Core was photographed in 2006, 2011, 2012, 2015, 2016, and 2020. Sample dispatch records are entered into Microsoft (MS) Excel spreadsheets or manually on paper logs and are currently being imported into an acQuire database and stored digitally onsite. The sample dispatch records are sent with the samples to the Minorca laboratory.

10.2.5 Drill Core Sampling

After the core is logged, it is then delivered to the laboratory. All Lower Cherty and Upper Cherty zones are sampled. Lower Slaty waste rock and Pokegama Quartzite are not sampled (unless MagFe is detected during logging by use of hand magnet), as is past practice due to low amounts of MagFe. Drill holes are assayed upon availability and added to the drill hole database at the beginning of modeling.

Minorca exploratory drill holes are assayed on site by the Minorca laboratory. In ore zones, samples for the laboratory are prepared in approximately 10 ft lengths but can range from 7 ft to 13 ft when intervals do not break evenly at 10 ft. Samples for assay do not cross logged subunit contacts, ensuring that Minorca samples are representative of a single stratigraphic zone. Occasionally, drill core may be cut and preserved as a legal requirement or as a reference hole for future use as selected by the engineer/geologist. Reference holes are used as a representation for future logging in determining lithology contacts and or assaying procedures. Preserved half-core is stored in original core boxes, while the other half follows the normal assaying procedure. This stage is done only after logging, sample collection, and core photography. Saved samples and split core are stored in shipping containers (most split core is stored in a repurposed training center/core logging facility to be available as a reference during logging).

Drill core logging and sample interval selection are performed by the project geologist. Digital core logs are stored on a common server and an individual server. Digital assay information is stored in original MS Excel files delivered by the laboratory as well as in a drill hole database. Saved samples are stored in core buildings and/or shipping containers.

Key drilling and sampling information is summarized in Table 10-3.



Table 10-3: Drilling as of April 24, 2021

	Diamond Drilling	RC Drilling	Total Drilling
No. of Holes Drilled	443	0	443
Footage Drilled	118,809	0	118,809
Footage Logged	91,280	0	91,280
Number of Samples	7,239	0	7,239
Samples Dispatched			
Samples Analyzed			

10.2.6 Sample Storage and Data Security

Drill core is transported directly from the drill rig to the core logging facility at Minorca by either the drilling contractor or Cliffs' personnel. Temporary core storage is located at the secure Minorca logging facility.

Whole core is placed in labeled bags for submission to the site assay laboratory. Selected drill cores have been disposed of from a historical practice of periodically disposing of drill core once cored intervals were mined out. Some archived drill core is consumed during re-assaying programs conducted sporadically for specific local areas of the mine.

Sample preparation and bench-metallurgical analysis of diamond drill core for resource estimation is conducted at the Minorca laboratory, located in St. Louis County, Minnesota. The laboratory is a Minorca-owned facility and is not currently accredited for its quality management system. Each shipment of core samples is accompanied by a sample sheet recording all the sample information and required analyses. The data are stored digitally on Minorca's shared servers. Unused sample materials are saved in envelopes, paper bags, or quart/pint bottles and stored in boxes located in C-tainers at the mine site or in the logging facility. Note that historical samples are preserved in the Old Training center (logging facility) as well as the onsite "Tin Shack" location at Minorca.

Digital copies of drill core analyses received from the site laboratory are stored in a backed-up network drive with restricted permissions, as well as within an acQuire database, which retains daily, weekly, monthly, and yearly backups.

Electronic storage of an as-drilled collar location file for each annual drilling program is accomplished using the database management system acQuire. A hard copy printout of the collar file with geologic logs and other documents relevant to the drill holes is stored in file cabinets at the Minorca Mine Engineering office.

10.3 QP Comment

It is the QP's opinion that there are no known drilling, sampling or recovery factors that could materially affect the accuracy and reliability of the results and that the results are suitable for use in the Mineral Resource estimation.



11.0 Sample Preparation, Analyses, and Security

Sampling of iron formation to evaluate the magnetite-bearing taconite ore potential is performed to characterize the metallurgical properties of the material. Therefore, conventional whole rock elemental assaying approaches utilized in evaluating most metallic ore deposits are eschewed in favor of methods designed to qualify and characterize recoverable magnetic concentrate.

Sample preparation and bench-metallurgical analysis of diamond drill core for resource estimation is conducted at the Minorca laboratory, located in St. Louis County, Minnesota. The laboratory is a Minorca-owned facility and is not currently accredited for its quality management system.

The laboratory analysis is performed by Minorca personnel. Laboratory data produced for the Mine for both exploration and production is visually checked daily with any discrepancies or unexpected values followed up on by both plant engineering and mine engineering personnel.

Only DD exploration holes are used for assaying and resource modeling. Blast hole sample results and magnetic susceptibility are used to check ore contacts as well as confirm expected grades during production. Reconciliations are run on current production versus modeled production, which provides insight on the accuracy of the modeled assay data versus actual production.

Reconciliation of actuals with the final model has historically been accurate for the type of formation at Minorca and has instilled a high degree of confidence in Minorca's diamond drill hole density and sampling procedure.

11.1 Sample Preparation and Analysis

11.1.1 Sample Preparation

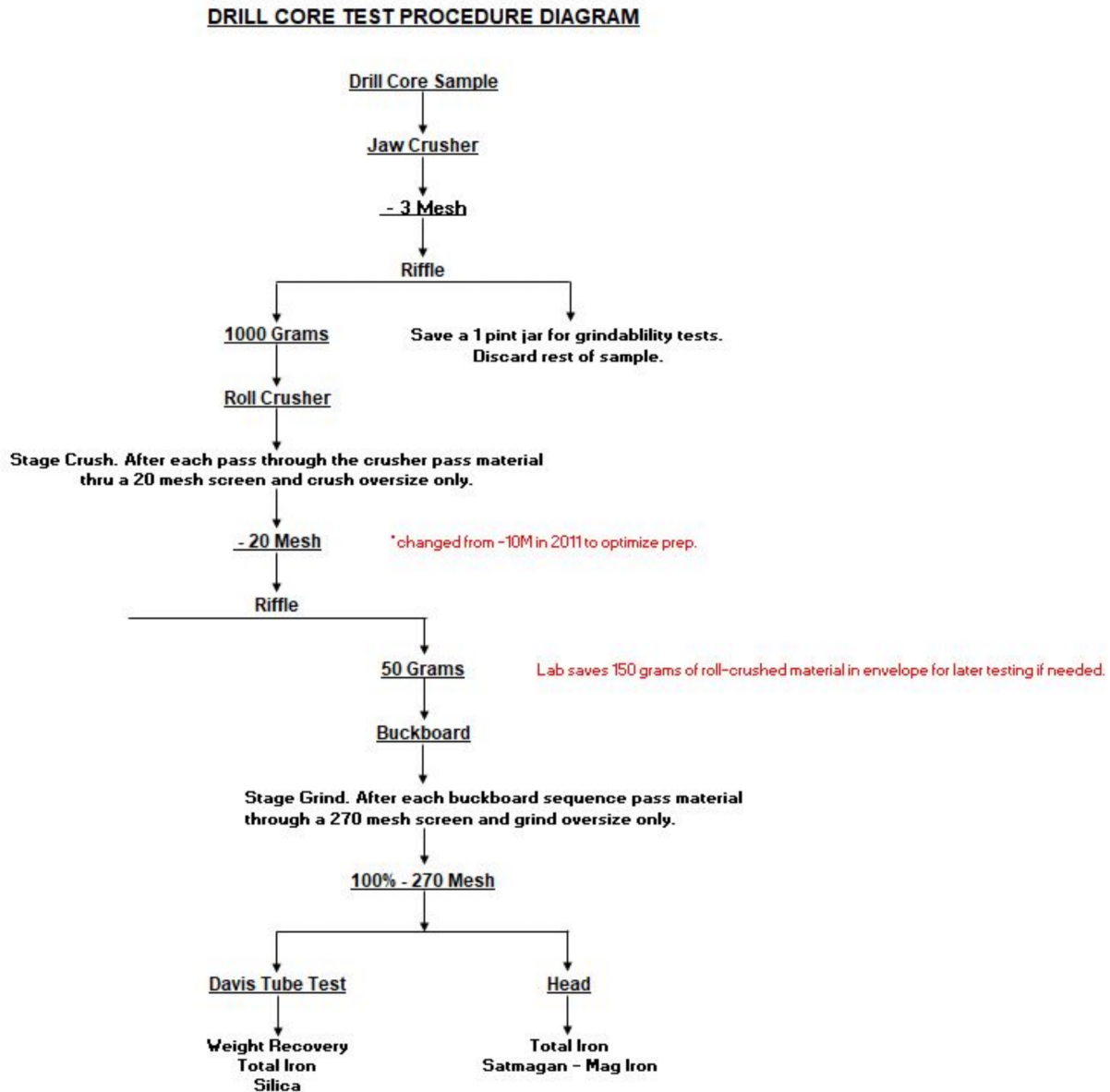
Drill core samples are put into a jaw crusher and reduced to -3 mesh. Note, only a select few drill holes have been cut or split, based on need by the geologist/engineer as a reference for lithology logs or as a legal requirement outlined in the exploration lease (State of Minnesota). The sample is split, with 1,000 g being put into a roll crusher and reduced to -10 mesh. A buckboard and muller are used to grind a 50 g split of the sample to 100% -270 mesh. The buckboard is a cast iron plate with three steel sides and a smooth upper surface. It measures 18 in. by 24 in. The buckboard and muller pulverization method is used to reduce small amounts of -10 mesh material to -270 mesh under controlled conditions. The sample to be pulverized is poured on a 270 mesh screen, and oversize material is placed on the buckboard. The muller is passed over the sample multiple times, and the ground material is screened on the 270 mesh screen. Material that is +270 mesh is returned to the buckboard and the process is repeated until the entire sample is ground to -270 mesh. The buckboard and muller grinding method provides a more consistent particle size distribution than a pulverizer and requires less time than grinding mills.

11.1.2 Sample Analysis

Samples are analyzed by a Davis Tube analysis and Saturation Magnetization Analyzer (Satmagan) analysis to determine the crude MagFe percent, percent weight recovery (wtrec), and concentrate silica. A flowsheet of sample preparation and analysis is illustrated in Figure 11-1.



Figure 11-1: Drill Core Test Procedure Workflow



Source: Cliffs 2021

11.1.2.1 Davis Magnetic Tube Separation Method

Davis Tube analysis involves a ground sample suspended in water being moved back and forth along the length of the tube, while a magnet is positioned in a mid-point in the tube. The magnetic material in the sample clings to the side of the tube where the magnet is positioned. This magnetic material is then collected and weighed to determine weight recovery % (as compared to the initial weight of the sample that enters this process). After weighing, the material then goes through a wet chemical process in which silica is digested and separated from the iron oxides. This material is again weighed and compared to the starting weight, which then provides the percent silica in the total sample.



Per Minorca laboratory procedure WI 22-W-010, the magnet is electric and is set at 1.7 A, and the DT motor is set 100 tube strokes per minute for 10 minutes. Separated products of the test include tails and the tube concentrate. The excess head material is analyzed with the Satmagan for magnetic iron (described below).

The DT tails are usually discarded but can be saved for future testing upon request. The concentrate is tested for silica by wet chemistry methods (described below).

A 20 g (0.71 oz) sample (100% passing 270 mesh) is put through the DT magnetic separator. Wash water flow of 0.4 gpm is verified prior to each use. After the sample is run in the Davis Tube, the sample is dried and demagnetized. A weight is taken of the DT concentrate, and silica content of the concentrate is determined by wet chemistry. As 20 g are used in the Davis Tube test, the weight recovery percent fraction is simply the dry weight of the concentrate multiplied by 5.

11.1.2.2 Satmagan Magnetic Iron Determination

A direct measure of the magnetic iron of the crude ore is measured with a Satmagan, which measures the total magnetic force acting on a sample to a precision of 0.1%. Satmagan analysis involves a ground sample being placed into a Satmagan machine to measure the magnetic field of the sample, which is then reported as a percent MagFe in the sample. This machine is calibrated to a standard sample of known MagFe content on a bi-weekly basis by laboratory personnel.

The Satmagan is a magnetic balance, in which the sample is weighed gravitationally and in a magnetic field. The ratio of the two weights is linearly proportional to the amount of magnetic material in the magnetically saturated sample.

Per Minorca laboratory procedure 22-W-011, a minimum of two grams of sample ground to 100% -270 mesh is needed for Satmagan analysis, and the sample to be tested is placed in a plastic testing container. The prepared sample is de-magnetized using the de-magnetization coil (de-mag coil). While the de-mag coil is on, the sample is moved into and out of the magnetic field until the sample is de-magnetized. The sample is placed on the magnetic balance, and the strength of the magnetic field is noted.

Hydrofluoric acid silica determination

Silica values reported are based on ASTM E247-96, Standard Test Method for Determination of Silica in Manganese Ores, Iron Ores, and Related Materials by Gravimetry. Per procedure 22-W-50, samples are first partially digested in hydrochloric acid to dissolve the non-silica components of the sample. The sample is then filtered and rinsed with distilled water. The rinsed sample is then treated with hydrofluoric acid and sulfuric acid to dissolve the silica and remove residual iron, aluminum, and titanium. The silica is desiccated to drive off water, and the weight is recorded.

11.1.2.3 Density

Density measurements on drill core started in 2012 and take place on site in Minorca's logging facility. In 2012, several density measurements were tried. Methods that accounted for porosity, such as wrapping cellophane wrapper around the core to maintain an impermeable core sample, did not work well. The wrapper failed in several instances with several types of wrappers used. Thus, a simple weight wet versus weight dry test was used and is summarized below. This was deemed sufficient, as taconite is relatively impermeable.



Core was selected from 14 drill holes by the mine geologist to be measured for density. The first step is to measure the mass of the sample, then measure the mass of the sample totally submerged in water. Because of water's buoyant force, the sample will weigh substantially less. The difference between those measures is equal to the mass of water displaced. Because water has a density of 1 g/cm³, the mass of the water is also the volume of water displaced and the volume of the sample.

At a minimum, a six-inch hand sample was tested for every assay interval. Waste rock that was not assayed was tested approximately every 20 ft. In order to accurately represent each interval, samples were chosen along the full interval and with the same coloration and apparent composition as the interval.

Density was determined by dividing the "Mass of sample in air" by volume.

$$\text{Bulk density} = \frac{\text{Mass of sample in air}}{\text{Mass of sample in air} - \text{mass of sample in water}}$$

$$\text{Convert from g/cm}^3 \text{ to Ft}^3/\text{LT: } \frac{1}{0.02786962527(\text{g/cm}^3)}$$

$$\text{Convert from Ft}^3/\text{LT to g/cm}^3: \left(\frac{1}{(\text{Ft}^3/\text{LT})} \right) \times \left(\frac{35.881358}{1} \right)$$

It was determined from the data measured and analyzed that the values were very similar to those previously used at Minorca for each subunit. Very little difference was found between core from the East 1 Pit and Central area, which is consistent with those characteristics observed in core logging. Currently, all density values are kept as previously used due to the similarity of values and the small data set available (Table 8-1).

Table 11-1: Minorca Current Density Values

Material Type	Tonnage Factor (ft ³ /LT)	Density (g/cm ³)	Notes
Ore	10.80	3.32	MagFe > or = 16% regardless of lithological unit
Lean Taconite	11.25	3.19	MagFe > 10% but < 16% regardless of lithological unit
Waste Rock	12.27	2.92	Regardless of lithological unit
Overburden	15.00	2.39	Laurentian deposit (higher content of gravel and cobbles)
Overburden	18.00	1.99	East deposit

11.2 Quality Assurance and Quality Control

Quality assurance (QA) consists of evidence to demonstrate that the assay data has precision and accuracy within generally accepted limits for the sampling and analytical method(s) used in order to have confidence in a resource estimate. Quality control (QC) consists of procedures used to ensure that an adequate level of quality is maintained in the process of collecting, preparing, and assaying the exploration drilling samples. In general, QA/QC programs are designed to prevent or detect contamination and allow assaying (analytical), precision



(repeatability), and accuracy to be quantified. In addition, a QA/QC program can disclose the overall sampling-assaying variability of the sampling method itself.

Minorca does not yet have a formal procedure for exploration drill core QA/QC. When SLR audited Minorca's Mineral Resource documentation in winter 2021, it recommended that there be a campaign QA/QC report for every DD hole program and formal documentation of QA/QC procedures.

Minorca has not historically included duplicate samples or reference samples of known value in diamond drilling sample analysis programs. In summer 2021, 50 blind duplicate samples sourced from ore crushed to $\frac{1}{2}$ in., spanning the period of drilling since 2003, were analyzed as a check assay program using Minorca's normal Davis Magnetic Tube Test (DMTT) for ore characterization. Results were compared to original data for the KEVs of crude Satmagan MagFe, concentrate SiO_2 , and weight recovery. The coarse reject duplicates were accompanied by 10 blind reference samples (crushed to $\frac{1}{4}$ in.) that are normally inserted in the nearby UTAC operation DD hole programs. In addition, Lerch Brothers International (Lerch) laboratory conducted a wet chemistry total Fe assay of each DT concentrate generated by the Minorca laboratory for this study. Lerch is accredited with ASQ/ANSI ISO-9001:2015 for its system of quality management. In tandem with the DT weight recovery, the concentrate iron data allowed calculation of magnetic iron for a direct, method-independent comparison with Minorca's crude Satmagan MagFe results.

Results from the duplicate samples and reference samples are presented in the following sections.

It is the QP's opinion that Minorca's sample preparation and analytical QA/QC results from a suite of blind duplicates spanning from 2003-2021 are adequate to validate the drill hole assay database used for Mineral Resource estimation and meet NI 43-101 reporting standards. Sample preparation and analyses follow established, written procedures.

11.2.1 QA/QC Procedure

There is no formal Minorca QA/QC procedure for drill core processing and analysis. For future campaign reports, a formalized procedure should be referenced in the report.

Prior to the 2021 verification QA program, no standards, blanks, or duplicate samples were inserted into the stream of diamond drilling samples and current laboratory quality practices are not directly tied to the resource drilling. The Minorca laboratory has procedures for sample preparation and analysis that are maintained in a company SharePoint site. The laboratory maintains its equipment by routine inspections internally as well as checks by an independent outside laboratory, the Natural Resources Research Institute (NRRI), located in Coleraine, Minnesota. Maintained as part of the University of Minnesota, NRRI is not currently an accredited laboratory. The Satmagan is re-calibrated whenever it does not pass verification with standards. Standards are checked bi-weekly or whenever maintenance is performed, whichever is more frequent. Minorca also has an XRF, re-calibrated when an x-ray tube is replaced; however, XRF data are not used in the resource estimation.

Templates for QA/QC analysis of standards and duplicates to be submitted with future diamond drilling were created in 2021.

11.2.2 Reference Materials (Standards)

Minorca does not have its own crude ore reference "standard" material. The 2021 verification QA program borrowed from a reserve of crude ore UTAC standard samples, which were



prepared from ore-grade material collected from the United Taconite Thunderbird North (TBN) mine. A 10-tonne (metric ton of 2,204.6 lb) sample was crushed to $\frac{1}{4}$ in., homogenized, and then split into approximately 5 kg subsamples by the Coleraine Mineral Research Laboratory of the University of Minnesota. The standard was analyzed according to Minorca's current crude ore characterization procedure and underwent the same series of preparation, magnetic separation, and chemical assay steps that crude ore samples undergo (DMTT of a 100% -270M prepared sample).

Standard(s) samples submitted in conjunction with DD samples did not exist prior to the 2021 verification QA program. Statistical process control (SPC) charts for individuals mean ($\bar{x}$) and moving range ($\overline{MR}$) were generated for all physical and chemical measurements and calculated variables from the DT crude ore characterization protocol (Figure 11-2 to Figure 11-4).

Data discussed in this Technical Report include only the 10 blind UTAC standards analyzed in the 2021 QA/QC verification campaign. Data are currently tracked on spreadsheet stored on the CTG LAN (Orobona, 2021). As the resource QA/QC database expands, results will be e-mailed to the site geologist or shared in a central location.

Control limits are based on the common approach for Shewhart control charts. For individuals mean charts, control limits are $\pm 2.66 * \text{Mean}_{\text{moving range}}$. For the MR charts, control limits are $3.267 * \text{Mean}_{\text{moving range}}$. In both cases, 1σ and 2σ are respectively one-third and two-thirds of the difference between the mean(s) and control limits. This approach is commonly used in statistical process control software and narrows control limits relative to three standard deviations (SD) from the mean of the data.

11.2.2.1 Sample Preparation

Screen size analysis was not run on the UTAC standards analyzed in the check assay study, and consistency in sample preparation over time is not known for historical samples. Variations in sample preparation and size distribution of prepared samples can have a material impact on the results of analysis (Orobona, 2015; Orobona, 2016 a-c). The Minorca laboratory should consider generation of its own crude ore standard, specific to diamond drill campaigns, that permits screen analysis following crushing but prior to pulverization to passing -270 mesh.

11.2.2.2 Satmagan Magnetic Iron 2021

Crude % Satmagan MagFe is derived from Satmagan. All data from the 2021 verification study (Figure 11-2) using UTAC standards were in apparent control; however, the dataset is still relatively small for a robust statistical analysis. The average value is 23.0 (standard deviation 0.9). Lerch analysis of this standard has averaged 22.5% crude MagFe (standard deviation 0.5) over the past several years, since the onset of periodic calibration with the Hibbing Taconite laboratory.



Figure 11-2: Satmagan Magnetic Iron 2021



Source: Cliffs 2021.



11.2.2.3 Calculated Magnetic Iron 2021

Calculated % MagFe is derived from the multiple of % wtrec and DT concentrate total % Fe by wet chemistry, divided by 100. All data from the 2021 (Figure 11-3) verification study using the UTAC standard were in apparent control; however, the dataset is still relatively small for a robust statistical analysis. For the purposes of this study, Lerch conducted the wet chemistry, as its fused bead method of XRF consumes a much smaller sample than the pressed puck method used at Minorca, which requires more sample than is typically recovered by the Davis Tube.

The average value is 21.9 (standard deviation 0.7). Lerch analysis of this standard has averaged 21.7% crude MagFe (standard deviation 0.4) over the past several years.

Figure 11-3: Calculated Magnetic Iron 2021



Source: Cliffs 2021.



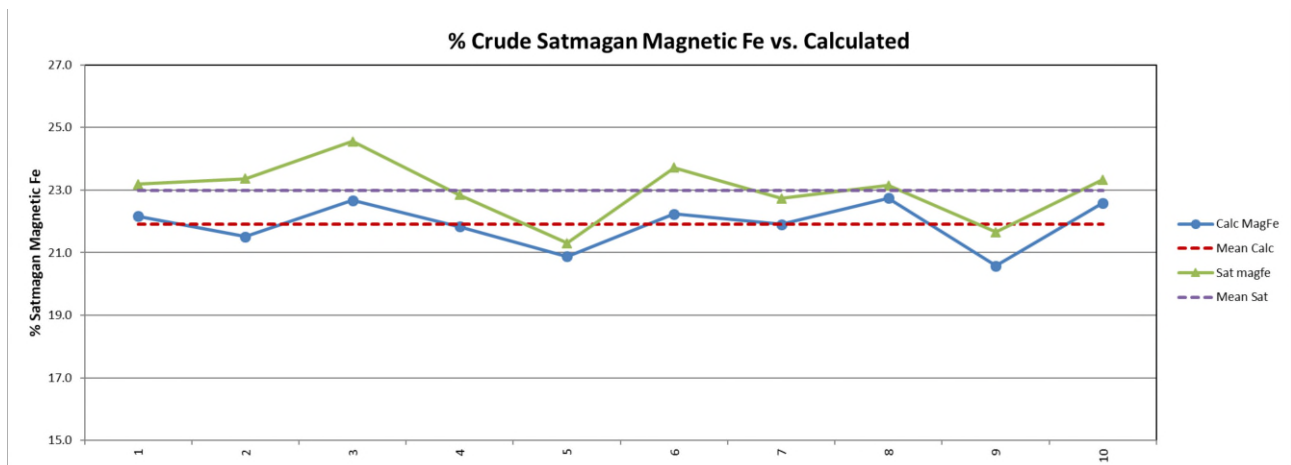
11.2.2.4 Calculated versus Satmagan Magnetic Iron 2021

Figure 11-4 illustrates calculated MagFe versus Satmagan MagFe for the crude samples. Systematic changes in the ratio between values merit investigation but were not observed over the time period covered in this Technical Report.

Note, historically, the nearby UTAC operation gives the DT (calculated) MagFe priority as long as the Satmagan MagFe/DT MagFe ratio is greater than 0.92; if less than 0.92, UTAC uses the Satmagan MagFe.

Considering the good agreement in standards for calculated MagFe between UTAC and Minorca (Lerch conducted iron analysis for both data sets), the relatively good precision in weight recovery, and relatively poor precision of Satmagan measurements (Figure 11-2), Minorca may wish to consider using a calculated MagFe (except where the ratio is below an established threshold as at UTAC).

Figure 11-4: Calculated Magnetic Iron versus Satmagan 2021



Source: Cliffs 2021.



11.2.3 Duplicates

During 2021, 50 blind, duplicate coarse crush reject samples (-½ in.) from exploration drilling between 2003 and 2021 were analyzed as a verification assay program, and results were compared to original data for the KEVs of Satmagan MagFe, concentrate SiO₂, and weight recovery. All duplicate pairs were selected from 14 DD holes, across the spectrum of ore units. The coarse crush reject duplicates were accompanied by 10 blind reference samples, the results of which are described in Section 11.2.2. The 50 duplicate samples and 10 reference samples were submitted to the Minorca laboratory and were subjected to the same processing and analyses as the primary samples to determine the degree of heterogeneity in the coarse-crushed sample material for head grades and the precision of metallurgical results obtained from a split of course-crushed reject. The one additional step was provision of total Fe wet chemistry for the DT concentrates provide by Lerch.

For each analyte or measured/calculated variable, plots generated include x-y (scatter) and a time series of mean relative percent difference. The latter chart normally illustrates variation in precision with time, which is not applicable for such a short timeframe study.

Scatter plots include the standard least squares trendline (the typical regression used by spreadsheet software). A second least squares trendline is generated assuming all error in "X." The reduced major axis (RMA) line assumes that neither axis depends on the other, and is a best-fit regression that should closely trend with the 1:1 line for a sample set in good precision.

Control limits to the mean relative percent difference between duplicate pairs are based on 3SD from the mean of data, where 1σ and 2σ are obviously 1SD and 2SD from the mean of the data. The Shewhart control approach used for the standards is not appropriate, since the QC metrics are not currently set up to track moving range.

Also monitored are Thompson and Howarth plots (Thompson and Howarth 1978), where the mean of each replicate pair is plotted against the absolute difference between the two analyses. On these plots, lines are drawn for any predefined precision level (e.g., 10% and/or 20%) and percentile (e.g., 90th or 99th), and the overall quality of the replicate analyses at different concentration ranges can be grasped at a glance. Precision within 20% is recommended for Minorca data unless otherwise noted. Pairs that deviate from the general trend should be identified and discussed with the laboratory. Two additional ways to plot the same results include plotting the mean of duplicates against the ratio between duplicates (the Ratio) and the mean of duplicates against the relative standard deviation (RSD). For the case of a duplicate pair, RSD is the square root of the square of the difference divided by two, divided by the duplicate pair mean:

$$RSD = \sqrt{[(x_1 - x_2)^2 / 2] / (x_1 + x_2) / 2}, \text{ expressed as a percentage.}$$

An acceptable RSD of 15% is approximately equal to the recommended 20% relative difference acceptance.

Each plot has advantages and disadvantages; using all four provides insight into data quality and analytical precision.

As the duplicate samples were processed in a single batch in mid-2021, in many cases individual duplicate results are several years older than the original sample analysis. The Ratio plots are particularly useful to illustrate the possibility of time-based biases between the original and duplicate data sets.



Data presented in Figure 11-5, Figure 11-6, and Figure 11-7 include only the 50 blind duplicates analyzed in the 2021 QA/QC verification campaign (Orobona 2021). As the resource QA database expands, results will be e-mailed to the site geologist and shared in a central location.

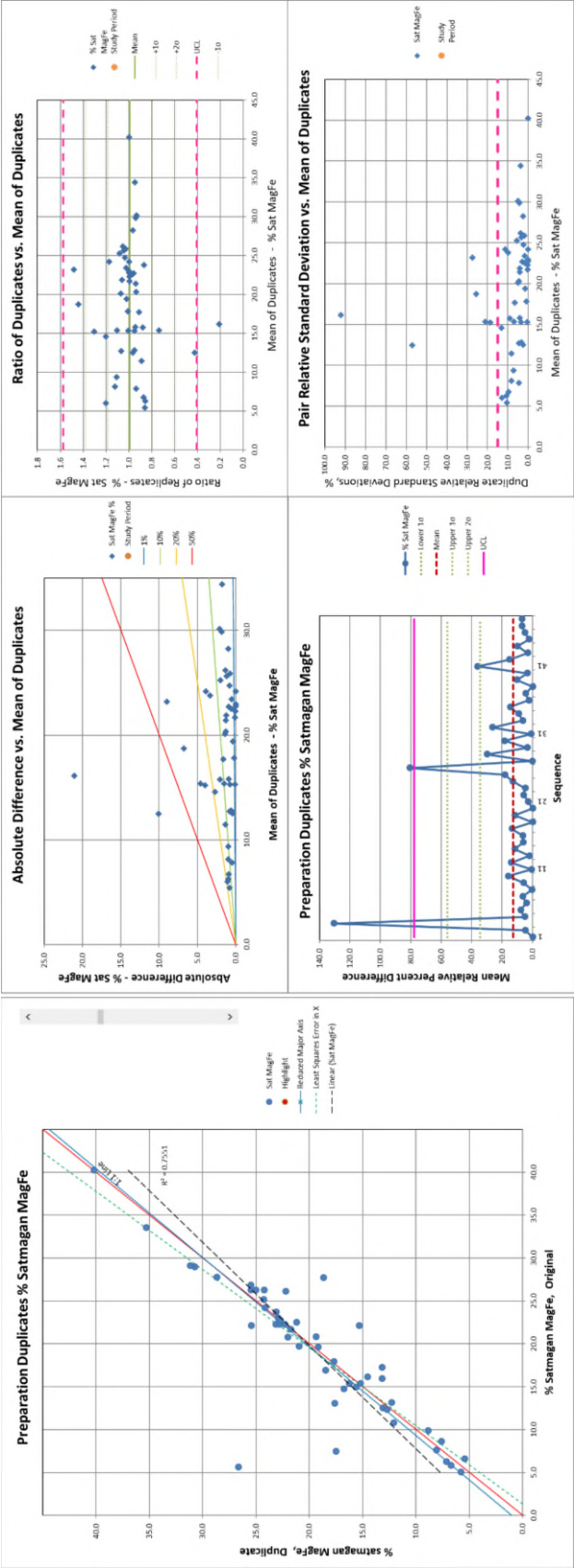
11.2.3.1 Satmagan Magnetic Fe Preparation Duplicates

For six of the 50 duplicate pairs, the absolute difference is more than 20% of the mean for Satmagan MagFe and, though the RMA is close to the 1:1 line, this demonstrates only adequate precision for the site's principal ore grading variable. For at least two points (those with absolute difference greater than 50% of the pair's mean), the sample analyzed in 2021 was demonstrably different than the original sample, as both original and duplicate samples' Satmagan MagFe were consistent with their respective DT weight recoveries. This flags a risk of errors due to sample handling and archival. For a third sample, the original Satmagan MagFe is not consistent with DT weight recovery, a potential data entry error.

There is no apparent time bias based on the Ratio plot, and it is unclear whether that plot indicates improved precision with grade.



Figure 11-5: Satmagan Magnetic Iron Preparation Duplicates



Source: Cliffs 2021.



11.2.3.2 Satmagan Magnetic Iron versus Calculated Magnetic Iron (2021 samples only)

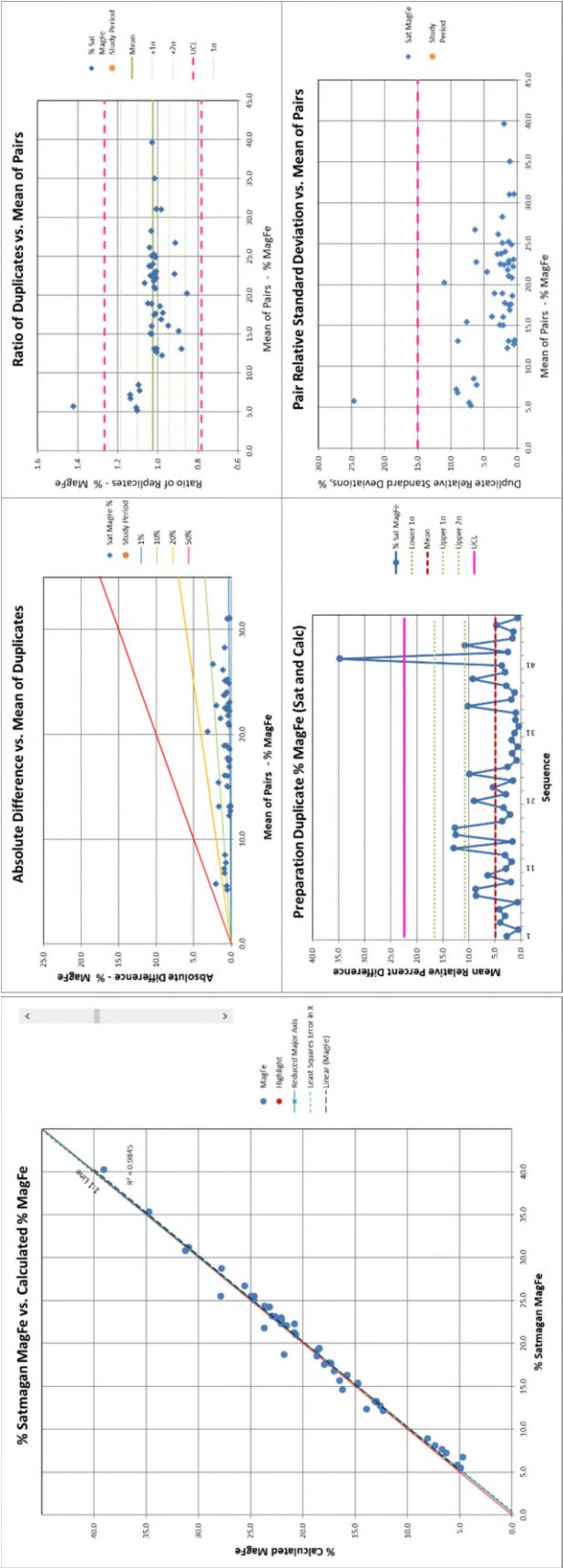
The illustrated samples are not duplicate pairs. Instead, Figure 11-6 is a plot of Satmagan MagFe for the duplicate samples analyzed in 2021 versus magnetic iron calculated from Davis Tube for the same samples. Calculated magnetic iron is a function of:

$$\% \text{ MagFe}_{\text{calculated}} = \% \text{ Fe}_{\text{DT Concentrate}} \times \% \text{ weight recovery} / 100$$

The QP notes that Lerch conducted the concentrate Fe analyses for this data set. For all but one of the 50 samples, the absolute difference is less than 20% of the mean for method pairs, the large majority are within 10%, and the RMA is very close to the 1:1 line, demonstrating good agreement between these methods of estimating magnetic iron. There is, however, an apparent high bias in the Satmagan results (39 of 50 samples); exceptions to that do not appear to be a function of material type (geology), geographic location, technician, or date of original sample.



Figure 11-6: Satmagan Magnetic Iron vs. Calculated Magnetic Iron (2021 samples only)



Source: Cliffs 2021.



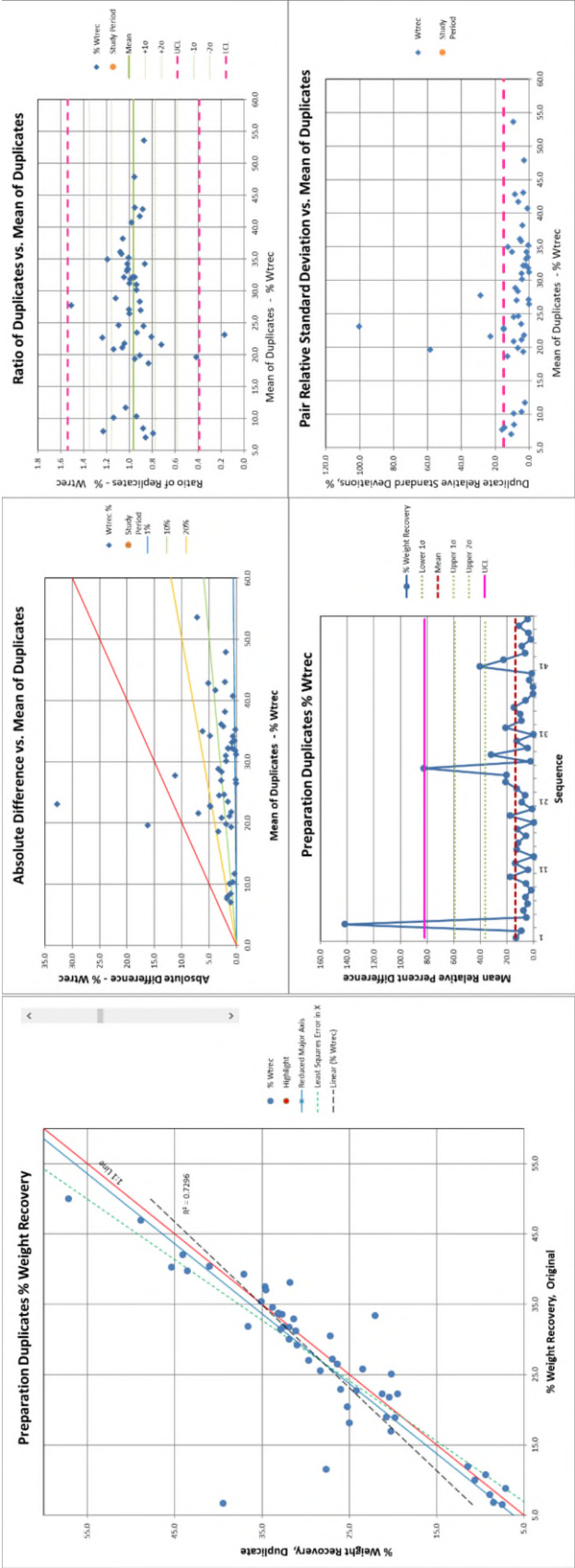
11.2.3.3 Weight Recovery Preparation Duplicates

Weight recovery is the weight proportion of concentrate recovered by the Davis Tube. For all but four duplicate pairs from the 2016-2019 study period (Figure 11-7), the absolute difference is within the recommended 20% of the mean for weight recovery, and the RMA is very close to the 1:1 line, demonstrating good precision considering that at least two of the failures are established to be a result of switched/wrong samples. The apparent bias towards higher duplicate results is largely driven by the fliers and is very unlikely to be time dependent. The Ratio plot appears to indicate increasing precision with increased recovery.

The typically better precision in weight recovery relative to Satmagan MagFe supports using a calculated crude MagFe value (at other Cliffs' sites) unless variation in Satmagan results can be reduced. That no such better precision is observed in these data is an indicator of inhomogeneity between prepared duplicates.



Figure 11-7: Weight Recovery Preparation Duplicates



Source: Cliffs 2021.



11.2.4 Blanks

Due to the preponderance of metallurgical testing rather than traditional assays, blanks are not recommended in conjunction with QA/QC procedures, nor are they relevant.

11.2.5 Check Assays

Check assays have been sporadically conducted using Lerch. Other potential external providers include the NRRI laboratory in Coleraine, Minnesota and Midland Research in Marble, Minnesota.

Lerch, accredited with ASQ/ANSI ISO-9001:2015 for their system of quality management, is a small, independent provider that relies on Cliffs' facilities and equipment.

For the 2021 DD holes characterization program, the Minorca laboratory sent a small number of samples to Lerch as checks (Table 11-2 and Figure 11-8). Lerch normally bucks its DT samples to 100% passing 200 mesh for other customers. Minorca usually bucks to 100% -270 mesh; however, Lerch erroneously processed the six samples using their standard -200 mesh process. While Satmagan analyses of the crude should be comparable, samples ground finer (-270 mesh) should have a lower weight recovery and lower concentrate silica grade, so direct comparison of the DT results is not possible. The QP notes, however, that the sample results flag a potential analytical precision improvement opportunity.

