Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report

PRESENTED TO

Greenland Resources Inc.

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
3D	3-Dimensional
3DBM	3-Dimensional Block Model
AAS	Atomic Absorption Spectrophotometer
A_i	Bond Abrasion Index
AIP	Aviation Information Publication
Amax	Amax Inc.
Arktisk	Arktisk Minekompagni A/S
ASP	Airport Safety Plan
ATB	Air Terminal Building
AWOS	Automated Weather Observation Station
BaseMet	Base Metallurgical Laboratories Limited
BGMV	Mestersvig Airport
BMA	Bulk Modal Analysis
BMP	Bureau of Minerals and Petroleum
BMWi	Bond Ball Mill Work Index
CCTV	Closed-Circuit Television
COWI	COWI A/S
DCE	Danish Centre for Environment and Energy
DCS	Distributed Control System
DL	Detection Limit
DSB	Design, Supply, and Build
EAMRA	Environmental Agency for Mineral Resource Activities
EGL	Effective Grinding Length
EIA	Environmental Impact Assessment
EMS	Environmental Management Plan
FEC	Field Electrical Centre
FLEET	Flotation Economic Evaluation Tool
Frontier	Frontier Geosciences Inc.
FS	Feasibility Study
G&A	General and Administrative
GET	Ground Engaging Tools
GNSS	Global Navigation Satellite System
GPS	Global Positioning System

Acronym/Abbreviation	Definition
GRI	Greenland Resources Inc.
HARD	Half Absolute Relative Difference
HGSP	High-Grade Stockpile
Hockema	Hockema Group, Inc.
HPGR	High Pressure Grinding Rolls
I/O	Input/Output
IAP	Instrument Approach Procedure
IBA	Impact Benefit Agreement
ICAO	International Civil Aviation Organization
ICP	Inductively Coupled Plasma
IRR	Internal Rate of Return
JK	Julius Kruttschnitt
KGHM	KGHM Polska Miedź S.A.
KP	Knight Piésold Ltd.
LAN	Local Area Network
LCT	Locked Cycle Test
LG	Lerch-Grossmann
LGSP	Low-Grade Stockpile
LGSP BASE	Low-Grade Stockpile Waste Base Fill
LOM	Life of Mine
M&I	Measured and Indicated
MCC	Motor Control Center
MDA	Minimum Descent Altitude
MFT	Modified Flotation Test
Micon	Micon International Limited
MLSA	Mineral License and Safety Authority
MMR	Ministry of Mineral Resources
MMTS	Moose Mountain Technical Services
MRA	Mineral Resources Authority
MS	Mild Steel
MSDS	Material Safety Data Sheets
MS-EP	MineSight Economic Planner
NI	Non-Instrument
NI 43-101	National Instrument 43-101
NPV	Net Present Value

Acronym/Abbreviation	Definition
NSG	Non-Sulphide Gangue
NSI	Navigational Safety Investigation
NSP	Net Smelter Price
OCSP	Open Cell Sheet Pile
OIS	Operator Interface Stations
OLS	Obstacle Limitation Surfaces
P&C	Paterson & Cooke Canada Inc.
P&P	Proven and Probable
PAPI	Precision Approach Path Indicators
PBX	Private Branch Exchange
PC	Personal Computer
Pinnacle	Pinnacle Logistics Solutions
PLC	Programmable Logic Controller
PND	PND Engineers, Inc.
PPT	Parts Per Thousand
QEMSCAN™	Quantitative Evaluation of Minerals by Scanning Electron Microscopy
QP	Qualified Person
Quadra FNX	Quadra FNX Mining Ltd.
RBC	Rotating Biological Contactor
RMS	Rapid Mineral Scan
RMWi	Bond Rod Mill Work Index
ROM	Run-of-Mine
ROW	Right-of-Way
RSF	Rock Storage Facility
SAG	Semi-Autogenous
SGS	SGS Lakefield Research Limited
SIA	Social Impact Assessment
SIBX	Sodium Isobutyl Xanthate
SMC	SAG Mill Comminution Test
TDZE	Touchdown Zone Elevation
Tetra Tech	Tetra Tech Canada Inc.
The Project	Malmbjerg Molybdenum Project
TMF	Tailings Management Facility
TMS	Trace Mineral Search
ToR	Terms of References

Acronym/Abbreviation	Definition
TSF	Tailings Storage Facility
VoIP	Voice Over Internet Protocol
WACC	Weighted Average Cost of Capital
WAN	Wide Area Network
WHMIS	Workplace Hazardous Materials Information Systems
WRSF	Waste Rock Storage Facilities
WSP	WSP Global
XRD	X-Ray Diffraction

Units of Measure

above mean sea level	amsl
acre	ac
ampere	A
annum (year)	a
bank cubic metres	bm^3
billion	B
billion tonnes	Bt
billion years ago	Ga
British thermal unit	BTU
centimetre	cm
cubic centimetre	cm^3
cubic feet per minute	cfm
cubic feet per second	ft^3/s
cubic foot	ft^3
cubic inch	in^3
cubic metre	m^3
cubic yard	yd^3
Coefficients of Variation	CVs
day	d
days per week	d/wk
days per year (annum)	d/a
dead weight tonnes	DWT
decibel adjusted	dBa
decibel	dB
degree	°
degrees Celsius	°C
diameter	ø
dollar (American)	USD$

dollar (Canadian)	Cdn$
dry metric ton	dmt
foot	ft
gallon	gal
gallons per minute (US)	gpm
gauge	ga
gigajoule	GJ
gigapascal	GPa
gigawatt	GW
gram	g
grams per litre	g/L
grams per tonne	g/t
greater than	>
hectare (10,000 m^2)	ha
hertz	Hz
horsepower	hp
hour	h
hours per day	h/d
hours per week	h/wk
hours per year	h/a
inch	"
kilo (thousand)	k
kilogram	kg
kilograms per cubic metre	kg/m^3
kilograms per hour	kg/h
kilograms per square metre	kg/m^2
kilometre	km
kilometres per hour	km/h
kilopascal	kPa
kilotonne	kt
kilovolt	kV
kilovolt-ampere	kVA
kilovolts	kV
kilowatt	kW
kilowatt hour	kWh
kilowatt hours per tonne (metric ton)	kWh/t
kilowatt hours per year	kWh/a
less than	<
litre	L
litres per minute	L/m
megabytes per second	Mb/s

megapascal	MPa
megavolt-ampere	MVA
megawatt	MW
metre	m
metres above sea level	masl
metres Baltic sea level	mbsl
metres per minute	m/min
metres per second	m/s
metric ton (tonne)	t
microns	µm
milligram	mg
milligrams per litre	mg/L
millilitre	mL
millimetre	mm
million	M
million bank cubic metres	Mbm^3
million bank cubic metres per annum	Mbm^3/a
million pounds	Mlb
million tonnes	Mt
minute (plane angle)	'
minute (time)	min
month	mo
Neutron	N
ounce	oz
pascal	Pa
centipoise	mPa·s
parts per million	ppm
parts per billion	ppb
percent	%
pound(s)	lb
pounds per square inch	psi
revolutions per minute	rpm
second (plane angle)	"
second (time)	s
specific gravity	SG
square centimetre	cm^2
square foot	ft^2
square inch	in^2
square kilometre	km^2
square metre	m^2
twenty-foot equivalent unit	TEU

thousand tonnes	kt
tonne (1,000 kg)	t
tonnes per day	t/d
tonnes per hour	t/h
tonnes per year	t/a
tonnes seconds per hour metre cubed	ts/hm^3
volt	V
week	wk
weight/weight	w/w
wet metric ton	wmt
year (annum)	a

1.0 SUMMARY

Greenland Resources Inc. (GRI) commissioned Tetra Tech to complete this Feasibility Study (FS) with the assistance of specialist consultants for the Malmbjerg Molybdenum Project, located near Mestersvig on the east coast of Greenland, in accordance with the NI 43-101 Standards of Disclosure for Mineral Projects. GRI is a Toronto-based exploration company that acquired the Malmbjerg exploration license in 2017.

The consultants commissioned to complete the FS are presented in Table 1-1.

Table 1-1: List of FS Consultants

Consultant	FS Components
Tetra Tech Canada Inc.	Overall project management, mineral processing and metallurgical testing, recovery methods, project infrastructure (overall site layout, ancillary infrastructure, and buildings including site roads and airports), project execution plan and summary of initial and sustaining capital and operating cost estimates
Moose Mountain Technical Services	Project description and location, accessibility, history, geological setting, deposit types, exploration, drilling, data verification, mineral resource estimate, mineral reserve estimate, waste rock management, glacier access road, RopeCon conveyor, mining initial, and sustaining capital and operating cost estimates and adjacent properties
Knight Piésold Ltd.	Pit slope design, site geotechnical, tailings management facility (TMF), water supply and site water management and pertinent initial and sustaining capital and operating cost estimates
PND Engineers, Inc.	Port and marine facilities and pertinent initial and sustaining capital and operating cost estimates
Hockema Group, Inc.	Marine vessels and naval architecture and pertinent initial and sustaining capital and operating cost estimates
Paterson & Cooke Canada Inc.	Overland pipelines and pump stations and pertinent initial and sustaining capital and operating cost estimates
Pinnacle Logistics Solutions	Logistics and shipping and pertinent initial and sustaining capital and operating cost estimates
H. Okumura Consulting Limited	Concentrate market studies and contracts
Micon International Limited	Economic analysis
Frontier Geosciences Inc.	Ice radar and seismic refraction investigation
COWI A/S	Environmental baseline studies for terrestrial and freshwater sites, permitting, and socio-economics
WSP	Environmental baseline, marine baseline, and bathymetry surveys

All currencies are expressed in United States dollars (USD$ or $) in this Technical Report unless otherwise noted.

1.1 Project Description and Location

1.1.1 Location

The Malmbjerg Molybdenum Project (the Project) is located in mountainous terrain in the central portion of the east coast of Greenland, approximately 26 km inland southwest of the east coast of Greenland. The Project area is bounded by latitudes 71º 57' N and 71 º 59' N and longitudes 24º 14' W and 24º 19' W, as shown in Figure 1-1. The Malmbjerg deposit is a wedge-shaped exposure within Høstakken Mountain located at the confluence of the Arcturus and Schuchert glaciers, as shown in Figure 1-2. The area is in an arctic environment with extreme relief. Elevations range from approximately 1,100 metres above sea level (masl) along the ridge top above the Project to 600 - 700 masl.

1.1.2 Land Tenure

Property tenure consists of Exploration Licence No. 2018/11, Addendum #2, granted to GRI in March 2019.