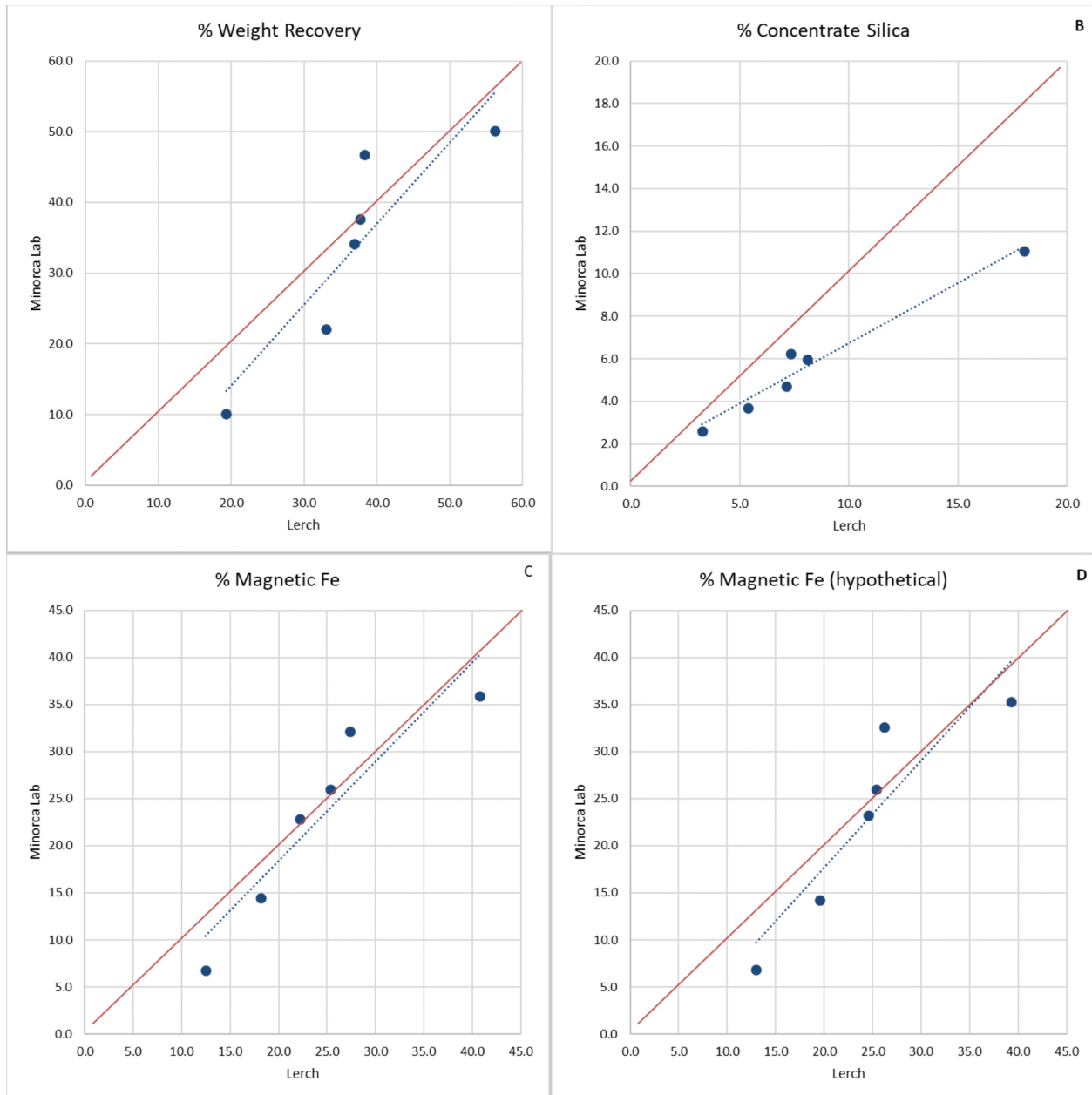


Table 11-2: Summary of 2021 Check Assay Program

DD	From	To	Wtrec %			% SiO ₂			% MagFe			Hypothetical % MagFe		
			Lerch	Minorca	Δ %	Lerch	Minorca	Δ %	Lerch	Minorca	Δ %	Lerch	Minorca	Δ %
75-58	314	327	36.93	34.15	8.15	8.09	5.95	35.97	22.17	22.8	-2.8	24.6	23.2	5.7
84-60	286	296	38.27	46.75	-18.15	5.38	3.69	45.80	27.39	32.11	-14.7	26.2	32.6	-19.6
122-22	92	103	33.00	22.05	49.66	18.04	11.08	62.82	18.17	14.44	25.8	19.6	14.2	37.9
132-22A	49	61.5	56.13	50.10	12.04	3.27	2.61	25.29	40.75	35.91	13.5	39.3	35.3	11.3
132-22B	218	229.5	19.33	10.10	91.42	7.34	6.22	18.01	12.45	6.77	83.9	13.0	6.9	89.1
85-46	66	74	37.73	37.65	0.22	7.12	4.71	51.17	25.38	25.98	-2.3	25.4	26.0	-2.3



Figure 11-8: Plots of Key Grading Ore Characterization Data for Six Check Samples Processed and Analyzed by Both Lerch and Minorca Laboratories



Source: Cliffs 2021.

There is a high degree in difference between the laboratories' weight recovery and silica results for individual sample pairs shown in Table 11-2 and illustrated in Figure 11-9, even if the overall sample sets show a high degree of correlation despite recovery/grade biases expected from differing buckboard %-passing targets. In particular, the least-squares regression trendline for silica on Figure 11-9B demonstrates a higher-silica bias and linear trend diverging from the 1:1 line that reflects the different liberation profile of samples bucked to -200 mesh versus -270 mesh. For five of the six sample pairs, the absolute value of the difference between duplicates is greater than 20% of the mean of the duplicates as shown in Section 11.2.3. This is not



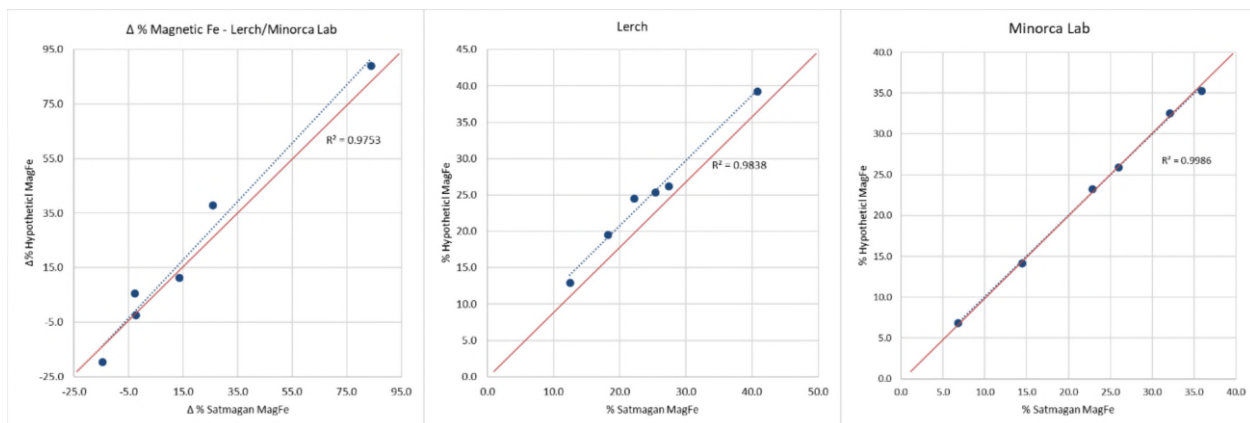
unexpected with different sample preparation techniques. The variation observed in sample pairs for crude Satmagan MagFe is more problematic. Though sample preparation (grind size) and packing can have some impact on Satmagan results, these should be minor; however, two of the six sample pairs (33%) would be “fails” in terms of RSD or Thompson and Howarth plots. This could be a factor of Satmagan calibration or natural variation in the sample.

As an additional check of the magnetic iron results, and without a concentrate Fe analysis to generate a “calculated magnetic iron” from DT weight recovery, a “hypothetical % crude magnetic iron” was calculated for the Lerch and Minorca samples using assumed concentrate stoichiometry and weight recovery (Table 11-2), where:

$$\% \text{MagFe}_{\text{hyp}} = ((100 - \% \text{SiO}_2) * 0.7236) * \% \text{wtrec} / 100$$

This assumes that magnetite is near-perfectly recovered and that the concentrate is composed entirely of magnetite (72.36% Fe) and silica. The hypothetical crude magnetic iron should be independent of the Satmagan results; however, the difference in actual Satmagan results between the laboratories is very similar to the hypothetical difference based on DT recovery (Table 11-2). In addition, for both Lerch and Minorca laboratories, the hypothetical magnetic iron values are very similar to the actual Satmagan values (Table 11-2).

Figure 11-9: Relationship of Satmagan Magnetic Iron and Hypothetical Magnetic Iron (Based On Weight Recovery and Magnetite Stoichiometry) for Minorca and Check Laboratory Samples



Source: Cliffs 2021.

In summary, the Satmagan and DT results are internally consistent for each laboratory. This suggests that variation in crude magnetic iron for individual sample pairs is much less a function of the instrumentation than sample heterogeneity (preparation of a replicable sample).

Separately, the Satmagan and DT results illustrates that concentrate silica grade at different grinds (liberation) is not a 1:1 function. There will also be a bias in weight recovery towards decreased recovery with a finer grind; however, the current (bucked to) 100% -270 mesh DT test does not necessarily reflect the actual plant target of 82% passing 325 mesh from the ball mill, nor the -500 mesh sizing of flotation regrind. Therefore, weight recovery and concentrate silica from the DT test give little information concerning relative liberation at varying grinds, and these modeled variables are not used at all for ore grading (weight recovery) or are only used as a general indicator of ores requiring flotation (silica).



11.2.5.1 Comparison with Previous Years

The 2021 QA/QC campaign was the first consistent, formal assessment of exploration drilling data accuracy and precision conducted for Minorca. Future QA/QC campaign reports will detail comparisons with previous years' reports.

11.3 Sample Security

11.3.1 Chain of Custody

The mine geologist transports the drill core in boxes from the drill rig to the secure core logging area. In this area, the core boxes are opened and logged by the geologist, who verifies the driller's footage marks and records observations into MS Excel spreadsheets for each diamond drill hole. Density measurements of core are taken on site at Minorca. The core is securely stored, and then transported to the Minorca laboratory for analysis. In the opinion of the QP no tampering of the drill core occurred in route to the assay laboratory, and the logging and sampling methods were professionally conducted in an unbiased manner.

11.3.2 Laboratory

Samples from the Mine are collected from the logging facility on the Property by the geologist and delivered by the geologist to the onsite Minorca laboratory. Regular internal audits are conducted by the geologist, in which saved samples are rerun by an outside laboratory (Lerch, started in 2011) as a check on the Minorca laboratory.

Samples are physically dropped off by the geologist. The geologist delivers a list of sample intervals to the laboratory supervisor. The laboratory supervisor manages the assaying procedures and submits completed assay values to the geologist. Any issues or questions are addressed by the geologist and laboratory supervisor during these procedures.

11.3.3 Security

Samples are handled by the geologist from field to the laboratory. The core logging building is an isolated building, and minimal personnel have access. Starting in 2011, saved samples have been stored on site in shipping containers. Note that historical samples are preserved in the Old Training center (logging facility) as well as the onsite "Tin Shack" location at Minorca.

11.4 Conclusions

Cliffs is developing a program of QA/QC that includes standards and duplicates and control-chart analysis, a program that did not exist for the previous more than 40 years of mine operation. When SLR audited Minorca's Mineral Resource documentation in early 2021, it recommended that there be a campaign QA/QC report for every DD hole program and formal documentation of QA/QC procedures.

QA/QC results for the 2021 verification study are appropriate for the style of mineralization and are sufficient to generate a drill hole assay database that is adequate for Mineral Resource estimation in accordance with international reporting standards. In conjunction with good agreement between planned and actual product produced over more than 40 years, it is the QP's opinion that procedures meet minimum industry guidelines. The QP notes, however, that there are opportunities for significant improvement in both accuracy and precision of concentrate silica and other calculated resource variables. The starting point for improving sample precision is in sample preparation; specifically, the jaw crush to -1/2 in. may be too



coarse based on results from five check samples analyzed for the 2021 assay verification program. For the other Minnesota sites, the archived coarse reject is 100% -¼ in.

Two of the 50 sample pairs (4%) are most likely not duplicates of the same sample, which indicates an opportunity to improve archival/storage and organization of reserved coarse reject.

Minorca's bench characterization (100% -270 mesh DT test) is very simple; however, there is no capability to measure relative liberation characteristics at varying grind or grade targets as at other nearby mines, so two of the three estimated block model variables are not used for direct resource/reserve determination or ore grading.

As Minorca uses an internal laboratory, a mechanism for submission of blind QA/QC samples would help improve transparency for statutory reporting. In addition, ISO or similar accreditation will improve the confidence of external QPs for classifying and signing off on Minorca's Mineral Reserves.

The QP is of the opinion that Minorca's sample preparation and analytical QA/QC results from the 2021 reporting period are acceptable to validate the drill hole assay database used for Mineral Resource estimation and meet NI 43-101 reporting standards. The samples are securely delivered to the assay laboratory, and the logging and sampling methods are professionally conducted in an unbiased manner.

11.5 Recommendations

- 1 Minorca laboratory should work towards ISO certification.
- 2 Minorca should develop a formal QA/QC procedure that includes preparation of a similar QA/QC campaign report following every annual diamond drilling program. The procedure should include:
 - a) Overview
 - b) Changes from previous years
 - c) Required insertion rates of standards and duplicates
 - d) Failure metrics
 - e) Failure actions
- 3 QA/QC results documented in this Technical Report support an initial standard and duplicate submission rate of 5% each.
- 4 Minorca should continue to submit a small number of "preparation duplicate" samples to a secondary accredited laboratory to confirm that results are comparable to those of Minorca's internal laboratory.
- 5 Minorca should continue to utilize the crude ore bulk UTAC standard for the present time. A bulk standard sample with different grade and liberation characteristics should be generated so the laboratory provider does not know which standard was provided.
- 6 If a formal process for ensuring blind duplicates is unfeasible, spot duplicates generated from crushed coarse reject (½ in.) retrieved by a mine engineering employee should be considered for occasional re-submission (three to five per drill campaign).
- 7 Investigation of opportunities to reduce error in the sample preparation steps ahead of the Davis Tube is recommended as a first action in isolating root causes of relatively poor precision in concentrate silica between separately prepared duplicate samples. In



particular, the degree of sample heterogeneity due to the relatively coarse crush ($-\frac{1}{2}$ in.) ahead of splitting/sampling should be investigated.

- 8 Minorca should investigate how the -270 mesh DT test can be supplemented by additional bench characterizations of DD samples, which incorporate predictive variables that better reflect model plant targets (grind/grade) and magnetite liberation in the block models used for mine planning.



12.0 Data Verification

Data verification is the process of confirming that data has been generated with proper procedures, is transcribed accurately from its original source into the project database, and is suitable for use as described in this Technical Report.

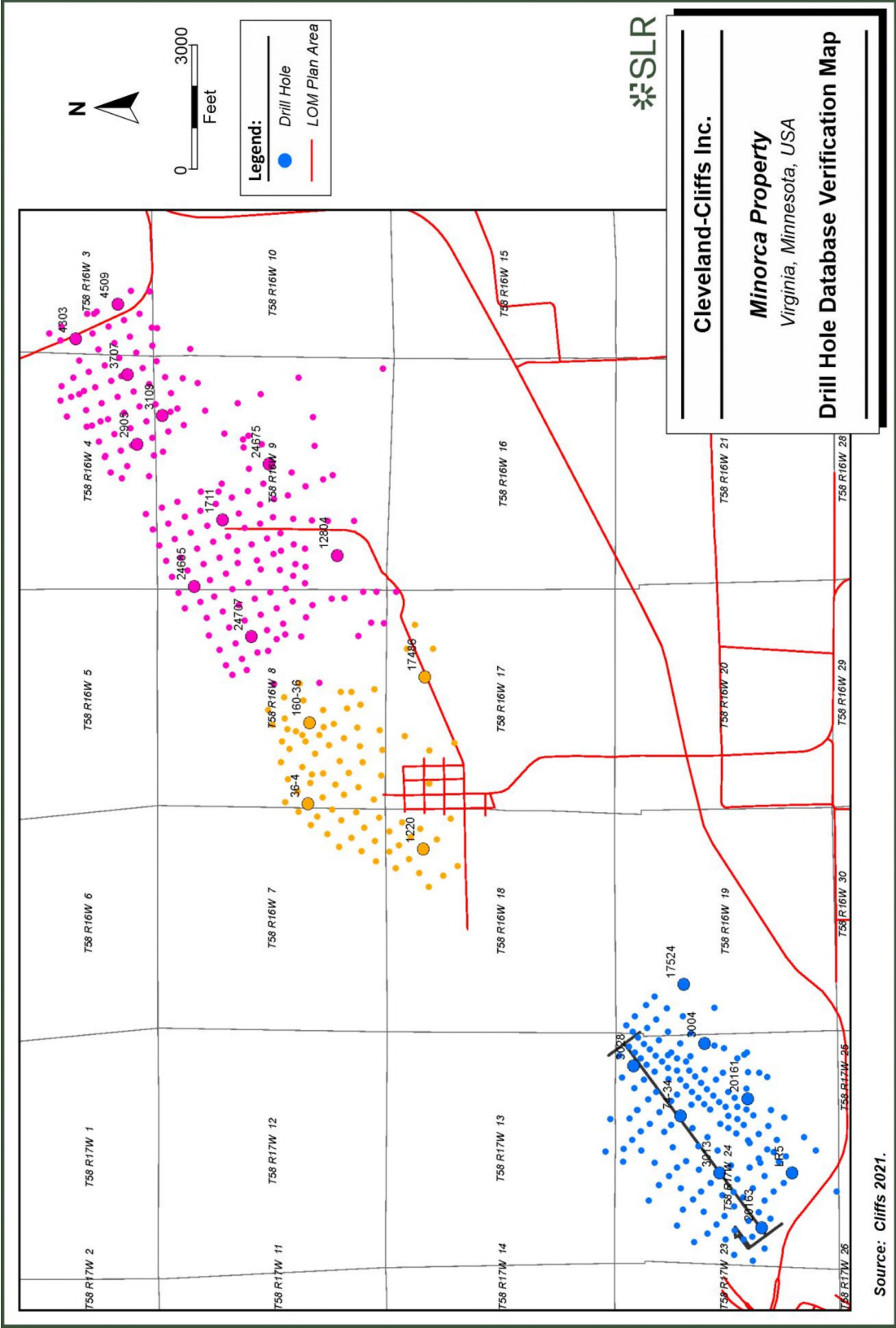
12.1 Procedures

Cliffs performs routine drill hole database verification with every new DD program and new block model build, including:

- Check of unique drill hole IDs and collar coordinates
- Check of assay or lithology points extending past the specified maximum depth of drill hole
- Check of abnormal dips and azimuths of downhole drill hole survey
- Check of negative, overlapping, and missing intervals
- Check of incorrect lithologic codes and assay values
- During 2021, a data verification exercise was performed by Cliffs geologists within the life of mine (LOM) plan area and audited by SLR for accuracy and completeness. Of the 443 holes in the current mine plan, 22 (four in Central, 10 in East, and eight in Laurentian), or approximately 5% of the drill holes, were selected for database verification. Holes were selected to provide spatial coverage of the future mining areas and represent holes from a variety of time periods. Figure 12-1 shows the location of the drill holes selected for verification within the Minorca mining areas. The database values were checked against source documents including collar surveys, geologic logs, and assay certificates. Data verification included collar coordinates, depth intervals of geologic units and assay samples, and results of analyses applied to Mineral Resource estimation and mine planning. The data verification findings are summarized in the following subsections.



Figure 12-1: Drill Hole Database Verification Map



12.1.1 Receipt of Data from Laboratory

The initial laboratory data is sent to the geologist and operating technology manager. The geologist checks whether or not the observations made during core logging are consistent with the laboratory data, while both the geologist and operating technology manager check for any values that are atypical of the units that were assigned. The data is then entered into the database by the geologist with support from Cliffs' external database manager. Checks are made visually in the mine software to ensure the data has been appropriately populated and no apparent typographical errors are present.

12.1.2 Database

Cliffs maintains a complete set of drill hole data, as well as other exploration data, for the entire project in an acQuire database that is backed up online at regularly scheduled intervals to provide data redundancy. Certification of database integrity is accomplished by both visual and statistical inspections comparing geology, assay values, and survey locations cross-referenced back to laboratory data. Any discrepancies identified are corrected by referring to hard copy assay information.

Blast hole sampling and downhole magnetic susceptibility probing are actively used to verify assay grades and ore/waste contacts of ore patterns before blasting. Any discrepancies are compared back to the model and subsequent diamond drill hole database and interpolation.

Records from the acQuire database including collar, lithology, and assays are then extracted for each target and imported into Maptek's Vulcan™ software (Vulcan) for geologic modeling and resource estimation. Prior to modeling, a secondary validation check using built-in data validation routines in Vulcan is completed.

12.1.2.1 Collar Location

DD collar locations are recorded on the original drill logs created at the time of drilling, including easting and northing coordinates and elevation of the collar in a local mine grid system, subsequently translated/modified to Minnesota State Plane, NAD 27 datum. Surveying methods have evolved over the years with advancements in technology, moving from optical methods to electronic distance measurement and to GPS, which is currently in use. All survey methods used for the collar locations would be expected to provide adequate accuracy for the drill hole locations. Current practice includes the electronic storage of an as-drilled collar location file for each annual drilling program and the inclusion of a hard copy printout of the collar file with other documents relevant to the drill holes stored in file cabinets at the Minorca Mine Geology office.

Downhole surveys are not routinely completed to verify the trajectory of the DD hole, because there is immaterial deviation historically in the short, vertical holes drilled at a high angle to the shallow-dipping stratigraphy.

Collar location coordinates for selected drill holes in the database were compared to the original source data. A small number of minor errors due to rounding were observed; however, there are no errors that would impact the Mineral Resource estimate.

12.1.2.2 Lithology

Original classification of the Biwabik IF into the Upper Slaty, Upper Cherty, Lower Slaty, and Lower Cherty members has long been recognized throughout the Mesabi district. Throughout the history of drilling at Minorca, geologists have evolved the classification scheme to further subdivide the original members into smaller subunits, each having continuity across appreciable



areas. In preparation for the use of Vulcan software for geologic modeling in 2021, Minorca's geological staff developed the currently utilized classification of the Biwabik IF that recognizes 14 subunits based on lithologic, metallurgical, and mineralogical characteristics within the local mine area.

All drill logs selected for examination were found to have recorded a geological interpretation based on the classification scheme that was in use at the time of drilling. For the 2021 resource estimate, all holes have been re-classified through re-logging, re-interpretation of original descriptions, or comparison to assay results.

12.1.2.3 Assays

Assays used for modeling crude ore grades and characteristics at Minorca are direct measurements taken from laboratory assays. Metallurgical assay data reviewed in the database were DT magnetic Iron, weight recovery, and concentrate silica. The drill holes examined represented every phase of ownership and analytical technique for drilling from 1960 through 2018.

As laboratory results are not added directly in the Vulcan ISIS database, data verification involved the tracking of results from original raw assay data to the final Vulcan database with the following discrepancies noted (Table 12-1):

Table 12-1: Minorca Database Validation Observations

Audit #	Area	Drill ID	Deviations	Validation Observation
1	Central Reserve	1220	11	No core log was found. Incorrect lithology flagging on second interval. Eight assay intervals lengths rounded down to whole numbers.
3	Central Reserve	17486	69	Coordinate locations slightly different. Overburden interval incorrect. Potential missing second interval, needs review. Lower Cherty lithology differs on both core log and report. Silica appears to be re-calculated. Final two sampled intervals MagFe and wtrec are different.
4	Central Reserve	160-36	5	Insignificant difference on northing/easting. Quality data incorrect for one interval.
2	Central Reserve	36-4	10	One lithology potentially misflagged. Assay lengths rounded down to whole number for six intervals.
5	East Pit #1	1711	8	Coordinates were rounded to whole numbers on log, and zone code on report was different for some intervals. This is probably due to the addition of a code and methods used in more recent models
6	East Pit #1	12804	34	Coordinates rounded to whole number on log. Elevation in model incorrect. There are two core logs: appears to be re-logged the next day. Recent notes were added that reorganized the Lower Cherty unit that was used in the model.
7	East Pit #1	24675	33	Coordinates rounded on log; elevation rounded in model. Appears the Lower Cherty has been re-defined for the model. MagFe was rounded in the model, and silica appears to be re-calculated.
8	East Pit #1	24685	21	Coordinates rounded on log; elevation rounded in model. Appears the Lower Cherty has been re-defined for the model (possible past



Audit #	Area	Drill ID	Deviations	Validation Observation
				logging practices of the LC4). MagFe was rounded in the model, and silica appears to be re-calculated.
9	East Pit #1	24707	20	Coordinates rounded on log; elevation rounded in model. Appears the Lower Cherty has been re-defined for the model. No lithology on the core log. MagFe was rounded in the model, and silica appears to be re-calculated. One incorrect wtrec.
10	East Pit #2	2905	13	Appears an interval was added to the report that does not match the core log. Conflicting data for one interval on report. Zone code is 3, but lithology is LC3; LC zone code should be 530.
11	East Pit #2	3109	5	Coordinates rounded to whole numbers on log and report. Report has incorrect lithology code for one interval (LC5B should be 10). Could reflect change in modeling methods.
12	East Pit #2	3707	8	Coordinates rounded to whole numbers on log and report. One Incorrect value for wtrec. Historically, the database was unable to process weight recoveries over 50%, so 50% was used as a default. Five instances where report has incorrect code for lithology; this is most likely due to a change in modeling methods, where the 530 code and 10 code were added.
13	East Pit #2	4303	8	Coordinates rounded to whole numbers on log and report. Six instances where report has incorrect code for lithology; this is most likely due to a change in modeling methods where the 530 code and 10 code were added.
14	East Pit #2	4509	14	Coordinates rounded to whole numbers on log and report. Two intervals that have a lithology of UC are flagging in the model as LS; this carries over from the core log to the report. Two additional instances where report has incorrect code for lithology; this is most likely due to a change in modeling methods where the 530 code was added
15	Laurentian Pit	3004	See Details	The log and report only have the lithological units of "Upper Cherty." No subunits are broken out. Open to interpretation based on the historical modeling. Historical lithology has a slightly different split. There is a weight % on the report. Unclear if this is the same as weight recovery. MagFe was calculated later and written on report at an unknown time. Silica in model is factored, as it does not match the report numbers.
16	Laurentian Pit	3013	See Details	The log and report only have the lithological units of "Lower Cherty." No subunits are broken out. Open to interpretation based on the historical modeling. Historical lithology has a slightly different split. There is a weight % on the report. Unclear if this is the same as weight recovery. MagFe was calculated later and written on report at an unknown time. Silica in model is factored, as it does not match the report numbers.
17	Laurentian Pit	3028	See Details	The log and report only have the lithological units of "Lower Cherty." No subunits are broken out. Open to interpretation based on the historical modeling. Historical lithology has a slightly different split. There is a weight % on the report. Unclear if this is the same as weight recovery. MagFe was calculated later and written on report at an unknown time. Silica in model is factored, as it does not match



Audit #	Area	Drill ID	Deviations	Validation Observation
				the report numbers. Two interval lengths were rounded down resulting in a total of 280 ft of samples vs. 281 ft.
18	Laurentian Pit	17524		Slight difference on state plane coordinates between model and log. One incorrect ending/starting interval. Re-classification of LC ore units, possible site-to-site differences. Silica values have been factored. Eight assay lengths are rounded down.
19	Laurentian Pit	20161	27	State plan northing and easting slightly different. Six interval lengths are rounded down in the assay section. Weight recovery is on the report sheet but not in the model.
20	Laurentian Pit	20163	36	State plan northing and easting slightly different. Elevation out to one extra decimal place. Ten interval lengths are rounded down in the assay section. Weight recovery is on the report sheet but not in the model.
21	Laurentian Pit	74-34	17	Depth incorrect. Two missing intervals at end of hole. One interval in report reads "LOST SMPL." There was a re-classification of two intervals.
22	Laurentian Pit	LR5	14	Bottom five intervals (LC3/LC2) missing from core log sheet. Twelve interval lengths in assay rounded down.

After reviewing the drill hole audit performed by Minorca site Geological Engineer Bill Ellingson, Cliffs and SLR QP are of the opinion that errors in crude magnetic iron are rare and immaterial. Crude magnetic iron is Minorca's ore grading and planning variable. Silica and weight recovery are reviewed for blending purposes but are not used for ore/waste determinations or in resource estimation. If, in the future, it was decided to use these other data for planning, Cliffs would first need to document correction factors that have been applied to historical weight recovery and silica data and update accordingly. Differences observed in the drill hole collar coordinates are due to the conversion from local mine grid coordinates to State Plane MN North NAD27 coordinates and have no impact on the resource estimation

12.2 Limitations

Cliffs' routine database validation is limited to desktop data. The 2021 data verification exercise reviewed a relatively small proportion of drill holes (5.0%) for verification; however, those selected are spatially representative of the LOM plan area and span several decades of project history.

12.3 Conclusions

Minorca has been in near-continuous production for over 40 years. There has been adequate drilling to develop the Mineral Resource models that have been used in the Mineral Reserve models and for historically successful mine planning. The Mineral Resource models have performed well, indicating that the drill hole database contains valid data and is deemed suitable for use in mineralized material estimation.

The QP visited the Minorca Mine on April 29, 2021. While at site, the QP reviewed drill core logging and sampling procedures, including chain of custody. The QP spoke with the technical team and found them to have a strong understanding of the mineralization types and their processing characteristics, and how the analytical results are tied to the results. SLR received the project data from Cliffs for independent review as a series of MS Excel spreadsheets,



Vulcan software database, and associated digital files (lithologic surfaces, topography surface, and pit shapes) from 443 drill holes totaling 118,809 ft. SLR used the information provided to validate the Mineral Resource interpolation, tons, grade, and classification. No major issues or significant errors have been observed with the data.

The following aspects were reviewed:

- Collar survey information relative to historical logs or paper-recorded logging: note that drill hole casings are typically removed, and most historical collar locations are now mined out, preventing ground truthing of historical drill hole locations.
- A comparison of original lithology logging to the current database, with consideration to the classification system of the Biwabik IF that uses 14 subunits, based on lithological and mineralogical characteristics within the local mine area. Some very minor discrepancies were noted and corrected.
- Metallurgical assay data in the database, with focus on DT MagFe: the QP recommended that a QA/QC program be implemented in conjunction with resource estimation procedures to help validate the 2021 model results. The QA/QC results confirmed and validated assays contained within the Minorca database.

The QP is of the opinion that the database verification procedures for Minorca comply with industry standards and are adequate for the purposes of Mineral Resource estimation.



13.0 Mineral Processing and Metallurgical Testing

The Plant commenced production in 1977. In 1987, Minorca began producing flux pellets as opposed to acid pellets. In 1992, Minorca constructed a flotation plant for silica reduction so that the Plant could achieve pellet-feed concentrate silica targets ahead of introducing ore from the Laurentian Pit that has more challenging silica liberation and separation characteristics. No recent metallurgical testing has taken place at Minorca.

Minorca's product is wholly consumed by Indiana Harbor #7 blast furnace (IH7).

13.1 Sampling and Metallurgical Testing

13.1.1 Drill Sample Preparation and Testing

Minorca performs diamond drilling to obtain drill core samples as needed to define the Mineral Resource, and update the mine plan accordingly. In addition, blast hole residues are analyzed in the same manner to validate projected ore gradations and develop blending plans. Drill core and blast hole samples are initially crushed in a jaw and roll crusher, then pulverized to -270 mesh using a buckboard grinding methodology. DT tests are then used to predict MagFe recovery, and wet silica analysis on the DT concentrate is used to forecast silica content used in the blending plans.

13.1.2 Process Plant Metallurgical Sampling and Testing

Minorca also conducts plant sampling for the purposes of process control and product quality reporting for compliance with Standard Product Parameters (SPPs) established by IH7, shown in Table 13-1 along with the lower standard limit (LSL) and the upper standard limit (USL).

Table 13-1: Flux Pellet Standard Product Parameters

SPP	Target	LSL	USL
CaO/SiO ₂ Ratio (C/S)	1.10	1.00	1.20
Fired Pellet SiO ₂ (%)	4.20	3.78	4.62
Contraction	8.00	N/A	10.00
Cold Compressive Strength (lb)	5.00	400	N/A
Pellet Size (BT -¼ in.)	1.00	N/A	2.00
Pellet Size (AT +½ in.)	20.00	8.00	32.00
Pellet Size (AT +¾ in. x -½ in.)	60.00	46.00	N/A
Pellet Size (AT -¼ in.)	4.75	N/A	6.00

The plant samples are collected on a routine basis from established sample collection points and according to the schedule provided in Table 13-2. The sample collection locations are identified in Figure 13-1, Figure 13-2, and Figure 13-3.

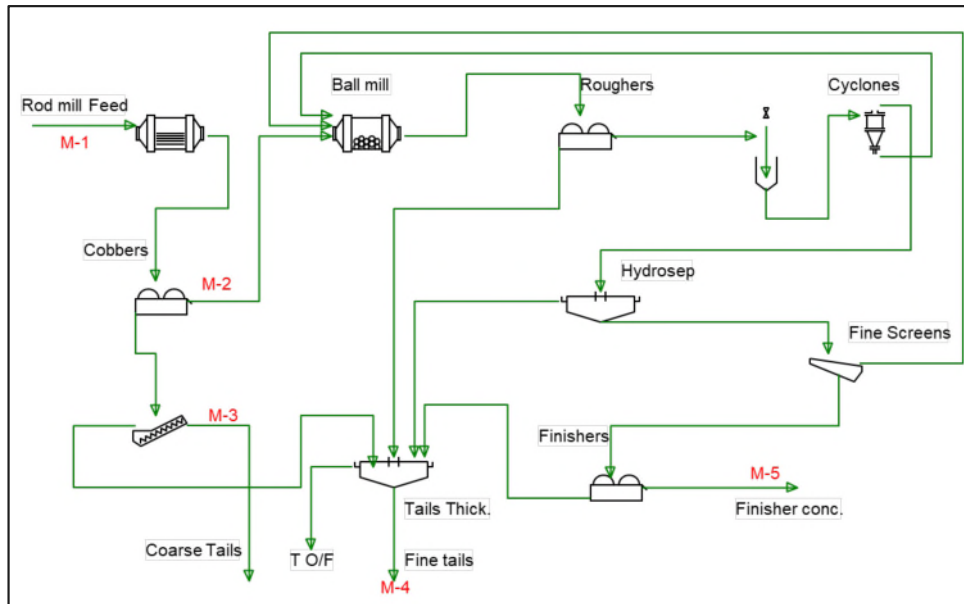


Table 13-2: Routine Sample Collection and Analysis

ID	Description	Type	Location	No.	Freq.	
Drill Core Sampling	Drill Hole Footage Intervals	Solid	Mine	As needed		Resource Mapping/Mine Planning
Blast Hole Samples	Drill/Blast Hole Residue	Solid	Blast Pattern	As needed		Verification of Current Ore Projection
MP-1	Rod Mill Feed	Solid	Rod Mill Feed Belt	1	8 hrs	Sizing/MagFe
MP-2	Rod Mill Discharge	Slurry	Cobber Concentrate Launder	1/Line	8 hrs	Sizing/Chemistry
MP-3	Coarse Tails	Solid	Spiral Classifier	1/Line	8 hrs	MagFe
MP-4	Fine Tails	Slurry	Fine Tails Sump	1	8 hrs	MagFe
MP-5	Raw Concentrate	Slurry	Finisher Drum	1/Line	2 hrs	MagFe
MP-6	NOLA Check - Flot Feed	Slurry	Box by Line 2 Finishers	1	4 hrs	Sizing / Chemistry
MP-7	NOLA Check - Flot Con	Slurry	Box by Line 2 Finishers	1	4 hrs	Sizing / Chemistry
MP-8	Ball Mill Feed	Slurry	Boil Box on Rougher Cell Floor	2	8 AM and 4 PM	Sizing
MP-9	Scavenger Feed	Slurry	Ball Mill Discharge Pump	2	8 AM and 4 PM	Chemistry
MP-10	Scavenger Con	Slurry	Scavenger Dart Valves	2	8 AM and 4 PM	Chemistry
MP-11	Scavenger Froth	Slurry	Scavenger Tails Launder	2	8 AM and 4 PM	Chemistry
MP-12	Total Flot Tails	Slurry	Flot Tails Launder	1	8 hrs	Chemistry
MP-13	Filter Cake	Solid	Disk Filters	2	Shift (12 hrs)	Moisture Content / Chemistry
MP-14	Green Balls Disk	Solid	Discharge Lip of Balling Disks	1	Shift (12 hrs)	Sizing
MP-15	Green Balls Furnace	Solid	Discharge Lip of Roll Deck	2	Shift (12 hrs)	Sizing
MP-16	Fired Pellets - Product	Solid	Indurator Discharge Feeders	6	2 hrs	Pellet Sizing , Chemistry, Physical Quality, Metallurgical Quality
Fluxstone	Ground Fluxstone	Solid	Flux Tank Feed Sump	1	Shift (12 hrs)	Sizing / Chemistry

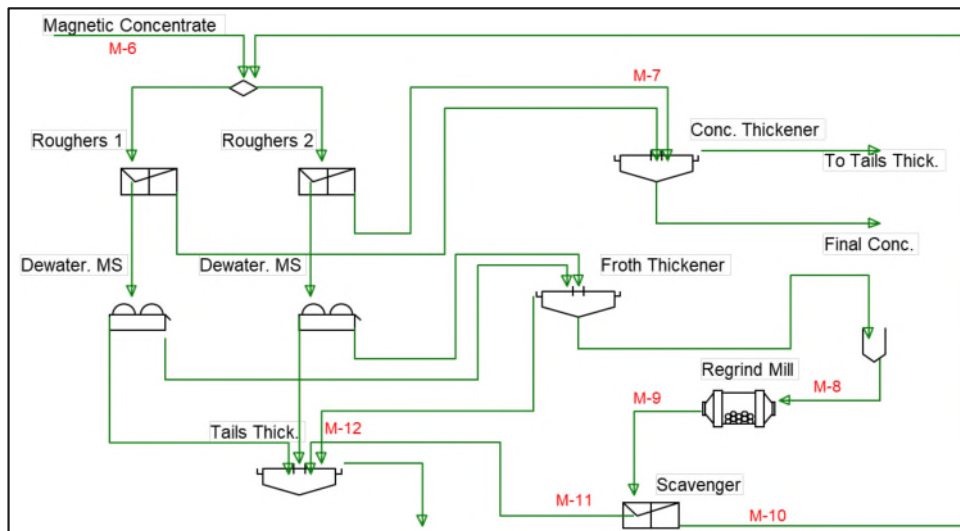


Figure 13-1: Sample Collection Points in Plant Magnetic Separation Circuit



Source: Cliffs 2021.

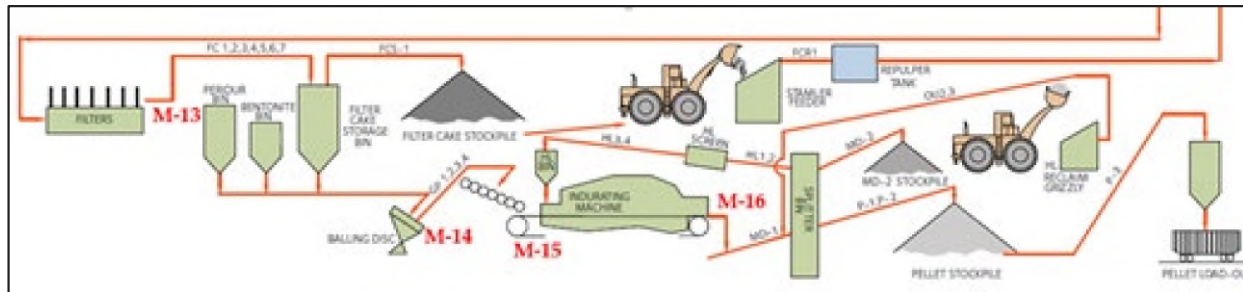
Figure 13-2: Sample Collection Points in Plant Flotation Circuit



Source: Cliffs 2021.



Figure 13-3: Sample Collection Points in Plant Pelletizing Circuit



Source: Cliffs 2021.

Sample analysis consists of six primary unit operations with standardized and documented procedures for each. Analytical samples are representatively split from the bulk sample using riffle splitters, drying ovens, sieves, and rolling cloths. Routine analysis includes size structures, chemistry, magnetic iron (ferrous), moisture content, fired pellet tumble strength, cold compression strength (CCS), and metallurgical pellet contraction.

Size Structure: Size structures are conducted using a Gilson stacked screen deck. Monthly checks are conducted to measure screen gap openings and are compared against the ASTM specification for acceptable tolerances. Screens are also changed out annually.

Chemistry: A basic chemistry protocol for all process and product samples consists of SiO_2 , Total Fe, CaO, and MgO. Additional chemical analysis is not commonly conducted or requested based on minimum deleterious elements present in Minorca taconite reserves and the requirements for the IH7. Chemical analysis is processed using a PANalytical, Zetium Minerals Edition XRF Spectrometer, Type: PW5400 (4 kW). Reference control standards are processed once every 24 hours, and certified standards are run monthly to validate accuracy.

MagFe: Magnetic iron is measured using Satmagan. Satmagan calibration standards are run every two weeks, and re-calibration is conducted approximately every two weeks to ensure the validity of the values.

Fired Pellet Tumble Strength: Pellet quality includes before tumble sizing, after tumble sizing, and CCS. Pellets are representatively composited and split to produce desired mass quantities for assessment. A tumble drum operating under ASTM standardized conditions is used to produce the after tumble pellets. All fired pellet sizings (before and after tumble) are conducted using the Gilson stacked screen deck.

Cold Compression Strength: An automated compression tester is used that complies with ASTM E-382, Determination of Crushing Strength of Iron Ore Pellets. The unit crushes 100 fired pellets using constant force to measure the peak compression strength, average, and standard deviation. Established pellet standards are used once weekly to validate average compressive strength and standard deviation of the standard, and ultimately the performance and calibration of the CCS automated tester.

Contraction: Fired pellet metallurgical contraction is a specialized test that was developed specifically for the IH7. The intent is to control the reduction and softening behavior in the cohesive zone of the IH7. Fired pellets are tested in a retort tube (reactor) under standardized test procedures and conditions that are well established and documented. It measures the percentage of deformation between 800°F and 1,100°F under standardized reducing gas conditions under a known weight. Individual retort reduction tubes are calibrated prior to use.



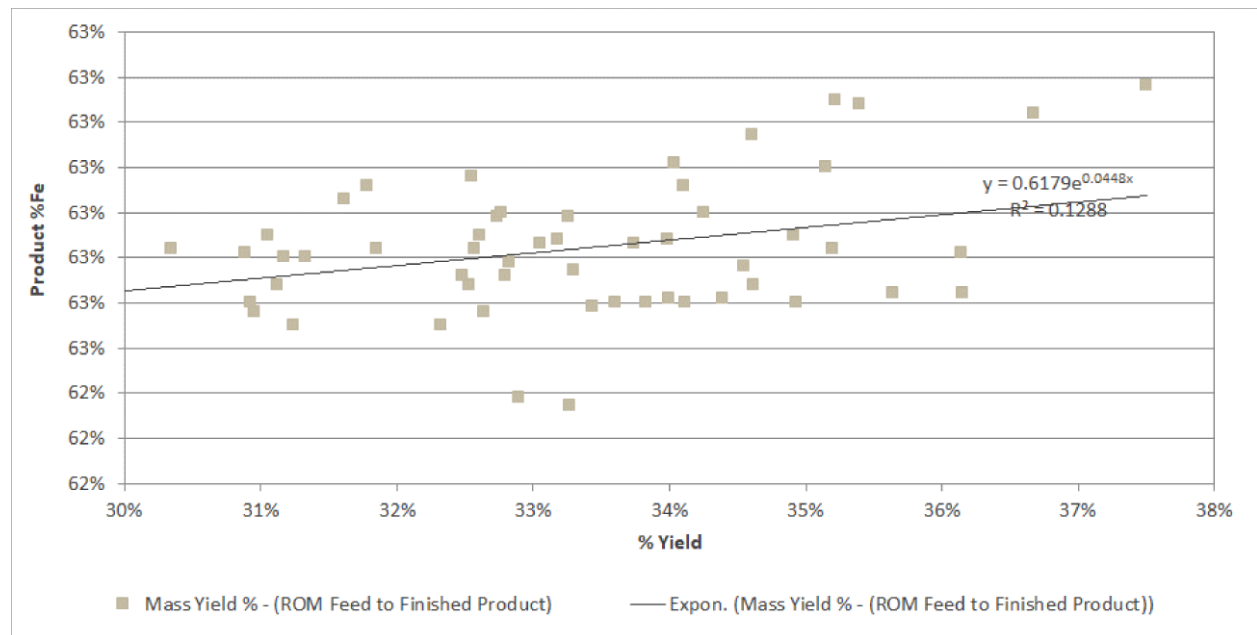
Contraction standard pellets are processed weekly to validate calibration, and results are compared to known values.

The QP is of the opinion that the data derived from the testing activities described above are adequate for the purposes of resource mapping, mine planning, ore quality verification, process control, and total product quality reporting.

13.2 Yield and Recovery

The final pellet product total Fe grade is consistent at 62.5%. Mass yield (ROM to finished product) is typically in the low 30% range. Figure 13-4 displays typical process recovery.

Figure 13-4: Process Recovery versus Grade



Source: Cliffs 2021.

13.2.1 Size Fractions, Rock Hardness, and Grindability

Grindability is reported as a 14 Bond Work Index. Grinds are primarily controlled by a target throughput of 80% to 82% passing -325 mesh (0.44 microns).

Table 10-3 shows the geotechnical properties of drill core samples taken from the Biwabik IF similar to those found at Minorca. Note that physical properties will vary in regard to the bedded/banded nature of Lake Superior-type BIFs. The Upper Cherty (UC), Lower Slaty (LS), and Lower Cherty (LC) members contain the common ore/waste units mined at Minorca. The Virginia Formation (Va) overlays the Biwabik IF.



Table 13-3: Example of Geotechnical Properties - Biwabik IF

Depth (ft)	Geol. Unit	Density (lbs/ft ³)	Trial		1		Trial		2		Trial		3		Avg. I (lbs/in ²)	UCS (lbs/in ²)
			Height (in)	Width (in)	P (lbs)	I (lbs/in ²)	Height (in)	Width (in)	P (lbs)	I (lbs/in ²)	Height (in)	Width (in)	P (lbs)	I (lbs/in ²)		
230.17	Va	164.5	0.49	1.20	984.7	1,308.2	0.72	1.30	1,052.1	887.6	0.56	1.18	442.9	529.4	908.4	16,348.6
318.21	Va	164.5	0.79	1.25	782.3	622.2	0.82	1.30	1,310.6	958.7	0.60	1.28	777.8	796.3	792.4	14,257.2
384.21	Va	172.1	0.59	1.20	1,495.0	1,670.8	0.73	1.30	901.5	748.4	0.54	1.18	1,375.8	1,691.1	1,370.1	24,662.2
532.19	Va	170.6	0.80	1.44	557.5	380.0	0.74	1.36	1,261.2	984.8	0.00	0.00	0.0	0.0	454.9	12,273.1
576.17	US	165.6	0.75	1.26	2,007.5	1,657.8	0.66	1.36	1,674.8	1,466.3	0.00	0.00	0.0	0.0	1,041.4	28,122.8
592.33	US	201.7	0.63	1.43	3,149.6	2,745.6	0.74	1.46	2,122.2	1,538.8	0.70	1.40	3,437.3	2,741.2	2,341.9	42,159.6
609.25	US	195.5	0.71	1.43	1,964.8	1,517.1	0.65	1.41	1,901.9	1,630.2	0.71	1.43	11.03	1,908.7	1,685.3	30,340.4
659.19	UC	235.7	0.69	1.51	3,747.6	2,839.8	0.72	1.47	5,211.1	3,839.1	0.73	1.45	3,187.8	2,349.6	3,009.5	54,168.7
698.25	UC	229.0	0.68	1.49	2,556.1	1,989.9	0.59	1.49	2,646.0	2,365.6	0.70	1.49	3,399.1	2,549.8	2,301.7	41,434.4
732.29	UC	207.7	0.58	1.46	344.0	1,565.0	0.71	1.46	3,691.4	2,771.7	0.71	1.47	3,280.0	2,472.9	2,269.8	40,860.0
759.25	UC	223.3	0.69	1.39	4,228.7	3,496.9	0.61	1.41	4,368.0	3,991.4	0.72	1.37	3,257.5	2,596.2	3,361.5	60,503.9
773.21	UC	199.7	0.61	1.11	2,713.4	3,176.3	0.63	1.12	2,288.6	2,535.3	0.83	1.10	3,039.4	2,628.1	2,779.9	50,039.5
824.17	LS	236.1	0.72	1.24	3,534.0	3,102.4	0.69	1.24	2,875.3	2,646.9	0.70	1.23	2,374.0	2,145.1	2,631.5	47,362.1
918.21	LS	214.8	0.65	1.37	3,005.7	2,648.4	0.60	1.39	3,450.8	3,279.3	0.69	1.36	3,246.2	2,723.8	2,883.8	51,913.3
958.17	LS	213.5	0.71	1.16	3,097.9	2,954.4	0.62	1.21	3,327.2	3,501.2	0.69	1.26	3,563.2	3,212.6	3,222.7	58,010.7
1022.67	LS	188.7	0.65	1.29	3,437.3	3,209.7	0.58	1.31	3,387.9	3,473.7	0.64	1.28	2,203.1	2,107.4	2,930.2	52,743.0
1077.21	LC	180.3	0.61	1.12	2,565.1	2,921.1	0.66	1.18	2,533.6	2,544.0	0.65	1.14	2,066.0	2,179.9	2,548.3	45,862.4
1193.84	LC	196.5	0.64	1.18	2,041.3	2,139.3	0.70	1.13	2,344.8	2,332.2	0.64	1.16	2,583.1	2,722.4	2,398.0	43,166.1
1245.71	LC	199.2	0.67	1.28	2,821.4	2,558.5	0.61	1.29	2,738.2	2,726.7	0.63	1.28	11.08	2,429.4	2,571.5	46,294.6
1281.71	LC	176.5	0.70	1.09	1,861.4	1,931.9	0.67	1.06	2,542.6	2,809.4	0.70	1.04	2,326.8	2,530.9	2,424.1	43,634.6
1341.25	LC	173.4	0.49	1.28	2,034.5	2,545.4	0.69	1.29	2,585.3	2,355.4	0.62	1.25	1,814.2	1,839.1	2,246.6	40,443.8

Source: Carranza-Torres as cited in Arcelor Mittal 2020a

Note. For samples 5 and 6, due to the size of the half-core sample, it was possible to cut and produce only two specimens for testing.



Table 10-4 presents the total quantity of pellets in wet tons and the iron grade of the pellets produced in the Laurentian and East pits by size fraction. Pellets are the sole product of Minorca, thus all recovered material is used as pellet feed.

In the QP's opinion, the data from the test work is suitable for use in this Technical Report.

Table 13-4: Pellets Produced by Pit and by Size Fraction

Area	Total Product		Product >1/4 in		Product <1/4 in >16 mesh		Product <16 mesh >100 mesh		Product <100 mesh	
	Tons (000)	% Fe Grade (total)	Tons (000)	% Fe Grade (total)	Tons (000)	% Fe Grade (total)	Tons (000)	% Fe Grade	Tons (000)	% Fe Grade
Laurentian	18,966	62.50%	18,160	62.50%	806	62.50%	-	-	-	-
East	18,572	62.50%	17,782	62.50%	789	62.50%	-	-	-	-
Total	37,668	62.50%	35,943	62.50%	1,595	62.50%	-	-	-	-

Notes:

1. Lump is >1/4 in; sinter feed (fines) between ¼ in and 16 mesh; and concentrate generally between 16 mesh and 100 mesh; pellet feed less than 100 mesh.
2. Tons to be shown as wet tons unless otherwise specified; % total Fe or MagFe to be stated.
3. Due to mining and processing methods used, Minorca only had a size fraction of –¼ in. and +¼ in. %Fe is not tracked separately as it is from the same source.



14.0 Mineral Resource Estimates

14.1 Summary

Mineral Resource estimates for the Minorca deposit were prepared by Cliffs and audited and accepted by SLR using available data from 1958 to 2021.

The 2021 Minorca Mineral Resource estimate was completed using a conventional block modeling approach. The general workflow included the construction of a geological or stratigraphic model representing the Biwabik IF by SLR in Seequent's Leapfrog Geo (Leapfrog Geo) from mapping, drill hole logging, and sampling data, which were used to define discrete domains and surfaces representing the upper contact of each unit of non-iron formation and iron formation subunits. The geologic model was then imported into Vulcan by Cliffs for resource estimation. Sub-blocked model estimates used inverse distance squared (ID^2) and length-weighted, 10 ft uncapped composites to estimate KEVs including magnetic iron, weight recovery, and silica in concentrate in a three-search pass approach, using hard boundaries between subunits, ellipsoidal search ranges, and search ellipse orientation informed by geology. Average density values were assigned by lithological unit.

Mineral Resources were classified in accordance with the definitions for Mineral Resources in CIM (2014) and adopted in NI 43-101. Blocks were classified as Measured, Indicated, or Inferred using distance-based and qualitative criterion. Cliffs classifies the Mineral Resources based primarily on drill hole spacing and influenced by geologic continuity, ranges of economic criteria, and reconciliation. Some post-processing is undertaken to ensure spatial consistency and remove isolated and fringe blocks. The resource area is limited by a polygon and subsequent pit shell based on practical mining limits. A resource block is classified as Measured if the distance to the nearest drill hole is within 400 ft and estimated with the pass 1 estimate. If the nearest drill hole is between 400 ft and 800 ft and estimated in the pass 2 estimate it is classified as Indicated. All remaining blocks are classified as Inferred. Models were depleted to July 1, 2021.

Estimates were validated using standard industry techniques including statistical comparisons with composite samples and parallel nearest neighbor (NN) estimates, swath plots, as well as visual reviews in cross-section and plan. A visual review comparing blocks to drill holes was completed after the block modeling work was performed to ensure general lithologic and analytical conformance and was peer reviewed prior to finalization. Mineral Resources with an effective date of December 31, 2021 are exclusive of Mineral Reserves, use a 16% MagFe cut-off grade, and are presented in Table 14-1.

To ensure that all Mineral Resource statements satisfy the "reasonable prospects for eventual economic extraction" requirement, in definition of the Mineral Resources for Minorca, factors significant to technical feasibility and potential economic viability were considered. Mineral Resources were defined and constrained within an open-pit shell, prepared by Cliffs and based on a US\$90/LT pellet value and a wet 62.5% Fe flux pellet.



Table 14-1: Summary of Minorca Mineral Resources - December 31, 2021

Class	Resources	MagFe	Process Recovery	Pellets
	(MLT)	(%)	(%)	(MLT)
Measured	484.3	22.9	32.9	159.3
Indicated	317.2	22.9	32.9	104.4
Measured + Indicated	801.5	22.9	32.9	263.7
Inferred	30.1	21.1	30.2	9.1
Notes: Tonnage is reported in long tons equivalent to 2,240 lb. 1. Mineral Resources are reported exclusive of Mineral Reserves and have been rounded to the nearest 100,000. 2. Mineral Resources are estimated at a cut-off grade of 16% crude MagFe. 3. Mineral Resources are estimated using a pellet value of US\$90/LT. 4. Waste within the pit is 986.7 MLT at a stripping ratio of 1.23:1 (waste to crude ore). 5. Saleable product reported as a 62.5% Fe content wet flux pellet, shipped product contains 2% moisture. 6. Classification of Mineral Resources is in accordance with the CIM (2014) definitions. 7. Bulk density is assigned based on average readings for each lithology type. 8. Mineral Resources are 100% attributable to Cliffs. 9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. 10. Numbers may not add due to rounding.				

The QP is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that could materially affect the Mineral Resource estimate.

While the estimate of Mineral Resources is based on the QP's judgment that there are reasonable prospects for eventual economic extraction, no assurance can be given that Mineral Resources will eventually convert to Mineral Reserves.

14.2 Resource Database

Cliffs maintains a property-wide drill hole database in acQuire, with exports used to populate Vulcan modeling software. The Minorca resource database dated June 15, 2021 includes drill hole collar locations, assay, and lithology data from 443 drill holes totaling 118,809 ft of drilling completed between 1958 and 2021.

Drilling has been completed on an approximate 400 ft by 400 ft grid oriented to the general strike (azimuth) of the deposits (45° – Laurentian, 52° – Central, and 69° – East), with all holes drilled vertically. Drilling depth ranges from 39.0 ft to 946.0 ft with an average depth of 268.2 ft. Figure 10-1 shows the location of the drill holes at Minorca.

There are a total of 8,337 lithology records and 7,239 assay (samples) records that have values for at least one KEV. KEVs include magnetic iron, weight recovery, and silica in concentrate.

14.3 Geological Interpretation

SLR geologists developed geologic models for Minorca in Leapfrog Geo software using topographic surfaces and drill hole lithology logs exported from the acQuire database supplied by Cliffs. Stratigraphic wireframes were created from points assigned to geology contacts determined from the logging results of the drill holes. The stratigraphic units at Minorca are listed in Table 14-2 and illustrated in Figure 7-3 and Figure 7-4.



Table 14-2: Rock Code versus Lithology

Rock Code	Lithology
1	FTWL
2	OVb
3	LC4
4	LC5A
5	LS
6	UC1
7	UC2
8	UC3
10	LC5B
11	US
530	LC3

No geologic structures were placed into the model. Faults were not modeled, as most of the major fault systems had been mined for hematite ore prior to mine modeling at Minorca and are between currently operating taconite pits. This is due to the change in permeability and ability of fault systems to focus oxygen and water that facilitates the meteoric oxidation process. The Minnesota State Geological Survey has mapped major fault systems along the Mesabi Iron Range based on aerial geophysical surveys as illustrated Figure 7-1. No intrusions intersect the mineralization.

No major fold structures have been mapped by Minorca staff, and the overall orientation of stratigraphic layers is very consistent. The iron mineralization has minor fold-like structures, although it is unclear whether this is due to compressional stress or is a result of soft sediment deformation. No need has been identified to model fault or fold structures to date due to the continuity of lithology between drill holes. The lack of outcrop between open pits, previous lack of detailed geophysics, and the wide drill hole spacing make it difficult to map and model small-scale structures accurately.

SLR then forwarded the geologic model to Cliffs' geologists for import into Vulcan for development of the block model ahead of resource estimation.

14.4 Resource Assays

Table 14-3 presents the uncapped, unweighted assay statistics for the principal economic variables effective as of May 26, 2021.

Table 14-3: Assay Statistics

Variable	Rock Code	Count	Min (%)	Max (%)	Mean (%)	StDev (%)	CV
magne	1	662	0.14	27.33	8.24	5.29	0.64
	2	3	1.11	12.84	5.25	6.58	1.25
	3	1640	0.30	37.19	22.66	5.23	0.23
	4	1,343	0.44	37.70	23.09	7.09	0.31



Variable	Rock Code	Count	Min (%)	Max (%)	Mean (%)	StDev (%)	CV
	5	467	0.01	26.80	5.33	6.32	1.18
	6	746	0.29	46.64	20.34	8.42	0.41
	7	312	5.53	36.63	18.81	4.53	0.24
	8	536	1.26	37.47	19.52	9.28	0.48
	10	428	0.13	35.78	10.94	7.81	0.71
	11	57	0.07	19.70	5.50	3.96	0.72
	530	856	0.34	32.96	11.53	6.53	0.57
		7,050	0.01	46.64	17.38	9.19	0.53
silica	1	401	0.65	15.93	5.18	2.31	0.45
	2	0					
	3	1,601	0.39	9.88	2.52	1.15	0.45
	4	1,300	1.05	11.26	4.35	1.37	0.32
	5	139	2.85	21.65	9.46	3.51	0.37
	6	690	0.98	21.69	4.18	2.57	0.61
	7	296	1.45	16.43	7.08	2.32	0.33
	8	476	0.15	15.78	6.04	2.61	0.43
	10	303	2.92	36.67	6.27	2.47	0.39
	11	23	2.55	16.67	7.75	3.85	0.50
	530	699	0.89	13.21	3.26	1.59	0.49
		5,928	0.15	36.67	4.27	2.49	0.58
wtrec	1	345	0.20	42.45	14.76	8.79	0.60
	2	1	0.45	0.45	0.45		
	3	1,424	0.11	49.20	32.45	6.10	0.19
	4	1,132	0.25	53.15	33.49	9.32	0.28
	5	98	0.25	37.15	17.53	9.38	0.54
	6	477	0.05	61.70	30.08	9.92	0.33
	7	192	10.15	57.95	26.73	6.79	0.25
	8	280	1.85	59.25	30.58	12.96	0.42
	10	278	0.10	51.20	17.83	11.60	0.65
	11	5	6.50	20.91	13.25	5.12	0.39
	530	643	0.10	47.60	17.90	10.00	0.56
		4,875	0.05	61.70	27.80	11.32	0.41



14.4.1 Treatment of High Value Assays

Raw assays were reviewed using basic statistics, histograms, and probability plots by Cliffs to determine whether value restriction using capping was warranted. No upper value restriction was applied to any variable at Minorca.

14.5 Compositing

The composite lengths used during interpolation were chosen considering the predominant sampling length, the minimum mining width, style of mineralization, and continuity of grade. The raw assay data contains samples having irregular sample lengths, which is mostly due to incorporating historical data with more recent Minorca drill hole data, which limits sample length to approximately 10 ft. Sample lengths range from 1.0 ft to 125 ft, with 40% of the samples taken at 10 ft intervals (Figure 14-1). Given this distribution, and considering the width of the mineralization in addition to past best practice at Minorca that composite length be determined by approximately half the bench height of 17.5 ft, Cliffs chose to composite to 10 ft lengths.

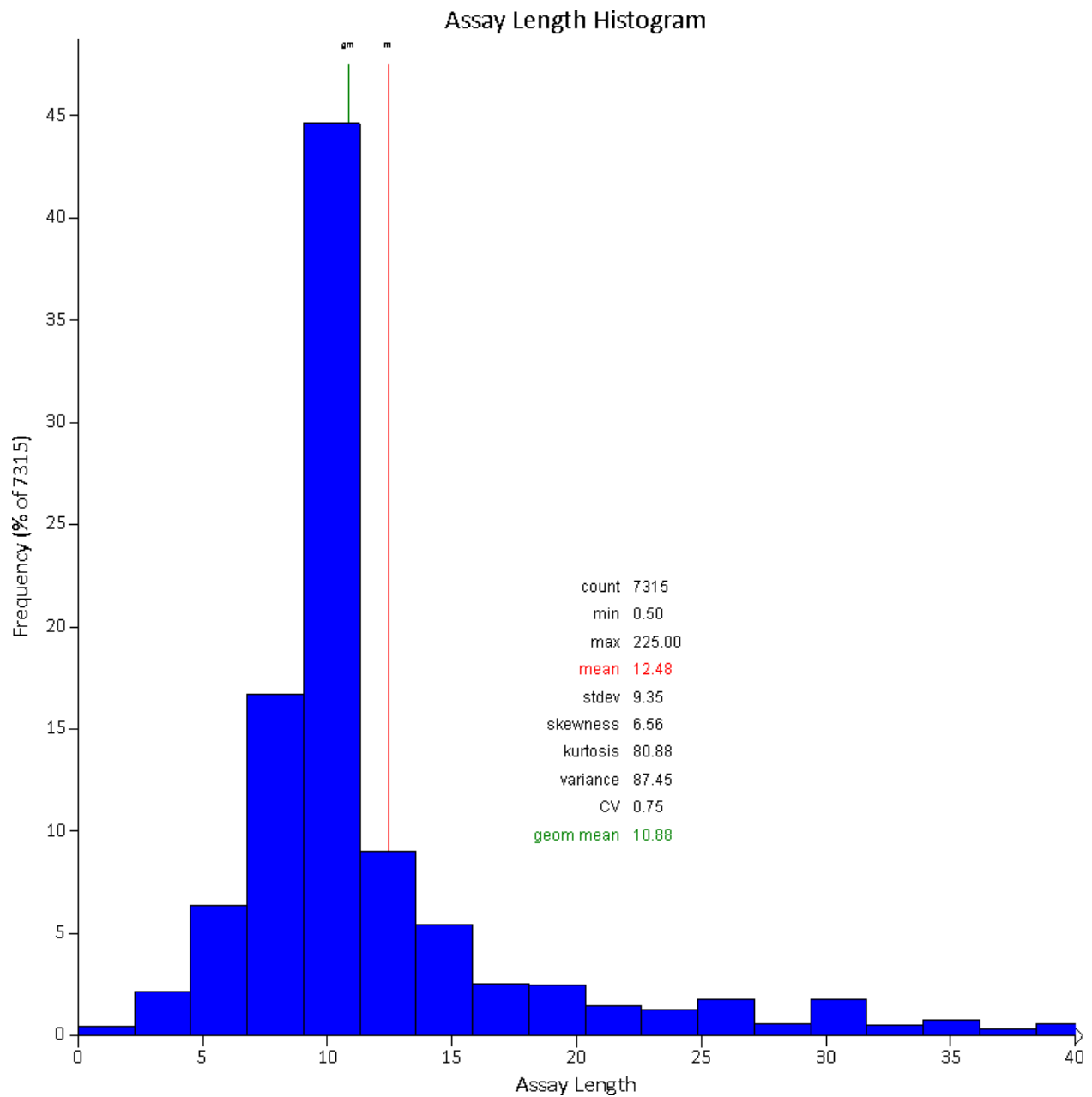
At Minorca, uncapped assays were composited in Vulcan using the run-length algorithm to 10 ft, broken at stratigraphic boundaries. There are 9,335 composite intervals in the composite database. The average composite length is 8.9 ft. The smallest composite length is 0.001 ft, and the longest is 10 ft.

Table 14-4 presents the unweighted statistics of the main grading variables in the composite file.

The QP is of the opinion that this composite length is appropriate for this style of mineralization.



Figure 14-1: Minorca Histogram of Sample Length



Source: SLR 2022.



Table 14-4: Composite Statistics

Variable	Rock Code	Count	Min (%)	Max (%)	Mean (%)	StDev (%)	CV
magfe	1	893	0.14	26.74	8.26	5.06	0.61
	2	22	1.11	29.72	12.11	8.73	0.72
	3	2,013	0.30	36.23	22.25	5.18	0.23
	4	1,622	0.44	37.70	23.02	6.74	0.29
	5	1,053	0.01	29.58	3.42	5.01	1.47
	6	1,019	0.20	46.21	19.08	8.31	0.44
	7	354	5.53	38.36	18.93	4.37	0.23
	8	579	1.85	37.05	19.57	8.66	0.44
	10	575	0.13	35.78	11.48	8.00	0.70
	11	149	0.07	24.95	6.92	5.01	0.72
	530	1,039	0.34	32.06	11.25	6.23	0.55
		9,331	0.01	46.21	16.11	9.41	0.58
silica	1	576	0.65	15.93	5.30	2.33	0.44
	2	10	2.38	10.41	6.32	3.11	0.49
	3	1,968	0.39	9.88	2.60	1.17	0.45
	4	1,583	1.05	11.26	4.31	1.34	0.31
	5	215	2.85	18.73	8.99	3.26	0.36
	6	949	0.98	20.59	4.39	2.47	0.56
	7	338	1.45	14.30	6.92	2.22	0.32
	8	533	0.15	15.47	5.87	2.49	0.42
	10	440	2.92	36.67	6.23	2.97	0.48
	11	82	2.06	16.67	7.22	3.87	0.54
	530	857	0.89	13.21	3.36	1.62	0.48
		7,564	0.15	36.67	4.34	2.49	0.57
wtrec	1	476	0.20	39.57	15.19	8.38	0.55
	2	11	0.45	40.00	21.20	14.80	0.70
	3	1,746	0.11	48.78	31.99	6.03	0.19
	4	1,363	0.25	51.71	33.43	8.79	0.26
	5	142	0.25	40.70	17.17	9.80	0.57
	6	648	0.05	57.10	28.97	9.51	0.33
	7	213	10.15	52.93	26.84	6.37	0.24
	8	292	2.49	59.25	30.01	12.24	0.41



Variable	Rock Code	Count	Min (%)	Max (%)	Mean (%)	StDev (%)	CV
	10	389	0.45	51.20	18.63	11.52	0.62
	11	30	3.45	51.45	17.59	12.64	0.72
	530	771	0.10	46.46	17.70	9.60	0.54
		6,081	0.05	59.25	27.30	11.01	0.40

14.6 Bulk Density

Density is reported as a tonnage factor, ft^3/LT , at Minorca (Table 14-5). Overburden (mix of unconsolidated glacial till) densities vary by pit; a value of $18 \text{ ft}^3/\text{LT}$ is used in the East and Central models, while $15 \text{ ft}^3/\text{LT}$ is used in the Laurentian model. The East model value was derived in 2010 by an outside consultant (NTS) by use of shallow test pits, while the Laurentian model value was developed internally by Minorca personnel during the development of the pit. The higher density ($15 \text{ ft}^3/\text{LT}$) in the Laurentian overburden is due to a thick stratum of boulders and cobbles located at the bottom of the overburden just above the bedrock contact, possibly the remnants of an old riverbed. Because of this thick boulder and cobble layer, Cliffs uses a higher density to account for it. This boulder and cobble strata is not present east of the Laurentian zone. Slaty waste rock units (Upper Slaty and Lower Slaty members of the Biwabik IF) have been assigned a density of $12.27 \text{ ft}^3/\text{LT}$; this was developed through mining of the Laurentian and East pits and was confirmed in density testing of 2011 and 2012 drill core from the East and Central deposits. Similarly, an assigned value of $10.8 \text{ ft}^3/\text{LT}$ was confirmed as adequate for the LC3, 4, 5A, and 5B subunits.

A detailed record or reports that describe how the original density factors were applied are not available. The tonnage factors are believed to be based on a study in the Laurentian Pit completed by a previous geologist. Regular reconciliations of current and modeled production data have not identified the tonnage factors developed in that presumed study as a source of error.

In 2012, a geologist started drill core density sampling using 2011 and 2012 drill core. Only a limited data set was collected due to the small amount of drilling; however, the data supports the current tonnage factors.

Bulk density has not been identified as an issue in past production reconciliations. There have been no observations to indicate a material variance in tonnage estimations from observations in the pit or from logging drill core. It is worth noting that the ore is competent and has very minimal porosity.

Table 14-5: Density Applied

Rock Code	Lithology	Area	Tonnage Factor (ft^3/LT)	Tonnage Factor (ft^3/ton)	Density (g/cm^3)	LT/ ft^3
1	FTW1	All	12.27	10.96	3.32	0.0815
2	OVB	East	18.00	16.07	1.99	0.0556
		Laurentian	15.00	13.39	2.39	0.0667
3	LC4*	All	10.80	9.64	3.32	0.0926



Rock Code	Lithology	Area	Tonnage Factor (ft ³ /LT)	Tonnage Factor (ft ³ /ton)	Density (g/cm ³)	LT/ft ³
4	LC5A*	All	10.80	9.64	3.32	0.0926
5	LS	All	12.27	10.96	2.92	0.0815
6	UC1*	All	10.80	9.64	3.32	0.0926
7	UC2*	All	10.80	9.64	3.32	0.0926
8	UC3*	All	10.80	9.64	3.32	0.0926
10	LC5B*	All	10.80	9.64	3.32	0.0926
11	US	All	12.27	10.96	2.92	0.0815
530	LC3*	All	10.80	9.64	3.32	0.0926
	Lean Taconite	All	11.25	10.04	3.19	0.0889
	*Ore Zones	≥16% MagFe	10.80			
		10%>=MagFe<%16	11.25			
		<10%	12.27			

Density is not correlated by grade and is not factored in compositing of the drill hole database. The densities used for ore classification and waste rock classification are uniform across each respective type. The only unique density that is applied outside of ore, waste, and overburden is that of lean taconite. Lean taconite is primarily waste rock with a MagFe content of greater than 10% but less than 16%. Given that this material has a higher MagFe content than waste rock, it has an assigned tonnage factor of 11.25 ft³/LT (3.19 g/cm³). According to current lease requirements, the lean taconite is segregated into a separate stockpile for possible future use should it become economically feasible.

14.7 Variography

Current estimation practices at Minorca do not incorporate modeled semi-variogram results within the estimation, as all variables are interpolated using an inverse distance weighted (ID) approach. Cliffs elected to use ID² for the estimation of quality variables.

14.8 Block Models

Sub-block and regularized block models were created by Cliffs' geologists and audited by SLR to support the Mineral Resource estimate for the iron deposits at the Property.

14.8.1 Base Sub-blocked Model

A sub-blocked base model (min_2021_base_v7.bmf) for Minorca constructed using the Vulcan 2021 software is oriented with an azimuth of 45°, dip of 0.0°, and a plunge of 0.0° to align with the overall strike of the mineralization within the given model. Sub-blocking was used to give a more accurate volume representation of the geologic contacts (wireframes) in the gently dipping mineralization using a parent block size of 100 ft by 100 ft in the X (along strike) and Y (across strike) directions and 10 ft in the Z (vertical or bench height) direction, honoring modeled geological surfaces. Sub-blocks are 50 ft (X) by 50 ft (Y) by 5 ft (Z). The model fully enclosed the modeled resource wireframes, with the model origin (lower-left corner at lowest elevation) at



State Plane MN North NAD27 coordinates 2,164,300E, 355,500N, and 0.0 (asl) elevation. A summary of the block model extents is provided in Table 14-6.

Table 14-6: Block Model Attributes

Deposit	Schema	Bearing	Plunge	Dip	Origin			Block Model Length (ft)			Block Dimension (ft)		
		(°)	(°)	(°)	X	Y	Z	X	Y	Z	X	Y	Z
Minorca	Parent	45	0	0	2,164,300	355,500	0	30,000	10,100	2000	100	100	10
	Sub-block										50	50	5

The QP considers the Minorca base block model parameters to be acceptable for a Mineral Resource estimate.

Upon completion of construction of a base model by Cliffs' geologists, the block model is delivered to the Cliffs mine engineering team for re-blocking and estimation of Mineral Resources and Mineral Reserves.

14.8.2 Estimation Methodology

The following variables are estimated or assigned into the block model:

- MagFe: crude Magnetic Iron % from Satmagan.
- SiO₂: Silica in 100% -270 mesh DT concentrate.
- wtrec: % weight (DT concentrate) recovered from 100% -270 mesh crude sample by a Davis magnetic tube test.
- Stratigraphic units from the modeled surfaces:
 - MagFe, SiO₂, and wtrec interpolations used ID². The interpolation strategy involved setting up search parameters in a series of three estimation runs for each individual lithology domain with isotropic search ellipsoid geometry oriented into the structural plane of the mineralization (Table 14-7).

The QP considers the Minorca estimation parameters to be acceptable for a Mineral Resource estimate.

Table 14-7: Estimation Method (Search Parameters)

General Pass	Bearing (Azimuth) (°)	Plunge (°)	Dip (°)	Ellipsoid Ranges			Number of Samples		Drill Hole Limit	Estimate Type	Discretization		
				Major (ft)	Semi-Major (ft)	Minor (ft)	Min	Max	Max Samples /Hole		X	Y	Z
Pass1	53	0	-10	400	400	50	2	8	2	ID ²	4	4	1
Pass2	53	0	-10	800	800	50	2	8	2	ID ²	4	4	1
Pass3	53	0	-10	1600	1600	50	1	8	N/A	ID ²	4	4	1

14.8.3 Resource and Reserve Regularized Block Model

New mine planning block models for the Laurentian Pit (minorca_2021_mm_laur_v2.bmf) and the East 1 and 2 pits (minorca_2021_mm_east_v2.bmf) were constructed in September 2021



from the base geologic model (min_2021_v7.bmf) created on July 20, 2021. The mine planning block models were re-blocked (regularized) to 50 ft by 50 ft by 17.5 ft (i.e., half the bench height). Scripts within Vulcan are executed that add variables for economic evaluation and mine planning, flag in-pit stockpile backfills, flag the current topography, re-block the model to represent the selective mining unit (SMU), incorporate crude ore loss and dilution impacts, and reinforce cut-off grades. Scripts also assign restrictions to blocks outside of the lease areas, outside Permit to Mine boundaries, and inside infrastructure areas (such as public roads and highways) – assigning blocks as restricted or waste when appropriate. The resulting block models are evaluated using the pit optimization and Chronos scheduling packages in Vulcan.

Iron formation can only be initially considered as “candidate” crude ore if the stratigraphy is one of the following geologic subunits (as detailed in section 7.3):

- Upper Cherty (UC) - uc3, uc2, uc1;
- Lower Cherty (LC) – lc5b, lc5a, lc4, or lc3.

All other geologic subunits are considered to be waste.

Candidate crude ore must then meet the following additional criteria to be considered crude ore blocks:

- Satisfy the pit optimization parameters as described in Section 14.9. In summary, candidate crude ore with MagFe lower than 16% is considered to be waste.
- Be classified as a Measured or Indicated Mineral Resource (Inferred Mineral Resources are considered to be waste).
- Not occur within a mining restricted area.
- Generate a net block value greater than the cost of the block as if it were mined as waste.

Pit optimization and pit design were conducted to convert the Mineral Resources to Mineral Reserves.

The analysis for the Mineral Reserve estimate includes both crude ore loss and mining dilution in the final reported tonnage and grades:

- Crude ore loss is material that meets all criteria for crude ore but is sent to the waste stockpile. Typically, thin layers of crude ore or individual blocks that are not separable with the current mining equipment are considered as unrecoverable and become crude ore loss. Percent crude ore loss is calculated by the amount of unrecoverable crude ore divided by the original crude ore content.
- Mining dilution is waste material that is mined and delivered as crude ore. Small areas of waste that cannot be separated from crude ore – and when the combined material still satisfies the cut-off criteria – become mining dilution. Percent mining dilution is defined as the diluted waste divided by the final scheduled and mined block of crude ore, which contains the diluted waste.

14.9 Cut-off Grade and Whittle Parameters

Pit optimization results are used as a guide for pit and stockpile designs. Inputs used for the optimization use a cost structure based on 2019 through 2020 actual production and the 2021 annual budget plan. The revenue and cost parameters for the Lerchs-Grossmann (LG) optimization are presented in Table 14-8.



Table 14-8: Pit Optimization Parameters

Parameter	Value
Pellet Sale Price	US\$90/LT wet flux pellet
<i>In Situ</i> Waste Mining Cost	US\$1.70/LT mined
Unconsolidated Waste Mining Cost	US\$2.00/LT mined
Crude Ore Mining cost	US\$4.20/LT crude ore
Crushing and Concentrating Cost	US\$5.80/LT crude ore
Pelletizing and General Cost	US\$34.00/LT wet flux pellet
Replacement Capital Cost	US\$7.25/LT wet flux pellet
Maximum Overall Pit Slope Angle	49.4° for <i>in situ</i> rock and 19.4° for surface overburden

In addition, the Laurentian Pit limits are constrained by the Permit to Mine boundary, availability of wetland credits, and Minnesota State Highway 135; thus, opportunity to expand the pit with higher pellet values is limited. The East 1 and East 2 pits are currently limited by their respective Permit to Mine boundaries.

The Laurentian Pit is geographically separate from the East 1 and East 2 pits, so these areas are optimized independently from one another.

The cut-off grade for Mineral Resources is 16.0% crude MagFe. This cut-off grade has been developed as a measure of maintaining product tonnage with constraints on the delivery of crude to the concentrator since mining began. This cut-off grade is verified through a break-even cut-off grade calculation (Figure 14-2):

Figure 14-2: Cut-off Grade Formula

$$\begin{aligned}
 & \text{Breakeven Cutoff Grade (COG)} \\
 &= \frac{\sum (\text{Cash Costs \$ / LT ore milled})}{\left(\left(\frac{\text{Revenue Rate}}{\text{Pellet \%Fe}} \right) - \left(\frac{\text{Sales Costs \$ / LT Pellet}}{\text{Pellet \%Fe}} \right) \right)} \times \frac{\text{Ore LT x \%MagFe}}{\text{Pellet LT x Pellet \%Fe}}
 \end{aligned}$$

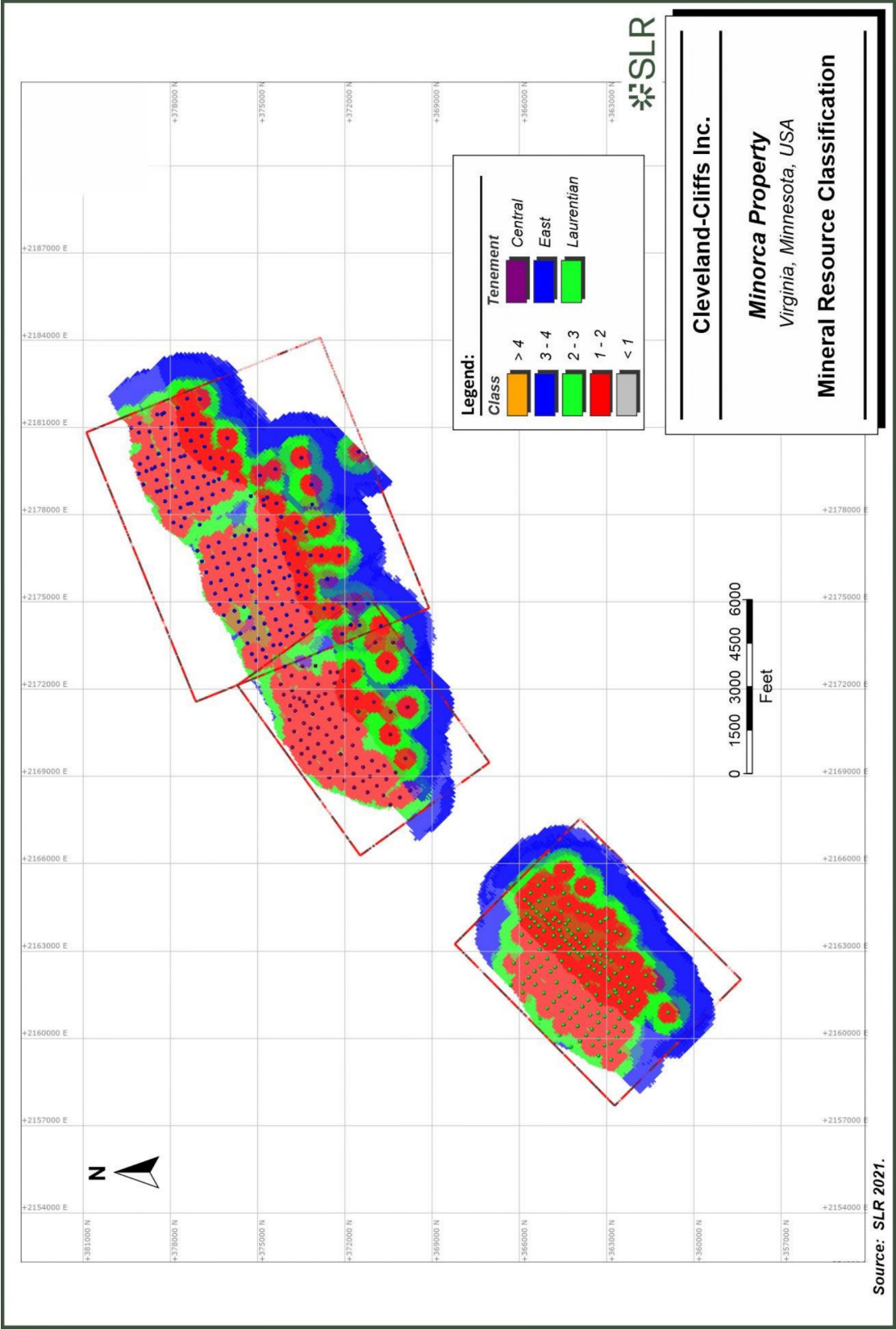
14.10 Classification

Definitions for resource categories used in this Technical Report are those defined by CIM (2014) as incorporated into NI 43-101. Mineral Resources are classified into Measured, Indicated, and Inferred categories.