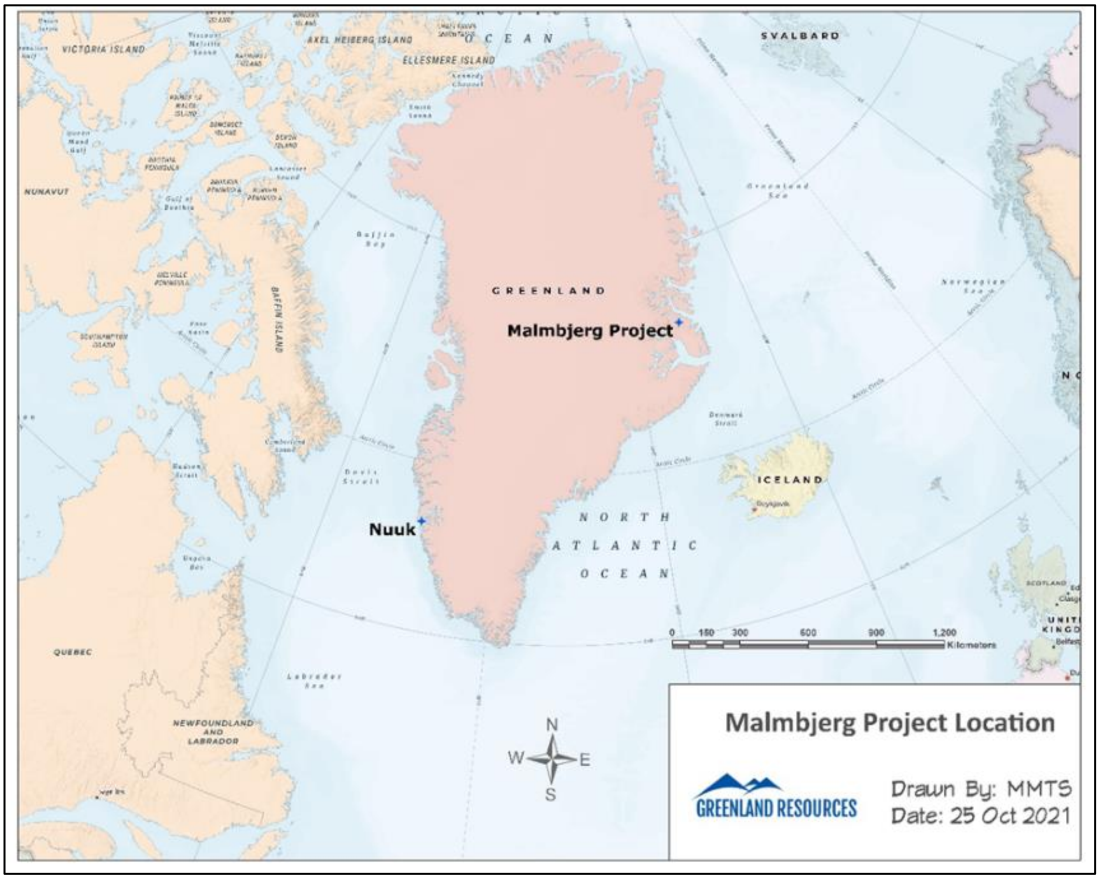
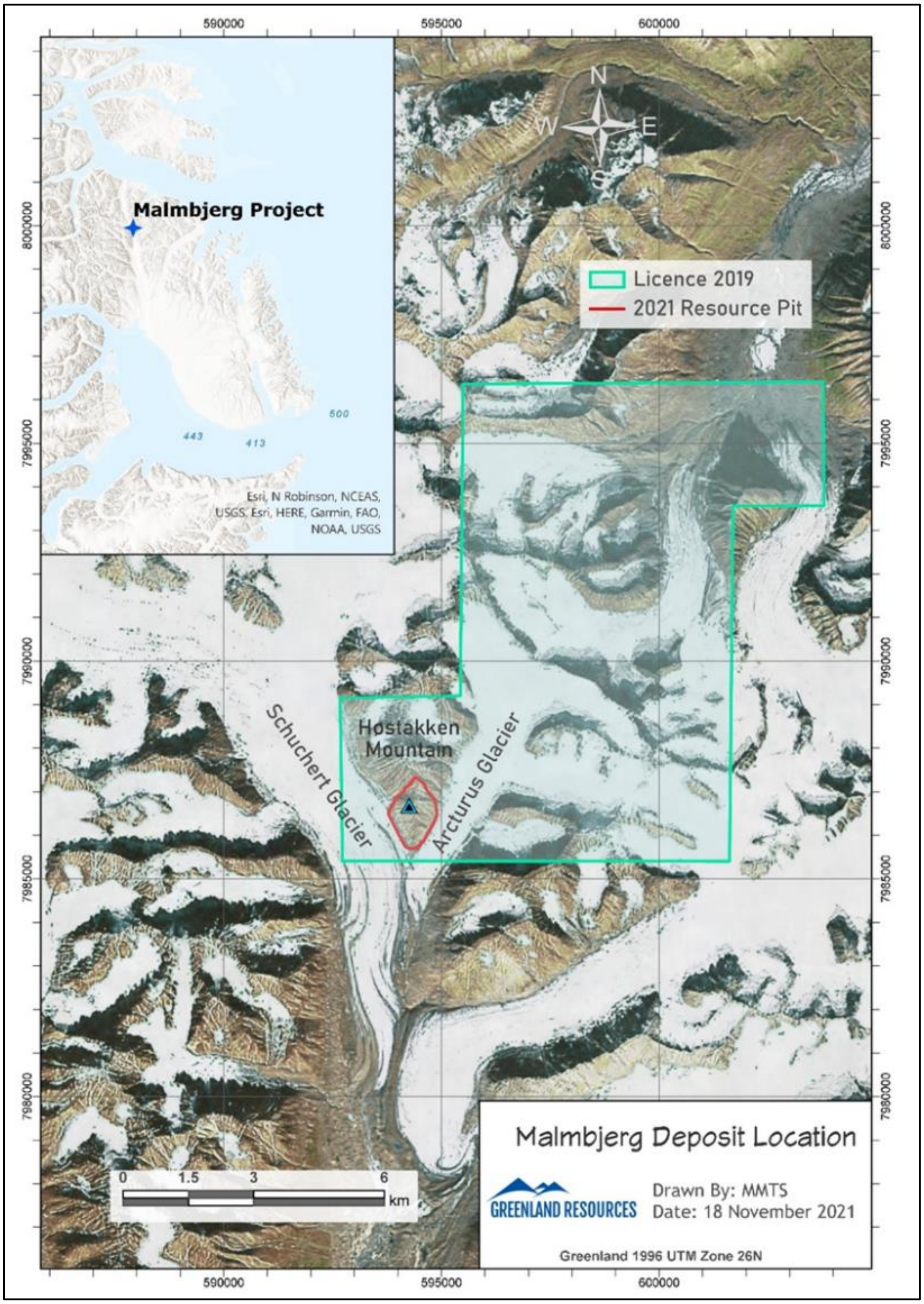


Figure 1-1: Malmbjerg Project Location



Note: Licence 2018/11 was granted in 2018 and revised in 2019.

Figure 1-2: Map View of the Malmbjerg Project at the Confluence of the Arcturus and Schuchert Glaciers

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

The Project is located in the Schuchert River catchment valley (known as Schuchert Dal), which drains into Scoresbysund, considered the largest fjord system in the world. There are no roads to the Project, and access is by rotary-wing aircraft only.

The closest settlement is Ittoqqortoormiit (Scoresbysund village), with about 310 inhabitants (Statistics Greenland, 2019), located about 185 km southeast of the Malmbjerg Project. The closest international airport is at Nerlerit Inaat (Constable Point), located 150 km to the southeast of the Malmbjerg deposit, which is accessible by scheduled flights year-round from Iceland. A closer, year-round, all-weather gravel airstrip is located at Mestersvig, 33 km northeast of the Project, and is an active Danish Naval Base. The nearest sources of logistical support are in Iceland, and currently supplies must either be shipped or flown to Mestersvig and then airlifted by helicopter to the site.

In the Project vicinity, there are wildlife protected areas (Nationalparken National park). Access to some areas is restricted at certain times and requires special permission.

No infrastructure currently exists at the Project. During the 2005 work program, International Molybdenum Inc. (InterMoly) maintained a 40-person camp at the Schuchert Glacier moraine and a 15-person camp at Nyhavn. For the 2007 program, Quadra Mining Ltd. (Quadra) established a similar camp in the same location as InterMoly. Current site visits utilize hotel boats anchored at Nyhavn for personnel accommodations.

Project climate is considered to be arctic. The mean annual temperature at Mestersvig is about -10°C; only in June, July, and August do the mean monthly temperatures rise above 0°C, with approximately 5°C mean temperature in August. February is the coldest month, with -24°C mean temperature and -49°C as the extreme minimum recorded temperature. The average annual precipitation is approximately 300 mm to 400 mm, reasonably well distributed throughout the year. The wettest month is usually March, with the drier months being April through to June. Snow accumulation at the mine site typically occurs every month except August.

1.3 History

The Project history is summarized as follows:

- 1954 – Molybdenum mineralization discovered at Malmbjerg.
- 1955 - 1958 – Nordmine completed seven diamond drill holes totalling 1,200 m and 28 m of drift development.
- 1959 - 1961 – 70 diamond drill holes and 659 m of drifting were completed. Amax Inc. (Amax) participation in the Project began in 1960.
- 1962 – Arktisk Minekompagni A/S (Arktisk), a consortium of Amax and Nordisk Mineselskab A/S (Nordisk), the original Nordmine group, carried out 642 m of development, and 70 holes totalling 9,844 m.
- 1966 – Arktisk conducted an FS for an open pit mine operation. The study concluded that the Project was only marginally profitable.

- 1973 – A pre-feasibility level sensitivity analysis was carried out by Amax and concluded that the Project was not economic.
- 1975 – One 972 m hole was drilled on the Project to look for a hypothesized deeper zone.
- 1980 – Amax terminated its interest in the Project.
- 1981 – Nordisk terminated its interest in the Project.
- 1994 - 1997 – Platinova A/S held an exploration licence over the Project but did not conduct any exploration work.
- 2004 – Galahad Gold Plc. acquired an exploration licence over the Project and the licence was transferred to InterMoly.
- 2005 – InterMoly initiated an FS on the Project. Work in support of the study included diamond drilling and channel sampling to verify the MRE. RPA Inc. (now SLR Consulting Ltd.) was retained to prepare an estimate of the Mineral Resources in support of this FS.
- 2007 – Quadra acquired the Project and resumed work on the FS. Part of this work comprised diamond drilling from surface and underground to expand the known Mineral Resources. The FS was not made public.
- 2017 – KGHM Polska Miedź S.A. (KGHM), having acquired Quadra FNX Mining Ltd. (Quadra FNX) in 2012, relinquished the licence.
- 2017 – GRI acquires the exploration licence covering the Malmbjerg Project.

1.4 Geology and Mineralization

The Malmbjerg Project is located within a north-northeast trending belt of Carboniferous to Lower Tertiary age sedimentary and intrusive units. Host rocks for the Malmbjerg Project comprise Mid-Tertiary alkalic leuco-granite stocks and clastic sedimentary rocks of the Lower Permian Rode Group. Intrusive rocks consist of four principal phases (listed in order of oldest to youngest): perthite granite, quartz porphyry (Arcturus porphyry), porphyritic aplite, and weakly feldspathic quartz porphyry (Schuchert porphyry). Post-mineralization basic and trachytic dikes have been mapped and occur within the Project. The basic dikes are quite narrow, usually decimetre-scale, are steeply dipping, and trend in a northeast-southwest direction. The trachytes occur as two 5 m to 15 m thick subvertical sheets, striking east-north Malmbjerg is a porphyry molybdenum deposit similar in style and morphology to the Climax deposit, Colorado, USA. Deposits of this type are typically large, measuring in the hundreds of millions of tonnes (Mt), with MoS_2 contents typically measuring less than 1% of the rock by weight. Late hydrothermal processes related to the intrusions were responsible for alteration and deposition of MoS_2 mineralization. The mineralization occurs as a diffuse zone of molybdenite (± accessory tungsten) in fractures and stockworks in both the intrusives and Molybdenite occurs as fracture-fillings and disseminations in association with hydrothermal alteration. The deposit is broadly dome shaped with an outside diameter of up to 600 m and a height of approximately 150 m. Accessory pyrite occurs as a halo around the molybdenite zone. Other accessory minerals include minor amounts of wolframite, scheelite, and fluorite. Re-assays done in 2021 confirmed Inductively Coupled Plasma (ICP) results having below detection limit (DL) (<10 ppm) uranium. There is also very minor galena, sphalerite, and chalcopyrite occur in veinlets at the periphery of the Project.

1.5 Exploration and Drilling

GRI has not conducted any Project exploration field work. However, significant validation work has been undertaken by GRI, as summarized in Section 1.7 and 12.0 of this report. Exploration work conducted by previous operators principally comprises mapping, surface sampling, underground drifting, diamond drilling, and channel sampling. A total of 147 holes (22,284 m) were drilled during the exploration programs carried out between 1959 and 1979. Three exploration drifts were driven in the late 1950s through to the early 1960s totalling 1,329 m. Most of the holes were drilled from underground using conventional equipment.

InterMoly carried out drilling, channel sampling, and mapping in 2005 to both confirm the pre-2005 data and expand the resource base. The program comprised 31 holes totalling 4,988 m of NQ2 (4.76 cm core dia.), NQ3 (4.51 cm), and PQ (8.31 cm) diamond drilling, 1,824 m of diamond saw channel sampling along the drift walls, bulk sampling, and geological mapping. Five of the holes were intended as twins of all or parts of earlier holes. Holes were sampled on 3 m intervals. The sampling program also included measurements of bulk density, and collection of specimens for determination of oxide Mo content.

In 2007, Quadra drilled 17 NQ2 holes totalling 4,194.7 m. Holes were drilled from both surface and underground to test for extensions of the known mineralization throughout the planned pit volume, as well as to determine acid generation potential of the waste material.