Cliffs classifies the Mineral Resources based primarily on drill hole spacing and influenced by geologic continuity, ranges of economic criteria, and reconciliation. Some post-processing is undertaken to ensure spatial consistency and remove isolated and fringe blocks. The resource area is limited by a polygon and subsequent pit shell based on practical mining limits. A block of ore is classified as Measured if the distance to the nearest drill hole is within 400 ft and estimated with the pass 1 estimate. If the nearest drill hole is between 400 ft and 800 ft and estimated in the pass 2 estimate it is classified as Indicated. All remaining blocks are classified as Inferred. Mineral Resource classification at Minorca is shown in Figure 14-3.



Figure 14-3: Mineral Resource Classification



In addition to numeric-based parameters, the relative confidence of all the data inputs during the assignment of the resource confidence category has been considered, including:

- the reliability of the drilling data,
- reliability or certainty of the geological and grade continuity, geological model interpretation, structural interpretation, and the assay database,
- reliability of inputs to assess reasonable prospects for eventual economic extraction and cut-off grades (e.g., ability to obtain permits, social acceptability, etc.), and
- legal and land tenure considerations.
- The QP is of the opinion that the classification at Minorca is generally acceptable. The QP notes, however, that the extension of classified material beyond drilling limits is slightly aggressive, and some post-processing to remove isolated blocks of different classification is warranted. The QP recommends transitioning the classification process in future updates to consider local drill hole spacing instead of a distance-to-drill hole criterion. The QP notes that, in general, classified blocks which extend beyond the drilling limits are outside the Resource Grade Shell.

14.11 Model Validation

Blocks were validated using industry-standard techniques including:

- Visual inspection of assays and composites versus block grades (Figure 14-4 to Figure 14-6)
- Comparison between ID^2 , NN, and composite means (Table 14-9)
- Swath plots

14.11.1 Visual Inspection

SLR reviewed the MagFe relative to blocks, drilled grades, and composites. SLR observed that the block grades exhibited general accord with drilling and sampling and did not appear to smear significantly across sampled grades.



Figure 14-4: Plan View 1,300 MASL Assay and Block MagFe Grades (20 ft Window)

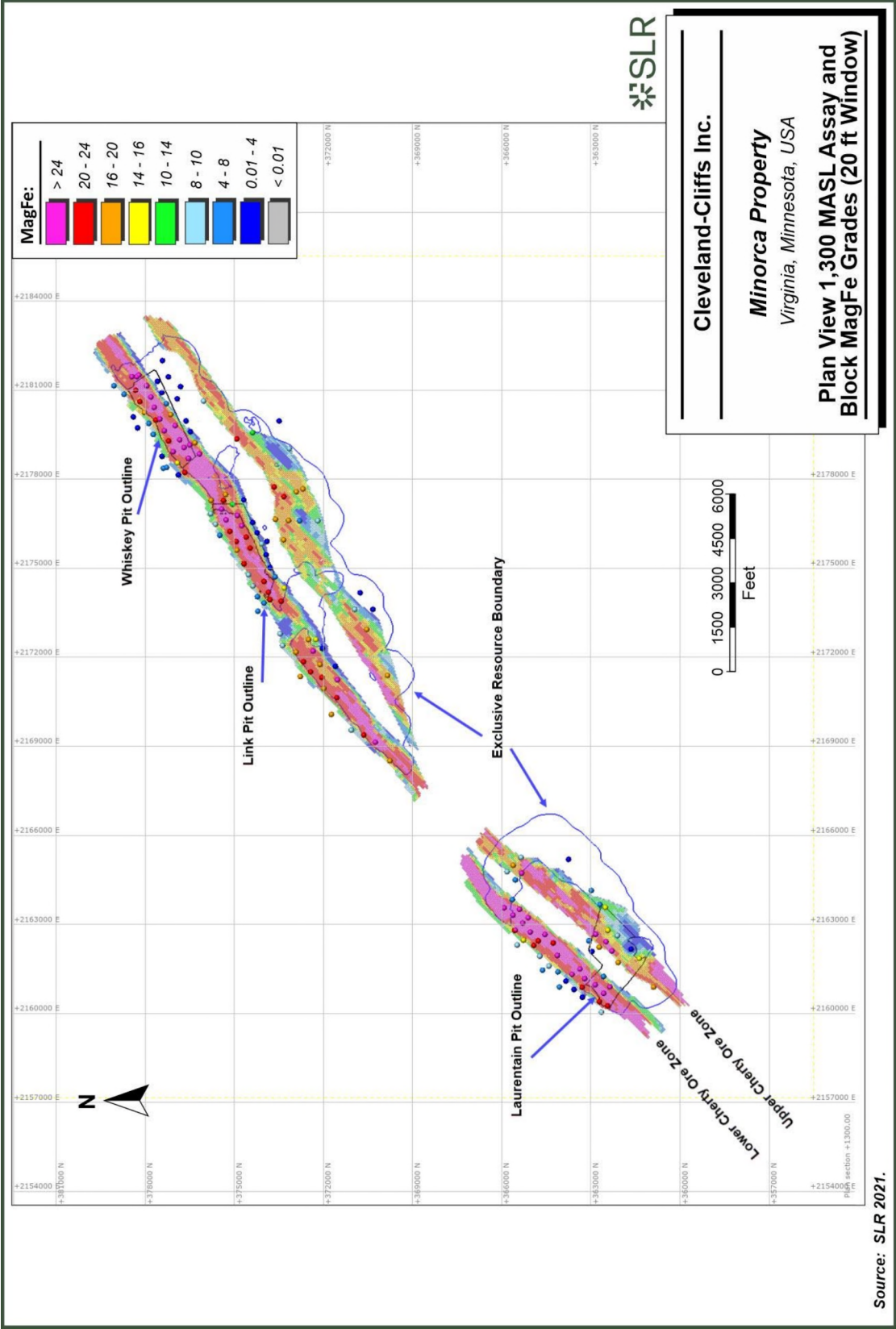


Figure 14-5: Cross-section East (Whiskey Pit) Assay and Block MagFe Grades (Looking Northeast)

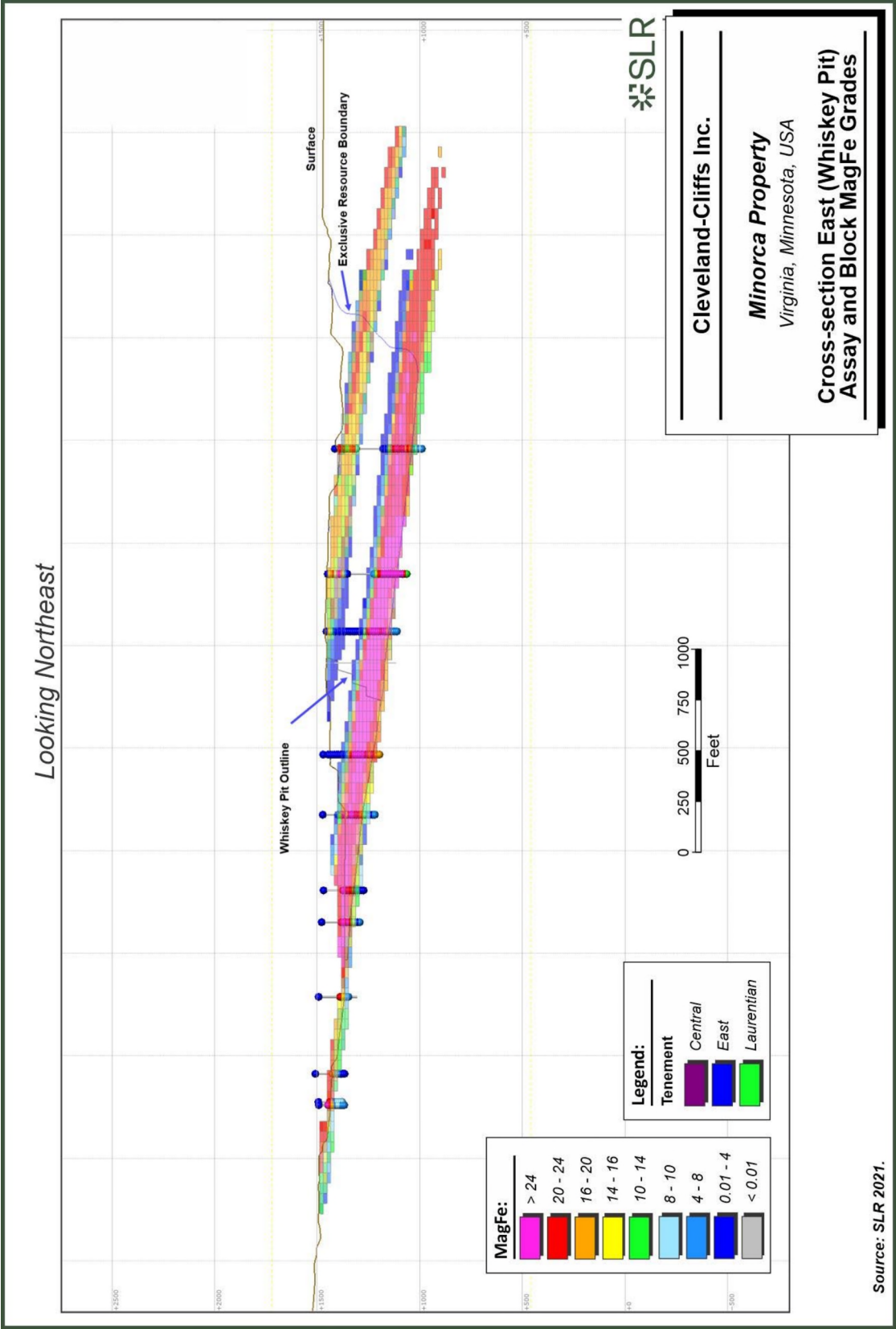
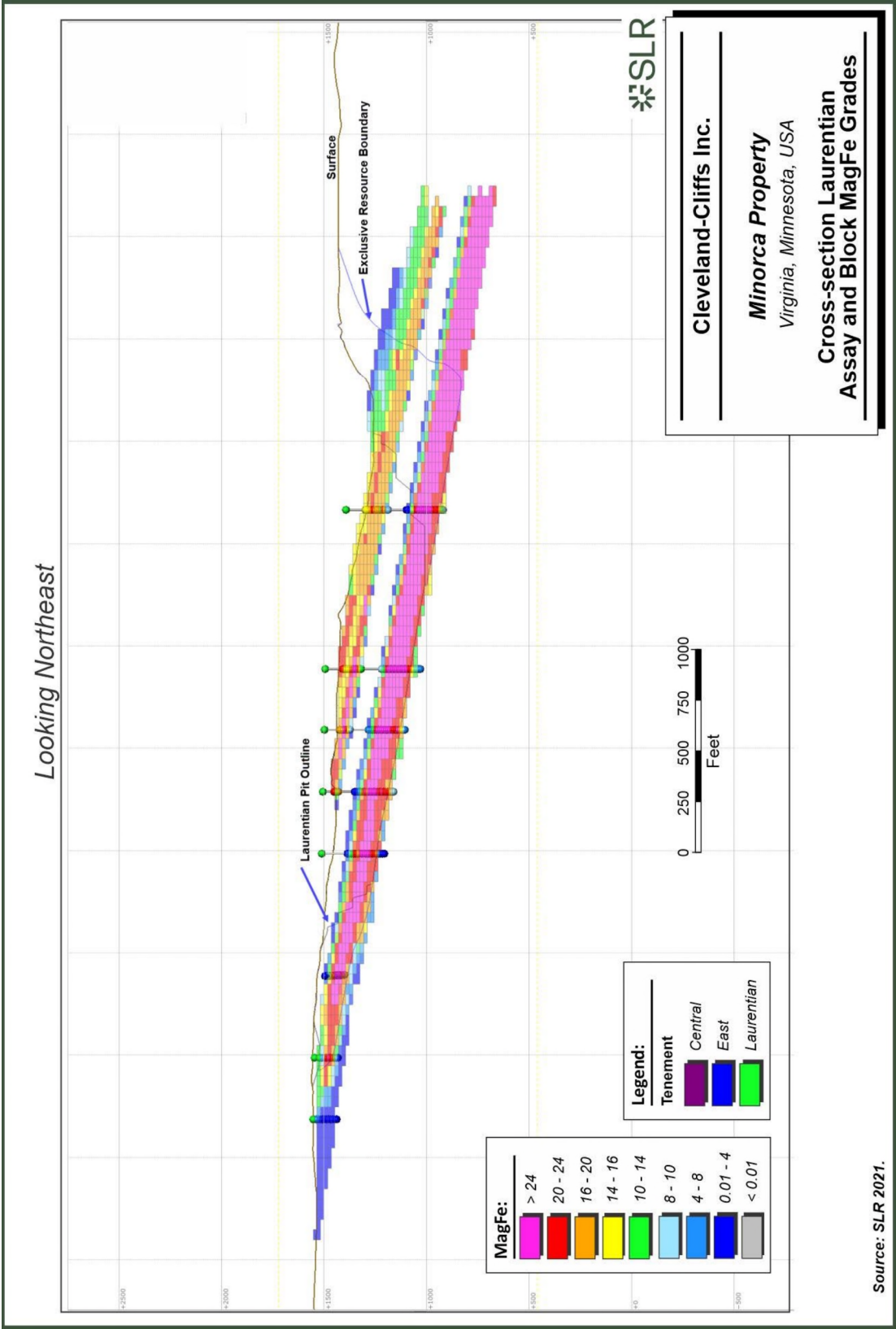


Figure 14-6: Cross-section Laurentian Assay and Block MagFe Grades (Looking Northeast)



14.11.2 Comparative Statistics Composites vs Block Grades

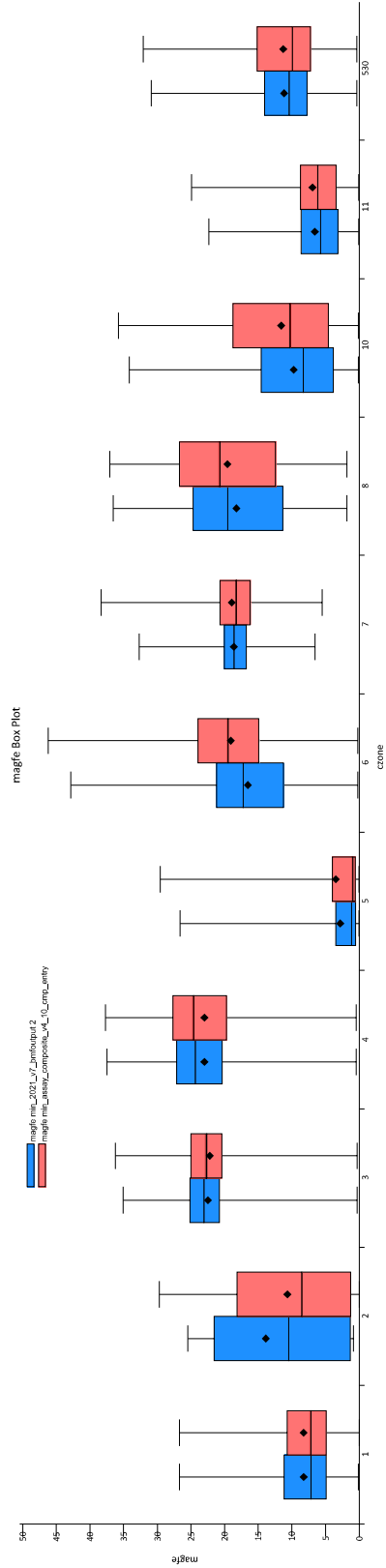
The mean grades in composites and blocks compare favorably for the MagFe evaluated in the LC and UC. Higher-percent-variance block grade means in the OVB, LS, UC1, and LC5B subunits, which led to an overall -18.4% difference, are observed due to the average of a larger number of low-grade blocks versus the composites (Table 14-9, Figure 14-7).

Table 14-9: Comparative Statistics of Composites and Blocks for Key Economic Variables Base Block Model

Data	Variable	Domain Field	Rock Code	Lithology	Count	Min (%)	Max (%)	Mean (%)	St Dev (%)	CV	% Mean Δ
Block Model	magfe	czone	1	FTW1	173,402	0.14	26.74	8.22	4.65	0.56	0.21%
Composite	magfe	czone	1	FTW1	872	0.00	26.74	8.24	5.05	0.61	
Block Model	magfe	czone	2	OVB	8	0.88	25.50	13.87	9.83	0.71	-30.12%
Composite	magfe	czone	2	OVB	25	0.00	29.72	10.66	9.10	0.85	
Block Model	magfe	czone	3	LC4*	116,253	0.30	35.08	22.49	4.78	0.21	-1.32%
Composite	magfe	czone	3	LC4*	1,973	0.30	36.23	22.20	5.20	0.23	
Block Model	magfe	czone	4	LC5A*	109,217	0.44	37.47	23.01	6.02	0.26	-0.01%
Composite	magfe	czone	4	LC5A*	1,586	0.44	37.70	23.01	6.71	0.29	
Block Model	magfe	czone	5	LS	129,207	0.02	26.65	2.83	3.72	1.31	18.73%
Composite	magfe	czone	5	LS	1,025	0.01	29.58	3.48	5.06	1.45	
Block Model	magfe	czone	6	UC1*	103,955	0.20	42.88	16.53	7.62	0.46	13.30%
Composite	magfe	czone	6	UC1*	1,014	0.20	46.21	19.06	8.32	0.44	
Block Model	magfe	czone	7	UC2*	17,569	6.52	32.66	18.63	2.46	0.13	1.56%
Composite	magfe	czone	7	UC2*	354	5.53	38.36	18.93	4.37	0.23	
Block Model	magfe	czone	8	UC3*	42,022	1.85	36.54	18.25	7.80	0.43	6.78%
Composite	magfe	czone	8	UC3*	579	1.85	37.05	19.57	8.66	0.44	
Block Model	magfe	czone	10	LC5B*	62,396	0.13	34.13	9.71	6.84	0.70	16.12%
Composite	magfe	czone	10	LC5B*	556	0.13	35.78	11.58	8.05	0.70	
Block Model	magfe	czone	11	US	36,350	0.07	22.35	6.56	4.69	0.72	5.22%
Composite	magfe	czone	11	US	149	0.07	24.95	6.92	5.01	0.72	
Block Model	magfe	czone	530	LC3*	86,281	0.37	30.90	11.16	4.95	0.44	0.95%
Composite	magfe	czone	530	LC3*	1,017	0.34	32.06	11.27	6.24	0.55	
Block Model	magfe	Total			876,660	0.02	42.88	13.16	8.99	0.68	18.40%
Composite	magfe	Total			9,163	0.00	46.21	16.13	9.39	0.58	
*Ore Domains											



Figure 14-7: Whisker Plots for MagFe Composites and Blocks in All Sub Members in Minorca



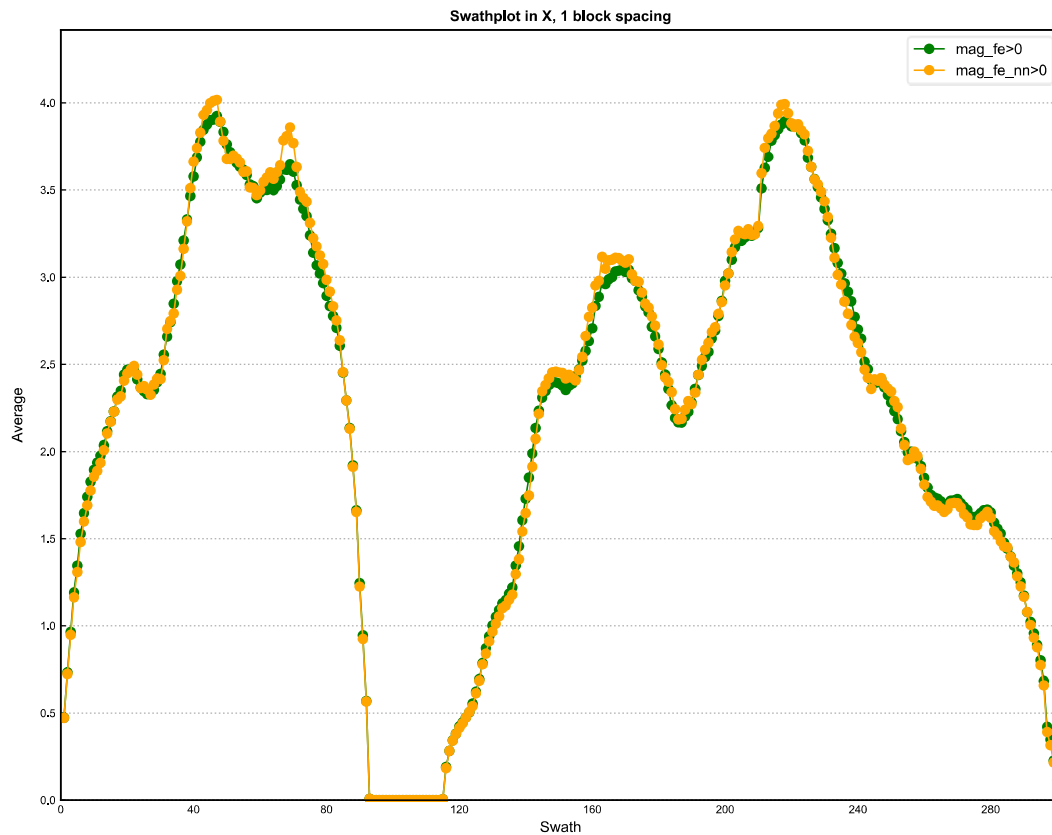
Source: SLR 2021.



14.11.3 Swath Plots

Swath plots (Figure 14-8, Figure 14-9, and Figure 14-10) demonstrate good correlation, with block grades being somewhat smoothed relative to composite grades, as expected. SLR notes, however, that the variance observed in comparing composites versus block grades is not observed when comparing the ID² estimate with an NN estimate in the swath plots, as only one hole was required for estimating block grades. Overall, the statistical evaluation provides acceptable validation of the model results. SLR recommends that future estimates use a minimum of two holes for the pass 1 estimate.

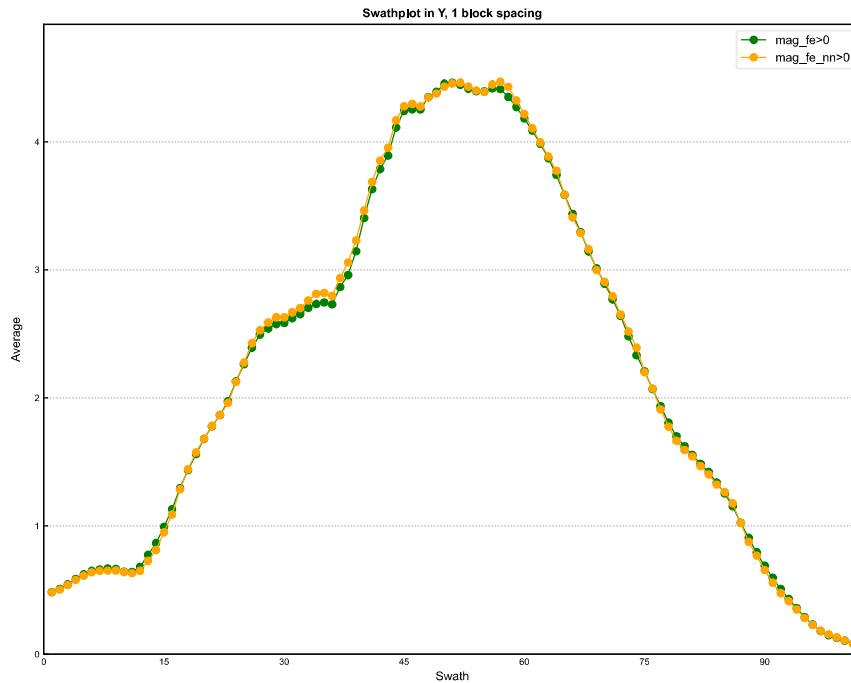
Figure 14-8: East-West (X) Swath Plot for MagFe ID² versus NN



Source: SLR 2021.

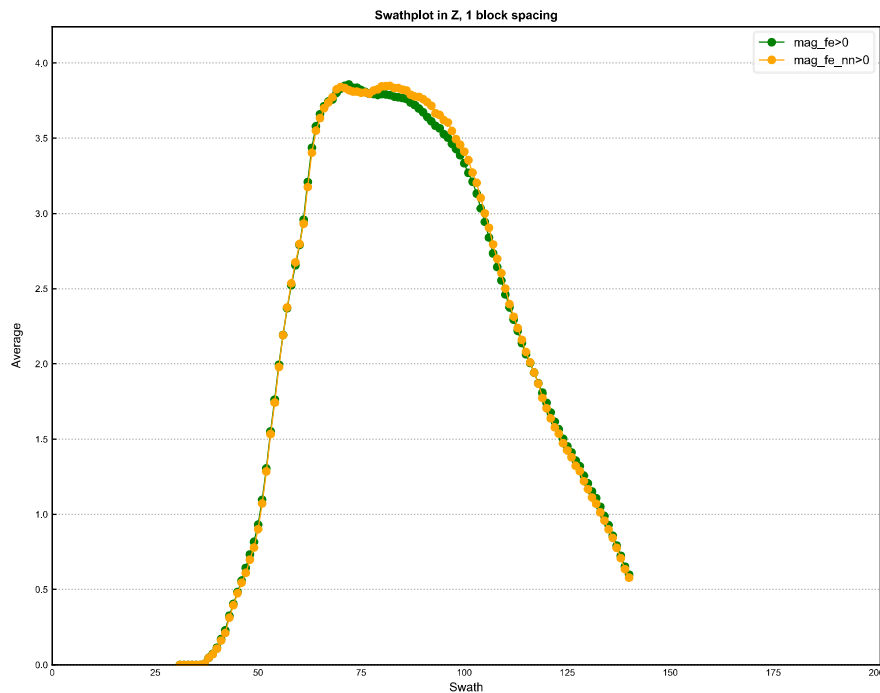


Figure 14-9: North-South (Y) Swath Plot for MagFe ID² versus NN



Source: SLR 2021.

Figure 14-10: Vertical (Z) Swath Plot for MagFe ID² versus NN



Source: SLR 2021.



14.12 Model Reconciliation

Reconciliation results comparing actual production results versus model-predicted values of crude ore and pellet production for the third quarter (Q3) of 2021 are presented in Table 14-10. Model values were determined by reporting tons and grade from solids of the actual mined areas for each area. The models used were the budget mine planning block models, which were modified from the geologic model to account for crude ore loss and dilution.

Overall, the block model is slightly conservative but is matching well against actual production:

- Total ore under-predicted by 9.2%.
- Waste over-predicted by 8.0%.
- Total material was within less than 1.0%.
- Crude MagFe and DT concentrate silica were both within less than 1%.

Table 14-10: Q3 2021 Model Reconciliation

	Block Model	Actual	Variance	%
Crude Ore (LT)	1,986,112	2,169,126	-183,014	-9.2%
MagFe (%)	22.86	22.94	-0.09	-0.4%
Silica (%)	3.02	3.00	0.01	0.4%
Waste (LT)	2,215,014	2,038,213	176,801	8.0%
Overburden	1,673,936	1,347,335	326,601	19.5%
Waste Rock	541,078	690,878	-149,800	-27.7%
Total Material Tons	4,201,126	4,207,339	-6,213	-0.1%

14.13 Mineral Resource Statement

Mineral Resource estimates for the Minorca deposit were prepared by Cliffs and audited and accepted by SLR using available data from 1958 to 2021.

To ensure that all Mineral Resource statements satisfy the “reasonable prospects for eventual economic extraction” requirement, in definition of the Mineral Resources for Minorca, the mine considered factors significant to technical feasibility and potential economic viability. Mineral Resources were defined and constrained within an open-pit shell, prepared by Cliffs, and based on a US\$90/LT pellet value and a wet 62.5% Fe flux pellet.

The Mineral Resource estimate as of December 31, 2021, is presented in Table 14-11.

Table 14-11: Summary of Mineral Resource -December 31, 2021

Class	Resources	MagFe	Process Recovery	Pellets
	(MLT)	(%)	(%)	(MLT)
Measured	484.3	22.9	32.9	159.3
Indicated	317.2	22.9	32.9	104.4
Measured + Indicated	801.5	22.9	32.9	263.7



Class	Resources	MagFe	Process Recovery	Pellets
	(MLT)	(%)	(%)	(MLT)
Inferred	30.1	21.1	30.2	9.1
Notes: 1. Tonnage is reported in long tons equivalent to 2,240 lb. 2. Mineral Resources are reported exclusive of Mineral Reserves and have been rounded to the nearest 100,000. 3. Mineral Resources are estimated at a cut-off grade of 16% crude MagFe. 4. Mineral Resources are estimated using a pellet value of US\$90/LT. 5. Waste within the pit is 986.7 MLT at a stripping ratio of 1.23:1 (waste to crude ore). 6. Saleable product reported as a 62.5% Fe content wet flux pellet, shipped product contains 2% moisture. 7. Classification of Mineral Resources is in accordance with CIM (2014) definitions. 8. Bulk density is assigned based on average readings for each lithology type. 9. Mineral Resources are 100% attributable to Cliffs. 10. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. 11. Numbers may not add due to rounding.				

Minorca has been in operation for many years, and land and mineral control has been long established. The QP is not aware of any mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

While the estimate of Mineral Resources is based on the QP's judgment that there are reasonable prospects for eventual economic extraction, no assurance can be given that Mineral Resources will eventually convert to Mineral Reserves.

The QP offers the following conclusions with respect to the Minorca Mineral Resource estimates:

- The KEVs in the block models for Minorca compare well with the source data. Future estimation should also review the cut-off grade used in reporting.
- The methodology used to prepare the block model is appropriate and consistent with industry standards.
- Validations compiled by the QP indicate that the block model is reflecting the underlying support data appropriately.
- The classification at Minorca is generally acceptable; however, the extension of classified material beyond drilling limits is slightly aggressive, and some post-processing to remove isolated blocks of different classification is warranted. Classified blocks which extend beyond the drilling limits are generally outside the Resource Pit Shell.
- The block model represents an acceptable degree of smoothing at the block scale for prediction of quality variables at Minorca. Visually, blocks and composites in cross-section and plan view compare well.
- 2021 actual versus model-predicted values of crude ore were accurate to within 10%, with the model values slightly lower than actual total ore processed.

The QP offers the following recommendations with respect to the Minorca Mineral Resource estimates:

- Apply a minimum of two holes during the pass 1 estimation for Minorca in future updates.



- Transition the process of classifying blocks in future updates to consider local drill hole spacing instead of a distance-to-drill hole criterion.
- Prepare model reconciliation over quarterly periods and document methodology, results, and conclusions and recommendations.



15.0 Mineral Reserve Estimates

15.1 Summary

Mineral Reserves in this Technical Report are derived from the current Mineral Resources. The Mineral Reserves are reported as crude ore and are based on open pit mining from the Laurentian, East 1, and East 2 Pit areas. Crude ore is the unconcentrated ore as it leaves the mine at its natural *in situ* moisture content. The Minorca Proven and Probable Mineral Reserves are estimated as of December 31, 2021, and summarized in Table 15-1.

Table 15-1: Summary of Mineral Reserves – December 31, 2021

Category	Crude Ore Mineral Reserves (MLT)	Crude Ore (% MagFe)	Process Recovery (%)	Wet Pellets (MLT)
Proven	102.8	23.7	34.0	35.0
Probable	6.8	25.1	36.1	2.5
Proven + Probable	109.7	23.8	34.1	37.4

Notes:

- Tonnage is reported in long tons equivalent to 2,240 pounds and has been rounded to the nearest 100,000.
- Mineral Reserves are reported at a \$90/LT wet flux pellet price free-on-board (FOB) Lake Superior, based on the three-year trailing average of the realized product revenue rate.
- Mineral Reserves are estimated at a cut-off grade of 16% crude MagFe.
- Mineral Reserves include mining dilution of 4% and mining extraction losses of 5%.
- The Mineral Reserve mining stripping ratio (waste units to crude ore units) is at 0.8.
- Pellets are reported as a 62.5% Fe content wet flux pellet; shipped pellets contain 2.0% moisture.
- Tonnage estimate based on December 31, 2021 production depletion from a surveyed topography on June 28, 2021.
- Mineral Reserve tons are as delivered to the primary crusher; pellets are as loaded onto lake freighters in Two Harbors, Minnesota.
- Classification of the Mineral Reserves is in accordance with CIM (2014) definitions.
- Mineral Reserves are 100% attributable to Cliffs.
- Numbers may not add due to rounding.

The three-year (2017 to 2019) trailing average of the realized pellet price is US\$98/LT; however, the reserves are evaluated using a pellet price of US\$90/LT based on the corporate guidance issued. The pellet value more closely represents the current economic outlook, and the optimization margins still allow for a robust mine-plan. The costs used in this study represent all mining, processing, transportation, and administrative costs including the loading of pellets into lake freighters in Two Harbors, Minnesota.

The QP is not aware of any mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

15.2 Conversion Assumptions, Optimization Parameters, and Methods

Using the mine planning block model for Minorca, pit optimization and pit designs are conducted to convert the Mineral Resources to Mineral Reserves. At Minorca, this work is carried out at the Mineral Resource estimation stage and is discussed in Section 14.8.3.



A reconciliation of the geologic block model to the mining models – which was re-blocked to 50 ft by 50 ft by 17.5 ft (i.e., half the bench height) – demonstrated that Minorca has a modeled average crude ore loss of 5% and an average mining dilution of 4%. The crude MagFe discount – a function of ore dilution – between the geologic block model and mining models was demonstrated to be 0.9%, which aligned closely to the empirically derived 1.0% discount used historically. With a 0.9% MagFe discount internalized within the mining model, the historically derived MagFe discount in the pellet recovery equation is reduced from 1.0% to 0.1%, so that when combined with the internal mining model factor, the resultant MagFe discount is still 1.0%.

Minorca has a long history of plant recovery, which is used as part of the pit optimization. The following summarizes the empirical relationship for pellet production based on crude ore tons and crude MagFe content:

$$\text{Wet Concentrate Tons} = \text{Crude Ore Tons} \times (\text{Crude MagFe} - \text{MagFe Discount}) \times \text{Recovery Factor}$$

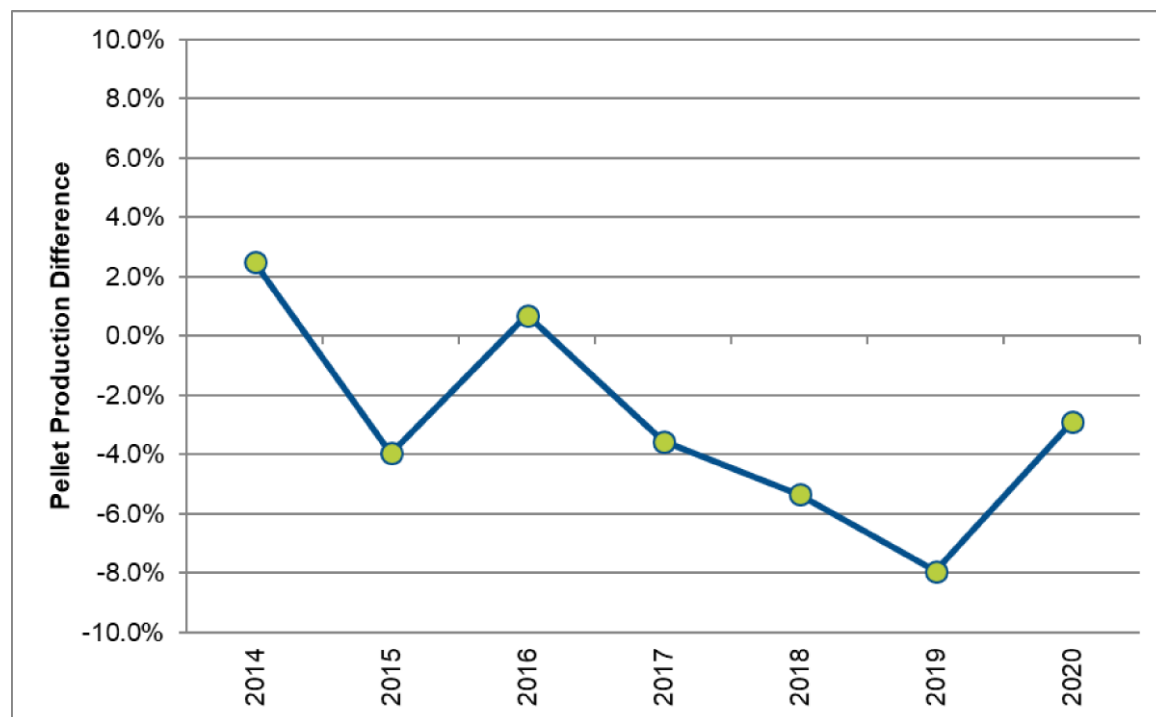
$$\text{Wet Flux Pellet Tons} = \text{Wet Concentrate Tons} \times \text{Flux Pellet Conversion Factor}$$

Where:

- MagFe Discount = 0.1%
- Recovery Factor = 1.3
- Historical wet concentrate to wet flux pellet ratio is 1.11

From 2010 through 2020, the equation has reconciled within 3% of the production years when comparing calculated wet flux pellet production to actual wet flux pellet production. Figure 15-1 shows the 2014 through 2020 variance between calculated and actual flux pellet production.

Figure 15-1: 2014–2020 Calculated versus Actual Pellet Production



Source: Cliffs 2021.



All Measured and Indicated Mineral Resources within the final designed pit that meet the above criteria are converted into Mineral Reserves. The only additional criterion for Measured Mineral Resources converting into Proven Mineral Reserves is that they must be scheduled within the first 20 years of the mine life. Table 15-2 shows the criteria to convert Mineral Resource classifications to Mineral Reserve classifications.

Table 15-2: Mineral Resource to Mineral Reserve Classification Criteria

Mineral Resources	Criteria for Conversion	Mineral Reserves
Measured	Scheduled Within the First 20 Years	Proven
Indicated	As Scheduled	Probable
Inferred	As Scheduled	Waste

15.3 Previous Mineral Reserve Estimates

Cliffs acquired Minorca during the 2020 purchase of AMUSA's assets. The SEC-reported Mineral Reserves for the past ten years are listed in Table 6-1 in Section 6.0 History. These Mineral Reserves were not prepared under the recently adopted SEC guidelines; however, they followed SEC Guide 7 requirements for public reporting of Mineral Reserves in the United States.

In 2019, the Laurentian Pit was expanded, resulting in a significant increase from the previously reported reserves.

The change in Mineral Reserves from 2019 to current is primarily attributable to mining depletion.

15.4 Pit Optimization

Pit optimizations were carried out on the Laurentian, East 1, and East 2 pit areas in Vulcan™ using the mine planning block models. Inputs used for the optimization use a bench-based mining cost escalator developed based on cost structure from 2019 through 2020 actual production and the 2021 annual budget plan.

15.4.1 Summary of Pit Optimization Parameters

The pit optimization parameters are summarized as follows:

- $Wet\ flux\ pellet\ tons = crude\ ore\ tons \times (crude\ MagFe - 0.1\%) \times 1.3 \times 1.11$
- Base case product average price = \$90/LT wet flux pellets.
- *In situ* waste mining cost = \$1.70/LT mined.
- Unconsolidated waste mining cost = \$2.00/LT mined.
- Crude ore mining cost = \$4.20/LT crude ore.
- Crushing and concentrating cost = \$5.80/LT crude ore.
- Pelletizing and general cost = \$34.00/LT wet flux pellet.
- Replacement capital cost = \$7.25/LT wet flux pellet.



- Maximum overall pit slope angle = 49.4° for *in situ* rock and 19.4° for surface overburden.

In addition, the Laurentian Pit limits are constrained by the Permit to Mine boundary, availability of wetland credits, and Minnesota State Highway 135; thus, opportunity to expand the pit with higher pellet values is limited. The East 1 and East 2 pits are currently limited by their respective Permit to Mine boundaries.

15.4.2 Pit Optimization Results and Analysis

Pit optimization results are used as a guide for pit and stockpile designs. The Laurentian Pit is geographically separate from the East 1 and East 2 pits, so these areas are optimized independently from one another.

Pit optimizations were run by varying the base-case product price with a block revenue factor. The risk profile and revenue-generating potential of the deposits is evaluated by considering the relationship between crude ore and waste rock and the associated relative discounted cash flows (DCF) generated at each incremental pit (discount rate of 10% utilized for the optimization analysis).

The results from the Laurentian Pit optimization are summarized in Table 15-3, showing the pit shell results from a price range of \$72.00/LT to \$99.00/LT of wet flux pellets, with pit shell 11 highlighted to indicate the selected pit shell to be used as a guide for final pit design. The pit-by-pit graph showing tonnages and relative DCFs is provided in Figure 15-2.

The results from the East 1 and East 2 optimization are summarized in Table 15-4, showing the pit shell results from a price range of \$72.00/LT to \$99.00/LT of wet flux pellets, with pit shell 14 highlighted to indicate the selected pit shell to be used as a guide for final pit design. The pit-by-pit graph showing tonnages and relative DCFs is provided in Figure 15-3.