1.6 Sample Preparation, Analyses, and Security

For the early drill programs, samples were analyzed on site using a colorimetric method. Assay Quality Assurance and Quality Control (QAQC) protocols were neither reported nor applied.

All primary assaying in the 2005 and 2007 drill programs was done at Acme Laboratories (Acme) in Vancouver, B.C., an independent laboratory holding ISO9001 accreditation at the time, using 4-acid digestion followed by ICP spectrophotometry, with appropriate analytical QAQC protocols.

Both Quadra and InterMoly included QAQC samples in the assay stream at a somewhat lower rate than expected. However, the results of the blanks, Certified Reference Materials, and duplicates are acceptable.

The Qualified Person (QP) has determined that the sampling, analysis, and security programs are appropriate for resource estimation.

1.7 Data Verification

The QP concludes that data from all phases of drilling and channel sampling are of adequate quality and suitable for resource estimation.

Because 66% of the data available for modeling are historic and are not supported by certificates or QAQC, these historic data have been validated from multiple angles:

- In 2021, the QP collected core samples from stored drill core for nine holes. The entire length of each interval was quartered and assayed, totalling 75.7 m. Statistical comparison show good agreement between the weighted mean, with the relative difference of the means approximately 1.4%. The scatterplot comparison has a slope close to unity with a correlation coefficient of 0.98.

The Half Absolute Relative Difference (HARD) plot exceeds the industry standard criteria for field duplicates.

- In 2005, InterMoly collected and assayed 131 pulps from the historic sampling. Review of these results shows acceptable results.
- The comparison of five holes drilled in 2005 as twins to the historic holes show comparable results.
- Statistical point validation was used to compare the Mo assays of the historic data to the 2005 and 2007 drilling, as well as the assays of channel samples to drill hole data. There was no bias observed between the two sets.

1.8 Mineral Processing and Metallurgical Testing

A comprehensive metallurgical test program on the Malmbjerg deposit occurred in 2005-2008 and in 2021 to provide process design information. A summary of metallurgical and process characteristics used in the plant design is summarized below:

- Molybdenite is the primary mineralized mineral, whereas quartz and feldspar are the dominant mineral species. Pyrite is the major sulphide gangue mineral with trace amounts of sphalerite and galena. Minor quantities of amphiboles, mica/clay minerals and fluoride minerals, fluorite, topaz and gearksutite are also present in the deposit.
- About 51% of the molybdenite is classified as "free," and about 26% as "locked" at a particle size of 200 µm. Most molybdenum associations are with quartz, feldspar, and mica, with very few associations with sulphides. The mineralogical results conclude that a coarse primary grind (about 200 µm) followed by a moderately fine regrind (about 30 µm) should yield satisfactory results.
- The grindability tests report the average A x b value of 40.7, indicating a moderately hard sample to Semi-Autogenous (SAG) milling. The average Bond Rod Mill Work Index (RMWi) and Bond Ball Mill Work Index (BMWi) values are 12.6 and 12.7 kWh/t, respectively, indicating a moderately soft sample to ball milling. The average and median abrasion indices values are 0.69 g and 0.76 g, respectively, indicating a relatively abrasive ore.
- The scoping simulations using JKSimMet software showed that a 10.36 m by 4.57 m (34' x 15') Effective Grinding Length (EGL) SAG mill with 10 MW installed power and a ball mill with 5 MW installed power would be adequate for a 15,000 t/d grinding circuit and to achieve a primary grind size P80 of 140 µm. This has been revised to two lines of 10.36 m x 5.21 m EGL SAG mills with 8 MW installed power and 6.1 m x 9.1 EGL ball mills with 4.2 MW installed power to process 35,000 t/d.
- Minimal impact on the rougher recovery was observed by varying primary P_{80} grind size from 145 µm to 180 µm. It was also observed that additions of fuel oil collector reagent to the mill and stage additions in the rougher cells were beneficial to the rougher recovery. A MIBC/DF250 frother combination enhanced selectivity over gangue flotation and improved rougher kinetics without negatively affecting molybdenum recovery compared with the use of pine oil frother.
- The variability study indicated that the Malmbjerg deposit could be processed using the developed flowsheet with the confidence of achieving the desired molybdenum recoveries and concentrate grades. Problematic ore will be where molybdenum is present as oxide, which is not recoverable

by flotation and areas with high iron (pyrite) content, although this would be controlled by increasing the pH value in the cleaner flotation circuit.

- The pilot-plant flotation test confirmed the relatively coarse primary grind P_{80} of 180 µm. The molybdenum recovery at the rougher stage was about 92% at a 5 to 6% mass pull. The first cleaner concentrate grade was 24% Mo with a recovery of about 88%. The Quantitative Evaluation of Minerals by Scanning Electron Microscopy (QEMSCAN™) analysis of the final concentrate from the locked cycle flotation test concluded that the diluents in the concentrate were liberated molybdenite and a combination of sulphide minerals, gangue quartz, and feldspar.
- A regrind P_{80} of less than 30 µm and two stages of bulk column cleaning of the first cleaner concentrate from the pilot plant tests produced a final concentrate with a grade of 52% Mo. The flowsheet is not dissimilar to other existing molybdenum operations and uses well-proven techniques in flotation. The Flotation Economic Evaluation Tool (FLEET) model predicts that a high-grade molybdenum concentrate of 54.1% Mo at 83.6% molybdenum recovery and 0.32% mass pull could be achieved at 0.21% molybdenum feed grade.
- The multi-element scan of the final flotation concentrate showed no deleterious elements that would pose significant problems for the marketability of the concentrate. Approximately 0.5% Cu and 0.5% Zn were present in the final concentrate, which is considered non-detrimental.
- The saltwater test program in 2021 showed a negative effect of increasing water salinity level on the molybdenum recovery using stainless steel grinding media. However, changing the grinding media to mild steel mitigated the adverse effect of saltwater. The batch cleaner flotation test produced a final concentrate with about 53% Mo, comparable to the concentrate grades obtained previously using tap water in the 2005-06 test campaign.

1.9 Mineral Resource Estimate

The Mineral Resource Estimate (MRE) has been prepared by Sue Bird, P.Eng., of Moose Mountain Technical Services (MMTS). The MRE was done using the 2019 Canadian Institute of Mining, Metallurgy and Exploration (CIM) Best Practice Guidelines and are reported using the 2014 CIM Definition Standards (CIM, 2014). Table 1-2 below summarizes the total model resource for the Malmbjerg Project which has an effective date of 12 October 2021. The base case cut-off grade within the “reasonable prospects of eventual economic extraction” constraining pit is an MoS_2 grade of 0.08% which corresponds to a Net Smelter Return (NSR) of \$14.79/t. This base case cutoff grade more than covers the mineral processing, General and Administrative (G&A), and tailings costs of \$12.50/t milled and roasted.

Table 1-2: MRE at the Base Case Cut-off – Effective Date 12 October 2021

Class	Tonnage (kt)	Tonnage (Mt)	Grade MoS_2 (%)	NSR (\$/t)	Mo (Mlb)
Measured	128,137	128	0.20	37.63	345
Indicated	153,310	153	0.16	28.90	317
Measured and Indicated (M&I)	281,447	281	0.18	32.87	661
Inferred	33,170	33	0.10	17.77	42

Table 1-3 summarizes a range of MoS_2 cut-off grades to show the sensitivity of the resource estimate to variations in cut-off, with the base case highlighted. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. These mineral resource estimates include inferred mineral resources that are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves. It is reasonably expected that most inferred mineral resources could be upgraded to Indicated.

Table 1-3: Sensitivity of the MRE to Cut-off Grade (Base Case Highlighted)

Class	Cut-off (MoS_2 %)	Tonnage (kt)	Tonnage (Mt)	Grade MoS_2 (%)	NSR ($/t)	Mo (Mlb)
Measured	0.06	134,744	135	0.20	36.42	351
	0.07	131,724	132	0.20	36.98	348
	0.08	**128,137**	**128**	**0.20**	**37.63**	**345**
	0.09	125,017	125	0.21	38.18	341
	0.10	122,104	122	0.21	38.67	337
	0.12	115,478	115	0.21	39.72	328
	0.14	104,391	104	0.22	41.39	309
	0.16	91,958	92	0.23	43.25	284
Indicated	0.06	197,560	198	0.14	25.33	357
	0.07	177,182	177	0.15	26.86	340
	0.08	**153,310**	**153**	**0.16**	**28.90**	**317**
	0.09	132,804	133	0.17	30.96	294
	0.10	114,668	115	0.18	33.10	271
	0.12	93,487	93	0.20	36.07	241
	0.14	80,811	81	0.21	37.98	219
	0.16	67,363	67	0.22	40.03	193
M&I	0.06	332,304	332	0.16	29.82	708
	0.07	308,906	309	0.17	31.18	688
	0.08	**281,447**	**281**	**0.18**	**32.87**	**661**
	0.09	257,821	258	0.19	34.46	635
	0.10	236,772	237	0.19	35.97	609
	0.12	208,965	209	0.21	38.08	569
	0.14	185,202	185	0.22	39.90	528
	0.16	159,321	159	0.23	41.89	477
Inferred	0.06	66,686	67	0.08	15.41	73
	0.07	52,738	53	0.09	16.32	61
	0.08	**33,170**	**33**	**0.10**	**17.77**	**42**
	0.09	20,724	21	0.10	19.07	28
	0.10	6,275	6	0.13	23.12	10
	0.12	1,727	2	0.18	32.83	4
	0.14	1,267	1	0.20	36.18	3
	0.16	1,154	1	0.20	37.03	3

Notes for Table 1-2 and Table 1-3:

1. Resources are reported using the 2014 CIM Definition Standards and were estimated using the 2019 CIM Best Practices Guidelines.
2. The Mineral Resource has been confined by a "reasonable prospects of eventual economic extraction" pit using the following assumptions to calculate the NSR: $18/lb Mo; 99% payable Mo, 0.15% losses and $824/wmt off-site roasting costs (roasting, transport, and insurance); a 2.5% NSR royalty; and uses an 86.4% metallurgical recovery.
3. Costs for the "reasonable prospects of eventual economic extraction" pit are: mining costs of $3.05/t for mineralized material and $2.50/t for waste; G&A cost of $3.00/t; and process costs of $8.00/t. These parameters were derived from engineering studies carried out in the concept study in 2018 (DRA, 2018).
4. Average bulk densities used were 2.62 t/m^3 for intrusive host rocks and 2.67 t/m^3 for sedimentary rocks.
5. Pit slope angles are assumed at 45º.
6. A site inspection and core review were undertaken from 15 to 25 August 2021 by Ms. Sue Bird, P.Eng. an "independent qualified person" as such term is defined in NI 43-101.
7. Conversion from MoS_2 to Mo is 0.599 based on the respective atomic weights 8. Numbers may not add due to rounding.
8. Numbers may not add due to rounding.

The following factors, among others, could affect the MRE: commodity price and exchange rate assumptions, pit slope angles and other geotechnical factors, assumptions used in generating the LG pit shell, including metal recoveries, and mining and process cost assumptions.

1.10 Mineral Reserve Estimate

The Mineral Reserve Estimate for the Project is a subset of the M&I Mineral Resources, described in Section 1.9. Proven and Probable (P&P) Mineral Reserves are converted from M&I Mineral Resources and are summarized in Table 1-4.