Table 15-3: Laurentian Pit Optimization Results

Pit Shell	Revenue Factor	Wet Flux Pellets (MLT)	Total Material Movement (MLT)	Crude Ore (MLT)	Stripping (MLT)	Strip Ratio	Process Recovery (%)	Product Price (\$/LT wet flux pellets)
1	0.80	2.8	7.8	7.2	0.6	0.09	39.6	72.00
2	0.81	3.6	10.3	9.3	1.0	0.11	38.9	72.90
3	0.82	4.7	13.9	12.2	1.8	0.14	38.2	73.80
4	0.83	5.9	18.6	15.6	2.9	0.19	37.7	74.70
5	0.84	6.9	22.8	18.6	4.3	0.23	37.3	75.60
6	0.85	8.0	27.6	21.7	5.9	0.27	36.9	76.50
7	0.86	9.4	34.3	25.8	8.5	0.33	36.5	77.40
8	0.87	21.1	97.9	59.4	38.5	0.65	35.6	78.30
9	0.88	26.0	125.2	73.6	51.6	0.70	35.3	79.20
10	0.89	28.0	136.6	79.4	57.2	0.72	35.2	80.10
11	0.90	30.6	153.0	87.1	65.9	0.76	35.1	81.00



Pit Shell	Revenue Factor	Wet Flux Pellets (MLT)	Total Material Movement (MLT)	Crude Ore (MLT)	Stripping (MLT)	Strip Ratio	Process Recovery (%)	Product Price (\$/LT wet flux pellets)
12	0.91	32.0	162.2	91.1	71.2	0.78	35.1	81.90
13	0.92	32.9	168.8	93.7	75.1	0.80	35.1	82.80
14	0.93	33.1	170.2	94.3	75.8	0.80	35.1	83.70
15	0.94	33.8	175.6	96.6	78.9	0.82	35.0	84.60
16	0.95	34.1	177.3	97.3	80.0	0.82	35.0	85.50
17	0.96	34.3	179.2	97.9	81.2	0.83	35.0	86.40
18	0.97	34.4	179.7	98.2	81.4	0.83	35.0	87.30
19	0.98	34.4	180.1	98.5	81.6	0.83	35.0	88.20
20	0.99	34.5	181.0	98.8	82.2	0.83	34.9	89.10
21	1.00	34.6	181.9	99.1	82.9	0.84	34.9	90.00
22	1.01	34.6	182.1	99.1	83.0	0.84	34.9	90.90
23	1.02	34.7	182.4	99.2	83.2	0.84	34.9	91.80
24	1.03	34.7	182.9	99.3	83.5	0.84	34.9	92.70
25	1.04	34.7	183.1	99.4	83.7	0.84	34.9	93.60
26	1.05	34.7	183.2	99.4	83.7	0.84	34.9	94.50
27	1.06	34.7	183.4	99.5	83.9	0.84	34.9	95.40
28	1.07	34.8	183.7	99.6	84.1	0.84	34.9	96.30
29	1.08	34.8	183.7	99.6	84.1	0.84	34.9	97.20
30	1.09	34.8	184.0	99.6	84.4	0.85	34.9	98.10
31	1.10	34.8	184.6	99.7	84.9	0.85	34.9	99.00



Figure 15-2: Laurentian Pit Optimization Pit-by-Pit Graph

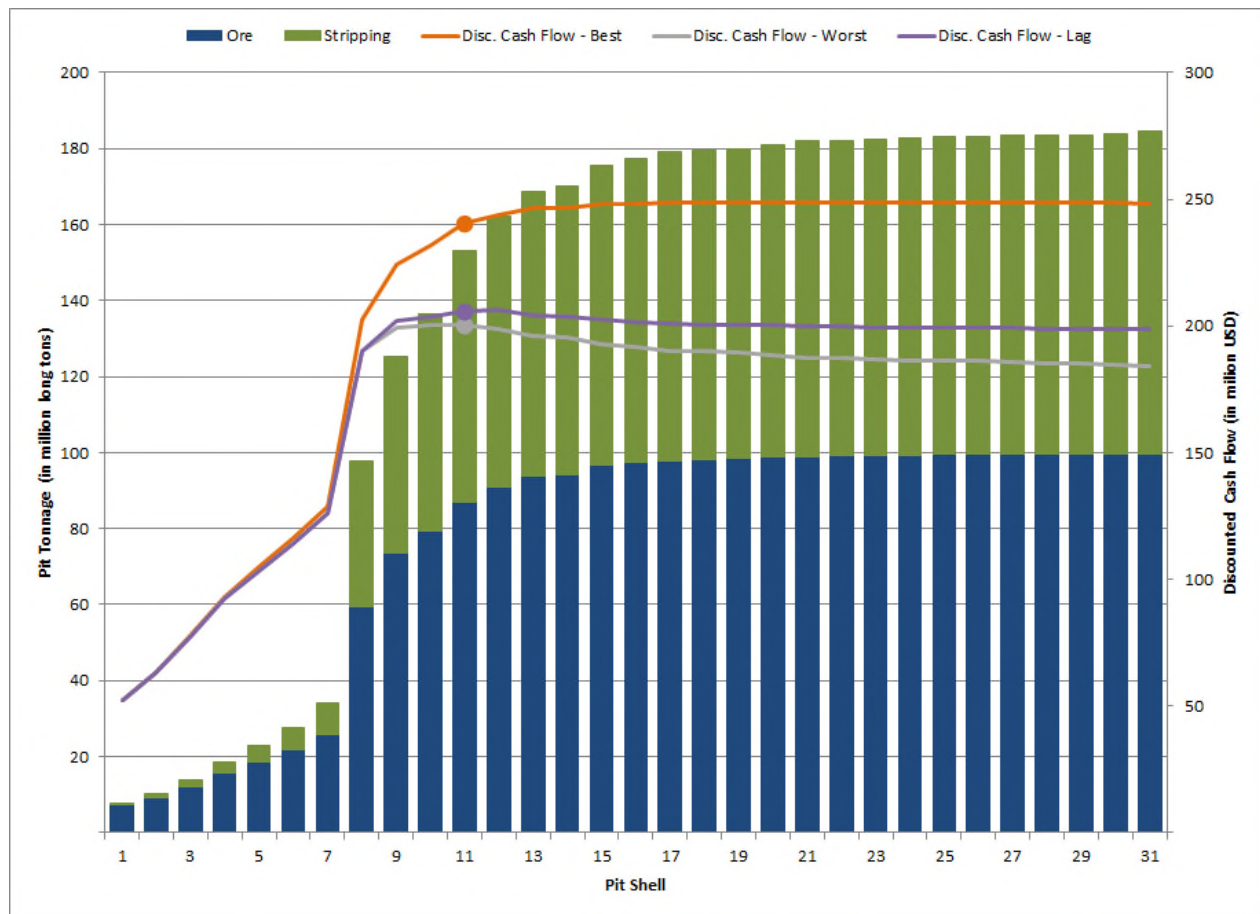
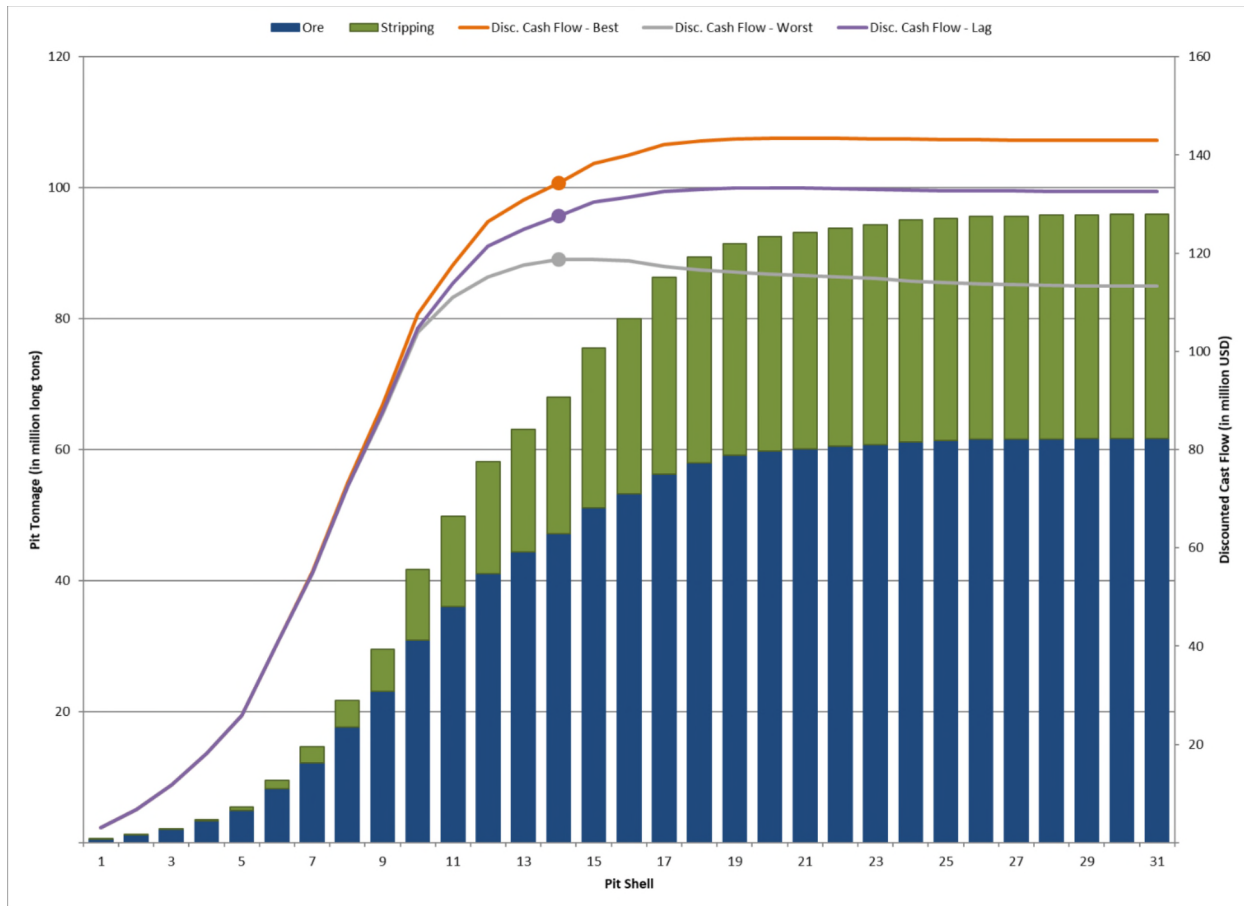


Table 15-4: East 1 and East 2 Pit Optimization Results

Pit Shell	Revenue Factor	Wet Flux Pellets (MLT)	Total Material Movement (MLT)	Crude Ore (MLT)	Stripping (MLT)	Strip Ratio	Process Recovery (%)	Product Price (\$/LT wet flux pellet)
1	0.80	0.2	0.5	0.5	0.0	0.00	37.5	72.00
2	0.81	0.4	1.1	1.1	0.0	0.02	36.9	72.90
3	0.82	0.7	2.1	2.0	0.1	0.05	36.7	73.80
4	0.83	1.2	3.5	3.3	0.2	0.07	36.3	74.70
5	0.84	1.8	5.4	4.9	0.5	0.10	35.9	75.60
6	0.85	2.9	9.5	8.2	1.2	0.15	35.5	76.50
7	0.86	4.3	14.6	12.2	2.4	0.20	35.3	77.40
8	0.87	6.1	21.7	17.6	4.1	0.23	35.0	78.30
9	0.88	8.0	29.6	23.1	6.4	0.28	34.7	79.20
10	0.89	10.6	41.7	30.9	10.8	0.35	34.5	80.10
11	0.90	12.3	49.9	36.0	13.8	0.38	34.3	81.00
12	0.91	14.0	58.2	41.1	17.1	0.42	34.1	81.90
13	0.92	15.0	63.1	44.4	18.7	0.42	33.9	82.80
14	0.93	15.9	68.0	47.2	20.8	0.44	33.8	83.70
15	0.94	17.2	75.5	51.2	24.3	0.48	33.6	84.60
16	0.95	17.9	80.0	53.3	26.7	0.50	33.5	85.50
17	0.96	18.8	86.3	56.3	30.1	0.53	33.4	86.40
18	0.97	19.3	89.5	57.9	31.5	0.54	33.3	87.30
19	0.98	19.7	91.5	59.1	32.4	0.55	33.2	88.20
20	0.99	19.8	92.6	59.8	32.8	0.55	33.2	89.10
21	1.00	19.9	93.2	60.2	33.0	0.55	33.1	90.00
22	1.01	20.0	93.8	60.5	33.3	0.55	33.1	90.90
23	1.02	20.1	94.3	60.8	33.5	0.55	33.1	91.80
24	1.03	20.2	95.1	61.2	33.9	0.55	33.0	92.70
25	1.04	20.3	95.4	61.4	34.0	0.55	33.0	93.60
26	1.05	20.3	95.6	61.6	34.1	0.55	33.0	94.50
27	1.06	20.3	95.7	61.6	34.1	0.55	33.0	95.40
28	1.07	20.3	95.8	61.6	34.2	0.55	33.0	96.30
29	1.08	20.3	95.9	61.7	34.2	0.55	33.0	97.20
30	1.09	20.3	95.9	61.7	34.2	0.55	33.0	98.10
31	1.10	20.3	96.0	61.7	34.3	0.56	33.0	99.00



Figure 15-3: East 1 and East 2 Optimization Pit-by-Pit Graph



15.5 Cut-off Grade

The Mineral Reserves cut-off grade is governed by metallurgical constraints applied in order to produce a saleable product followed by verification through a break-even cut-off grade calculation. The Mineral Reserves are reported at a 16% MagFe cut-off grade, which is the same cut-off criteria as those used for Mineral Resources, described in Section 16.0.

15.6 Mine Design

The Laurentian, East 1, and East 2 final pit designs incorporate several design variables including geotechnical parameters (e.g., wall angles and bench configurations), equipment size requirements (e.g., mining height and ramp configuration), and physical mining limits (e.g., property boundaries and existing infrastructure). The following summarizes the design variables and final pit results; more detail is provided in the preceding subsections and in Section 16.0.

The final highwall pit slope is designed at an inter-ramp angle (IRA) of 49.4° for *in situ* rock and 19.4° for surface overburden. The bench design for rock consists of double-stacked, 35-ft-high mining benches with a 74° bench face angle (BFA) and a 40-ft catch bench (CB). There are no ramps designed into the final highwall, as the footwall slope is less than 8% for most of the mining areas and can support the development of haulage ramps.

There are multiple physical mining limits that are applied to the pit optimization and/or the mine plan:



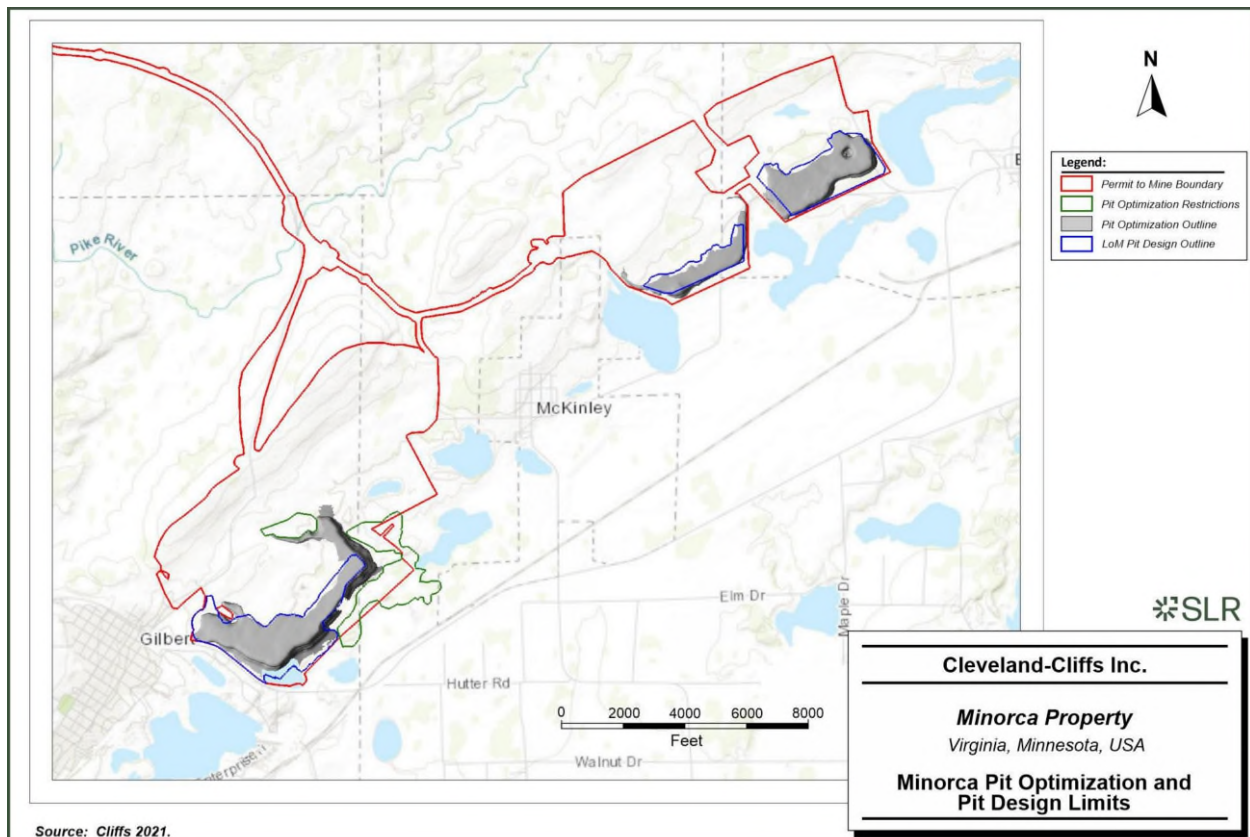
- The crude ore Mineral Reserve boundary resides within controlled mineral lease areas and also within the existing Permit to Mine.
- Mining limits are set at 500 ft from the closest buildings in the local communities.
- Mining limits are set at 200 ft from the centerline of local roads and highways.

The selected final pit shell results compared to the final pit design are detailed in Table 15-5 and shown in Figure 15-4. Pit design results are reported prior to depletion to be consistent with the pit optimization results.

Table 15-5: Pit Optimization to Pit Design Comparison

	Crude Ore (MLT)	Grade (% MagFe)	Stripping (MLT)	Total Material (MLT)	Stripping Ratio
Laurentian					
Pit Shell 11 (RF=0.90)	87	24.4	66	153	0.8
Pit Design	68	24.1	62	130	0.9
East 1, 2					
Pit Shell 14 (RF=0.93)	47	23.5	21	68	0.4
Pit Design	46	23.1	26	71	0.6

Figure 15-4: Minorca Pit Optimization and Pit Design Limits



In general, the final pit designs are a reasonable representation of the final pit shell guides, with the exception of certain areas due to physical mining limitations applied during mine design work (i.e., the restrictions were not applied during the optimization). Examples of such restrictions include minimum widths for phase development, availability of wetland remediation credits, and relocation of existing pit infrastructure that requires external permits for modification or additional land use agreements.

The eastern portion of the Laurentian Pit displays a noticeable deviation between the pit optimization shell and final pit design. This eastern area was mathematically calculated to be economically viable during the pit optimization, but does not possess adequate mining width, is encumbered by the main pit (White Lake) dewatering line, and cannot be integrated into the current pit haulage network. Based on the spatial limitation and the infrastructure encumbrances, this eastern area of the Laurentian Pit was not incorporated into the final pit design. The eastern area is also constrained to the east and west by non-mitigated wetlands, adding further complications.

When adequate wetland remediation credits are available and the White Lake pipeline has been relocated, this area will be re-evaluated for extraction.



16.0 Mining Methods

16.1 Mining Methods Overview

The Laurentian, East 1, and East 2 areas are mined using conventional surface mining methods. The surface operations include:

- Clearing and grubbing
- Overburden (glacial till) removal
- Drilling and blasting (excluding overburden)
- Loading and haulage

The Mineral Reserve is based on the ongoing annual average crude ore production of approximately 8.6 MLT from the Laurentian, East 1, and East 2 pits, producing an average of 2.8 MLT of wet flux pellets for domestic consumption.

Mining and processing operations are scheduled 24 hours per day, and the mine production is scheduled to directly feed the processing operations.

The current LOM plan has mining for 14 years and mines the known Mineral Reserve. The average stripping ratio is 0.8 waste units to 1 crude ore unit (0.8 stripping ratio).

The final Laurentian Pit is approximately 1.2 mi long along strike, 0.9 mi wide, and up to 640 ft deep. Crude ore averages approximately 24.4% MagFe. The final East 1 Pit is approximately 0.9 mi along strike, 0.5 mi wide, and up to 310 ft deep. Crude ore within the East 1 Pit averages approximately 22.5% MagFe. The East 2 final pit is approximately 0.7 mi along strike, 0.4 mi wide, and up to 350 ft deep. The East 2 Pit crude ore contains an average of 23.7% MagFe.

Primary production for all mine pits includes drilling a combination of 12.25 in.- and 16.00-in.-diameter rotary blast holes. Production blast hole depth varies as the pit benches transition from the footwall contact to a full 35-ft bench height. Burden and spacing varies depending on the material being drilled. The holes are filled with explosive and blasted. A combination of front-end loaders (FEL) and hydraulic shovels load the broken material into a mixed fleet of 200 ton- and 240 ton-payload mining trucks for transport from the pit.

The Mine follows strict crude ore blending requirements to ensure that the Plant receives a uniform head grade. The two most important characteristics of the crude ore are magnetic iron content and predicted concentrate silica. Generally, two ore zones are mined at one time to obtain a satisfactory crude ore blend for the Plant. Crude ore is hauled to the crushing facility and either direct tipped to the primary crusher or stockpiled in an area adjacent to the primary crusher. The crude ore stockpiles are used as an additional source for blending and production efficiency.

The major pieces of pit equipment include diesel hydraulic shovels, FELs, haul trucks, drills, bulldozers, and graders. Extensive maintenance facilities are available at the mine site to service the mine equipment.



16.2 Pit Geotechnical

16.2.1 Summary

The Laurentian, East 1, and East 2 pits are relatively shallow and, structurally, the in situ crude ore and waste rock is of excellent quality. The deposit dips into the highwall at 8° to 10°, reducing the risk of large-scale slope failures.

Final wall slopes, effectively the IRA as there are no haul ramps in the final highwall, are at 49.4°. The final wall design uses a double bench configuration with a bench height (BH) of 35 ft, totaling 70 ft between each 40-ft CB.

Haulage ramps are also incorporated into the designs. The ramp width is sized at 150 ft, which can safely support two-way traffic of the 200 ton- and 240 ton-payload mining trucks.

The maximum pit depth and vertical highwall exposure is approximately 640 ft for the Laurentian Pit, and 310 ft and 350 ft for the East 1 and East 2 pits, respectively.

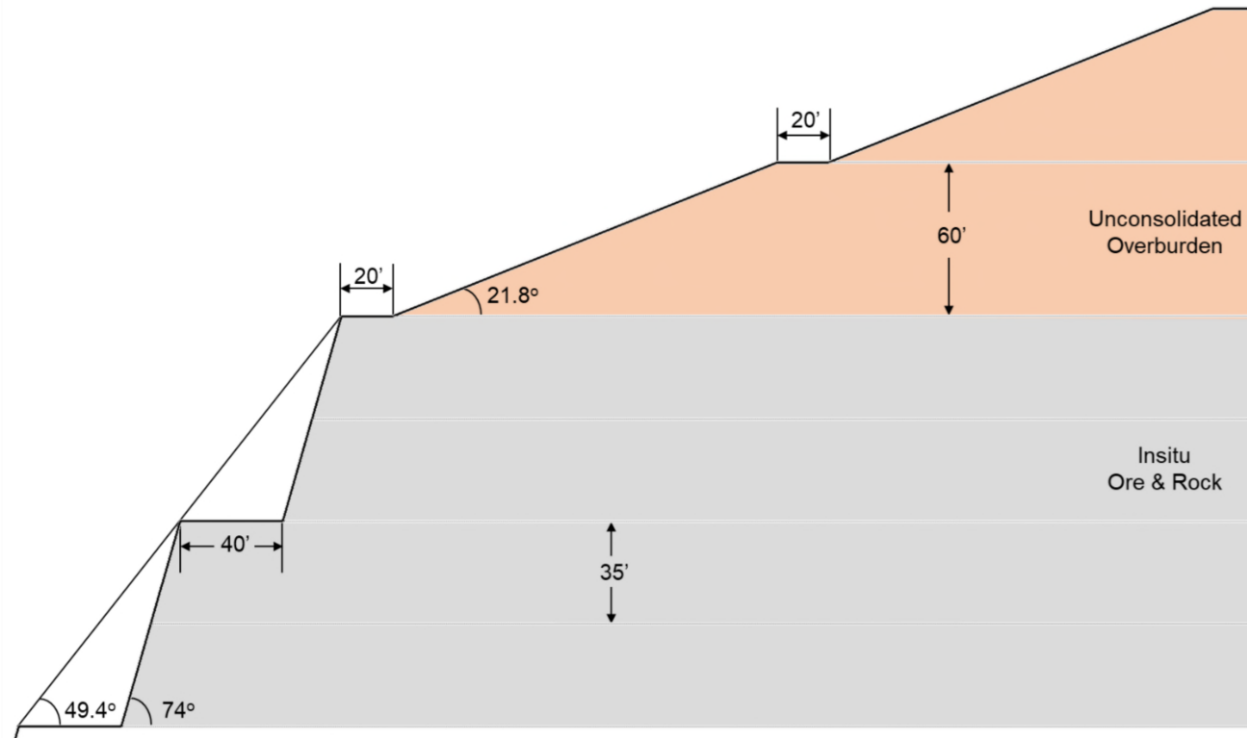
Geotechnical and ramp parameters incorporated into the Minorca pit design are summarized in Table 16-1 and illustrated in Table 16-1.

Table 16-1: Geotechnical Parameters

Parameter	Unit	Final Wall	Intermediate Overburden	Final Overburden
IRA	(°)	49.4	25.8	19.4
BFA	(°)	74.0	30.0	21.8
BH	ft	35	35	60
CB	ft	40	20	20
Ramp Width - 2 way	ft	150	150	150
Ramp Width - 1 way	ft	90	90	90
Ramp Gradient (Shortest)	%	8	8	8



Figure 16-1: Example of Final Pit Wall Geometry



Source: Cliffs 2021.

16.2.2 Geotechnical Data and Design Analysis

The surface overburden slopes follow Minnesota Administrative Rules Standard 6130.2900, where the toe of the overburden slope is set-back 20 ft from the crest of the rock slope, bench heights are limited to 60 ft, and the bench face is no steeper than 2.5H:1V (21.8°).

The BH for the rock slopes is determined from double benching the standard 35 ft mining height for Minorca. The bench face angle is what is practically achievable through drilling and blasting the double benched configurations. Bench widths are based on experience and what is considered suitable for effective management of rockfall hazards. The bench width is compliant with the modified Richie criterion for determining bench widths for control of rockfall hazard as developed by Call & Nicholas Inc. (Ryan and Pryor 2000):

$$\text{Bench Width (ft)} = 0.2 \times \text{Bench Height} + 4.5$$

According to the modified Richie criterion, a bench width of 29 ft would be required for a 70-ft-high bench. The design implemented at Minorca is 11 ft greater at 40 ft.

Considering Minorca is an operational mine, and the slope design parameters have been in use for some time without significant challenges, the QP is of the opinion they are suitable for use in Mineral Reserve estimations. The QP recommends the completion of a geotechnical study for the pit slopes to confirm the existing slope parameters and test the potential for steepening slope angles. This will require collection of relevant data through geotechnical logging, mapping and laboratory testing of rock samples, development of a geotechnical model, and undertaking stability analysis.



16.2.3 Hydrogeology and Pit Water Management

From 2011 through 2020, in-pit dewatering activities have averaged 1.3 billion gallons per year with a permitted maximum of approximately 2.2 billion gallons per year (6.0 million gallons per day limit).

As detailed in section 18.4, the project-wide water balance is relatively stable year over year.

The Laurentian Pit is currently being mined at a depth that is 400 ft (122 m) below the original water table. The pit is dewatered at an average rate of 2,600 gpm by pumps placed into a sump. The sump is located at the lowest level of the pit and is re-established as the pit expands deeper.

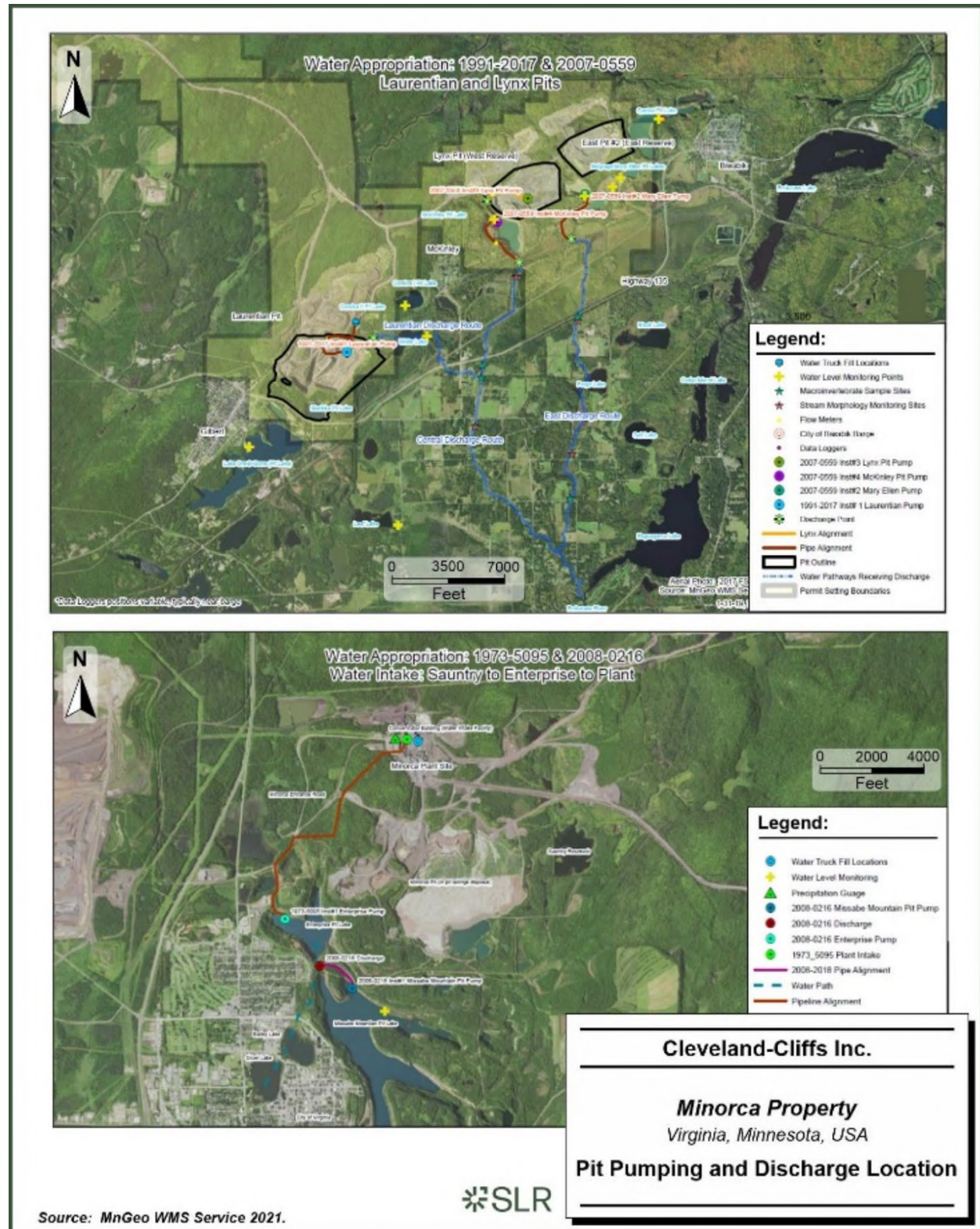
In the East Pit mining area, two adjacent natural ore pits can be dewatered at a rate of 3,000 gpm each to lower the water table (combined 6,000 gpm).

The water from these pits is also discharged into the Lake Superior watershed. Minorca is permitted to pump via sump from East 1 (West), East 2 (East), and Laurentian Pit into the natural ore pits. The combined rate of discharge may not exceed 4,161 gpm, and discharge rate must be monitored and reported.

The water being discharged is a combination of groundwater and runoff (precipitation). Currently, no treatment is needed before it is released to the environment. The discharge locations and general flow are illustrated in Figure 16-2.



Figure 16-2: Pit Pumping and Discharge Location



16.3 Open Pit Design

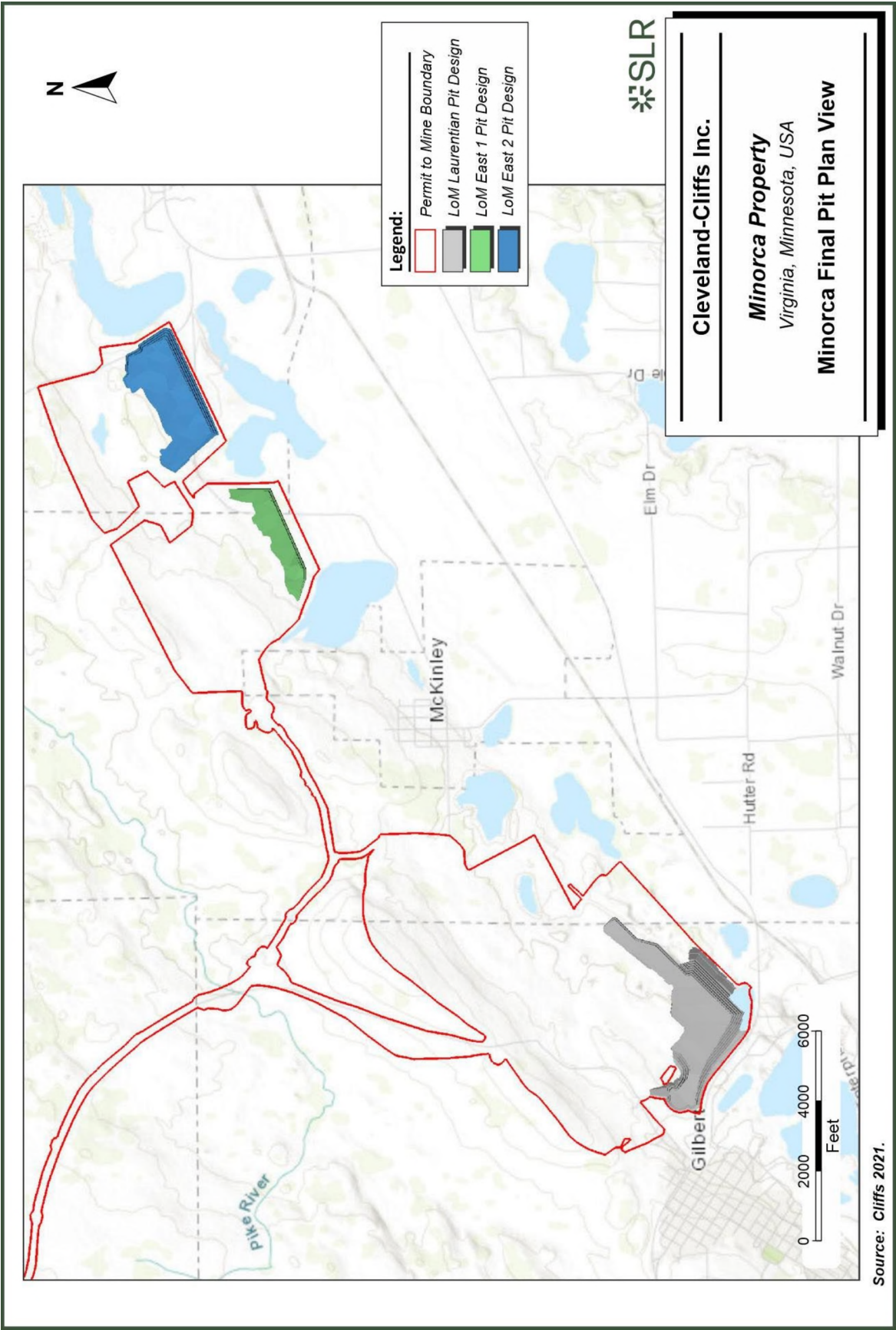
The Laurentian, East 1, and East 2 pit designs combine current site access, mining width requirements, geotechnical recommendations, pit optimization results, and hard mining limits as described previously in Sections 15.0 and 16.0. Table 16-2 details the contents of the final pit designs as of June 28, 2021. Figure 16-3 presents a plan view of the final pit designs (waste rock stockpiles are not shown as they include in-pit backfills, which would obscure the final pit design view).

Table 16-2: Final Pit Design LOM Totals

Pit	Crude Ore (MLT)	MagFe (%)	Stripping (MLT)	Total Material (MLT)	Strip Ratio
Laurentian	68.2	24.1	61.7	129.9	0.9
East 1	9.2	22.3	1.4	10.6	0.2
East 2	36.5	23.4	24.4	60.9	0.7
Total	113.9	23.7	87.5	201.4	0.8



Figure 16-3: Minorca Final Pit Plan View



16.3.1 Pit Phase Design

Intermediate phase designs or pushbacks are included in the LOM planning. The main purpose for phased designs is to balance waste stripping and haulage profiles over the LOM and ensure haulage access is maintained while developing the pit.

Intermediate phase designs are largely driven by the effective mining width and access to critical material inventories, specifically the LC material. The phase designs incorporate the transition from intermediate, non-reclaimed overburden slopes to final reclamation overburden slopes.

16.4 Production Schedule

16.4.1 Clearing

Before mining operations commence in new undeveloped areas, it is necessary to remove any overburden material. The primary clearing and grubbing equipment include bulldozers, hydraulic shovels, FELs, and trucks. This equipment has been successfully deployed in historical overburden clearing operations at Minorca.

16.4.2 Grade Control

As described in Section 7.0, the geology is well known with two primary crude ore members, the UC and LC, each divided into subunits. The potential ore subunits for the UC are uc3, uc2, and uc1; the potential ore subunits for the LC are lc5b, lc5a, lc4, and lc3. Minorca uses blast hole magnetic susceptibility probing in conjunction with blast hole assays for crude MagFe and concentrate silica to assist in delineating ore/waste boundaries as well as transitions between subunits.

Generally, two crude ore faces are mined at a time, with a loading unit mining either one or two subunits. The short-range (weekly) mine plan provides instruction on the amount of material from each mining location that is to be blended at the crusher. Blending is done on a shift-by-shift basis, with mid-shift load counts being conducted to monitor compliance to the planned crude ore blend. If the crushing facility is down for maintenance, then the loads are stockpiled on the ground next to the crusher and picked up later and crushed.

16.4.3 Production Schedule

The basis of the production schedule is to:

Consistently produce 2.8 MLT/y of wet flux pellets for the LOM.

Limit crude ore delivery to crusher to 8.7 MLT/y.

Limit yearly concentrate silica to a maximum of 4.2%. the QP notes that, in general, a target of 3.8% concentrate silica is ensured to reduce the use of the flotation circuit over the LOM.

Limit the Upper Cherty (UC3, UC2, and UC1) component of the overall ore blend composition to a maximum of 30%.

Limit total mined tons per year at approximately 18 MLT to balance both stripping requirements and mine equipment fleet utilization.

The production schedule is planned yearly throughout the LOM. Crude ore is mined from the Laurentian, East 1, and East 2 pits concurrently throughout the schedule and blended at the crusher.



Table 16-3 presents the production schedule for Minorca from January 1, 2022 through the end of the mine life.