Table 1-4: Mineral Reserve Estimate – Effective Date 8 February 2022

Classification	Mt	Grade (% MoS_2)	Contained Mo (Mlb)
Proven	123	0.202	328
Probable	122	0.151	243
TOTAL P&P	245	0.176	571

Notes for Tables:

1. The Mineral Reserves statement is prepared by Jesse Aarsen, P.Eng. (who is also an Independent Qualified Person), reported using the 2014 CIM Definition Standards and the 2019 CIM Best Practices Guidelines, and have an effective date of 8 February 2022
2. Mineral Reserves are mined tonnes and grade, the reference point is the primary crusher prior to transport via the rope conveyor to the processing plant
3. Mineral Reserves are reported at a cut-off NSR of $11.14/t NSR (diluted). The cut-off value covers the processing + G&A costs of $8.34/t, ore transport costs of $0.14/t, and stockpile rehandle costs of $1.25/t
4. NSR cut-off grade assumes $18/lb Mo, block recoveries from the model, 99% MoS2 payable, 0.15% roasting losses, $1/lb roasting charges, $1,290/t concentrate off-site costs, and 2.5% royalty
5. The average molybdenum metallurgical recovery is 84.6%
6. Conversion from MoS2 to Mo is 0.599 based on the respective atomic weights
7. Mined tonnes and grade are based on an SMU of 15 m x 15 m x 12 m, including additional mining losses estimated for the removal of isolated blocks (bounded by waste on four sides)
8. Mineral Reserves are converted from M&I Mineral Resources through the process of pit optimization, pit design, production scheduling and are supported by a positive cash flow model
9. The estimate of Mineral Reserves may be materially affected by environmental, permitting, legal, title, socio-political, marketing, or other relevant issues
10. Rounding as required by reporting guidelines may result in summation differences

1.11 Mining Methods

The Malmbjerg Molybdenum Project comprises of a conventional open pit mine producing 35,000 t/d of Mo rich ore for processing in a conventional base metal sulphide concentrator. The mine plan equipment fleet consists of two x 34 m^3 hydraulic shovels loading 13 x 230 t haul trucks operating on 12 m benches. The operational mining plan will utilize an economic grade control system where higher value ore will be separated and transported to the concentrator while the lower value ore will be stockpiled and processed at the end of conventional mining. Waste rock will be stored on the west side of the deposit and used for haul road and construction activities at the mine site. Current mining reserves dictate a mine life of 20 years where the concentrator will be fed directly from the open pit for a period of 11 years, and stockpiled ore will be processed for the remaining 9 years.

1.12 Recovery Methods

The processing plant has been designed to process ore from the Malmbjerg molybdenum deposit at a nominal throughput of 35,000 t/d and produce market-grade Mo concentrate. The life of mine (LOM) average mill feed grade will be 0.11% Mo, and the anticipated molybdenum recovery will be 84.6%. The LOM average annual Mo concentrate production will be approximately 20,290 t/y at an average grade of 54% Mo.

A conventional comminution and flotation process will be used for the recovery process. A single gyratory crusher operating as the primary crushing unit will reduce the run-of-mine (ROM) ore to a particle size of approximately 80% passing 125 mm. The crushed ore will be conveyed using a RopeCon conveyor to the concentrator stockpile with a live capacity of 35,000 t. The mill feed will be reclaimed from the crushed ore stockpile in two parallel lines to two SABC grinding circuits to reduce the particle size to approximately 80% passing 180 µm.

The ground ore will be fed to a train of rougher/scavenger flotation cells. The Mo concentrate will be upgraded using two stages of regrinding and three stages of cleaner flotation to produce the final concentrate containing approximately 54% Mo. The final concentrate will be thickened, pressure filtered and then dried to a final moisture content of 2% (w/w). The dried concentrate will be bagged and stored in containers ready for shipping.

The flotation tailings will be thickened prior to disposal in the TMF, located at Noret, via a tailings pipeline. Process water recovered from the tailings thickener and the TMF will be combined for reuse in the grinding and flotation circuits. Flotation circuit reagents comprised of lime for pH control, diesel oil (kerosene) as the collector reagent, and W31 as the frother reagent. Magnafloc 351, a flocculant, will be added to the concentrate and tailings thickeners. An onsite metallurgical laboratory will be utilized to support the concentrator operation.

The concentrator has been designed to use salt water. The process water plan has been designed as a zero environmental harm operation as all process water will be recycled and not discharged to the environment.

1.13 Project Infrastructure

The Project will require the development of a number of infrastructure items. The locations of Project facilities and other infrastructure items take into consideration local topography, environmental, and capital and operating costs. Project infrastructure considerations will include:

- A network of access roads to connect the port site to the existing Mestersvig Airport (BGMV), port site to the TMF, port site to the mine site and Schuchert airstrip.
- A tailings storage facility to safely manage the tailings and water associated with mill feed processing, tailings transport and disposition systems and a reclaim water system
- A network of site haul roads
- A new airstrip at Schuchert
- Logistics and warehousing
- Accommodation and administration offices
- Communications
- Fuel storage and fuel farm

1.13.1 Access Roads

The design focus of Project access roads is to distribute consumables and personnel throughout the Project. Constructed roadways routes are as follows:

- Port site access road to Glacier road connection
- Glacier road connection to mine site and Schuchert Airstrip
- Mine site roads
- Port site, TMF, and Mestersvig airport access roads

1.13.2 Airport and Airstrip

BGMV will require runway extension, navigation instrument upgrade and a new terminal. The new runway will be 1,750 m long and 45 m wide and will have a gravel surface capable of operating year-round including the thaw periods. All runway, taxiway, and apron maintenance, cargo handling, passenger assistance, baggage handling, aircraft de-icing and anti-icing, aircraft ground handling, aircraft fuelling, building and electrical maintenance will be provided. This upgraded airport will be used to transport mine personnel and critical supplies to the site regularly.

After completion of initial mine construction, mine pre-production and commencement of mine operation at the mine site, a new airstrip will be built near the Schuchert Glacier moraine to facilitate a more convenient and direct means of staff transportation to and from mine site.

1.13.3 RopeCon Conveyor

Ore transportation from Malmbjerg mine site to the Mesters Vig port concentrator will be performed by a 26 km aerial RopeCon conveyor (Section 18.4) No input energy is required to operate the conveyor as a result no CO_2 will be generated. The elevation difference from ore conveyor loading and discharge will be approximately 930 m, as a result the conveyor will generate 1.3 MW electrical energy from conveyor braking operations. The electrical energy will be fed into the local mine grid.

The RopeCon conveyor reclamation footprint will be negligible, as the reclamation plan will involve the removal of four towers and the cables and conveyor.

1.13.4 Port Site

Port site infrastructure will consist of the following:

- Permanent berths for floating barge for cargo dock, cruise ship worker accommodations, and ice class fuel tanker
- Process plant barge modules permanently grounded onshore
- Container storage yard and access jetty
- Temporary port infrastructure (required prior to developing the permanent port infrastructure)

The process barges will be grounded on an engineered foundation and protected from waves and ice with an earthen dike reinforced with rock armour. Each process barge will contain fuel storage located below deck with a double hull and leak detection system (Section 18.8). In addition, the main processing component is water with minimal concentration of reagents. The barges can be relocated further inland away from the high tide line with additional dredging.

Upon Project closure, the rock barrier around the barges will be removed from each of their docking excavations and together with all three barges will be transported by a tugboat for salvage. Reclamation of the barge locations will be performed by re-sloping the barge areas to the original topography.

A majority of the project diesel fuel will be stored in an Aframax ice class tanker (Section 18.8.3). Tanker refuelling will occur as required. Additional fuel storage will be contained in the process barges. The tanker will be connected to the process barges with a double-walled pipeline.

Waste heat generated from stationary equipment will be employed for building heating therefore reducing the additional requirement to install isolated heating plants for individual structures.

1.13.5 Pipeline Infrastructure

The pipeline infrastructure consists of three pipelines:

- Tailings pipeline
- Reclaim process water pipeline
- Fuel pipeline and farm

1.13.6 Tailings Management Facility

Tailings generated from the concentrator will be stored by confined discharge into Noret TMF, which consists of the following:

- An embankment
- Two (2) saddle embankments

- A permanent spillway
- TMF distribution pipelines
- Reclaim water barge and pumps

Tailings produced from the concentrator are deposited underwater during the TMF operating life, at a depth of 70 m with a minimum water cover of 3.5 m over the tailings. A rock and filter structure embankment will be constructed at the Noret inlet (Section 18.7) to prevent water/ice movement from King Oscar Fjord into Noret TMF and prevent tailings migration from Noret TMF into King Oscar Fjord. The TMF design and operating plan includes the construction of an overflow structure at the Noret TMF that will maintain a 3.5 m water depth coverage for in-perpetuity. Industry-accepted guidelines published by the Canadian Dam Association for TMF design and operating will be employed for the TMF. The TMF will operate maintenance free for in-perpetuity after mine closure.

TMF has capacity to store the anticipated total LOM production of tailings solids (i.e., 245 Mt; 175 million m^3 at an assumed in situ dry density of 1.4 t/m^3). The final tailings surface would be maintained approximately 3.5 m below the current water surface in Noret at the end of operations.

The TMF is located in a reservoir that is already contaminated from zinc and lead tailings from the previous operated Blyklippen mine which ceased operations in 1962. Our planned TMF water coverage will assist in mitigating the zinc and lead contamination distribution as the continuation will be contained in the TMF.

As the ore body has below detection deleterious elements and the main processing component is water, there are no contained deleterious elements in the tailings.

The Noret TMF water storage pond contains salt water from King Oscar Fjord and will be used as the process water source. Surface runoff water will feed into the storage pond from the surrounding area to resupply process water losses due to evaporation and concentrate drying, etc.

1.13.7 Overall Mine Closure Footprint after Reclamation

The Project has been designed on a low disturbance footprint approach because most of the infrastructure is modularized. Upon reclamation at the Malmbjerg mine-site, all structures will be removed, and any diverted water courses returned to their original channels. All disturbed land will be regraded and, if possible, local wild grass seeding of suitable areas will be performed. All roadways will be scarified and regraded to return the roadways to their natural topography. All culverts and bridges will be removed. Mesters Vig Inlet process barges will be removed from site by a tugboat. Plant site infrastructure will be removed, regraded, and seeded with local natural grass seed to original topography. The TMF infrastructure (i.e., pumps, pipes) will be removed and reclaimed.

1.14 Environmental Studies and Permitting

The Malmbjerg Project initially received its operating permit in 2008 based on the utilization of the Schuchert Dal southern access and infrastructure installation. The Mineral License and Safety Authority (MLSA) required GRI to resubmit the Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) applications to receive the operating permit in 2020, since the Project access route was changed from the south (Scoresbysund fjord) to the north (King Oscar fjord).

Most of the collected terrestrial, freshwater, and marine data for the 2008 operating permit are still valid. Additional fieldwork has been carried out in August 2021 to supplement these existing data. The focus area of this survey was the area north of Malmbjerg towards Mesters Vig Inlet, as this area was not study in detail for the previous project. Baseline hydrological and water quality studies were combined with geochemical (acid rock drainage and metal leaching) characterization of waste rock, ore, and tailings to assess potential environmental impacts for the 2008 project. These studies will be updated to reflect the existing project during the EIA.

The permitting process involves the MLSA, a government agency within the Ministry of Mineral Resources and Justice and the Environmental Agency for Mineral Resource Activities (EAMRA), a government agency part of the Ministry of Agriculture, Self-Sufficiency, Energy and Environment. The MLSA is the one-door administrative authority for mineral resource activities, licences etc. The Ministry of Mineral Resources and Justice is responsible for all socio-economic aspects of mineral resources, including SIA and Impact Benefit Agreements (IBA), and EAMRA is the administrative authority for environmental matters, including the protection of the environment and nature and EIA. EAMRA also receives input from scientific and independent environmental institutions and therefore works closely with the Greenland Institute of National Resources, Pinngortitaleriffik and the Danish Centre for Environment and Energy (DCE) at Aarhus University.

Although the permitting process is subject to regulatory decisions that can positively or negatively influence the timing and outcome of the exploitation license process, the company has been working diligently in each step of the process and used the extensive environmental monitoring data conducted by the Danish Centre for Environment and Energy from 2005-2017, and is therefore aiming to receive an exploitation license in Q1 2023.

1.15 Capital and Operating Costs

1.15.1 Capital Cost Estimate

The total estimated initial and sustaining capital cost for the design, construction, installation, and commissioning of the Project is $1,038.1 million. This includes all direct costs, indirect costs, owner's costs, and contingency. A summary breakdown of the capital cost is provided in Table 1-5. This estimate has been prepared in accordance with the Class 3 cost estimate standards of AACE International. The estimated accuracy of this cost estimate is +15%/-15%.

Table 1-5: Capital Cost Summary

Capital Costs (millions)	Initial Capex		Sustaining Capex		Total Capex	
	$M	€M	$	€	$	€
Mining	88.6	77.2	53.0	46.2	141.6	123.4
Rope Conveyor	194.4	169.4	50.0	43.6	244.4	212.9
Process Plant	112.9	98.4	50.0	43.6	162.9	142.0
Marine Vessels and Naval Architecture	28.3	24.7	10.0	8.7	38.3	33.4
Infrastructure	62.1	54.1	50.0	43.6	112.1	97.7
Tailings Storage and Reclaim Water	47.2	41.1	5.0	4.4	52.2	45.5
Construction Indirects	104.3	90.9				
Owner's Cost	10.0	8.7				
Preproduction, Start Up/Commissioning	147.5	128.5				
Subtotal (before equipment financing)	**795.4**	**693.0**	**218.0**	**189.9**	**1,013.4**	**882.9**
Contingency	83.7	73.0				
Subtotal (including contingency)	**879.1**	**766**				
Less: Equipment Financing Drawdowns	-88.6	-77.2				
Add: Equipment Lease Payment & Fees	29.6	25.8				
Total Initial Capital (after equipment financing)	**820.1**	**714.6**	**218.0**	**189.9**	**1,038.1**	**904.5**
Closure and Reclamation			TBD			
Total Capital Costs	**820.1**	**714.6**	**218.0**	**189.9**	**1,038.1**	**904.5**

Note:

1. Sums may not add up due to rounding
2. Contingency included at project sub-category basis and totals approximately 12%
3. Closure capital cost estimate has not been included in the analysis which will be considered as an operating cost as the finalized closure amount has not been negotiated with the Greenland Government authorities.

1.15.2 Operating Cost Estimate

The Project operating cost estimate consists of mining, ore transportation from mine to concentrator, processing, tailings and reclaim water management, port facilities and G&A costs, are summarized in Table 1-6. The average operating cost is estimated to be $12.42/t ore milled.

Table 1-6: Project Average LOM Operating Cost Summary

Description	Operating cost ($/t ore milled)
Mining (excludes pre-production)	3.94
Processing + Tailings	7.70
Rope Conveyor	0.14
Infrastructure	0.19
G&A	0.46
Total	**12.42**

Numbers may not add due to rounding.

1.16 Financial Analysis

Project revenues will be generated from the sale of molybdenum concentrate to an offshore smelter after allowing for concentrate transport and treatment charges and related selling costs. The Project has been evaluated using a constant molybdenum market price of $18/lb Mo, reflecting the recent upturn in the spot price. The LOM base case Project net cash flow after tax is presented in Table 1-7 and summarized in Figure 1-3.

Table 1-7: Base Case LOM Cash Flow Summary

Description	LOM Total Operating Cost	Unit cost per tonne milled	Unit cost per lb Payable Mo
	$'000	$/t	$/lb
Gross revenue	8,856,572	35.05	18.00
Total Costs	3,835,896	15.66	8.04
Net Operating Margin	4,750,676	19.39	9.96
Greenland Royalty	194,827	0.80	0.41
Inventory Finance Costs	79,169	0.32	0.17
Corporate Taxes	706,236	2.88	1.48
Capital Expenditure	1,097,031	4.48	2.30
Net Cash flow after Tax	**2,673,414**	**10.91**	**5.60**

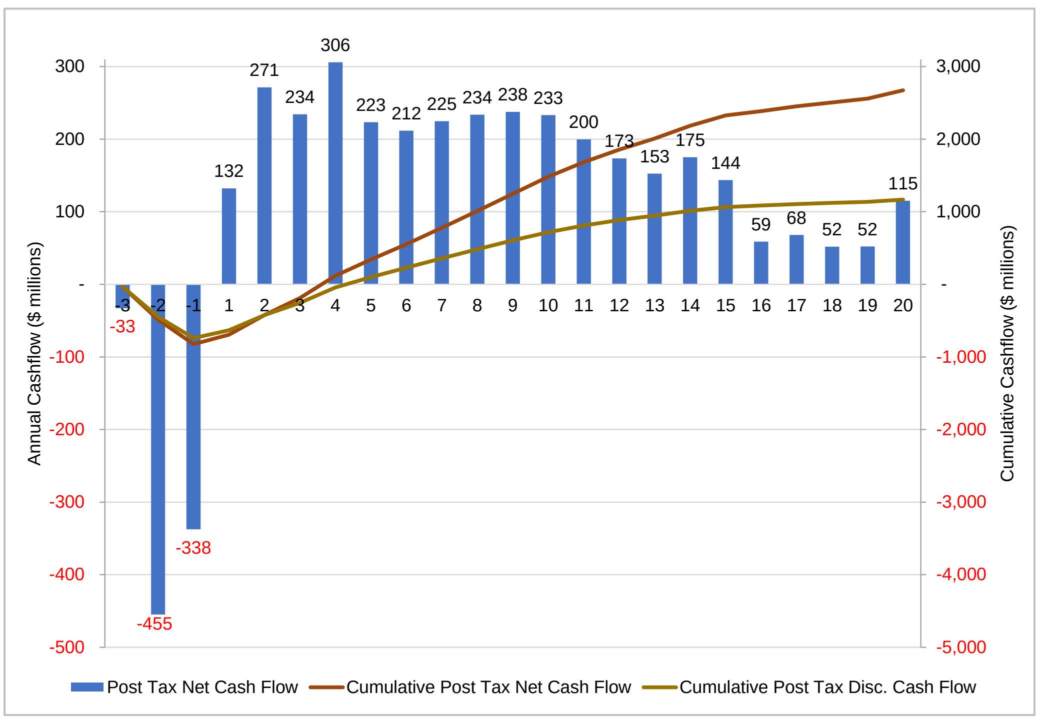


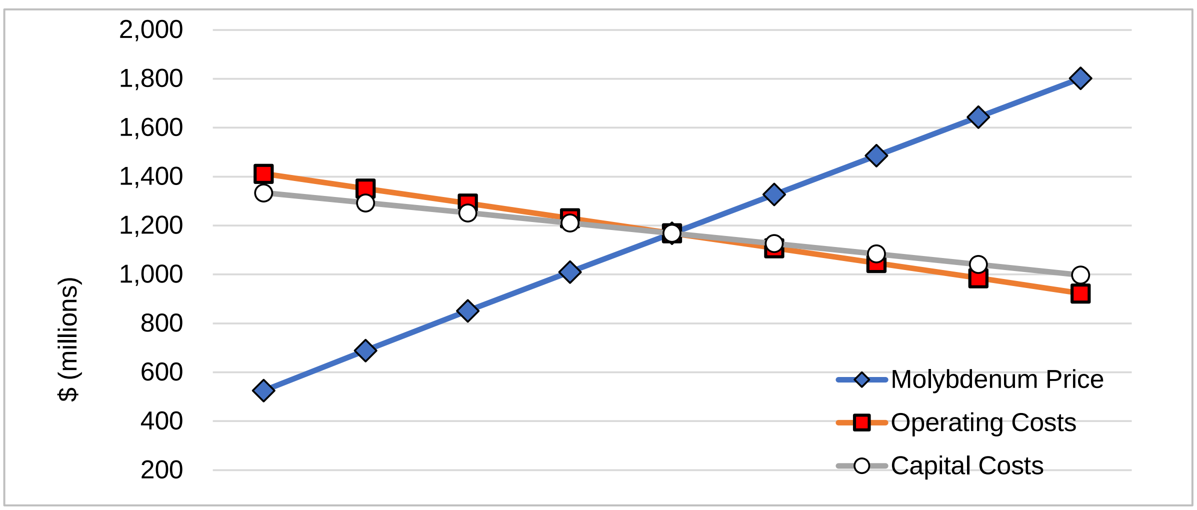
Figure 1-3: LOM Annual After-tax Net Cash Flow

Applying an annual discount rate of 6%, the Project base case after-tax cash flow evaluates to a net present value (NPV_6) of $1,169 million and an Internal Rate of Return (IRR) of 22.4%. After-tax undiscounted payback is 3.6 years, or 4.3 years when discounted at 6% per year. Further details of the base case results are given in Table 1-8.

Table 1-8: Base Case Economic Results

Item	Units	Base Case	
		$	Euro
Pre-tax Undiscounted Cash Flow	Millions	$3,574	€3,114
Pre-tax NPV@6%	Millions	$1,803	€1,570
Pre-tax IRR	%	27.7	
Pre-tax Payback	years	3.1	
After-tax Undiscounted Cash	Millions	$2,673	€2,329
After-tax NPV @ 6%	Millions	$1,169	€1,018
After-tax IRR	%	22.4	
After-tax Payback	years	3.6	

The sensitivity analysis illustrated in Figure 1-4 identifies revenue drivers (price, grade and recovery) as the most important factor in determining the viability of the Project. Capital and Operating costs are less important, though the Project is slightly more sensitive to the latter. Importantly, the results demonstrate that NPV_6 remains positive across the range of sensitivity tested, suggesting the Project can withstand 20% negative variance in any of these three factors.



Description	-20%	-15%	-10%	-5%	Base	+5%	+10%	+15%	+20%
Molybdenum Price	525	689	852	1,010	1,169	1,327	1,486	1,644	1,802
Operating Costs	1,412	1,351	1,290	1,230	1,169	1,108	1,1047	985	923
Capital Costs	1,334	1,293	1,252	1,210	1,169	1,126	1,084	1,041	998

Figure 1-4: NPV Sensitivity to Price, Capital, and Operating Costs

Figure 1-5 shows the sensitivity of the Project after-tax IRR and NPV_6 to changes in molybdenum price, indicating the positive impact of using a spot price of $19.80/lb in place of the base case of $18.00/lb. It can also be seen that NPV_6 remains positive with a 25% reduction in price to $13.50/lb. In the Base Case, NPV_6 is reduced to zero at a price of $10.10/lb Mo.

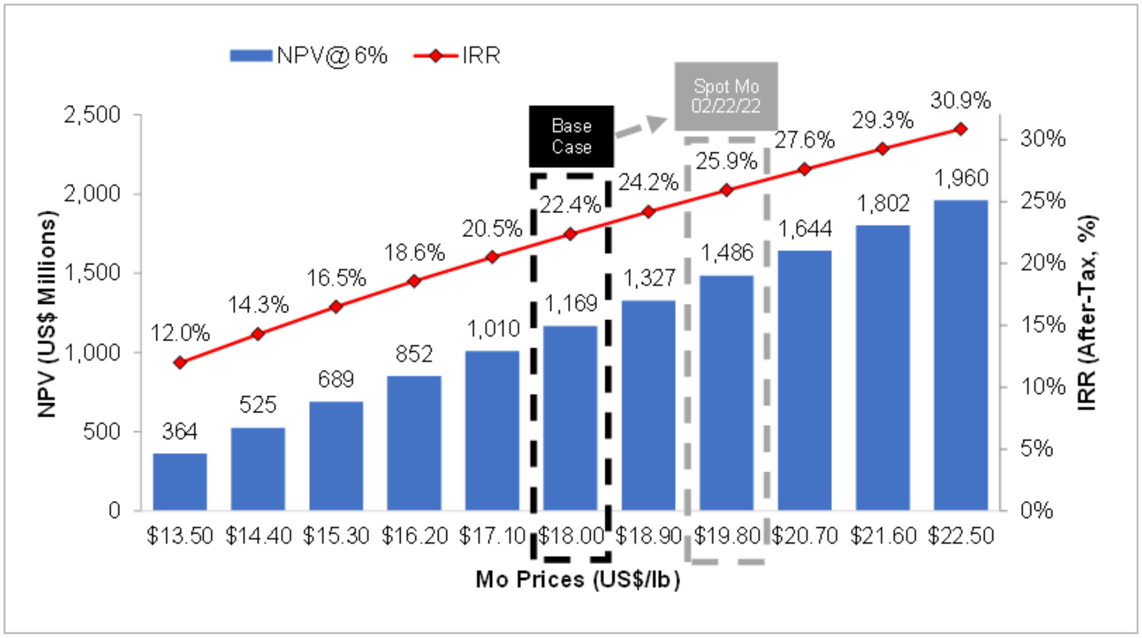


Figure 1-5: Base case Sensitivity to Molybdenum Price

In the Levered Case, after-tax undiscounted payback is 2.4 years, or 2.7 years when discounted at 6% per year. Table 1-9 provides more details of the results for the Levered Case.

Table 1-9: Levered Case Economic Results

Item	Units	Levered Case	
		$	Euro
Pre-tax Undiscounted Cash Flow	Millions	$3,101	€2,702
Pre-tax NPV@6%	Millions	$1,730	€1,504
Pre-tax IRR	%	40.4	
Pre-tax Payback	years	2.0	
After-tax Undiscounted Cash	Millions	$2,312	€2,002
After-tax NPV @ 6%	Millions	$1,129	€984
After-tax IRR	%	33.8	
After-tax Payback	years	2.4	

Figure 1-6 shows the sensitivity of the Levered Case after-tax IRR and NPV_6 to changes in molybdenum price, indicating the positive impact of using a spot price of $19.80/lb in place of the base case $18.00/lb. It can also be seen that NPV_6 remains positive with a 25% reduction in price to $13.50/lb. In the Levered Case, NPV_6 is reduced to zero at a price of $11.25/lb.