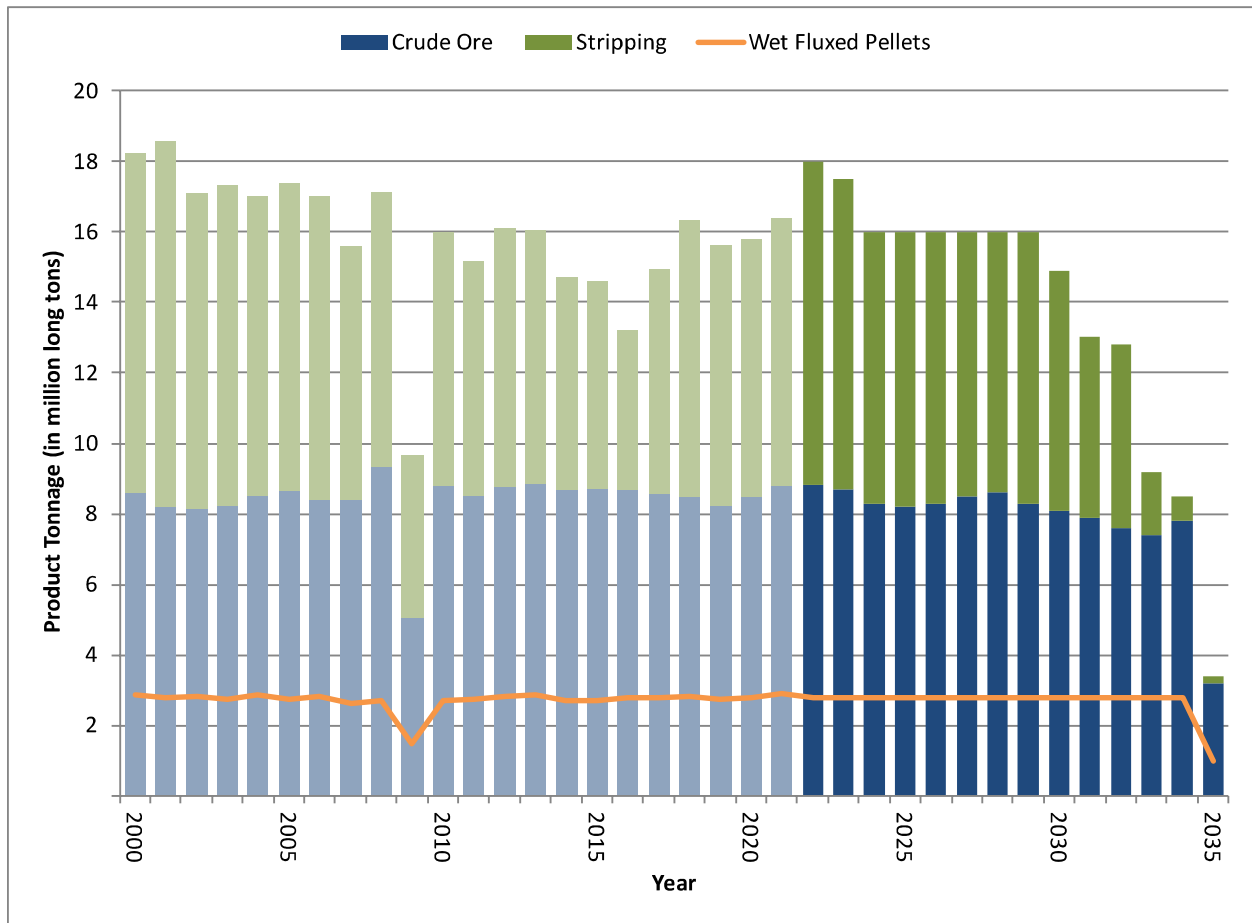
Table 16-3: LOM Mine Production Schedule

Year	Crude Ore (MLT)	MagFe (%)	Stripping (MLT)	Total Material (MLT)	Stripping Ratio	Process Recovery (%)	Concentrate SiO ₂ (%)	Wet Pellets (MLT)
2022	8.8	22.4	9.2	18.0	1.0	32.2	3.2	2.8
2023	8.7	22.4	8.8	17.5	1.0	32.2	3.2	2.8
2024	8.3	23.4	7.7	16.0	0.9	33.6	3.1	2.8
2025	8.2	23.8	7.8	16.0	1.0	34.1	3.7	2.8
2026	8.3	23.5	7.7	16.0	0.9	33.7	3.5	2.8
2027	8.5	23.0	7.5	15.9	0.9	33.0	4.2	2.8
2028	8.6	22.7	7.4	15.9	0.9	32.6	4.0	2.8
2029	8.3	23.6	7.7	16.0	0.9	33.9	3.7	2.8
2030	8.1	24.0	6.8	14.9	0.8	34.4	3.4	2.8
2031	7.9	24.8	5.1	12.9	0.6	35.6	3.4	2.8
2032	7.6	25.6	5.2	12.8	0.7	36.8	3.3	2.8
2033	7.4	26.3	1.8	9.2	0.2	37.8	3.3	2.8
2034	7.8	25.0	0.7	8.5	0.1	35.9	3.2	2.8
2035	3.2	22.9	0.2	3.4	0.1	32.0	3.3	1.0
LOM Schedule	109.7	23.8	83.4	193.1	0.8	34.1	3.5	37.4

Recent past production (2000 to current) and LOM planned production for Minorca is summarized graphically in Figure 16-4.



Figure 16-4: Minorca Historical and LOM Production



Source: Cliffs 2021.

Of note, a production curtailment occurred during the 2009 operating year due to a downturn in the iron ore market. Other than the 2009 curtailment, production targets have been met every year since 2000.

16.5 Overburden and Waste Rock Stockpiles

Overburden and waste rock material is discretely stockpiled concurrently within designated stockpiles.

Waste material removed from the Laurentian Pit can be placed either external or internal (in-pit) to the mine pit. In-pit waste material placement is the preferred method of storage, but the advancement of the Laurentian in-pit stockpile is limited to final pit footwall exposure along the bottom of the pit. When in-pit stockpiling capacity is unavailable, waste material is placed external to the pit in surrounding stockpiles located to the north and east.

The East 1 and East 2 pits are not permitted for in-pit waste stockpiling. All waste material for these pits is placed externally in stockpiles located to the north of each respective mining pit.

The overburden and waste rock stockpile design parameters follow the requirements outlined in Minnesota Administrative Rules Standard 6130.2700 and are detailed in Table 16-4.



Table 16-4: Minorca Stockpile Parameters

Parameter	Units	Waste Rock	Overburden
Overall Slope Angle	(°)	19.4	17.5
BFA	(°)	35.0	21.8
BH	ft	30	30
Berm Width	ft	30	20
Ramp Width - 2 way	ft	150	150
Ramp Width - 1 way	ft	90	90
Ramp Gradient	%	8	8

Three-dimensional models of the rock and overburden stockpiles were used to calculate the volume of the stockpile designs. Swell factors of 30% for *in situ* rock and 15% for *in situ* overburden were used to calculate the annual stockpile volume requirement.

The designed stockpile volume capacity and total LOM stockpiling requirements for the Laurentian Pit and East 1 and East 2 pits as on June 28, 2021 are shown in Table 16-5 and Table 16-6, respectively.

Table 16-5: Laurentian Pit Stockpile Capacities

Name	Capacity (million ft ³)
Total Laurentian Pit Stockpile Capacity	1,341
2021 LOM Stockpile Requirements	979

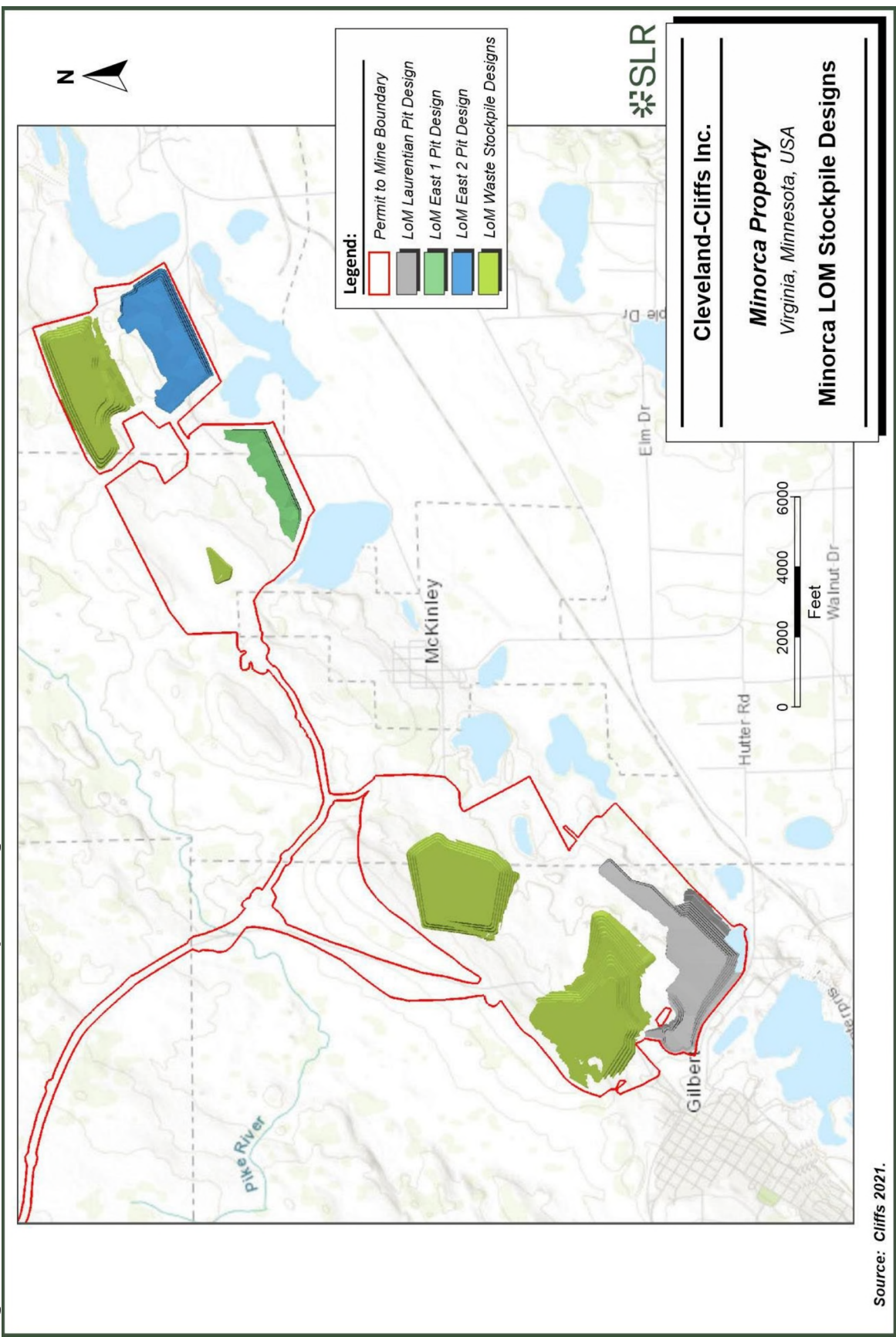
Table 16-6: East 1 and East 2 Pit Stockpile Capacities

Name	Capacity (million ft ³)
Total East 1 and East 2 Pits Stockpile Capacity	519
2021 LOM Stockpile Requirements	412

The QP notes that there is sufficient overburden and waste rock stockpile capacity included in the LOM plan. The final stockpile layouts including the pit backfills are shown in Figure 16-5. Final reclamation will involve relocating some of the stockpiled overburden as cover for the remainder of the disturbed area.



Figure 16-5: Minorca LOM Stockpile Designs



16.6 Mining Fleet

The primary mine equipment fleet consists of large drills, diesel hydraulic shovels, FELs, and off-road dump trucks. In addition to the primary equipment, there are also bulldozers, graders, water trucks, and backhoes for support. Additional equipment is on site for non-productive mining fleet tasks. The current fleet is to be maintained with replacement units as the current equipment reach the stated maximum operating hours.

Table 16-7 presents the planned average major fleet requirements estimated to achieve the LOM plan.

Table 16-7: Major Mining Equipment

Year	Drills	Shovels	Trucks	Loaders	Bulldozer	Graders
2022	3	2	13	5	2	3
2023	3	2	13	5	3	3
2024	3	2	13	5	3	3
2025	3	2	13	5	3	3
2026	3	2	13	5	3	3
2027	3	2	13	5	4	3
2028	3	2	13	5	4	4
2029	3	2	13	5	4	3
2030	3	2	13	5	3	3
2031 - 2035	3	2	13	5	3	3
Size/Payload	120,000 lb	26 yd ³	200/240 ton	19 yd ³	29 yd ³	16 ft
Useful Life (hrs)	90,000	90,000	90,000	60,000	65,000	65,000
Example Unit	P&H 120A	Caterpillar 6040FS	Caterpillar 789C/793C	Caterpillar 994H	Caterpillar D10T	Caterpillar 16M

Longer haulage distances will be realized as mining operations in the Laurentian, East 1, and East 2 pits progress down dip. The LOM plan has been scheduled in a sequence, with periods of long haulage distances delivering increased crude ore MagFe grade in conjunction with lower stripping requirements. This will lead to an overall reduction in required total material movement and, as a result, remove the requirement for additional haul trucks.

The primary loading and hauling equipment were selected to provide good synergy between mine selectivity of crude ore grade and the ability to operate in wet and dry conditions. Since crude ore is blended at the primary crusher, the loading units in crude ore do not operate at capacity.

Extensive maintenance facilities are available at the mine site to service the mine equipment.

16.7 Mine Workforce

Minorca manpower is detailed in section 21.2. Current mining manpower is summarized as follows:



Mine operations – 99

Mine maintenance – 61

Mine supervision and technical services – 18

Any additional required mine operations or mine maintenance manpower will be sourced from local communities.

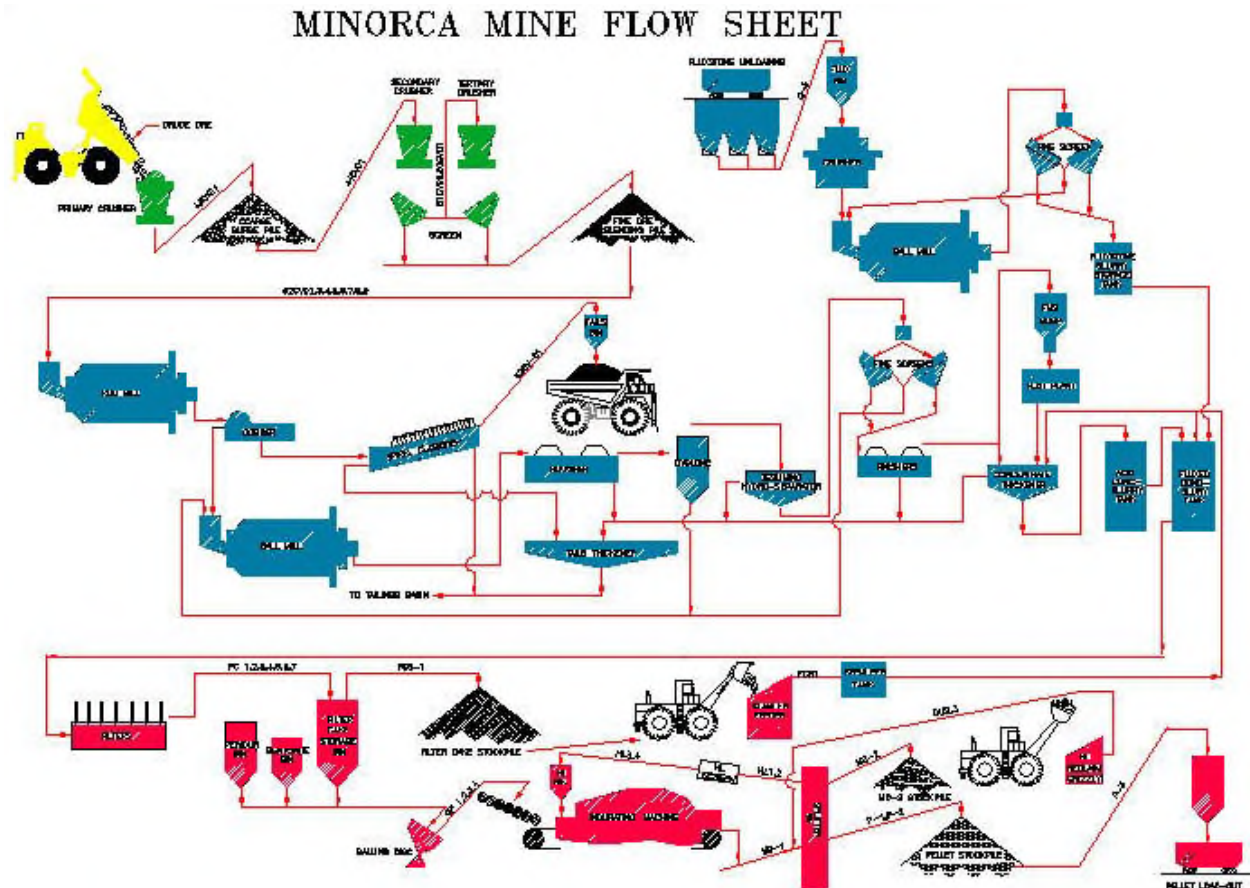


17.0 Recovery Methods

17.1 Process Description

A simplified process flowsheet for the Minorca process facilities is presented in Figure 17-1.

Figure 17-1: Minorca Mine Process Flow Sheet



Source: Cliffs 2021.

17.1.1 Crushing

The primary crusher is a 54 in. x 84 in. gyratory crusher, which crushes the ROM material to P_{80} 6 in. The crushed material is conveyed to a coarse ore stockpile. The coarse ore is reclaimed from the stockpile with vibrating feeders and transported by the conveyor system beneath the stockpile into the secondary crushing plant crusher feed bins. Secondary crushing consists of a bank of Symons 7-ft standard cone crushers. The secondary cone crusher discharge is screened on double-deck screens. The screen oversize material is conveyed to the tertiary 7-ft Symons short-head cone crushers for fine crushing. The crusher discharge is screened. The screen oversize material feeds conveyors that recycle the material to the tertiary crusher, and the screen is product size with a P_{100} $\frac{5}{8}$ in. The crushed product is conveyed and stacked on the fine ore stockpile. The material is reclaimed from the fine ore stockpile with a series of 20 vibrating feeders in two parallel reclaim tunnels beneath the stockpile and is conveyed to the rod mill feed bin. Five fixed-speed and five variable-speed feeders are located above each tunnel conveyor. Dual



conveyors and the multiplicity of feeders provide considerable potential reclaiming flexibility, as any combination of six operating feeders will supply the 1,396 LT/h design reclaiming rate. Dust control is provided by two baghouse dust collectors.

17.1.2 Concentrator

The concentrator comprises three lines with the following unit operations included in each of the three lines.

- Rod milling – open circuit
- Cobber magnetic separation
- Ball milling – closed circuit
- Rougher magnetic separation
- Cyclone classification
- Cyclone overflow hydroseparation
- Hydroseparator underflow screening
- Finisher magnetic separation
- Finisher magnetic concentrate thickening
- Magnetic concentrate reverse flotation
- Rougher flotation concentrate (underflow) to concentrate thickening
- Rougher flotation tailings (overflow) magnetic separation
- Rougher tailing magnetic separation concentrate regrinding
- Scavenger reverse flotation
- Scavenger concentrate to rougher flotation feed
- Concentrate collection and storage
- Concentrate filtration
- Filter cake conveyed to pellet plant

Minus $\frac{5}{8}$ in. nominal size fine ore is drawn from the crushed ore feed bins into three concentrator lines. The fine crushed material draws from the rod mill feed bin into a 15-ft-diameter by 20-ft-long rod mills with 2,500 hp drives. Each line is designed to process 365 LT/h. Rod mill discharge slurry from each mill is pumped to three cobber magnetic separators operating in parallel.

The cobbbers are counter-rotation, wet magnetic separators, which separate the magnetic solids by collecting them on the face of a rotating magnetic drum. The magnetic field is provided by stationary permanent magnets fastened inside the rotating stainless-steel drums. Magnetic particles in the feed adhere to the surface of the drum and discharge when the drum surface rotates out of the magnetic field. The non-magnetic flow of the tank discharges through outlets located below each of the drums.

The non-magnetic material flows to a spiral classifier, which separates coarse and fine material. Spiral classifiers consist of a settling tank and a rotating spiral conveyor. The coarse fraction of the cobber tailings (-6 mesh by +65 mesh) settled in the tank are raked to the top of the inclined



tank bottom by the rotating spiral. The rotating motion of the spiral also imparts a squeezing action that helps dewater the tailings. The coarse material is trucked to tailings, and the fine material slurry is pumped to the tailings thickener.

The magnetic material is pumped to a 15-ft-diameter by 20-ft-long ball mill for fine grinding. The target grinding product size is 78% to 83% passing 325 mesh (44 μm). The ball mill discharges into the rougher magnetic separator feed pumpbox, and the slurry is then pumped to eight rougher magnetic separators operating in parallel. The rougher magnetic separators are double-drum, counter-rotation type, wherein the pulp (concentrate) flows in the opposite direction to the drum rotation. As the magnetite particles are attracted towards the drum magnets, counter-current wash water aids in removal of non-magnetic or weakly magnetic particles from the concentrate product. The non-magnetic tailing reports to the tailings thickener, and the magnetic concentrate is pumped to the ball mill hydrocyclone classifiers.

The cyclone overflow, which is nominally 90% -325 mesh (44 μm), flows by gravity to the hydroseparator in the same concentrator line. The cyclone underflow is discharged into the ball mill feed box for regrinding. Each 20-in.-diameter cyclone with a 3.5 in. apex orifice is made of cast iron with replaceable, molded rubber lining. Since only five of the six cyclones are normally used at one time, most cyclone maintenance can be accomplished during operation.

Each concentrator line has a hydroseparator, which receives the overflow from the corresponding cluster of six cyclones. Before reaching the hydroseparator, the cyclone overflow is channeled through a permanent magnet, which magnetizes the magnet particles in the slurry. This causes the magnetic particles to agglomerate into flocculants that settle much more rapidly than the individual particles. The feed slurry enters the hydroseparator at the central feed well. The magnetic flocculants settle to the bottom of the tank, while the finely divided siliceous material is swept out into the peripheral overflow launder by the rising stream of hydraulic water. Rotating rakes with blades spaced radially across the rake arm plow the settled solids to the center of the tank. Spiral vane rake blades at the center guide the material through the discharge cone and out to the finisher feed pumps.

The hydroseparator underflow is pumped through a demagnetizing coil to four finisher magnetic separators operating in parallel. This final concentrating step is accomplished by two-drum, counter-current, finisher magnetic separators. Four units are provided for each line and are fed with hydroseparator underflow. Feed is introduced in the feed box at the top and is carried upwards to the first drum by a stream of repulping water introduced below the feed. Magnetic particles are attracted to the revolving drum surface and are carried through the clean water wash. Clean magnetic particles are discharged and processed through the second drum in a similar manner. Tailings flow through the bottom outlets and are laundered to the tailings thickener. The magnetic concentrate is pumped to the concentrate thickener or, if the silica content is higher than the pellet feed specification, to the flotation circuit feed tank.

A flotation plant was added to the process to treat ore from the Laurentian Pit, which contains a higher percentage of silica in magnetically recovered concentrate, requiring flotation to meet the silica targets of pellet feed. The flotation feed pumps pump concentrate slurry to the flotation feed distributor. An amine collector, frother, and water solution is pumped to a spray bar in the distributor, where it is mixed with the concentrate slurry, which then flows into the rougher flotation cells, where it is agitated with air drawn into the cells through the agitator shafts. Silica particles attach to the air bubbles and are floated from the concentrate reporting to the flotation cell overflow (reverse flotation), while the magnetic iron concentrate leaves the flotation circuit through the rougher cell underflow, which goes to the flotation concentrate sump. The material is then pumped to the concentrate thickener.



The rougher flotation overflow tailings are passed through magnetic separators to separate the magnetic iron and fine tails in the material. The magnetic iron flows to the flotation thickener, and the non-magnetic tailings flow to the tailings thickener. The flotation thickener underflow material is pumped to the boil box feeding the flotation regrind ball mill, where it is ground to a P_{80} 500 mesh (25 μm) to liberate the remaining silica from iron particles. The slurry is pumped to a bank of cyclones for classification, with the cyclone underflow returning to the ball mill and the cyclone overflow flowing to the scavenger flotation feed tank and into a bank of scavenger flotation cells. The scavenger flotation cell overflow slurry flows to the tailings thickener, and the scavenger flotation concentrate is pumped to the rougher flotation feed tank.

The magnetic and/or flotation concentrate is pumped from the concentrate thickener underflow to the acid concentrate storage tank. The acid concentrate is then transferred to the fluxed concentrate storage tank, where it is mixed with flux slurry from the flux slurry storage tank.

17.1.3 Flux Plant

The flux plant, located near the flux stockpile, was added to the operation to introduce calcium and magnesium to the pellet composition. Process performance at the IH7 is more effectively and efficiently optimized by infusing calcium and magnesium into the pellets at Minorca ahead of steel making.

The mine receives flux stone via rail car, which is unloaded and conveyed to a storage pile by a series of feeders and conveyors. The system consists of three Syntron Feeders beneath the rail car-unloading hopper, and four conveyors that transport the flux stone to the storage pile. The flux stone is brought into the flux plant system via loader and is required to maintain an operation level (80% to 100%) in a flux slurry storage tank in the concentrator. This slurry is added to the concentrate slurry to accomplish a target calcium to silica ratio (C/S) of 1.10 in the pellet chemistry.

The stone is loaded (by the loader) into a hopper that feeds a conveyor, which enters the pellet building where the flux crusher and ball mill are located. The crusher reduces the flux to less than 5/8 in. size with a gapping of $\frac{3}{8}$ in. This material is passed into the flux ball mill charged with 2 in. grinding balls, which discharges into the screen feed sump feeding a distributor that passes the material over six three-panel vibrating screens (one typically in standby). Oversize particles are recirculated to the ball mill. The undersize material is then pumped into the flux slurry tank via one of the two available screen-undersize pumps.

17.1.4 Pellet Plant

After magnetic separation, the concentrate contains 67.5% magnetite and has a particle size distribution of 88% passing 325 mesh (44 μm). It is stored in the slurry storage tanks at a density of approximately 65% solids.

The concentrate slurry is filtered to approximately 9.3% moisture using disc filters and discharged onto conveyors feeding the agglomeration (balling) discs. The filtered concentrate is then mixed with bentonite at a rate of 20 lb/LT of filter cake using an on-belt Pekay mixer, which delivers the feed onto one of six, 20-ft-diameter balling discs with a variable speed rate of 4 rpm to 8 rpm to produce green balls having a size distribution of at least 90% $+\frac{1}{4}$ in. and $-\frac{1}{2}$ in. Each disc contains a ceramic-coated plow to scrape the surface of the disc and prevent build-up. Water sprays are used to add moisture to control the rate of green ball generation. The green balls are discharged over the peripheral lip of the balling disc onto a conveyor for delivery to the indurating area. Bentonite handling includes bentonite unloading, bentonite silo transfer, and a



shift-in baghouse and is incorporated in the pellet plant. This full system was supplied by the H.B. Fuller Company.

The green balls are then indurated on a straight grate furnace (natural gas fed burners) to form fired pellets; moisture is driven out of the pellets in the furnace, and magnetite is converted to hematite. A Dravo straight-grate indurator is used at Minorca, in which green balls from the balling discs are hardened in stages by drying, preheating, firing at high temperature, and then cooling. The furnace splits into six zones: Updraft Drying, Down Draft Drying, Preheating, Firing, First Cooling, and Second Cooling. The fired product discharged from the machine is conveyed to the splitter chute, where the required hearth and side layer is separated and recycled through the furnace. The remaining product is conveyed to the pellet storage pile and/or emergency pellet storage pile. The fired pellets from the storage piles are loaded into rail cars.

17.2 Major Equipment

A list of major equipment is provided in Table 17-1.

Table 17-1: Major Processing Equipment

Area	Equipment	Model	In Use	Size	Power
Primary Crushing	Gyratory Crusher	Allis Chalmers	1	54" x 84"	1,000 hp
Secondary Crushing	Standard Cone Crusher	Nordberg	3	7'	350 hp
Secondary Crushing	Double Deck Screen	Tyler	3	6' x 16'	30 hp
Tertiary Crushing	Short Head Cone Crusher	Nordberg	4	7'	350 hp
Tertiary Crushing	Double Deck Screen	Tyler	4	6' x 16'	30 hp
Concentrator	Rod Mill	Nordberg	3	15' x 20'	2,500 hp
Concentrator	Double Drum Cobber Magnetic Separator	Stearns	9	36" x 120"	7.5 hp
Concentrator	Spiral Classifier	Denver	3	78" dia. x 43'4" L	30 hp
Concentrator	Ball Mill	Allis Chalmers	3	16'6" x 36'	3,000 hp
Concentrator	Rougher Magnetic Separators	Stearns	19	36" x 120"	7.5 hp
Concentrator	Cyclones	Krebs	18	20"	350 hp
Concentrator	Finisher Magnetic Separators	Stearns	12	30" x 120"	7.5 hp
Concentrator	Primary Hydro Separator	Eimco	3	43' dia.	10 hp
Concentrator	Finisher Fine Screens	Derrick	24	4' x 8'	1.5 hp
Concentrator	Concentrate Thickener	Eimco	2	52' dia.	3 hp
Concentrator	Tails Thickener	Eimco	1	400' dia.	10 hp



Area	Equipment	Model	In Use	Size	Power
Flotation	Rougher Flotation Cells	Wemco	8	1000ft ³	75 hp
Flotation	Flotation Froth Thickener	Eimco	1	40' dia.	10 hp
Scavenger	De-Watering Magnetic Separator	Eriez	2	48" x 120"	7.5 hp
Scavenger	Flot Regrind Mill	Marcy	1	10'8" x 18'	900 hp
Scavenger	Scavenger Flotation Cells	Wemco	3	500ft ³	40 hp
Fluxstone	Flux Cone Crusher	Nordberg	1		200 hp
Fluxstone	Flux Ball Mill	Marcy	1	10'8" x 18'	900 hp
Fluxstone	Fine Screens	Derrick	6	4' x 8'	1.5 hp
Filtering	Filters - 10 Disk	Scanmec	7	9' dia.	7.5 hp
Filtering	Vacuum Pumps	Nash	5		700 hp
Filtering	Vacuum Pumps	Somorokis	1		700 hp
Balling	Balling Disks	Dravo	6	19' 9" dia.	125 hp
Balling	Mixers	PeKay	6	16" Wheel	(2) 15 hp
Balling	Tabler Feeders	Sala	6		20 hp
Pelletizer	Indurating Machine	Dravo	1	4 m wide x 76 m long	
Pelletizer	Cooling Air Fan	Westinghouse	1	613,760 cfm	3500 hp
Pelletizer	Windbox Exhaust Fan	Westinghouse	1	458,710 cfm	4500 hp
Pelletizer	Updraft Drying Fan	Westinghouse	1	550,160 cfm	3500 hp
Pelletizer	Windbox Recoup Fan	Westinghouse	1	532,230 cfm	3500 hp
Pelletizer	Hood Exhaust Fan	Westinghouse	1	587,480 cfm	2000 hp

17.3 Plant Performance

Table 17-2 presents the key performance indicators (KPI) for the Plant from 2013 to 2020. From 2015 to 2020, the Minorca concentrator processed an average 8,782,900 LT/y of ore with an average MagFe grade of 22.7%. The overall mass recovery to concentrate averaged 32.5% with an overall MagFe recovery of 95.4%. Final product for the period averaged 2,789,200 LT/y of flux pellets and 42,200 LT/y of lump product with grades of 62.6% Fe and 4.2% SiO₂. Plant performance continues to be very consistent. Primary crusher and grinding mill performance and productivity are primarily dependent on preventative maintenance and operating conditions. The increase in pellet plant productivity in recent years is largely attributed to maintenance.



Table 17-2: Minorca Concentrator Performance 2013–2020

	2013	2014	2015	2016	2017	2018	2019	2020
Total ROM (kWLT) Primary Crusher Feed	9,002.7	8,852.5	8,895.6	8,843.9	8,710.8	8,645.7	8,751.8	8,730.9
Laurentian	0.0	0.0	0.0	3,309.8	4,814.6	4,109.2	2,196.3	5,187.2
Central	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
East	0.0	0.0	0.0	5,534.2	3,896.2	4,536.5	6,555.5	3,543.8
%Fe (mag)	22.7%	23.2%	20.9%	23.0%	22.6%	22.5%	23.1%	24.0%
% SiO ₂	3.7%	3.6%	3.6%	3.7%	3.4%	3.6%	4.9%	3.5%
% Moisture	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Feed to Processing Plant (kWLT) Rod Mill Feed	8,939.0	8,615.7	9,004.4	8,871.4	8,693.5	8,645.7	8,751.8	8,730.9
% Mass Yield	32.7%	31.9%	30.5%	32.0%	32.8%	33.2%	33.2%	33.2%
Finished Concentrate Production (kWLT)	2,926.6	2,744.2	2,742.2	2,836.1	2,852.7	2,872.1	2,715.6	2,897.3
% MagFe Recovery	95.4%	94.6%	94.0%	94.5%	93.9%	96.2%	96.8%	97.4%
Finished Production (kWLT)	2,921.4	2,743.4	2,742.2	2,836.1	2,852.7	2,872.1	2,783.3	2,902.1
Lump	48.9	51.3	49.9	39.0	43.6	39.1	39.0	42.9
Pellet	2,872.5	2,692.1	2,692.3	2,797.1	2,809.1	2,833.0	2,744.4	2,859.3
Tailings/Processing Waste (kWLT)	6,665	6,300	6,600	6,401	6,042	6,141	6,214	6,199
Tailings Fe% (total)	1.6%	1.7%	1.8%	2.0%	1.9%	1.7%	1.6%	1.6%
Year-End Product Inventory (kWLT)	456.3	546.2	382.8	439.6	544.1	623.7	253.0	243.5
Lump	24.1	8.3	20.2	15.6	19.1	34.4	13.7	2.2
Pellet	96.8	211.1	134.4	239.7	267.3	451.7	42.8	19.6
Fines	306.9	216.1	94.8	133.6	235.9	95.6	158.9	108.4
Concentrate	1.9	5.1	50.4	6.5	2.5	2.1	28.4	34.0
Pellet Feed	26.6	105.6	83.0	44.2	19.3	39.9	9.3	79.1
Finished Shipments (kWLT)	2,890.8	2,758.1	2,729.5	2,823.6	2,799.4	2,820.7	2,695.9	2,880.5
Lump	36.9	67.1	38.1	43.6	40.1	23.8	58.6	40.6
Pellet	2,853.9	2,691.0	2,691.4	2,780.0	2,759.3	2,796.9	2,637.2	2,839.9



17.4 Pellet Quality

Table 17-3 presents the key quality parameters for Minorca flux pellet production from 2013 through 2020. Pellets' grades for the period averaged 62.6% Fe and 4.2% SiO₂. The required range for SiO₂ content of the fired pellets is 3.78% to 4.62%, respectively.

Table 17-3: Flux Pellet Quality

Characteristic	2013	2014	2015	2016	2017	2018	2019	2020
Fe% - Final Product	62.72%	62.73%	62.53%	62.74%	62.76%	62.79%	62.50%	62.50%
SiO ₂ % - Final Product	4.21%	4.23%	4.25%	4.22%	4.21%	4.20%	4.20%	4.20%
Al ₂ O ₃ % - Final Product	0.20%	0.18%	0.20%	0.19%	0.17%	0.20%	0.21%	0.22%
P% - Final Product	0.010%	0.009%	0.010%	0.011%	0.009%	0.008%	0.007%	0.007%
% Moisture - Final Product	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%

17.5 Consumable Requirements

Table 17-4 summarizes the energy, water, and product supplies that Minorca used in 2020.

Table 17-4: Energy Usage

	Unit	Rate
Energy Usage		
Crusher Power	kWh/LT Pellet	9.09
Concentrator Power	kWh/LT Pellet	67.63
Pellet Plant Power	kWh/LT Pellet	49.51
Indurator Fuel	MMBTU/LT Pellet	0.55
Consumable Usage		
Grinding Balls	lbs/LT Pellet	1.87
Grinding Rods	lbs/LT Pellet	2.95
Fluxstone	LT/LT Pellet	0.12
Flocculent	lbs/LT Pellet	0.05
Flotation Additives	lbs/LT Pellet	0.12
Bentonite	lbs/LT Pellet	24.13
Caustic	gal/LT Pellet	0.011
Make Up Water	gal/LT Pellet	392.95

17.6 Process Workforce

Current processing headcount totals 165 and is summarized as follows:

Plant operations – 82



Plant maintenance – 73

Plant supervision and technical services – 10



18.0 Project Infrastructure

18.1 Roads

The Property is located approximately one mile to the west of the city of Virginia, Minnesota. The towns of Gilbert and Biwabik are approximately one mile to the west and east, respectively (Figure 18-1). The Property is accessed by County, State, and Federal paved and unpaved roads. The Property is also easily accessible from the major regional population center of Duluth, Minnesota, which is located approximately 69 mi to the southwest via US Highway 53.

18.2 Rail

Finished pellets are loaded into rail cars called ore jennies from storage silos with automated feeders located north of the pellet plant. The pellets are transported by CN Railway from the plant site to the CN-operated port facilities in Two Harbors, Minnesota, a distance of 75 mi, as shown in Figure 18-1. The pellets are transported in ore freighters on the Great Lakes from Two Harbors to the Cliffs Indiana Harbor steel mill in East Chicago, Indiana. Alternatively, the pellets are transported by rail directly from the Minorca plant site to the Indiana Harbor.

18.3 Port Facilities

Port facilities are located in Two Harbors, Minnesota and are controlled by CN Railway and include pellet storage and ship loading docks. Two Harbors consists of two operating iron ore docks, Dock No. 1 and Dock No. 2, and outside on-ground stockpile storage.

Figure 18-2 shows an aerial view of the two operating docks including Dock No. 1 to the north and Dock No. 2 to the south of Dock No. 1. The third, most southerly dock is not currently in operation. Dock No. 1 is 1,344 ft long and has a total of 224 pockets with capacities of 250 tons each for a total of 56,000 tons. The top of the dock has four parallel rail lines positioned above the ore pockets. The pockets are filled from bottom-discharge ore jennies (rail cars). There are 112 pockets on each side that have gravity discharge chutes, which are lowered to load the ore freighters.

Dock No. 2 is 1,368 ft long and has both rail and conveyor access. The north side of the dock has 114 pockets with capacities of 300 tons each for a total of 34,200 tons. The north side pockets are loaded from rail cars. The south side of the dock is equipped with a tripper conveyor and ship loading system, which is fed from a 2.5 million ton outside storage area. The outside storage comprises long stockpiles managed with a stacker reclaimer system. Ships are loaded using gravity-discharge chutes on the north side and conveyors on the south side.

Ships leaving the port vary in size between 20,000 tons and 65,000 tons per vessel. An aerial view of the overall port facilities is shown in Figure 18-3.



Figure 18-1: Minorca Roads and Rail

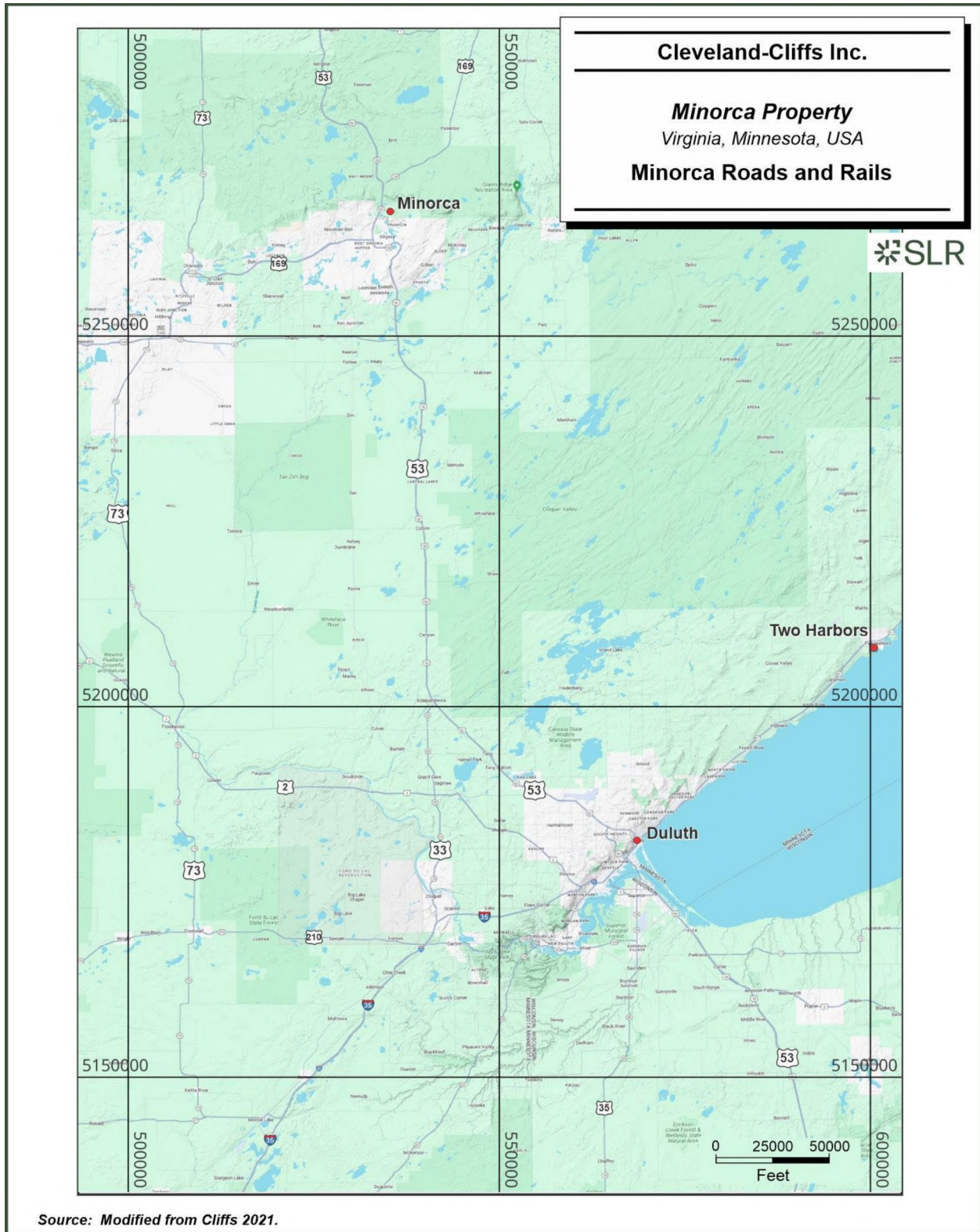


Figure 18-2: Aerial View of the Two CN Operating Docks at Two Harbors, Minnesota



RailPictures.Net - Image Copyright Todd M.



Figure 18-3: CN Dock Facilities – Two Harbors, Minnesota



18.4 Tailings Storage Facility

Minorca's mining operation has two disposal areas for tailings waste: the Upland Tailings Basin (Upland) and the Minorca In-Pit Tailings Basin (In-Pit). The Upland Tailings Basin is located approximately three miles northeast of the plant, and the In-pit is located approximately one mile south-southwest of the Plant. Minorca began using the Upland as a disposal site for fine tailings in the mid-1970s and continued to do so until December 2001, at which time Minorca switched to disposing of fine tailings in the In-pit. Minorca switched back to the Upland near the end of 2011, with intermittent disposal into the Minorca In-pit.

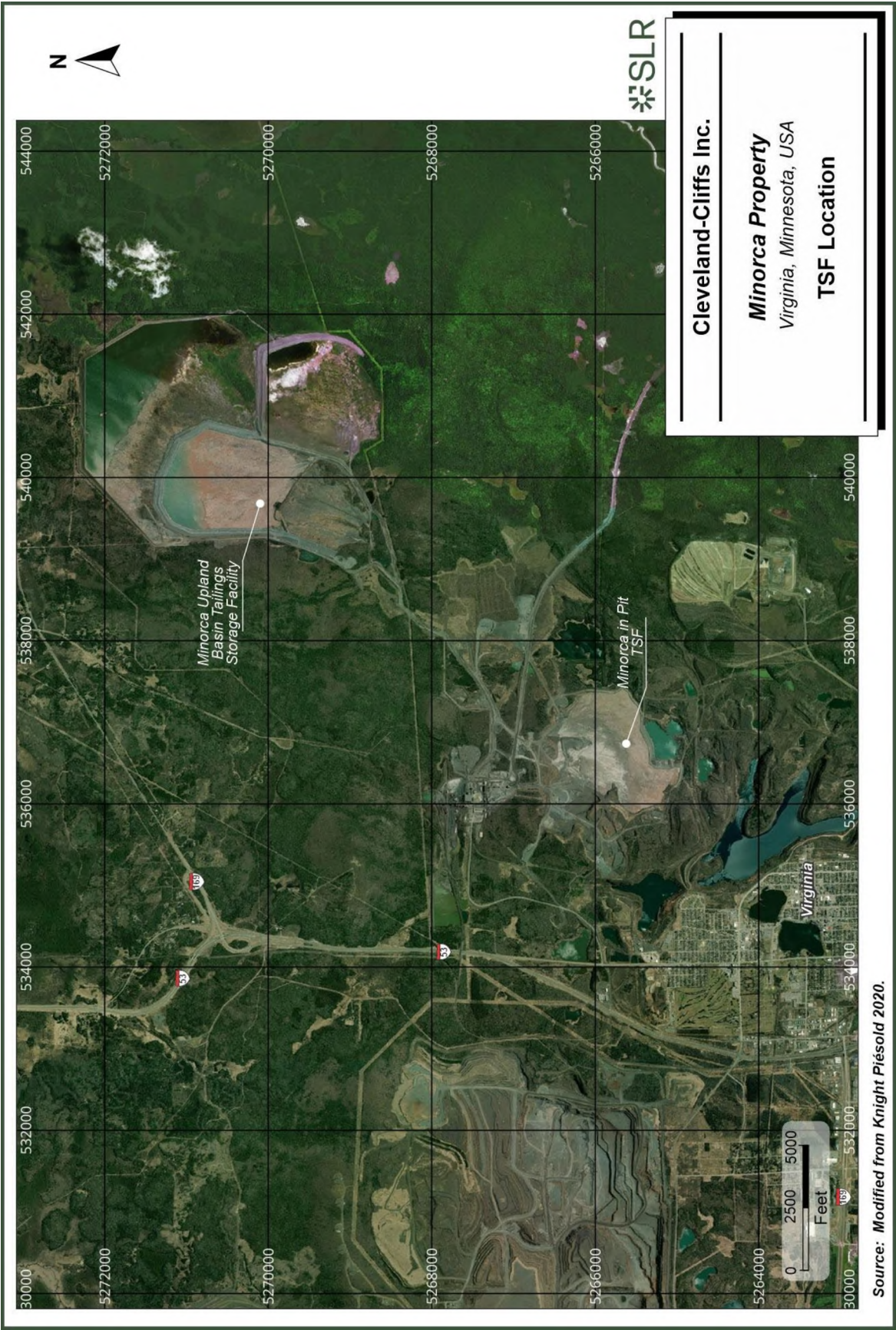
The In-Pit Tailings Basin was permitted as unlined facilities, with the foundation materials and tailings providing a low-permeability material to reduce seepage. The Main Perimeter Dam of the Upland was constructed with a PVC geomembrane on the upstream face.

Two types of tailings are produced and placed within the tailings basins: coarse tailings and fine tailings. The plant total tailings are classified before the fines tailings pumps with a screw classifier. Approximately 26% of the total tailings are coarse tailings, which are trucked to the basin for dam construction material. The remaining approximately 74% are considered fine tailings and are pumped as slurry at a rate of approximately 4,500 gpm at 45% to 50% solids. Minorca produces approximately 6.1 Mt of tailings annually, consisting of 4.5 Mt fine tailings and 1.6 Mt coarse tailings.

The location of the Upland and In-pit Tailings Basins is shown on Figure 18-4.



Figure 18-4: TSF Location



18.4.1 Facility Description

18.4.1.1 Upland Tailings Facility

The Upland Tailings Basin is divided into four cells (from south to north): Cell I, Cell II, Cell IIA, and the Main Basin. The Main Basin is the largest of the four cells, covering approximately 1,420 acres, and occupies the northern half of the basin. The Main Basin Dam is currently approximately 2.9 mi long, has an approximately 50 ft maximum height, and has been raised in a downstream manner.

Cell I and Cell II are located at the southwest portion of the basin, while Cell IIA is located at the southeast portion of the basin, adjacent to eastern side of Cells I and II. Sections of the Cell I North Interior Dam (NID), Cell IIA Interior Dam (ID), and Cell IIA Dike IIA were constructed in an upstream manner, with the dam constructed over tailings placed within the Main Basin. Tailings deposition in Cell I and Cell II were managed separately; however, the dams have been raised (currently at Phase 5 with plans to go to Phase 7), and the tailings are now at an elevation where the Cell I Interior Berm dividing the two will be covered with tailings. Cell I/II will be managed as one basin, with tailings currently being discharged at the southern edge of Cell I. Cell I/II is approximately 3.2 mi long, has a maximum height of approximately 100 ft, and was raised in an upstream and modified centerline methodology using the coarse tailings at slopes that vary from 3H:1V to 5H:1V, with some newer sections of the tailings dam being constructed entirely on coarse tailings and having an overall composite slope of 7.5H:1V when intermediate benches are included. Cell IIA was raised in a downstream and modified centerline methodology using coarse tailings and has a maximum dam height of approximately 80 ft and a dam crest length of approximately 1.5 mi. Tailings are not being deposited in Cell IIA currently; however, long range plans consider construction of a new Cell IIB to the north of Cell IIA and adjacent to Cell II, constructed in an upstream manner over tailings placed within the Main Basin and tailings deposition from the southern end of Cell IIA.

While tailings are currently being deposited in Cell II, the supernatant pool and water level is controlled by a decant structure located at the northwest end, adjacent to the Cell II NID. The decant structure consists of an eight-foot-diameter, pre-cast concrete manhole, a base slab, and trash rack, which is connected to a 42 in. (outer diameter), high-density polyethylene pipe (HDPE) that extends through the embankment and daylights at the downstream toe of Cell II WPD. The decant structure makes it possible to control the elevation of the Cell II pond while minimizing the amount of fine tailings entering the Main Basin.

Reclaim pumps are located in the Main Basin to recycle water for plant operation. An emergency spillway is located on the east abutment of the Main Basin perimeter dam. A siphon is located on the Main Basin perimeter dam to control water level within the Main Basin Pond.

18.4.1.2 Minorca In-Pit Tailings Facility

The Minorca Pit is an exhausted taconite mine located approximately one mile south of the Plant. Containment is provided by post-mining pit topography and four engineered dams, and the In-Pit has an area of approximately 560 acres. The engineered dams were constructed with upstream slopes of 2H:1V and downstream slopes that range from 2H:1V (buttress slopes) to 3H:1V (dam slopes). The In-Pit comprises associated red ore (DSO) pits including the Sullivan, the Higgins, and the Lincoln D pits and was first used for fine tailings disposal in December 2001, when Minorca ceased discharging into Cell IIA within the Upland area. Fine tailings were pumped to the In-Pit via pipeline. Water for plant use was pumped via a floating reclaim barge that was initially located in the Higgins Pit (Barr, 2010).



In order to provide additional containment around the perimeter of the pit, the East and South Rim Dams were constructed and raised in 2008 and 2010 in a centerline manner to a minimum crest elevation of approximately 1,479 ft, with a clay material in the core or on the upstream slope to limit seepage. Two diversion dikes were first constructed in 2004 and 2005 to address water quality issues at the water reclaim barge. Construction of North/South and East/West Diversion Dikes essentially separated the Minorca Pit (including the Sullivan) from the Higgins and Lincoln D. These diversion dikes were constructed to a minimum crest elevation of approximately 1,479 ft using a permeable waste rock to improve the water quality reporting to the Higgins and Lincoln D Pit, and was raised in 2010 in an upstream manner (Barr 2010). A spillway on the north corner of the North/South Diversion DiKE allows flow into the Higgins and Lincoln D Pit, where it is reclaimed and pumped back to the Plant.

The primary flow of tailings was switched back to the Upland at the end of 2011. The In-Pit has been used intermittently for fine tailings disposal since 2011 and is used occasionally for maintenance activities related to the Upland and piping infrastructure. The In-pit is near capacity based on the current design and permit, and design work is in progress to increase storage capacity for an additional two years of storage.

18.4.2 Design and Construction

The QP understands that Cliffs has retained Barr Engineering Co. (Barr) as the Engineer of Record (EOR) for both of the tailings basin areas. Typical EOR services include the design (i.e., volumetrics, stability analysis, water balances, hydrology, seepage cut-off design, etc.), construction and construction monitoring, inspections (i.e., annual dam safety inspections), and instrumentation monitoring data review (i.e., regularly scheduled instrumentation monitoring and interpretation), to verify that the Tailings Basins are being constructed and operated by Cliffs as designed and to meet all applicable regulations, guidelines, and standards.

Barr performed geotechnical investigations for the Upland in 2006, 2010, 2012, 2013, 2014, and 2016 (Barr 2017), and in 2018, 2019, and 2020 (Cliffs 2021) consisting of exploratory boreholes, cone penetration tests, field vane shear tests, and installation of piezometers. Barr also performed geotechnical investigations for the In-pit in 2009 (Barr 2010) and 2018 (Cliffs 2021) that focused on geotechnical and pore water data pressure. Barr considers the slope stability Factors of Safety and the flood storage requirements to meet the minimum specified requirements for both Cell II of the Upland (Barr, 2015) and In-Pit (Barr 2010).

In 2020, Minorca performed a geotechnical investigation at the Upland Tailings Basin. The scope of work included but was not limited to standard penetration boreholes, vibratory wire piezometer installation, cone penetrometer testing, and *in situ* vane shear testing. This investigation was completed in order to evaluate the performance of existing dams and evaluate the existing ground conditions for preliminary design of a future tailings basin interior cell. The results and analysis of this investigation is pending final report.

18.4.3 Audits

The most recent audit was performed by Knight Piésold Limited (KP) for the Upland and In-Pit TSFs in 2019 (KP 2021). The previous audit was undertaken by SRK Consulting (Australia) Pty Ltd (SRK) in 2015 (SRK 2015).

The QP understands that an External Peer Review Team (EPRT) was established in 2019 as part of the tailings basin design and operations review. The EPRT is an independent group that is not associated with the day-to-day engineering activities performed by Barr or Cliffs, and



works with the EOR and Owner to review design, construction, monitoring, and risk management.

18.4.4 Inspections

Regular inspection and monitoring are carried out by Barr, which is currently identified as the EOR for the TSFs, and include dam inspections (Barr 2021) and piezometer measurements collected by Minorca, inclinometer data collected by Barr, and ancillary information through various site visits and communications with Minorca.

18.4.5 Reliance on Data

The QP relies on the statements and conclusions of Barr, Cliffs, and KP and provides no conclusions or opinions regarding the stability of the listed dams and impoundments.

18.4.6 Recommendations

Minorca has been operating the Upland as a disposal site for fine tailings since the mid-1970s and the In-Pit since 2001, both of which are currently operating under the permit requirements of the MDNR Dam Safety Unit. Upstream tailings dam raises, such as those carried out by Cliffs at Minorca, are typically done in low-seismic zones and can be constructed using the coarse-fraction tailings (sand) material. This type of construction approach, however, requires a comprehensive communication and documentation system, careful water management, monitoring of the dam and foundation performance, and the placement of tailings material to ensure that it meets the design requirements. To address these issues, Cliffs has retained Barr as the EOR, with the EOR designation being an industry standard for tailings management, as the EOR typically verifies that the tailings storage basin cells are being constructed and operated by Cliffs as designed and to meet all applicable regulations, guidelines, and standards.

Based on a review of the documentation provided, the QP has the following recommendations:

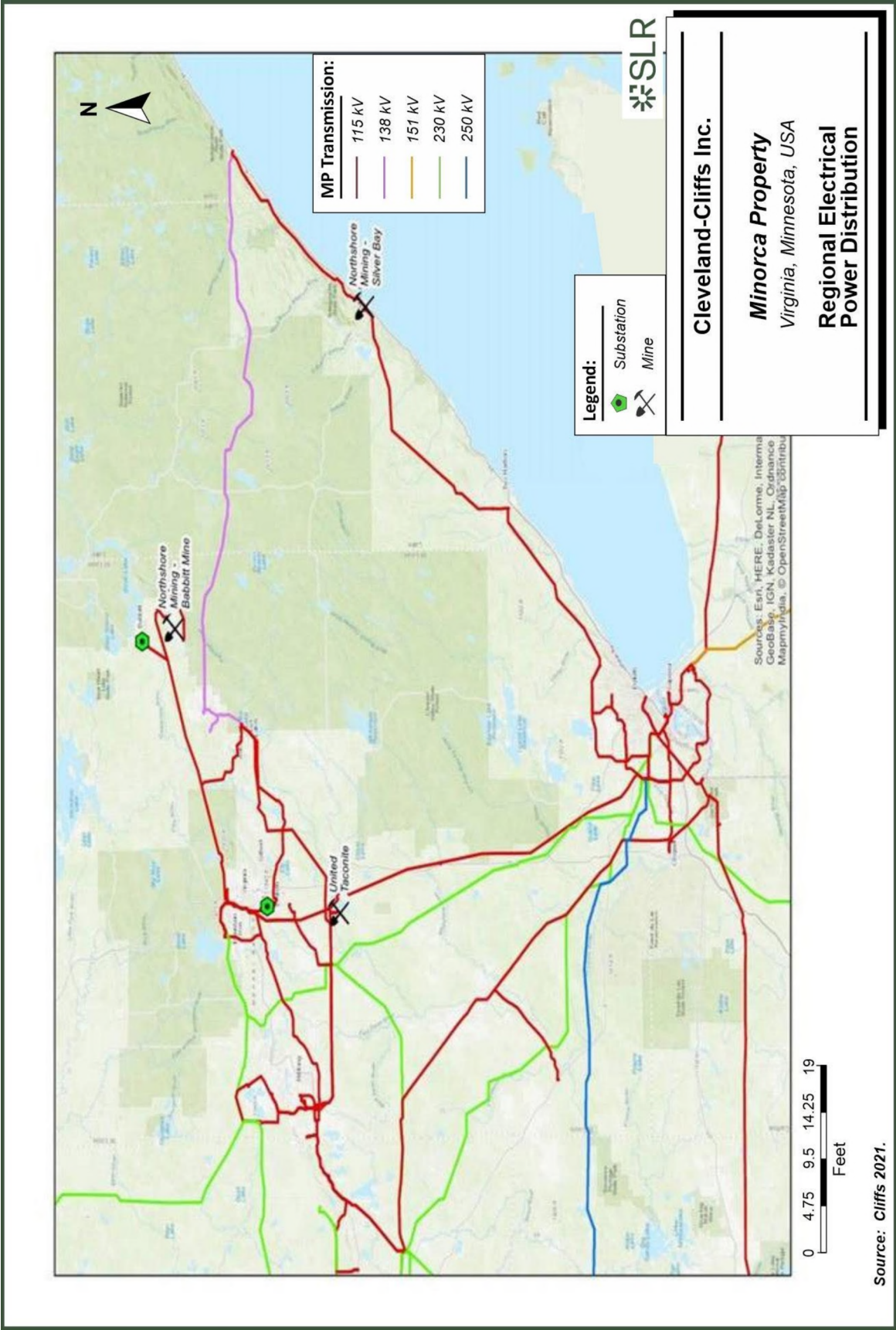
- 1 Prioritize the completion of an Operations, Maintenance and Surveillance (OMS) Manual for the TSF with the EOR in accordance with Mining Association of Canada (MAC) guidelines and other industry recognized standard guidance for tailings facilities.
- 2 Document, prioritize, track, and close out in a timely manner the remediation, or resolution, of items of concern noted in TSF audits or inspection reports.
- 3 While interim reporting has been developed, an ultimate or LOM TSF design should be developed, in which a conceptual TSF configuration can accommodate the 14-year Mineral Reserve estimate.

18.5 Power

Electricity is supplied by Minnesota Power, a division of ALLETE, Inc., by overhead power lines sourced from the Virginia substation with a backup from Minnesota Power's MinnTac substation; both lines run parallel to the rail tracks north of the Plant site. Minnesota Power supplies the power to the Property through its existing electricity grid, which is interconnected to the grids of neighboring states (Figure 18-5).



Figure 18-5: Regional Electrical Power Distribution

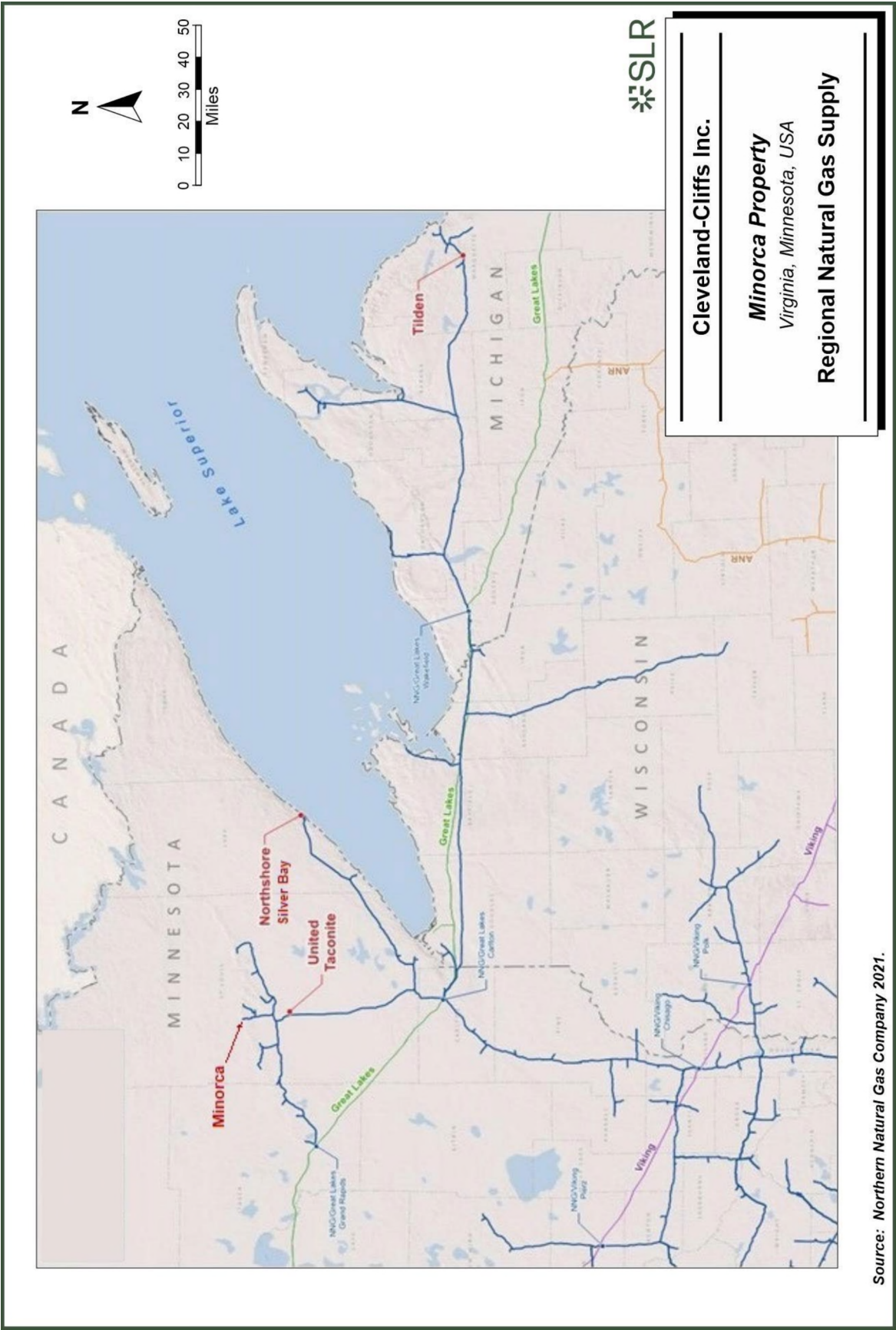


18.6 Natural Gas

Natural gas is provided by Northern Natural Gas (NNG) and scheduled by Constellation Energy. Gas is delivered to the Plant using a high-pressure pipeline that connects into the North American network. Minorca has a long-term contract providing for transport of natural gas on the NNG Pipeline for its Mining and Pelletizing Operations. NNG has an extensive interstate pipeline system that travels through the Midwest and is interconnected to other major interstate pipelines (Figure 18-6). NNG supplies the processing facility via a 10 in. pipeline at 70 psi.



Figure 18-6: Regional Natural Gas Supply



18.7 Diesel, Gasoline, and Propane

Large diesel equipment is fueled in the field by contractor. Small diesel and gasoline fueling stations are used for small maintenance equipment and fleet vehicles. Best Oil supplies diesel fuel to all of Cliffs' Minnesota operations, while Thompson Gas supplies propane. There is sufficient fuel supply in the region to meet the requirements of the operation.

18.8 Communications

Communications at the Plant site include email and telephone (landline and cell phone, for those requiring cell phones). Radio communications are utilized at the Mine and Plant. A Gaitronics intercom system is utilized in the plant facilities.

Wenco mobile dispatch systems are utilized for haul trucks and loading units. The loading units contain a low-precision GPS system to track event locations. Production data as well as vehicle information management system (VIMS) data is delivered back to the Plant site via line-of-site Motorola radios. The data is stored in a Wenco database, managed and maintained by Mine Engineering and Pit Operations staff. A maintenance agreement with Wenco is available for updates and troubleshooting.

18.9 Water Supply

Water to the 2,000 gal, raw potable water feed sump is normally supplied from the Enterprise Reservoir. A backup water supply is provided through a pipe re-routing into the concentrator. An on/off control valve maintains level in this sump. Two-turbine-type vertical pumps are provided to pump water through filters and into a 24,000 gal potable water reservoir. The two filters are backwashed automatically by a timer. Chlorine is added to the water through an ejector and a 7.5 gpm booster pump. The level in the potable water reservoir is maintained through level switches, which operate the raw potable water feed pumps. Potable water is pumped into the 4,000 gal, hydro-pneumatic tank by two vertical turbine pumps, each capable of pumping 200 gpm at 185 ft of total head. The hydro-pneumatic tank is pressurized by plant air through pressure switches and a solenoid valve. Water from the hydro-pneumatic tank is distributed to various parts of the Plant.

A sewage treatment building is located and managed on site. Sanitary wastewater from the Plant is treated by an extended aeration digestion package plant prior to discharge to the Plant site settling basin through monitoring station WS002. The sewage treatment plant is designed to treat average wet-weather flow of 0.017 million gallons per day with a CBOD5 influent strength of 160 ppm. Sewage sludge is removed from the treatment plant and transferred to a publicly owned treatment works (POTW) in accordance with the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) permit for the facility. This falls under NPDES/SDS Permit No. MN0055964.

18.10 Mine Support Facilities

The mine support facilities (Figure 18-7) located at the Mine include an office building for mine management staff, production engineers, environmental personnel, safety personnel, and other support staff. Truck shops, truck wash, railroad shop, and warehouse buildings are located on the site.



Figure 18-7: Aerial View of Minorca Plant Site



18.11 Plant Support Facilities

The primary buildings at the Plant site include:

- Primary crusher
- Fines crusher
- Concentrator
- Pellet plant
- Service plant (containing offices, truck shop, IT, electrical shop, machine shop)

Compressed air is generated on site. The compressed air systems include a plant air system serving the concentrator, fine crushing plant, auxiliary systems, and the pellet plant. A second portable backup system can supply the primary crushing facility if plant air is lost. The plant air system provides for all other compressed air requirements in both the concentrator and pellet plant. Air is supplied by a single 1,250 hp, 4,600 inlet air capacity (ICFM), 125 psig compressor (63-CP-04). This compressor also supplies the instrument air and the filter snap-blow air.

A cooling water system, separate from the other plant water systems, provides the cooling requirements for the plant air systems.



19.0 Market Studies and Contracts

19.1 Markets

Note that while iron ore production is listed in long or gross tons (2,240 lb), steel production is normally listed in short tons (2,000 lb) or otherwise noted.

Cliffs is the largest producer of iron ore pellets in North America. In 2020, Cliffs acquired two major steelmakers, AMUSA, and AK Steel (AK), vertically integrating its legacy iron ore business with steel production and emphasis on the automotive end market.

Cliffs owns or co-owns five active iron ore mines in Minnesota and Michigan. Through the two acquisitions and transformation into a vertically integrated business, the iron ore mines are primarily now a critical source of feedstock for Cliffs' downstream primary steelmaking operations. Based on its ownership in these mines, Cliffs' share of annual rated iron ore production capacity is approximately 28.0 million tons, enough to supply its steelmaking operations and not have to rely on outside supply.

In 2021, with underlying strength in demand for steel, the price reached an all time high. It is expected to remain at historically strong levels going forward for the foreseeable future. In 2020, North America consumed 124 million tons of steel while producing only 101 million tons, which is consistent with the historical trend of North America being a net importer of steel. That trend is expected to continue going forward, as demand is expected to outpace supply in North America. Given the demand, it will likely be necessary for most available steelmaking capacity to be utilized.

On a *pro-forma* basis, in 2019 Cliffs shipped 16.5 million tons of finished, flat-rolled steel. The next three largest producers were Nucor with 12.7 million tons, U.S. Steel with 10.7 million tons, and Steel Dynamics with 7.7 million tons. In 2019, total US flat-rolled shipments in the United States were approximately 60 million tons, so these four companies make up approximately 80% of shipments.

With respect to its blast furnace (BF) capacity, Cliffs' ownership and operation of its iron ore mines is a primary competitive advantage against electric arc furnace (EAF) competitors. With its vertically integrated operating model, Cliffs is able to mine its own iron ore at a relatively stable cost and supply its BF and direct reduced iron (DRI) facilities with pellets in order to produce an end steel or hot-briquetted iron (HBI) product, respectively. Flat-rolled EAFs rely heavily on bushelling scrap (offcuts from domestic manufacturing operations and excludes scrap from obsolete used items), which is a variable cost. The supply of prime scrap is inelastic, which has caused the price to rise with the increased demand. S&P Global Platts has stated the open market demand for scrap could grow by nearly 9 million tons through 2023 as additional EAF capacity comes online, with the impact of the scrap market to continue to tighten as all new steel capacity slated to come online is from EAFs (S&P Global Platts, news release, March 18, 2021).

In addition to its traditional steel product lines, Cliffs-produced steel is found in products that are helping in the reduction of global emissions and modernization of the national infrastructure. For example, Cliffs' research and development center has been working with automotive manufacturer customers to meet their needs for electric vehicles. Cliffs also offers a variety of carbon and plate products that can be used in windmills, while it is also the sole producer of electrical steel in the United States. Additionally, in Cliffs' opinion, future demand for steel given its low CO₂ emissions positioning will increase relative to other materials such as aluminum or carbon fiber.



Cliffs is uniquely positioned for the present and future due to a diverse portfolio of iron ore, HBI, BF's, and EAFs, generating a wide variety of possible strategic options moving forward, especially with iron ore. For instance, Cliffs has the optionality to continue to provide iron ore to its BF's, create more DRI internally, or sell iron ore externally to another BF or DRI facility.

The necessity for virgin iron materials like iron ore in the industry is apparent, as EAFs rely on bushelling scrap or metalics. As of 2020, EAFs accounted for 71% of the market share, a remarkably high percentage among major steelmaking nations. Because scrap cannot be consistently relied upon as feedstock for high-quality steel applications, the industry needs iron ore-based materials that Cliffs provides to continue to make quality steel products.

The US automotive business consumes approximately 17 million tons of steel per year and is expected to consume around or at this level for the foreseeable future. Cliffs' iron ore reserves provide a competitive advantage in this industry as well, due to high quality demands that are more difficult to meet for scrap-based steelmakers. As a result, Cliffs is the largest supplier of steel to the automotive industry in the United States, by a large margin.

Table 19-1 shows the historical pricing for hot-rolled coil (HRC) product, Bushelling Scrap feedstock, and IODEX iron ore indexes for the last five years. The table also includes the 2021 pricing for each index, which shows a significant increase that is primarily driven by demand.

Table 19-1: Five-Year Historical Average Pricing

Indexes	2017	2018	2019	2020	2021	5 Yr. Avg.
U.S. HRC (\$/short ton)	620	830	603	588	1,611	850
Busheling (\$/gross ton)	345	390	301	306	562	381
IODEX (\$/dry metric ton)	71	69	93	109	160	100

The economic viability of Cliffs' iron ore reserves will in many cases be dictated by the pricing fundamentals for the steel it is generated for, as well as scrap and seaborne iron ore itself.

The importance of the steel industry in North America and specifically the USA, is apparent by the actions of the US federal government by implementing and keeping import restrictions in place. Steel is a product that is a necessity to North America. It is a product that people use every day, often without even knowing. It is important for middle-class job generation and the efficiency of the national supply chain. It is also an industry that supports national security of the US by providing products used for US military forces and national infrastructure. Cliffs expects the US government to continue recognizing the importance of this industry and does not see major declines in the production of steel in North America.

For the foreseeable future, Cliffs expects the prices of all three indexes to remain well above their historical averages, given the increasing scarcity of prime scrap as well as the shift in industry fundamentals both in the US and abroad.

19.2 Contracts

19.2.1 Pellet Sales

Since Cliffs' 2020 acquisition of AK and AMUSA's BF steelmaking facilities, Minorca flux pellets are shipped to Cliffs' steelmaking facilities in the Midwestern USA. Pellet product specifications and Minorca's performance can be found in Sections 17.3 and 17.4 of this Technical Report.



For cash flow projections, Cliffs uses a blended three-year trailing average revenue rate based on the dry standard pellet from all Cliffs' mines, calculated from the blended wet pellet revenue average of \$98/WLT Free on Board (FOB) Mine as shown in Table 19-2. Pellet prices are negotiated with each customer on long-term contracts based on annual changes in benchmark indexes, such as those shown in Table 19-1, and other adjustments for grade and shipping distances.

Table 19-2: Cliffs Consolidated Three-Year Trailing Average Wet Pellet Revenue

Description	2017	2018	2019	3YTA
Revenue Rate (\$/WLT)	88.02	105.64	99.50	98.00
Total Pellet Sales (MWLT)	18.7	20.6	19.4	19.5

SLR examined annual pricing calculations provided by Cliffs for the period 2017-2019 for external customers, namely AK. The terms appear reasonable. It should be noted that Cliffs has subsequently acquired AK and AMUSA steelmaking facilities in 2020, making the company a vertically integrated, high-value steel enterprise, beginning with the extraction of raw materials through the manufacturing of steel products, including prime scrap, stamping, tooling, and tubing.

For the purposes of this Technical Report, it is assumed that the internal transfer pellet price for Cliffs' steel mills going forward is the same as the \$98/WLT pellet price when these facilities were owned by AK and AMUSA. Based on macroeconomic trends, the QP is of the opinion that Cliffs pellet prices will remain at least at the current three-year trailing average of \$98/WLT or above for the next five years.

19.2.2 Operations

Minorca is a captive mine whose pellets are shipped wholly to Cliffs' Indiana Harbor complex, which is one of the largest integrated steelmaking facilities in North America and located in East Chicago, Indiana, just 20 mi southeast of Chicago.

Major current suppliers for the Minorca operation include, but are not limited to, the following:

- Electrical Grid Power: Minnesota Power
- Natural Gas: NNG with scheduling by Constellation Energy
- Diesel Fuel: Best Oil
- Propane: Thompson Gas
- Pellet Rail Transport and Two Harbors Port ship loading: CN Railway



20.0 Environmental Studies, Permitting, and Social or Community Impact

The SLR review process for Minorca included updating information that Cliffs had developed as part of its draft 2019 SK-1300 report. SLR also conducted a site visit at Minorca in 2021. SLR has not seen or reviewed environmental studies, management plans, permits, compliance documentation, or monitoring reports. The original and updated information included in this section is based on the information provided by the Cliffs project team.

20.1 Environmental Studies

Minorca has been operating for over 40 years, and baseline and other environmental studies have been undertaken as needed to support various approvals and compliance-based reporting over the site's operating history. Currently, additional environmental studies, including collecting new or updated baseline information, are undertaken on an as-required basis to support new permit applications or to comply with specific permit conditions.

Environmental studies completed during the 2020 reporting year include the following:

- Barr identified, delineated, and mapped wetlands in four study areas in July and August 2020. The study areas are located between the cities of Biwabik, McKinley, Gilbert, and northeast of the City of Virginia, all in St. Louis County, Minnesota. The four study areas include: (1) Upland Tailings Basin – two areas encompassing 129 acres; (2) Laurentian Stockpile – two areas encompassing two acres; (3) Canton Pipeline – two areas separated by the existing permitted East Pit, encompassing 53 acres; and (4) Future Mine Reserve including one 115-acre area adjacent to the Laurentian Pit and one 369-acre area adjacent to the East Pit.
- Barr performed mercury (Hg) emissions determinations on the indurating furnace (EU026) Stacks A-D (SV014-SV017) at Minorca. Testing was completed on June 23 to 24, 2020, to satisfy Minnesota Mercury Rule - Minnesota Rule 7019.3050(E)(5). Each mercury test consisted of three, two-hour test runs as required by ASTM 6784 Ontario Hydro Method. Indurating Furnace Stack A (SV014) and Indurating Furnace Stack C (SV016) were tested simultaneously on June 23, 2020. Indurating Furnace Stack B (SV015) and Indurating Furnace Stack D (SV017) were tested simultaneously on June 24, 2020.
- 2020 monitoring of the Central Stream and East Stream, located downstream of the East Pit Development. The monitoring activities include physical and biological monitoring, comprising the “synoptic survey” that is required by the MDNR Appropriations Permit. All water appropriations permits have been obtained to support the LOM plan schedule. There are no known factors or risks that may affect access, title, or the right or ability to perform work at the Property.

There are no known environmental issues that could materially impact Cliffs' ability to extract Mineral Resources and Mineral Reserves.

20.2 Environmental Requirements

Minorca maintains an environmental management system (EMS) that is registered to the international ISO 14001:2015 standard. The ISO standard requires components of leadership commitment, planning, internal and external communication, operations, performance



evaluation, and management review. Minorca's continued registration to the ISO standard is evaluated annually through internal auditors and every other year through external auditors.

Cliffs maintains a regulatory matrix as part of its EMS, as well as a regulatory reporting calendar tracker. CCMMI conducts internal auditing of its compliance system on a regular basis, and Cliffs corporate conducts a formal compliance audit on a routine basis.

Impacts to surrounding communities (noise, vibration, etc.) are considered by the EMS, and views of interested parties are part of the ranking process when ranking environmental aspects.

No significant environmental and social issues arose in 2020 that are specific to Minorca. Minor impacts and mitigation methods being employed are discussed below. Mining is currently taking place in the Laurentian Pit, East 1, and East 2 at Minorca. All mining activity is covered by a permit to mine obtained from the MDNR Lands and Minerals division. The mine complies with the conditions of its permit and all rules laid out by the MDNR in Taconite and Iron Ore Mineland Reclamation Rules Chapter 6130. The mining impacts wetlands that Minorca is required to replace. Minorca is currently utilizing a bank of wetlands that was established in the 1990s in Aitkin County to replace the wetlands impacted by current mining operations. A new wetland bank has been developed near Meadowlands, Minnesota, and credits will become available for use over the next several years. The initial deposit of 17.6813 wetland credits was completed on March 25, 2020.

- Laurentian Pit
 - The drainage system for the Laurentian Pit is directed to and collected in a sump, which is located at the lowest point of the pit. The sump is sized to adequately settle out sediments before the collected water is pumped out of the pit to discharge location SD003, as described in the NPDES/SDS Permit. The sump is moved as needed to the new lowest point within the Laurentian Pit. Runoff can also potentially enter the pit from the overburden piles, maintenance/spare parts areas, and haul roads. Runoff from the active overburden stockpiles primarily flows southeast into a drainage ditch. Most of the water flows into the Corsica II Pit, while the rest is diverted around the Corsica II Pit and flows to the same lowland that permitted SD003 discharges are released to; this runoff then eventually enters White Lake.
- East Pit
 - The drainage system for the East 1 Pit is directed to and collected in a sump, which is located at the lowest point of the pit. The sump is sized to adequately settle out sediments before the collected water is pumped out of the pit to discharge location SD005, as described in the NPDES/SDS Permit. Periodically, the sump and pump are moved as needed to the new lowest point of the East Pit. Runoff from the stockpiles primarily either naturally infiltrates or flows into the pit, where it is captured by the sump and discharged as indicated above.
- Haul Roads
 - Berms are constructed out of rock and coarse tailings along haul roads as required by Mine Safety and Health Administration (MSHA) to keep trucks from running off the road. These berms also serve as structural control to direct runoff along the road and direct discharge to selected locations. Gaps in the berms are strategically placed to allow drainage of the haul roads and to divert runoff to areas where impacts of the runoff are minimized. Dry sediment basins are located at breaks within the berm where drainage has the potential to leave the property. In locations where haul road



runoff has the potential to impact surface waters, structural best management practices have been followed.

- Plant Site
- Drainage from the areas in and around the pellet plant is directed toward the plant site settling basin. The plant site settling basin provides stormwater treatment by settling solids and serving as a large sedimentation pond. Most of the water reaching the basin is pumped back to the facility for use as process water. Water discharges are governed by the EPA and MPCA.
- Overburden and Soils Storage
 - Overburden and soil stockpiles are reclaimed to the standards of the MDNR in Taconite and Iron Ore Mineland Reclamation Rules Chapter 6130. The stockpiles are shaped and seeded to avoid erosion and to create wildlife habitat.
- Processing
 - Air emissions from processing are governed by the EPA and MPCA.
- Tailings
- Air emissions from processing and tailings disposal are governed by the EPA and MPCA. Water discharges are governed by the EPA and MPCA.

20.2.1 Site Monitoring

Minorca operates through permission granted by multiple permits, which are summarized in Table 20-1. The permits contain requirements for site monitoring including air, water, waste, and land aspects of the Minorca operation. The permit-required data is maintained by the facility, and exceptions to the monitoring obligations, if they occur, are reported to the permitting authority as defined in the individual permit. Monitoring is conducted in compliance with permit requirements, and management plans are developed as needed to outline protocols and mitigation strategies for specific components or activities. Monitoring and management programs currently undertaken in compliance with Minorca's existing permits include:

- Air Quality: Management plans including fugitive dust control plans, operation and maintenance plans, and startup, shutdown, and malfunction plans; monitoring of fugitive sources and stacks, visible dust emission monitoring at the tailings facility; and greenhouse gas (GHG) emissions monitoring and reporting.
- Noise and Vibration: Blast management plans including vibration monitoring.
- Surface Water: Routine water quality sampling in receiving waters; quantity of water takings and discharges.
- Groundwater: Routine water quality sampling from mine dewatering and at plant wells; quantity of water takings.
- Wetlands: monitoring of nearby wetlands where the potential for an impact has been identified, including potential indirect impacts, where appropriate.
- Wildlife: monitoring of endangered species in accordance with specific permit conditions.
- Infested waters: operating and monitoring plan associated with the mine dewatering permit.



There are no specific management plans related to social aspects in place.

With regard to compliance, there are currently no outstanding enforcement items at the facility.

The State and Federal government conduct regional ecologic monitoring in the vicinity of the facility operations. Two recent examples of such monitoring include:

- EPA conducted its residual risk and technology review (RTR) of the Taconite NESHAP (40 CFR 63). EPA's final rule on July 28, 2020 documents that risks from the taconite iron ore processing source category are acceptable, and the current standards provide a margin of safety to protect public health and prevent an adverse environmental effect.
- The State of Minnesota conducts regional watershed monitoring to assess the overall health of water bodies throughout the state, including water quality and macroinvertebrate and fish population diversity and health. The State may develop watershed management tools for water bodies of concern such as Total Maximum Daily Load (TMDL) plans. Minorca is not currently subject to any TMDL-based load restrictions.

20.2.2 Water

Minorca presently maintains NPDES/SDS permits for the pit, NPDES/SDS Permit No. MN0059633, and plant site and tailings areas, NPDES/SDS Permit No. MN0055964. Monitoring is conducted at multiple discharge outfalls, groundwater monitoring wells, surface water monitoring locations, discharges to the plant site settling basin, influent of tailings slurry to the TSF, return water from the TSF to the clear water pool, and two pit-water monitoring locations. Reporting for the NPDES/SDS permits includes monthly and annual stormwater reporting and annual chemical dust suppression reporting.