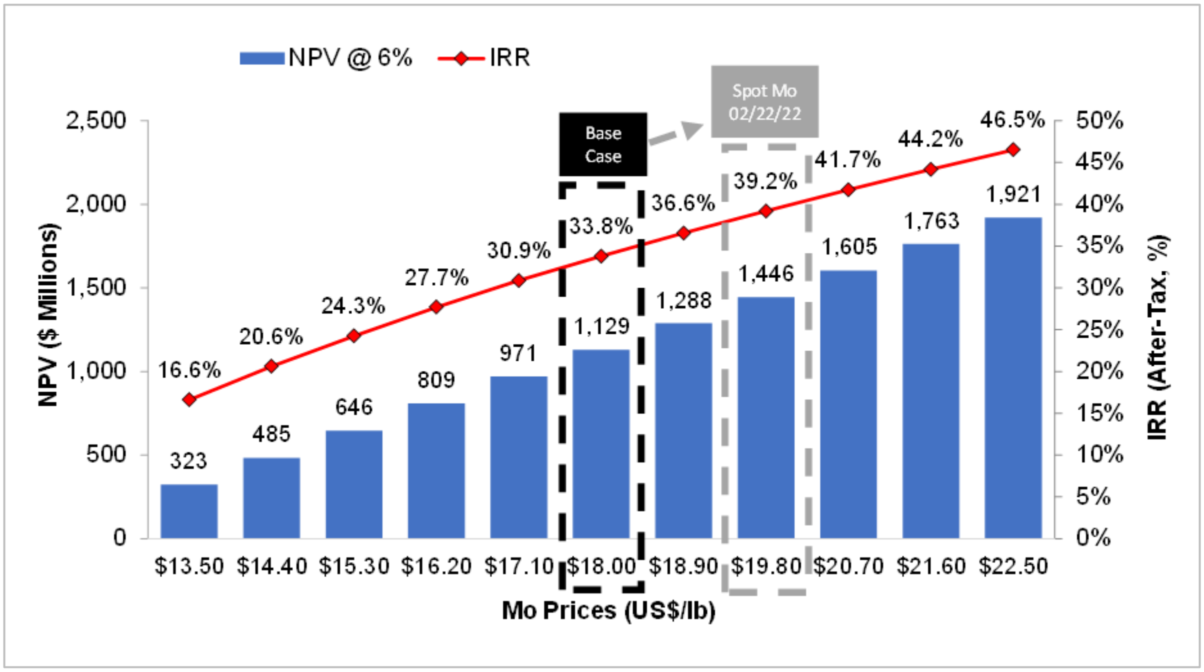


Figure 1-6: Levered Case Sensitivity to Molybdenum Price

Economic analysis of the Malmbjerg Molybdenum Project Base Case demonstrates that the Project is economically viable using the stated price assumptions, cost estimates and technical parameters generated by the FS, and the sensitivity analysis shows that positive returns can be achieved even with 20% adverse variance in price, operating costs or capital expenditure.

The alternative Levered Case demonstrates that returns to equity may be further enhanced when debt funding is applied to 60% of the initial capital costs.

1.17 Conclusions and Recommendations

The Malmbjerg Project is considered to be technically and economically viable based on FS parameters and results.

It is recommended to continue and complete the Project permitting process, detailed engineering, planning and scheduling and source financing.

2.0 INTRODUCTION

GRI commissioned Tetra Tech to complete this FS with the assistance of specialist consultants for the Malmbjerg Molybdenum Project, located near Mestersvig on the east coast of Greenland, in accordance with the NI 43-101 Standards of Disclosure for Mineral Projects. GRI is a Toronto-based exploration company that acquired the Malmbjerg exploration license in 2017.

The following consultants were commissioned to complete the components of the FS:

- Tetra Tech Canada Inc. (Tetra Tech): Overall project management, mineral processing and metallurgical testing, recovery methods, project infrastructure (overall site layout, ancillary infrastructure and buildings including site roads and airports), project execution plan and summary of capital and operating cost estimates.
- Moose Mountain Technical Services (MMTS): Project description and location, accessibility, history, geological setting, deposit types, exploration, drilling, data verification, mineral resource estimate, mineral reserve estimate, waste rock management, glacier access road, ore conveying system (RopeCon conveyor), mining capital and operating cost estimates and adjacent properties.
- Knight Piésold Ltd. (KP): Pit slope design, site geotechnical, TMF, water supply and site water management and pertinent capital and operating cost estimates.
- PND Engineers, Inc. (PND): Port and marine facilities and pertinent capital and operating cost estimates.
- Hockema Group, Inc. (Hockema): Marine vessels and naval architecture and pertinent capital and operating cost estimates.
- Paterson & Cooke Canada Inc. (P&C): Overland pipelines and pump stations and pertinent capital and operating cost estimates.
- Pinnacle Logistics Solutions (Pinnacle): Logistics and shipping and pertinent capital and operating cost estimates
- H. Okumura Consulting Ltd.: Concentrate market studies and contracts
- Micon International Limited (Micon): Economic analysis
- Frontier Geosciences Inc. (Frontier): Ice radar and seismic refraction investigation
- COWI A/S (COWI): Environmental baseline studies for terrestrial and freshwater sites, permitting and socio-economics
- WSP Global (WSP): Environmental baseline, marine baseline and bathymetry surveys

The list of consultants responsible for each report section is summarized in Table 2-1.

Table 2-1: Summary of Report Sections and Consultants

Section	Description	Company	QP
1.0	Summary	All	Sign off by Section
2.0	Introduction	Tetra Tech	Hassan Ghaffari, P.Eng.
3.0	Reliance on Other Experts	Tetra Tech	Hassan Ghaffari, P.Eng.
4.0	Property Description and Location	MMTS	Sue Bird, P.Eng.
5.0	Accessibility, Climate, Local Resources, Infrastructure, & Physiography	MMTS	Sue Bird, P.Eng.
6.0	History	MMTS	Sue Bird, P.Eng.
7.0	Geological Setting and Mineralization	MMTS	Sue Bird, P.Eng.
8.0	Deposit Types	MMTS	Sue Bird, P.Eng.
9.0	Exploration	MMTS	Sue Bird, P.Eng.
10.0	Drilling	MMTS	Sue Bird, P.Eng.
11.0	Sample Preparation, Analyses, and Security	MMTS	Sue Bird, P.Eng.
12.0	Data Verification	MMTS	Sue Bird, P.Eng.
13.0	Mineral Processing and Metallurgical Testing	Tetra Tech	Marinus (Andre) de Ruijter, P.Eng.
14.0	Mineral Resource Estimate	MMTS	Sue Bird, P.Eng.
15.0	Mineral Reserve Estimate	MMTS	Jesse Aarsen, P.Eng.
16.0	Mining Methods	MMTS	Jesse Aarsen, P.Eng.
	Pit Slopes	KP	Daniel Yi Yang, P.Eng.
17.0	Recovery Methods	Tetra Tech	Marinus (Andre) de Ruijter, P.Eng.
18.0	Project Infrastructure	--	--
	Site Layouts, Ancillary Facilities, Utility and Services, All-Weather Access Roads, Airports	Tetra Tech	Hassan Ghaffari, P.Eng.
	Glacier Access Road	MMTS	Jesse Aarsen, P.Eng.
	Rope Conveying System	Tetra Tech	Hassan Ghaffari, P.Eng.
	Overland Pipelines and Pump Stations	P&C	Stewart Bodtker, P.Eng.
	TMF and Site Water Supply and Management	KP	Reagan McIsaac, P.Eng.
	Port Facilities and Marine Infrastructure	PND	Gary Watters, P.Eng., P.E. Carl McNabb, P.E.
	Marine Vessels and Naval Architecture	Hockema	John Myers, P.E.
19.0	Market Studies and Contracts	H. Okumura Consulting Ltd./ Tetra Tech	Hassan Ghaffari, P.Eng.

table continues…

Section	Description	Company	QP
20.0	Environmental Studies, Permitting, and Social or Community Impact	WSP	David Brown, P.Geo.
21.0	Capital and Operating Cost Estimates	Tetra Tech/ MMTS/ P&C/PND/ Hockema	Hassan Ghaffari, P.Eng. Jesse Aarsen, P.Eng. Stewart Bodtker, P.Eng. Gary Watters, P.Eng., P.E. Carl McNabb, P.E. John Myers, P.E.
22.0	Economic Analysis	Micon	Christopher Jacobs, CEng.
23.0	Adjacent Properties	MMTS	Sue Bird, P.Eng.
24.0	Other Relevant Data and Information	--	--
	Project Execution Plan	Tetra Tech	Hassan Ghaffari, P.Eng.
	Logistics	Pinnacle/Tetra Tech	Hassan Ghaffari, P.Eng.
25.0	Interpretation and Conclusions	All	Sign off by Section
26.0	Recommendations	All	Sign off by Section
27.0	References	All	Sign off by Section
28.0	QP Certificates	All	--

The names of all the QPs of this report and their QP certificates are included in Section 28. The following QPs conducted the site visit of the Property:

- Mr. Hassan Ghaffari, P.Eng. of Tetra Tech, visited the site from 16 to 23 August 2021 and conducted a general project site overview in the proposed processing plant and infrastructure areas.
- Ms. Sue Bird, P.Eng. of MMTS, visited the site from 16 to 23 August 2021 and reviewed drill cores and the general layout of the camp and topography.
- Mr. Jesse Aarsen, P.Eng. of MMTS, visited the site from 16 to 23 August 2021 and reviewed the deposit site, drill cores and the general layout of the camp and topography.
- Mr. Stewart Bodtker, P.Eng. of P&C, visited the site from 16 to 23 August 2021 to identify preferred pipeline corridors and other construction challenges.
- Mr. Carl McNabb, P.E. of PND, visited the site from 16 to 23 August 2021 and conducted a site reconnaissance in the proposed port site.
- Mr. Reagan McIsaac, P.Eng. of KP, visited the site from 16 to 24 August 2021 and conducted a general project site overview in the Tailings Storage Facility and water supply.

2.1 Effective Date

This Technical Report has the following effective date: 23 February 2022.

2.2 Information Sources

Information sources used in compiling this report are included in Section 27.0.

3.0 RELIANCE ON OTHER EXPERTS

This Technical Report has been prepared by Tetra Tech and other project consultants for GRI. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to Tetra Tech, MMTS and other project consultants at the time of preparation of this Technical Report
- Assumptions, conditions, and qualifications as set forth in this Technical Report.
- For this Technical Report, MMTS has relied on ownership information provided by GRI. GRI has relied on a title opinion letter dated 2 February 2018 from Anita Strauss Sorensen, a lawyer for Nuna Law Firm in Nuuk, Greenland. This opinion is relied on in Section 4.0 and the Summary of this Technical Report. Neither Tetra Tech nor MMTS has researched property title or mineral rights for the Malmbjerg Property and expresses no opinion as to the ownership status of the Property.

Hassan Ghaffari, P. Eng. of Tetra Tech, relied on Howard Okumura of H. Okumura Consulting Ltd. for matters related to Market Studies and Contracts detailed in Section 19.0 of this report and Gord McNeil of Pinnacle Logistics Solutions for matters of Logistics detailed in Section 24.0 of this report.

David Brown, P.Geo. of WSP, relied on Dr. Morten Christensen and Signe Gammeltoft-Pedersen of WSP Danmark A/S for matters related to Environmental Studies, Permitting, and Social or Community Impact detailed in Section 20.0 of this report.

David Brown also relied upon third-party geochemical characterization reports completed by SRK Engineers and Scientists, Lorax Environmental, and Golder Associates, as referenced in Section 27.0.

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

The Malmbjerg Molybdenum Project is located in extremely rugged mountainous terrain, in the central portion of the east coast of Greenland.

Exploration licences are issued and monitored by the Government of Greenland MLSA. Cash payments must be made and assessment work completed to maintain the licence. A title opinion letter from Nuna Law Firm (2021) states that GRI is the sole owner of License No. 2018/11 and all payments due had been paid and that the licence was current.

The original licence, measuring 11 km^2 in area that encompasses the Malmbjerg deposit, was issued to GRI in December 2017, and became effective on 18 January 2018. In March 2019, GRI successfully applied to MLSA for an enlargement of the licence area to its present size of approximately 82 km^2. The term of these licences is initially for two periods of 5 years which may be extended for 3 years at a time up to 22 years. An extension of up to 10 years may be granted on modified terms (Nuna, 2021).

The Project is located 30 km from Greenland's east coast, near Latitude 72º north. The Malmbjerg licence area, as updated in March 2019, is described in an agreement signed by GRI and the Government of Greenland (Licence No. 2018/11, Addendum no.2, 2019), and is located in the central portion of the east coast of Greenland, approximately 600 km north of Iceland (Note: Licence was granted in 2018 and revised in 2019). The licence area encompasses the Malmbjerg Project and covers approximately 82 km^2.

GRI has applied to MLSA for the transfer of ownership of License No. 2018/11 to a wholly owned Greenland-based subsidiary, GRI A/S. The purpose for the transfer is to fulfill a legal requirement for conversion of the MEL to an Exploitation Licence. At the time of writing, the transfer request was awaiting approval from MLSA.

The QP does not provide opinions regarding property tenure. However, MMTS has reviewed the documentation provided by GRI and the documentation posted on the MLSA website (www.govmin.gl) and has no reason to doubt the validity of the property tenure documentation.

The QP is not aware of any environmental liabilities on the Project. GRI has all required permits to conduct the proposed work on the Project. MMTS 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 Project.

In regards to the establishment of Project infrastructure: in Greenland, there is no private ownership of land as all land belongs to the public. Pursuant to section 1407 of the Greenland Exploration Standard Terms, a licensee is entitled to establish buildings, production plants, installations, tailings, and waste disposal sites, etc. within and outside of the licence area provided they are approved in accordance with articles 10 (now section 19) and 25 subsection 1 (now section 86 subsection 1) of the Mineral Resources Act (Nuna, 2021).

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

5.1 Accessibility

The Project is located approximately 30 km inland from the east coast of Greenland centered at 26W 594354m E and 7987055m N in an area bounded by latitudes 71º 57’ N and 72 º 03’ N and longitudes 24º 00’ W and 24º 19’ W as shown in Figure 5-1. The Project is located in the Schuchert River catchment (known as Schuchert Dal), which drains into Scoresbysund, the largest fjord system in the world.

There are no roads to the Project and access is by rotary-wing aircraft only.

5.2 Local Resources

The closest settlement is Ittoqqortoormiit (Scoresbysund village) with about 310 inhabitants (Statistics Greenland 2019) located about 185 km south-east of the Malmbjerg deposit. as shown in Figure 5-1. The closest international airport is at Nerlerit Inaat (Constable Point), located 150 km to the south-east of the Malmbjerg deposit, which is accessible by scheduled flights year-round from Iceland. A closer gravel airstrip, at Mestersvig, 33 km northeast of the deposit, is maintained by the Danish military. The nearest sources of logistical support are in Iceland, and supplies must either be shipped or flown to Mestersvig, and then airlifted by helicopter to the site.

The nearest sources of logistical support are in Iceland, and supplies must be either shipped or flown to Mestersvig, and then airlifted by helicopter to the site. At Mestersvig, located approximately 33 km to the northeast of the Project, there exists a gravel airstrip maintained by the Danish military. This airstrip is capable of handling Hercules C-130 aircraft or equivalent and serves as a principal entry point for the region.

In the Project vicinity, there are wildlife protected areas. Access to some areas is restricted at certain times and requires special permission. The only people who have free access are the Ittoqqortoormiit hunters who are allowed limited hunting access under certain circumstances.

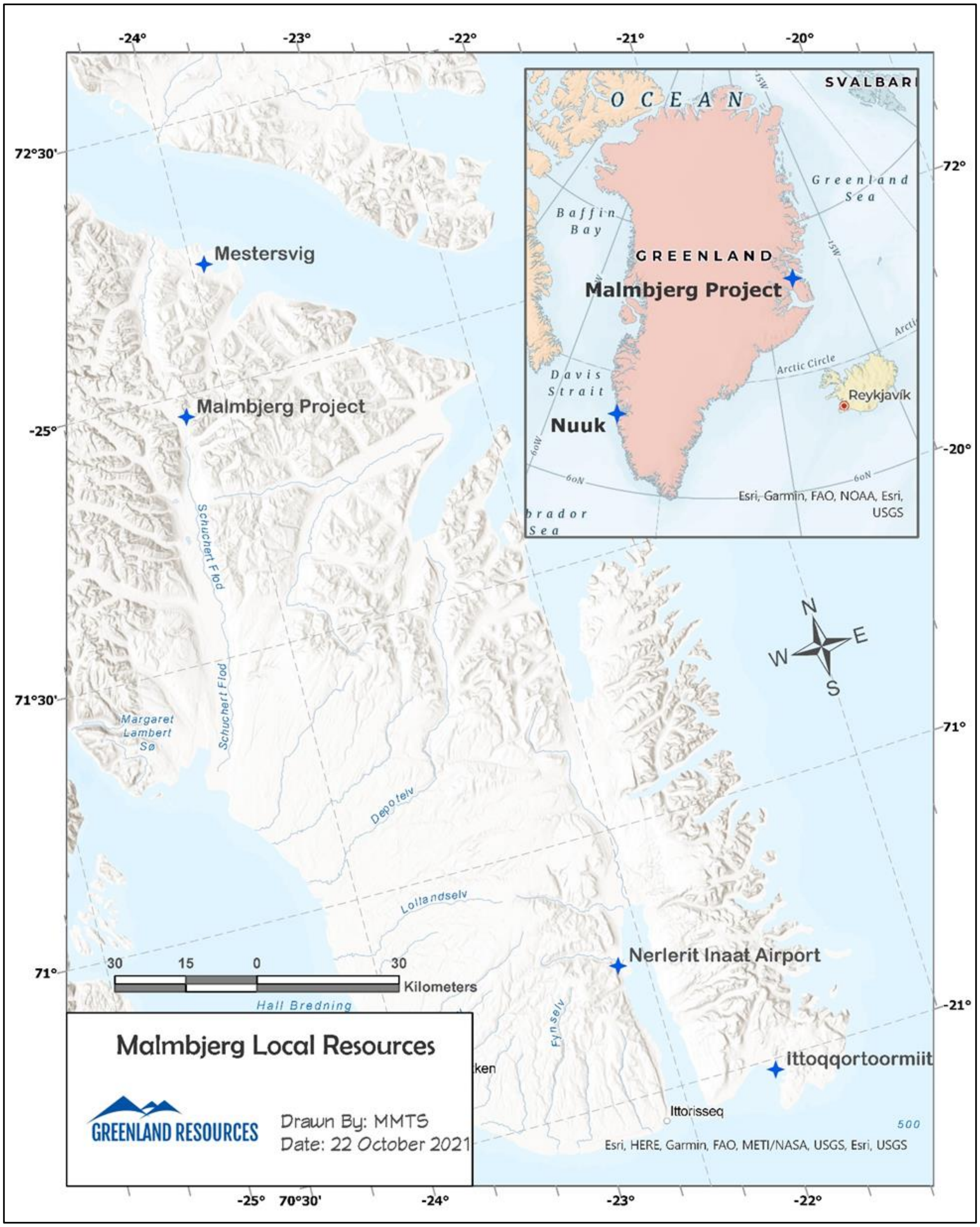


Figure 5-1: Malmbjerg Local Resources

5.3 Infrastructure

There is no infrastructure on the Project. During the 2005 work program, InterMoly maintained 40-person camp at site on a moraine on Schuchert Glacier, as well as a 15-person camp at Mestersvig. For the 2007 program, Quadra established a camp some distance south of Malmbjerg, in order to construct it on dry land. Current visits to site have employed hotel boats for crew accommodations.

5.4 Climate

The climate for the region is arctic. Weather records at Mestersvig were collected by the Danish Meteorological Institute between 1961 and 1985 and at Nerlerit Inaat Airport from 1996 to 2001. The mean annual temperature at Mestersvig is about -10°C; only in June, July, and August do the mean monthly temperatures rise above 0°C with approximately 5°C mean temperature in August. February is the coldest month with -24°C mean temperature and -49°C as the extreme minimum recorded temperature.

InterMoly and Quadra installed three automated weather stations in the Malmbjerg area to record weather data for the period of June 2005 to April 2014. During this period, the average annual temperature at an elevation of 700 masl was -8°C and the minimum temperature recorded was -28°C. Additionally, the maximum wind speed recorded during this period was 20 m/s.

The average annual precipitation is approximately 300 mm to 400 mm reasonably well distributed throughout the year. The wettest month is usually March, with the drier months being April through to June. Snow typically occurs from September until July. A maximum snow depth of approximately 150 cm is reached from March to May.

Wind data have been recorded on the Jameson Land between 1982 and 1988. Wind direction during winter is predominantly from the north-northeast, and in summer from the west and northwest. Highest wind speeds occur mostly in the winter, with maximum recorded speed of 52 m/s.

In the low land and open-sea areas fog appears frequently between June and September and may persist for several days.

5.5 Physiography

The Malmbjerg Molybdenum Project lies under Høstakken Mountain within a wedge-shaped exposure located at the confluence of the Arcturus and Schuchert glaciers (Figure 5-2). Elevations range from approximately 1,100 masl along the ridge top above the Project, to 600 - 700 masl on the ice in the valleys.

The Project area is situated in the transition zone between the high arctic and the low arctic habitats. Several types of dwarf shrub heaths dominate the dry areas, while fens and grassland dominate the lower wet areas. More than 70% of the area is either snow, ice, bare ground or very sparsely vegetated. In the vicinity of the proposed mine area, there is no reported vegetation.

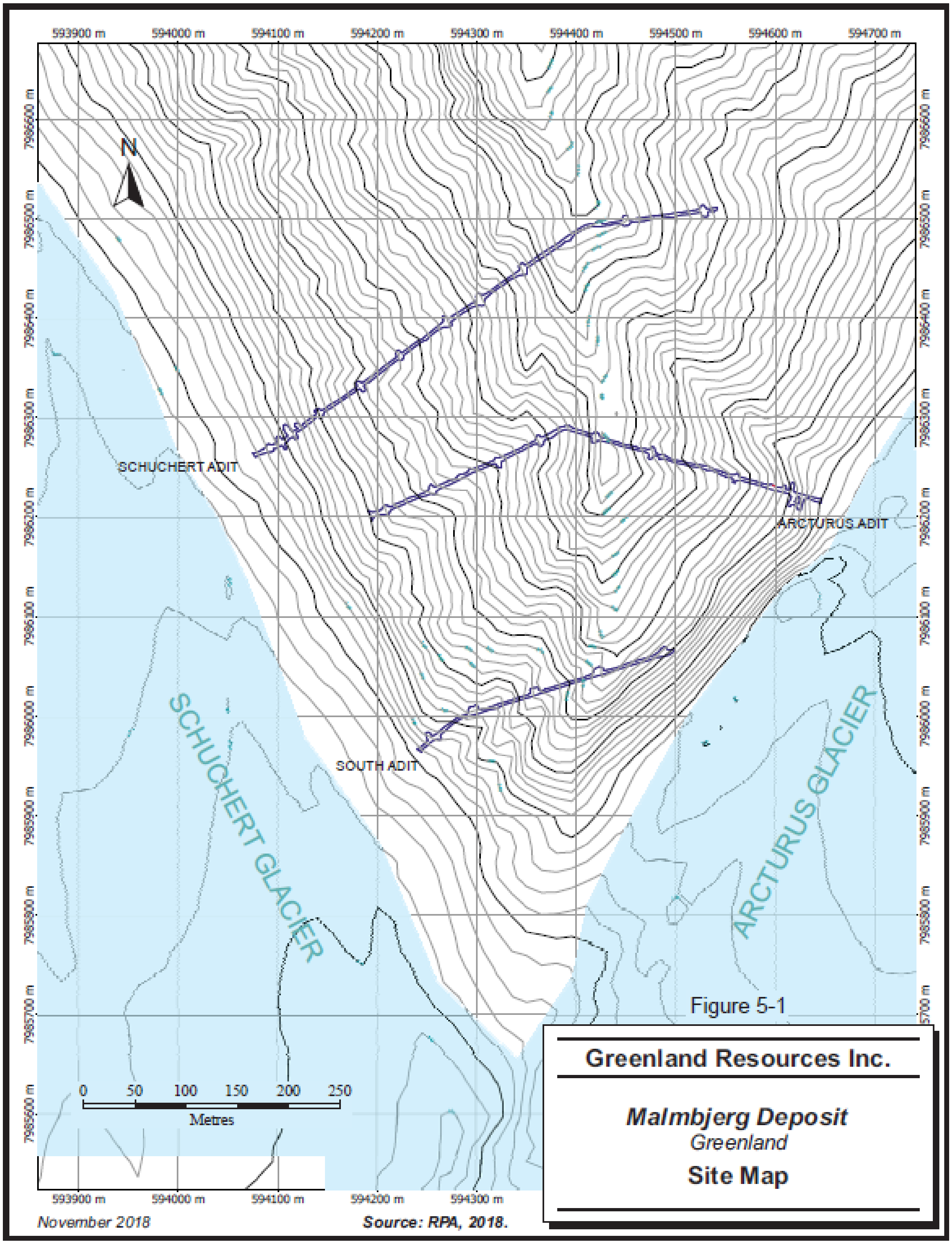


Figure 5-2: Site Map

6.0 HISTORY

6.1 Prior Ownership

The Malmbjerg Project was discovered in 1954 by geologists of the Danish East Greenland Expedition. From 1955 to 1958, the Project was operated by Nordmine, which in 1959, was restructured and renamed Nordisk Mineselskab A/S (Nordisk). Amax began participation in the Project in 1960 via a joint venture agreement and took over management of the exploration work. By 1962, Amax had fully earned into the Project under the terms of the joint venture, and the entire corporate structure was reorganized into Arktisk.