Minorca maintains five water appropriations permits through the water appropriations program that facilitate surface and groundwater use with adequate capacity for the Mine and Plant. Monitoring of the amount of water appropriated or used is conducted and reported monthly.

20.2.3 Hazardous Materials, Hazardous Waste, and Solid Waste Management

Minorca typically generates small quantities of hazardous waste and is a small quantity generator per Minnesota hazardous waste rules and generation quantity and according to the federal Resource Conservation and Recovery Act (RCRA). Hazardous waste management is authorized by permits from the applicable regulatory authorities. See Table 20-1 for a full list of permits. Minorca generates other waste materials typical of any large industrial site and manages those wastes offsite through approved vendors.

20.2.4 Tailings Disposal, Mine Overburden, and Waste Rock Materials

Requirements for tailings disposal are discussed in Section 18.4 of this Technical Report. Tailings disposal is authorized by permits from the applicable regulatory authorities. See Table 20-1 for a full list of permits.

Because iron ore geochemistry is different from other metallic mineral deposits, acid rock drainage is not a concern with the iron ore bodies and associated tailings in Minnesota. Moreover, EPA itself describes the iron ore mining and beneficiation process as generating wastes that are "earthen in character." Chemical constituents from iron ore mining include iron oxide, silica, crystalline silica, calcium oxide, and magnesium oxide—none of which are Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances. The acid-neutralizing potential of carbonates in iron ore offsets any



residual acid rock drainage risks, leading to pit water that naturally stabilizes at a pH of 7.5 to 8.5.

Regular inspections of dams and waste facilities are not mandated for Minorca; however, Minorca proactively conducts annual inspections of the tailings impoundment with the Engineer of Record.

Requirements for the disposal of mine overburden and non-mineralized or lean rock are discussed in section 16.5 of this Technical Report. Stockpiling of these materials is authorized by permits from the applicable regulatory authorities. See Table 20-1 for a full list of permits.

20.3 Operating Permits and Status

The environmental permitting status is summarized in Table 20-1. Currently there are no planned or future environmental permits required for the LOM schedule; however, permit renewal is required for multiple permits that are currently administratively extended to allow for continued operation.

Table 20-1: List of Existing Environmental Permits

Permit	Existing Environmental Permits						
	Property ID	Permit Number	Agency	Start Date	Expiration Date	Annual Fees & Taxes (\$000)	Compliance Status
Holding Tank Operating Permit	-	#23987	St. Louis County	2/25/2015	10/14/2024	-	YES
Holding Tank Operating Permit	-	#21867	St. Louis County	2/25/2015	10/14/2024	-	YES
Holding Tank Construct and Operating Permit		#37659	St. Louis County	10/21/2020	10/21/2022	-	YES
Hazardous Materials Certificate of Registration	-	060220550422C	US Department of Transportation	7/1/2019	6/30/2021	-	YES
Hazardous Waste Generator License	-	MND000819342	MPCA	7/1/2019	6/30/2021	-	YES
NPDES	-	MN0059633	MPCA	NA	NA	-	YES
NPDES	-	MN0055964	MPCA	NA	NA	-	YES
Title V Air Permit	-	137000362-003	MPCA	NA	NA	-	YES
Section 404 Permit	-	MVP-2005-110-JKA	US Army Corps of Engineer	3/5/2007	12/31/2025	-	YES
Laurentian Pit 4040 Permit	-	96-03995-IP-TWP	US Army Corps of Engineer	5/1/1997	12/31/1999	-	Expired
Laurentian Pushback WCA – Wetland Replacement Plan	-	-	MDNR	4/27/2018	NA	-	YES
Radiation License	-	MN1088-100-69	MDH	7/11/2017	4/30/2022	-	YES
Water Appropriation Permit	-	1991-2017	MDNR	12/27/2002	NA	-	YES
Water Appropriation Permit	-	2008-0216	MDNR	4/24/2008	NA	-	YES
Water Appropriation Permit	-	1980-2095	MDNR	1/28/1980	NA	-	YES



Permit	Existing Environmental Permits						
	Property ID	Permit Number	Agency	Start Date	Expiration Date	Annual Fees & Taxes (\$000)	Compliance Status
Water Appropriation Permit	-	1973-5095	MDNR	8/15/1974	NA	-	YES
Water Appropriation Permit	-	2007-0559	MDNR	12/12/2007	NA	-	YES
MDNR Permit to Mine – Original Permit	-	1973-5095	MDNR	5/26/1905	NA		YES
MDNR Dam Safety Permit – Minorca In-Pit	-	2009-0263	MDNR	11/17/2008	12/31/2009	-	Amended in 2010, Permit can expire at expiration date or at when permit design limit is reached.
MDNR Dam Safety Permit – Upland Basin	-	2011-0659	MDNR	9/6/2011	4/12/2023	-	
MDNR Dam Safety Permit – Upland Basin Perimeter Dam Repair	-	2015-0536	MDNR	11/14/2014	11/14/2019*	-	Permit can expire at expiration date or at when permit design limit is reached.

20.4 Mine Closure Plans and Bonds

Minorca's current mine life is projected at 14 years (2035) as indicated in section 16.4 of this Technical Report. This long life makes preparation of a detailed closure plan difficult to undertake considering the potential variability of planned development. Minnesota Rule 6130.4600 does not require a plan for deactivation of the mine until at least two years in advance of deactivation of a mining area. No plan has yet been required or requested by the State agency. As a matter of good mining practice, Minorca seeks to conduct concurrent reclamation throughout its mining life to minimize risk and costs at closure. Minorca actively reclaims stockpiles that have no further planned use, consistent with the State of Minnesota mining rule requirements.

Cliffs performs an annual review of significant changes to each operations asset retirement obligation (ARO) cost estimates. Additionally, Cliffs conducts an in-depth review every three years to ensure that the ARO legal liabilities are accurately estimated based on current laws, regulations, facility conditions, and cost to perform services. Cost estimates are conducted in accordance with the Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) 410. FASB ARO estimates comply with rules set forth by the United States General Accepted Accounting Principles (USGAAP) and the SEC, and those costs are reported as part of Cliffs' SEC disclosures. Cliffs calculated the 2019 ARO legal obligation closure and reclamation costs associated with Minorca closure to be \$29.3 million. The QP notes that there are differences between the ARO estimate and the book value calculated by Cliffs due to the long life of the operation.

SLR cannot comment on the adequacy of the closure costing and the closure plan based on currently available information.



20.5 Social and Community

Cliffs has been investing in the region for over a century, including direct employment and contributions to state, local, and taconite taxes. Taconite taxes contribute to an existing government-administered property tax credit program for people living in the Mesabi Iron Range mining area funded through mining production taxes. The QP is not aware of any formal commitments to local procurement and hiring; however, Cliffs has indicated that it has long-standing relationships with local vendors and also purchases through local and regional services and supplies.

Cliffs' employees make contributions to local United Way chapters through donations that are supported with a matching contribution from the company. Employees also serve as board members and volunteers for the United Way. Another initiative includes agreements with local municipalities or organizations to make Cliffs-owned and leased land that is not utilized for mining available for local community use including trails used for snowmobiling, biking, and ATV. Cliffs' goal is to work collaboratively with stakeholders to support activities that are of benefit to the communities in which the company operates.

Minorca's mine progression necessitates the drawdown of water levels in the Canton Pit, which is utilized for source water by the City of Biwabik. Minorca entered into a Source Water Change Action Plan with the City of Biwabik (with approval by MDNR) to transition the city's water source to the Embarrass Pit in 2021/2022. Through this agreement, Minorca has invested in new infrastructure to be owned and operated by the City of Biwabik, so the municipality will experience a seamless transition to its new water source (which is of similar quality to the Canton Pit).

The QP is not able to verify the adequacy of management of social issues and what the general issues raised are but understands that Cliffs has a positive relationship with stakeholders and that in the event of a complaint, Cliffs works directly with affected community members to develop a mutually acceptable resolution. Public affairs representatives from Cliffs formally engage with the community on an ongoing basis and serve as the face of the company. They sit on boards of community and business organizations at regional and local levels, participate in discussions with government officials, and act as a point of contact within the community. In doing so, they keep stakeholders apprised of critical issues to the operations, understand important topics in the community, and seek to listen to any questions or concerns. Cliffs indicated that this strategy allows it to maintain an ongoing relationship with stakeholders and collaborate with communities to find solutions should any issues arise. Cliffs' Public/Government Affairs maintains a list of stakeholders for Cliffs' iron ore mine operations.



21.0 Capital and Operating Costs

Cliffs' forecasted capital and operating costs estimates are derived from annual budgets and historical actuals over the long life of the current operation. According to the American Association of Cost Engineers (AACE) International, these estimates would be classified as Class 1 with an accuracy range of -3% to -10% to +3% to +15%. All unit rates are reported in WLT pellets.

21.1 Capital Costs

Table 21-1 shows the sustaining capital cost forecast for the five-year period from 2022 to 2026, which totals \$131.8 million, or \$9.40/LT pellet. These costs include, but are not limited to:

- Mobile and fixed equipment additions and replacements
- Infrastructure and health systems improvements

For the remaining life of the operation starting in 2027, a sustaining capital cost of \$4/WLT pellet, or \$11.2 million annually, is used in the economic model for an additional \$78.4 million for the remaining mine life.

Table 21-1: LOM Capital Costs

Type	Units	Total	2022	2023	2024	2025	2026	2027	2028-2035
Capital Costs									
Total Sustaining	\$ millions	210.2	28.2	25.5	27.8	27.1	23.2	11.2	67.2
Pellet Sales									
Pellet Sales	MWLT	37.4	2.8	2.8	2.8	2.8	2.8	2.8	20.6
Unit Rates									
Total	\$/WLT	5.63	10.00	9.11	9.93	9.69	8.28	4.00	3.28

A final closure reclamation cost of \$29.3 million is estimated, with \$9.8 million spent annually starting in the last year of production in 2035 and the two subsequent years.

21.2 Operating Costs

Operating costs for the LOM are based on the 2022 plan. For this period, costs are based on a full run rate of flux pellet production consistent with what is expected for the LOM. In the period 2022 to 2026, higher tailings basin costs are estimated at \$41 million. After that point in time, however, there are no items identified that should significantly impact operating costs either positively or negatively for the evaluation period. Minor year-to-year variations should be expected based upon maintenance outages and production schedules. Forecasted 2022 and average operating costs over the remaining 14 years of mine life are shown below in Table 21-2.



Table 21-2: LOM Operating Costs

Parameter	2022 (\$/WLT Pellet)	LOM (\$/WLT Pellet)
Mining	20.84	16.89
Processing	48.43	45.57
Site Administration	2.20	2.20
Logistics/Dock	10.78	10.78
General/Other Costs	10.10	10.10
Operating Cash Cost	92.34	85.53

Processing costs consist of railing ore from the Mine to the Plant, as well as typical crushing, grinding, concentrating, pelletizing, and tailings basin disposal. Logistics/Dock costs include rail transport of pellets to the Two Harbors, Minnesota port and ship loading. General/Other costs include production tax and royalty costs, insurance, and other minor costs.

The operation employs a total of 362 salaried and hourly employees as of Q4 2021, consisting of 50 salaried and 312 hourly employees. The majority of the hourly employees are United Steelworkers production and maintenance bargaining unit members.

Table 21-3 summarizes the current workforce levels by department for the Property.

Table 21-3: Workforce Summary

Category	Salary	Hourly	Total
Mine	9	157	166
Plant	10	155	165
General Staff Organization	31	0	31
Total	50	312	362



22.0 Economic Analysis

22.1 Economic Criteria

The economic analysis detailed in this section was completed after the mine plan was finalized. The assumptions used in the analysis are current for the time the analysis was completed (Q4 2021), which may be different from the economic assumptions defined in Sections 14.0 and 15.0 when calculating the economic pit. For this period, costs are based on a full run rate of flux pellet production, consistent with what is expected for the LOM.

An un-escalated, technical-economic model was prepared on an after-tax DCF basis, the results of which are presented in this section. Key criteria used in the analysis are discussed in detail throughout this Technical Report. General assumptions used are summarized in Table 22-1.

Cliffs uses a 10% discount rate for DCF analysis incorporating quarterly cost of capital estimates based on Bloomberg data. The QP is of the opinion that a 10% discount/hurdle rate for after-tax cash flow discounting of large iron ore and/or base metal operations is reasonable and appropriate.

Table 22-1: Technical-Economic Assumptions

Description	Value
Start Date	December 31, 2021
Mine Life	14 years
Three-Year Trailing Average Revenue	\$98/WLT Pellet
Operating Costs	\$85.53/WLT Pellet
Sustaining Capital (after five years)	\$4/WLT Pellet
Discount Rate	10%
Discounting Basis	End of Period
Inflation	0%
Federal Income Tax Rate	20%
State Income Tax Rate	None – Sales made out of state

The operating cost of \$85.47/WLT pellet includes royalties and Minnesota State production taxes.

The production and cost information developed for the Property are detailed in this section. Table 22-2 presents a summary of the estimated mine production over the 14-year mine life.

Table 22-2: LOM Production Summary

Description	Units	Value
ROM Crude Ore	MLT	109.7
Total Material	MLT	193.2
Grade	% MagFe	23.8
Annual Mining Rate	MLT/y	16



Table 22-3 presents a summary of the estimated plant production over the 14-year mine life.

Table 22-3: LOM Plant Production Summary

Description	Units	Value
ROM Material Milled	MLT	109.7
Annual Processing Rate	MLT/y	8.5
Process Recovery	%	34.2
Total Pellet	MLT	37.3
Annual Pellet Production	MLT/y	2.8

22.2 Cash Flow Analysis

The indicative economic analysis results, presented in Table 22-4, indicate an after-tax Net Present Value (NPV), using a 10% discount rate, of \$70 million at an average blended wet pellet price of \$98/WLT. The after-tax Internal Rate of Return (IRR) is not applicable as the processing facility has been in operation for a number of years. Capital identified in the economics is for sustaining operations and plant rebuilds as necessary.

Project economic results and estimated cash costs are summarized in Table 22-4. Annual estimates of mine production and pellet production with associated cash flows are provided for years 2022 to 2027 and then by ten-year grouping through to the end of the mine life in 2035 plus two additional years of final reclamation.

The economic analysis was performed using the estimates presented in this Technical Report and confirms that the outcome is a positive cash flow that supports the statement of Mineral Reserves.

Table 22-4: LOM Indicative Economic Results

Mine Life		1	2	3	4	5	6	7-16
Calendar Years	Total	2022	2023	2024	2025	2026	2027	2028-2037
Reserve Base:								
Minorca Mining Ore Pellet Reserve Tons (millions)	37.3	34.5	31.7	28.9	26.1	23.3	20.5	-
Tonnage Data:								
Minorca Mining Total Tons Moved (millions)	193.2	18.0	17.5	16.0	16.0	16.0	16.0	93.7
Minorca Mining Crude Ore Tons Mined (millions)	109.7	8.8	8.7	8.3	8.2	8.3	8.5	58.9
Minorca Mining Pellet Production Tons (millions)	37.3	2.8	2.8	2.8	2.8	2.8	2.8	20.5
Inputs:								
Minorca Mining Pellet Revenue Rate (\$/ton)	98	98	98	98	98	98	98	98



Mine Life		1	2	3	4	5	6	7-16
Calendar Years	Total	2022	2023	2024	2025	2026	2027	2028-2037
Income Statement:								
Minorca Mining Gross Revenue (\$ in millions)	3,659	276	274	274	274	274	274	2,010
Mining	631	59	57	52	52	52	52	306
Processing	1,701	137	141	129	131	125	125	914
Site Administration	82	6	6	6	6	6	6	45
Logistics / Dock	402	30	30	30	30	30	30	221
General / Other Costs	377	28	28	28	28	28	28	207
Minorca Mining Operating Cash Costs (\$ in millions)	3,193	260	263	245	248	242	242	1,693
Operating Cash Costs (\$/LT Pellet)	85.53	92.34	93.89	87.68	88.51	86.38	86.45	82.52
Minorca Mining Operating Income (excl. D&A)	465	16	11	29	27	33	32	318
Federal Income Taxes (\$ in millions)	(93)	(3)	(2)	(6)	(5)	(7)	(6)	(64)
Depreciation Tax Savings (\$ in millions)	49	4	4	4	4	4	4	27
Accretion Tax Savings (\$ in millions)	4	0	0	0	0	0	0	3
Minorca Mining Income after Taxes (\$ in millions)	425	17	13	27	25	30	30	284
Other Cash Inflows & Outflows (\$ in millions):								
Sustaining Capital Investments	(210)	(28)	(26)	(28)	(27)	(23)	(11)	(67)
Significant All Material Change Capital Additions	-	-	-	-	-	-	-	-
Mine Closure Costs (Incl. Post Closure)	(29)	-	-	-	-	-	-	(29)
Minorca Mining Cash Flow (\$ in millions)	186	(11)	(12)	(1)	(2)	7	19	187
Minorca Mining Discounted Cash Flow (\$ in millions)	70	(11)	(11)	(1)	(1)	5	12	78



22.3 Sensitivity Analysis

Project risks can be identified in both economic and non-economic terms. Key economic risks were examined by running cash flow sensitivities. The operation is nominally most sensitive to market prices (revenues) followed by operating cost as demonstrated in Table 22-5. For each dollar movement in sales price and operating cost, respectively, the after-tax NPV changes by approximately \$18 million.

The QP notes that recovery and head grade sensitivity do not vary much in iron ore deposits compared to metal price sensitivity. In addition, sustaining capital expenditures amount to 6.5% of LOM operating costs and, therefore, do not have much impact on the viability of operating mines.

Table 22-5: After-tax NPV at 10% Sensitivity Analysis (\$M)

		Operating Costs					
		\$100	\$95	\$90	\$85	\$80	\$75
Sales Price (\$/WLT Pellet)	\$83	(\$462)	(\$374)	(\$285)	(\$196)	(\$108)	(\$19)
	\$88	(\$374)	(\$285)	(\$196)	(\$108)	(\$19)	\$70
	\$93	(\$285)	(\$196)	(\$108)	(\$19)	\$70	\$158
	\$98	(\$196)	(\$108)	(\$19)	\$70	\$158	\$247
	\$103	(\$108)	(\$19)	\$70	\$158	\$247	\$336
	\$108	(\$19)	\$70	\$158	\$247	\$336	\$424
	\$113	\$70	\$158	\$247	\$336	\$424	\$513
	\$118	\$158	\$247	\$336	\$424	\$513	\$602
	\$123	\$247	\$336	\$424	\$513	\$602	\$690



23.0 Adjacent Properties

There are several iron mines along the Mesabi Iron Range in Minnesota. The Mineral Resource and Mineral Reserves stated in this Technical Report are contained entirely within the Property's mineral leases, and information from other operations was not used in this Technical Report.



24.0 Other Relevant Data and Information

No additional information or explanation is necessary to make this Technical Report understandable and not misleading.



25.0 Interpretation and Conclusions

Minorca has been a successful producer of iron pellets for over 44 years. The update to the Mineral Resource and Mineral Reserve does not materially change any of the assumptions from previous operations. An economic analysis was performed using the estimates presented in this Technical Report and confirms that the outcome is a positive cash flow that supports the statement of Mineral Reserves for a 14-year mine life. There are no significant risks and uncertainties that could reasonably be expected to affect the reliability or confidence in the Mineral Resource or Mineral Reserve estimates or Minorca's continued economic viability.

The QPs offer the following conclusions by area.

25.1 Geology and Mineral Resources

- Above a crude MagFe cut-off grade of 16%, Minorca Measured and Indicated Mineral Resources exclusive of Mineral Reserves are estimated to total 801.5 MLT at an average grade of 22.9% MagFe.
- The East, Central, and Laurentian deposits are examples of Lake Superior-type BIF deposits. Both the site and corporate technical teams have a strong understanding of the Minorca geology, as well as the processing characteristics of the mineralization.
- Exploration sampling, preparation, analyses, and security processes for both physical samples and digital data are appropriate for the style of mineralization and are sufficient to support the estimation of Mineral Resources.
- Cliffs is developing a program of QA/QC that includes standards and duplicates and control-chart analysis. A comprehensive QA/QC program did not exist for the previous 44 years of mine operation. QA/QC results for the 2021 verification study are appropriate for the style of mineralization and are sufficient to generate a drill hole assay database that is adequate for Mineral Resource estimation in compliance with international reporting standards. Based on these results, in conjunction with good agreement between planned and actual product produced over more than 40 years, it is the QP's opinion that procedures are consistent with industry standards.
- The KEV in the block models for Minorca compare well with the source data. Future estimations should also review the cut-off grade used in reporting.
- The methodology used to prepare the block model is appropriate and consistent with industry standards.
- Validations compiled by the QP indicate that the block model is reflecting the underlying support data appropriately.
- The classification at Minorca is generally acceptable. In the QP's opinion, however, the extension of classified material beyond drilling limits is slightly aggressive, and some post-processing to remove isolated blocks of different classification is warranted. Classified blocks that extend beyond the drilling limits are generally outside the Resource Pit Shell.
- The block model represents an acceptable degree of smoothing at the block scale for prediction of quality variables at Minorca. Visually, blocks and composites in cross-section and plan view compare well.



- 2021 actual versus model-predicted values of crude ore were accurate to within 10%, with the model values slightly lower than actual total ore processed.

25.2 Mining and Mineral Reserves

- Minorca has been in production since 1976, and specifically under 100% Cliffs operating management since 2020. Cliffs conducts its own Mineral Reserve estimations.
- Total Proven and Probable Mineral Reserves are estimated at 109.7 MLT of crude ore at an average grade of 23.8% MagFe.
- Mineral Reserve estimation practices follow industry standards.
- The Minorca Mineral Reserve estimate indicates a sustainable project over a 14-year LOM.
- The geotechnical design parameters used for pit design are reasonable and supported by previous operations.
- The LOM production schedule is reasonable and incorporates large mining areas and open benches.
- An appropriate mining equipment fleet, maintenance facilities, and manpower are in place, with additions and replacements estimated, to meet the LOM production schedule requirements.
- Sufficient storage capacity for waste stockpiles and tailings has been identified to support the production of the Mineral Reserve.

25.3 Mineral Processing

- Minorca's product has been wholly consumed by IH7 since production began in 1977. In 1987, Minorca began creating flux pellets as opposed to standard pellets. In 1992, Minorca constructed a flotation plant for silica reduction to treat the higher silica, Laurentian Pit ores.
- Minorca performs diamond drilling to characterize the Mineral Resource associated with the mine plan. Blast hole samples are analyzed to validate ore grades and develop blending plans. Minorca also conducts plant sampling for process control and product quality reporting for compliance with SPPs established by IH7.
- Ore is blended from the Laurentian and East pits based on MagFe content and silica grade as well as scheduled material movement.
- Crushing, concentrating, and pelletizing processes are conventional. Mined ore is processed in primary, secondary, and tertiary crushers to produce a final product with P_{100} of 5/8 in. that is delivered to the concentrator at a design rate of 1,396 LT/h.
- The concentrator comprises three lines that include rod milling, primary magnetic separation, ball milling, and secondary magnetic separation closed by cyclones, hydroseparation, and finisher magnetic separation to produce a magnetite concentrate.
- Bentonite and dolomite flux are added to the concentrate, which is agglomerated into balls using balling discs and fired in a straight-grate indurating furnace to produce a final, hardened, fluxed pellet product.



- From 2015 to 2020, the Minorca concentrator processed an average of 8.78 MLT/y of ore with an average MagFe grade of 22.7%. The overall mass recovery to concentrate averaged 32.5% with an overall MagFe recovery of 95.4%. Final product for the period averaged 2.79 MLT/y of flux pellets and 42,200 LT/y of lump product with grades of 62.6% Fe and 4.2% SiO₂.
- The main process water supply for the concentrator is recycled from the tailings thickener. Other sources include the Upland and Minorca tailings basins, the Missabe Mountain Pit, the Sauntry/Enterprise Pit, and the Plant Site settling basin.

25.4 Infrastructure

- The Property is located in a historically important, iron-producing region of Northeastern Minnesota. All the infrastructure necessary to mine and process significant commercial quantities of iron ore is in place.
- Cliffs has been operating the Upland Tailings Basin as a disposal site for fine tailings since the mid-1970s and the In-Pit Tailings Basin since 2001, both of which are currently operating under the permit requirements of the Minnesota Department of Natural Resources Dam Safety Unit

25.5 Environment

- Minorca maintains the requisite state and federal permits and is in compliance with all permits. Environmental liabilities and permitting are further discussed in Section 20.0 of this Technical Report.



26.0 Recommendations

26.1 Geology and Mineral Resources

- 1 Continue to develop and expand the QA/QC program to ensure that the program includes clearly defined limits when action or follow-up is required, and that results are reviewed and documented in a report, including conclusions and recommendations, regularly and in a timely manner.
 - a) Complete ISO certification for the Minorca laboratory.
 - b) Develop a formal QA/QC procedure that includes preparation of a QA/QC campaign report following every annual diamond drilling program.
 - c) Continue to submit a small number of “preparation duplicate” samples to a secondary accredited laboratory to document capability(ies), cost, and time efficiency of alternate provider(s) and confirm that results are comparable to those of Minorca’s internal laboratory.
 - d) Add sample completion date to all diamond drill hole certificates of analysis returned to the mine geologist.
- 2 Apply a minimum of two holes during the first pass estimation for Minorca in future updates.
- 3 In future updates, use local drill hole spacing instead of a distance-to-drill hole criterion for block classification.
- 4 Prepare model reconciliation over quarterly periods and document methodology, results, and conclusions and recommendations.
- 5 Continue to update Minorca Mineral Resource estimates with new drilling.

26.2 Mining and Mineral Reserves

- 1 Complete additional work at Minorca to support conversion of on-strike Mineral Resources to Mineral Reserves and update mine planning accordingly.
- 2 Review potential comingling of waste rock stockpiles between the Minorca pits for opportunities to reduce the stockpile footprint created external to the open pits and reduce waste haulage profiles.

26.3 Mineral Processing

- 1 Follow the established procedures for sampling and testing to support ore blending and ensure operational consistency and preventive maintenance.

26.4 Infrastructure

- 1 Prioritize the completion of an OMS Manual for the TSF with the EOR in accordance with MAC guidelines and other industry-recognized standard guidance for tailings facilities.
- 2 Document, prioritize, track, and close out in a timely manner the remediation, or resolution, of items of concern noted in TSF audits or inspection reports.



27.0 References

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28.0 Date and Signature Page

This report titled “NI 43-101 Technical Report for the Minorca Property, Minnesota, USA” with an effective date of December 31, 2021 was prepared and signed by the following authors:

(Signed & Sealed) *Mark B. Mathisen*

Dated at Lakewood, CO
August 16, 2024

Mark B. Mathisen, C.P.G.

(Signed & Sealed) *Andrew P. Hampton*

Dated at Lakewood, CO
August 16, 2024

Andrew P. Hampton, M.Sc., P.Eng.

(Signed & Sealed) *Balaji Subrahmanyam*

Dated at Lakewood, CO
August 16, 2024

Balaji Subrahmanyam, SME(RM)

(Signed & Sealed) *Dean K. Korri*

Dated at Cleveland, OH
August 16, 2024

Dean K. Korri, P.E., MASCE

(Signed & Sealed) *Brooke A. Lund*

Dated at Forbes, MN
August 16, 2024

Brooke A. Lund, C.P.G.

(Signed & Sealed) *Grant A. Malensek*

Dated at Lakewood, CO
August 16, 2024

Grant A. Malensek, M.Eng., P.Eng.



29.0 Certificate of Qualified Person

29.1 Mark B. Mathisen

I, Mark B. Mathisen, C.P.G., as an author of this report entitled "NI 43-101 Technical Report for the Minorca Property, Minnesota, USA" with an effective date of December 31, 2021 prepared for Cleveland-Cliffs Inc., do hereby certify that:

1. I am Principal Geologist with SLR International Corporation, of Suite 100, 1658 Cole Boulevard, Lakewood, CO, USA 80401.
2. I am a graduate of Colorado School of Mines, Golden, CO, USA in 1984 with a Bachelor of Science degree in Geophysical Engineering.
3. I am a Registered Professional Geologist in the State of Wyoming (Reg.# PG-2821), a Certified Professional Geologist with the American Institute of Professional Geologists (Reg.# CPG-11648), and a Registered Member of SME (Reg.# 04156896). I have worked as a geologist for a total of 28 years since my graduation. My relevant experience for the purpose of the Technical Report is:
 - Mineral Resource estimation and preparation of NI 43-101 Technical Reports.
 - Director, Project Resources, with Denison Mines Corp., responsible for resource evaluation and reporting for uranium projects in the USA, Canada, Africa, and Mongolia.
 - Project Geologist with Energy Fuels Nuclear, Inc., responsible for planning and direction of field activities and project development for an in situ leach uranium project in the USA. Cost analysis software development.
 - Design and direction of geophysical programs for US and international base metal and gold exploration joint venture programs.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (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" for the purposes of NI 43-101.
5. I visited the Minorca Property on April 29, 2021.
6. I am responsible for Sections 4 to 12, 14, and 23, and related disclosure in Sections 1, 25, 26, and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had prior involvement with the property that is the subject of the Technical Report. I was involved in the preparation of an S-K 1300 Technical Report Summary dated February 7, 2022.
9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the Section Nos. in 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.



Dated this 16th day of August, 2024.

(Signed & Sealed) *Mark B. Mathisen*

Mark B. Mathisen, C.P.G.



29.2 Andrew P. Hampton

I, Andrew P. Hampton, M.Sc., P.Eng., as an author of this report entitled "NI 43-101 Technical Report for the Minorca Property, Minnesota, USA" with an effective date of December 31, 2021 prepared for Cleveland-Cliffs Inc., do hereby certify that:

1. I am Principal Metallurgist with SLR International Corporation, of Suite 100, 1658 Cole Boulevard, Lakewood, CO, USA 80401.
2. I am a graduate of Southern Illinois University in 1979 with a Bachelor of Science degree in Geology, and a graduate of the University of Idaho in 1985, with an Master of Science degree in Metallurgical Engineering.
3. I am registered as a Professional Engineer in the Province of British Columbia, Licence No. 22046. I have worked as an extractive metallurgical engineer for a total of 35 years since my graduation. My relevant experience for the purpose of the Technical Report is:
 - Process plant engineering, operating and maintenance experience at mining and chemical operations, including the Sunshine Mine, Kellogg, Idaho, Beker Industries Corp, phosphate and DAP plants in Florida and Louisiana respectively, and the Delamar Mine in Jordan Valley Oregon.
 - Engineering and construction company experience on a wide range of related, precious metal projects and studies, requiring metallurgical testing, preliminary and detailed design, project management, and commissioning and start-up of process facilities and infrastructure. EPCM companies included Kilborn Engineering Pacific Ltd., SNC Lavalin Engineers and Constructors, Washington Group International Inc. and Outotec USA, Inc.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (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" for the purposes of NI 43-101.
5. I visited the Minorca Property on April 29, 2021.
6. I am responsible for Sections 13, 17, and 18 (except Subsection 18.4), and related disclosure in Sections 1, 25, 26, and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had prior involvement with the property that is the subject of the Technical Report. I was involved in the preparation of an S-K 1300 Technical Report Summary dated February 7, 2022.
9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the Section Nos. in 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.

Dated this 16th day of August, 2024.

(Signed & Sealed) Andrew P. Hampton

Andrew P. Hampton, M.Sc., P.Eng.



29.3 Balaji Subrahmanyam

I, Balaji Subrahmanyam, SME(RM), as an author of this report entitled “NI 43-101 Technical Report for the Minorca Property, Minnesota, USA” with an effective date of December 31, 2021 prepared for Cleveland-Cliffs Inc., do hereby certify that:

1. I am Principal Mining Engineer with SLR International Corporation, of Suite 100, 1658 Cole Boulevard, Lakewood, CO, USA 80401.
2. I am a graduate of College of Engineering, Chennai, India in 1993 with a Bachelor of Science degree in Mining Engineering.
3. I am a Registered Member of the Society for Mining, Metallurgy & Exploration (SME RM# 04224038). I have worked as a mining engineer for a total of 30 years since my graduation. My relevant experience for the purpose of the Technical Report is:
 - Open pit operational experience in Asia, Australia, Africa and abroad.
 - Review and report as a consultant on open pit mining projects and operations around the world for studies, audits, due diligence, and regulatory requirements.
 - Open pit mine planning and cost estimation.
 - Project cash flow modelling and economic analysis.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (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" for the purposes of NI 43-101.
5. I did not visit the Minorca Property.
6. I am responsible for Sections 15 and 16, and related disclosure in Sections 1, 25, 26, and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had prior involvement with the property that is the subject of the Technical Report. I was involved in the preparation of an S-K 1300 Technical Report Summary dated February 7, 2022.
9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the Section Nos. in 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.

Dated this 16th day of August, 2024.

(Signed & Sealed) Balaji Subrahmanyam

Balaji Subrahmanyam, SME(RM)



29.4 Dean K. Korri

I, Dean Korri, PE, MASCE, as a QP for this report entitled “NI 43-101 Technical Report for the Minorca Property, Minnesota, USA” with an effective date of December 31, 2021, prepared for Cleveland-Cliffs Inc., do hereby certify that:

1. I am Director – Civil Engineering/Tailings Basin Engineering with Cleveland-Cliffs Inc., 200 Public Square, Suite 3300, Cleveland, OH 44114
2. I am a graduate of Michigan Technological University in 1989 with a BSE in Civil Engineering.
3. I am registered as a Professional Engineer in the both the State of Michigan (#43181) and Minnesota (#62743). I have worked as a Civil – Geotechnical Engineer for a total of thirty-five (35) years since my graduation. My relevant experience for the purpose of the Technical Report is:
 - Oversight of all Cliffs’ site(s) dam safety, engineering, operations, and long-range planning.
 - Responsible for regulatory and dam safety compliance for all TSF basins in portfolio.
 - More than 35 years of experience in (dam safety) design, engineering, permitting, construction, monitoring, and reclamation of mine tailings storage facilities.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (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" for the purposes of NI 43-101.
5. I am familiar with and visit the Minorca Property fairly frequently (over thirty years).
6. I have reviewed and accepted responsibility for information in Section 18.4 and related disclosure in Sections 1, 25, 26, and 27 of the Technical Report.
7. I am not independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had prior involvement with the property that is the subject of the Technical Report. I have been with Cleveland-Cliffs, Inc. for 35 years.
9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Section 18.4 and related disclosure in Sections 1, 25, 26, and 27 in 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.

Dated this 16th day of August, 2024.

(Signed & Sealed) Dean K. Korri

Dean K. Korri, P.E., MASCE



29.5 Brooke A. Lund

I, Brooke A. Lund, CPG, as a QP for this report entitled "NI 43-101 Technical Report for the Minorca Property, Minnesota, USA" with an effective date of December 31, 2021 prepared for Cleveland-Cliffs Inc., do hereby certify that:

1. I am Project Manager of Environmental Permitting & Regulatory with Cleveland-Cliffs, 8470 Townline Road, Forbes, MN 55738.
2. I am a graduate of the University of Wisconsin Eau Claire in 2010 with a Bachelors of Science in Geology.
3. I am registered as a Certified Professional Geologist in the United States of America through the American Institute of Professional Geologists (Reg.# 12021). I have worked as a mining and environmental geologist for a total of 14 years since my graduation. My relevant experience for the purpose of the Technical Report is:
 - Environmental permitting and compliance
 - Environmental studies
 - Hydrogeological studies
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (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" for the purposes of NI 43-101.
5. I visited the Minorca Property on a regular basis.
6. I have reviewed and accepted responsibility for information in Section 20 and related disclosure in Sections 1, 25, 26, and 27 of the Technical Report.
7. I am not independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had prior involvement with the property that is the subject of the Technical Report as an employee of Cleveland-Cliffs.
9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Section 20 and related disclosure in Sections 1, 25, 26, and 27 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.

Dated this 16th day of August, 2024.

(Signed & Sealed) Brooke A. Lund

Brooke A. Lund, CPG



29.6 Grant A. Malensek

I, Grant A. Malensek, M.Eng., P.Eng., as an author of this report entitled "NI 43-101 Technical Report for the Minorca Property, Minnesota, USA" with an effective date of December 31, 2021 prepared for Cleveland-Cliffs Inc., do hereby certify that:

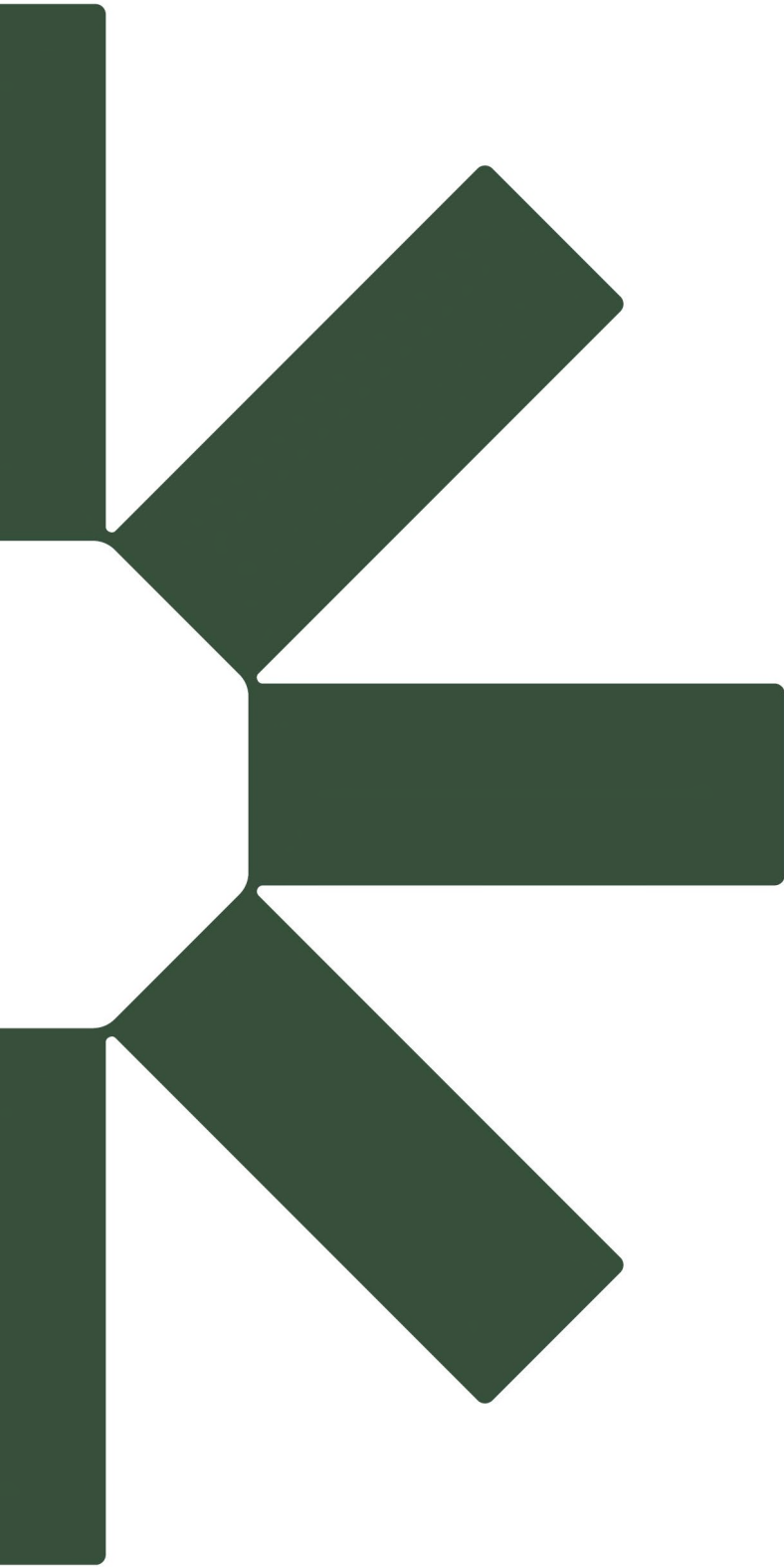
1. I am Technical Director – US Mining Advisory, and Senior Principal Mining Engineer with SLR International Corporation, of Suite 100, 1658 Cole Boulevard, Lakewood, CO, USA 80401.
2. I am a graduate of the University of British Columbia, Canada, in 1987 with a Bachelor of Science degree in Geological Sciences and Colorado School of Mines, USA in 1997 with a Master of Engineering degree in Geological Engineering.
3. I am registered as a Professional Engineer/Geoscientist in the Province of British Columbia (Reg.# 23905). I have worked as a mining engineer/geologist for a total of 27 years since my graduation. My relevant experience for the purpose of the Technical Report is:
 - Feasibility, prefeasibility, and scoping studies
 - Fatal flaw, due diligence, and Independent Engineer reviews for equity and project financings.
 - Financial and technical-economic modelling, analysis, budgeting, and forecasting.
 - Property and project valuations.
 - Capital cost estimates and reviews.
 - Mine strategy reviews.
 - Options analysis and project evaluations in connection with mergers and acquisitions.
4. I have read the definition of "qualified person" set out in National Instrument 43-101 (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" for the purposes of NI 43-101.
5. I visited the Minorca Project on April 29, 2021.
6. I am responsible for Sections 2, 3, 19 to 22, and 24, and related disclosure of Sections 1, 25, 26, and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had prior involvement with the property that is the subject of the Technical Report. I was involved in the preparation of an S-K 1300 Technical Report Summary dated February 7, 2022.
9. I have read NI 43-101, and the Technical Report has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the Section Nos. in 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.

Dated this 16th day of August, 2024.

(Signed & Sealed) Grant A. Malensek

Grant A. Malensek, M.Eng., P.Eng.





Making Sustainability Happen