Amax dropped its interest in the Project in 1980. Nordisk continued with reconnaissance level mapping and sampling but terminated its interest in 1981.

No work is recorded on the Project from that time until 2004. Platinova A/S held an exploration licence on the ground from 1994 to 1997 but did not do any field work. In 2004, Galahad Gold Plc acquired an exploration licence and carried out a review of available data. The licence was transferred to InterMoly in December 2004.

On 30 March 2007, Quadra announced an offer to purchase InterMoly shares and warrants for one Quadra share for each 36.22 InterMoly shares, and one Quadra share for each 99.23 InterMoly warrants. The offer agreement officially closed on 22 June 2007, at which time Quadra had acceptances for approximately 82.47% of InterMoly shares and 90.82% of InterMoly warrants.

Quadra eventually merged with FNX Mining Company Inc. in 2010 to form Quadra FNX and was acquired by KGHM in 2012. KGHM relinquished the licence in 2017. GRI applied for and acquired the present licence in December 2017.

The licence was extended in March 2019, under agreement with the government of Greenland (Naalakkersuisut, 2019).

6.2 Exploration and Development History

From 1955 to 1958, Nordmine carried out exploration work consisting of prospecting, surface sampling, geological mapping, and a modest amount of diamond drilling. Nordmine collared the Brinch (now Schuchert) adit and drove in 28 m. They also drilled seven holes totalling 1,200 m. Samples were taken at 5 m intervals in these holes and sent to Germany for analysis.

In 1959, Nordmine was restructured into Nordisk and exploration work resumed with an additional 182 m of advance on the Brinch adit. In addition, the Arcturus adit was collared on the east side of the mountain and driven westward for 477 m. Diamond drill holes were fanned from these drifts along sections spaced approximately 40 m to 50 m apart, oriented primarily NW-SE. A total of 70 holes were drilled from 1959 to 1961. Sampling was carried out on 10 m intervals and analyzed at a laboratory established on site. Amax began participation in the Project in 1960 via a joint venture agreement and took over management of the exploration work.

By 1962, Amax had fully earned into the Project under the terms of the joint venture. During that year, the South adit was collared and driven 277 m, and the Brinch adit was extended 365 m. Diamond drilling continued from underground with the completion of another 70 holes totalling 9,844 m.

Following the 1962 program, field work effectively ceased and, for the next decade or so, work focused on evaluation of the resource and feasibility studies.

In 1966, Arktisk conducted an FS for a projected 8,500 t/d operation with a molybdenum price $1.00 to $1.50 per lb. The study concluded that the Project was only marginally profitable and little more was done on the Project until 1973. In that year, Amax retained a London-based engineering consortium to carry out a pre-feasibility level sensitivity analysis. This study contemplated three different sized open pit mines ranging in production rate from 10,000 t/d to 30,000 t/d, and a price per pound of molybdenum of $1.70 per lb. The result of this study showed that the Project was marginally sub-economic, and Amax decided not to proceed further.

In 1974, Amax embarked on a detailed review of the exploration data collected up to that point. This work included relogging of approximately 50% of the core. Based on this work, a single 972 m hole was drilled from surface to look for a possible second zone at depth. Another hole on a second target area was also proposed but was not drilled after the first hole was unsuccessful. By the end of 1979, diamond drilling on the Project totalled 22,284 m in 147 holes, along with 3 exploration drifts totalling 1,329 m.

InterMoly initiated a pre-feasibility study for the Project in 2005. Work included diamond drilling and channel sampling to confirm the older drill data and the mineral resources. InterMoly completed 31 diamond drill holes totalling 4,988 m, 1,824 m of diamond saw channel sampling along the drift walls, bulk sampling, and geological mapping. Five of the holes were intended as twins of all or parts of earlier holes. The sampling program also included measurements of bulk density and collection of specimens for determination of oxide Mo content.

Beginning in 2007, Quadra continued with feasibility-level engineering studies, which included 4,195 m of diamond drilling to both expand the resource and support acid generation testing. Quadra also applied for and was granted an Exploitation Licence for the Project from the Greenland Bureau of Mines.

The drilling and sample work conducted by InterMoly and Quadra is discussed in more detail in Sections 9.0, 10.0, and 11.0 of this report.

6.3 Past Production

There has been no production at Malmbjerg to date.

7.0 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Malmbjerg Project is located within a north-northeast trending belt of Carboniferous to Lower Tertiary age sedimentary and intrusive units (Shonwandt and Dawes, 1992). This belt is bounded on the east and west by Archaean to Upper Proterozoic metamorphic and plutonic rocks (Figure 7-1). These rocks have been complexly folded and overthrust during Caledonian collisional tectonism. The contact with the younger Paleozoic-Tertiary strata is a steeply dipping fault which developed from mid-Atlantic rifting during the separation of Greenland from Europe in Tertiary times. Tensional stress resulted in development of grabens in post-Caledonian strata and has localized intrusion of Tertiary age plutons and dikes of the Werner Bjerge Complex. A portion of one of these plutons is host to the Malmbjerg Project.

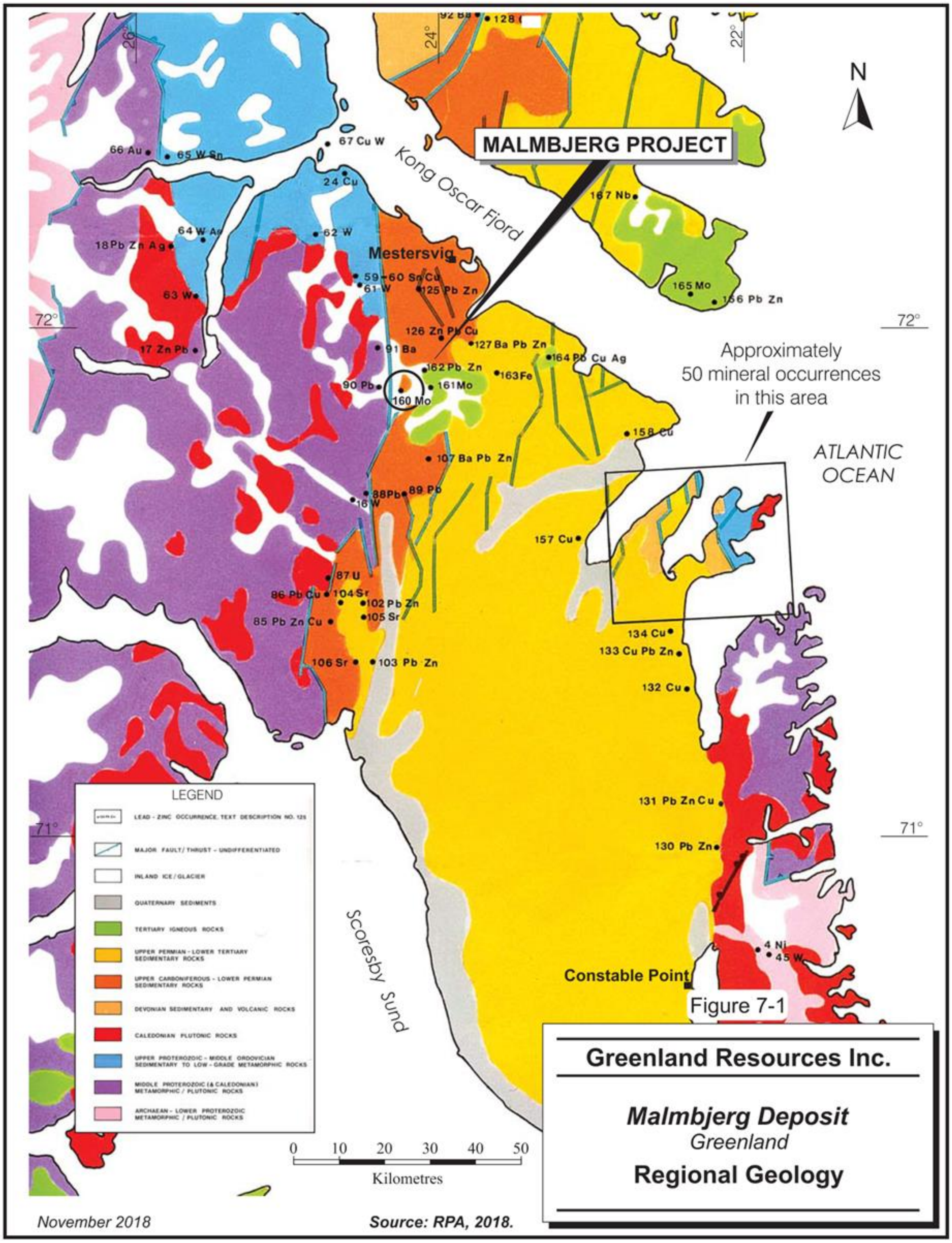


Figure 7-1: Regional Geology

7.2 Local and Property Geology

Host rocks for the Malmbjerg Project comprise Mid-Tertiary alkalic leuco-granite stocks and clastic sedimentary rocks of the Lower Permian Rode Group (Figure 7-2). The sedimentary rocks are primarily arkosic and conglomeratic sandstones that have been variously hornfelsed. Intrusive rocks consist of four principal phases: perthite granite, quartz porphyry (Arcturus porphyry), porphyritic aplite, and weakly feldspathic quartz porphyry (Schuchert porphyry). In the western cliff face of Høstakken Mountain, the intrusive/sediment contact is plainly visible, forming a broad arch with the Rode Group rocks draped over top.

Contact relationships within the intrusion are complex and are often ambiguous. The perthite granite is the most widespread phase and is believed to be the oldest. The perthite shows gradational contacts with the Arcturus porphyry, which is compositionally similar to the perthite and is discriminated primarily on the basis of texture. The Arcturus porphyry tends to occur at the top and on the northeast side of the intrusion. Its chemical similarity and complexly interlayered relationship to the perthite granite suggest that the Arcturus may just be another phase of the perthite granite. Following the Arcturus porphyry was the aplite, which occurs as both porphyritic and non-porphyritic variants. Alate phase of the aplite is observed to be unmineralized. The final phase is the Schuchert porphyry, which occupies the northern portion of the Project. The Schuchert is observed to crosscut the perthite granite and the aplite. Silicification, noted in the perthite and aplite, is not seen in the Schuchert porphyry, indicating that it post-dates this alteration event.

Post-mineralization basic and trachytic dikes have been mapped and occur within the Project. The basic dikes are quite narrow, usually decimetre-scale, are steeply-dipping and trend in a NE-SW direction. The trachytes occur as two 5 m to 15 m thick subvertical sheets, striking east-northeasterly. Lamprophyre dikes have been noted in the area but have not been identified in the drift mapping or drillhole logs. K-Ar dates for the intrusives place the age of emplacement at around 25 Ma, which is late Oligocene.

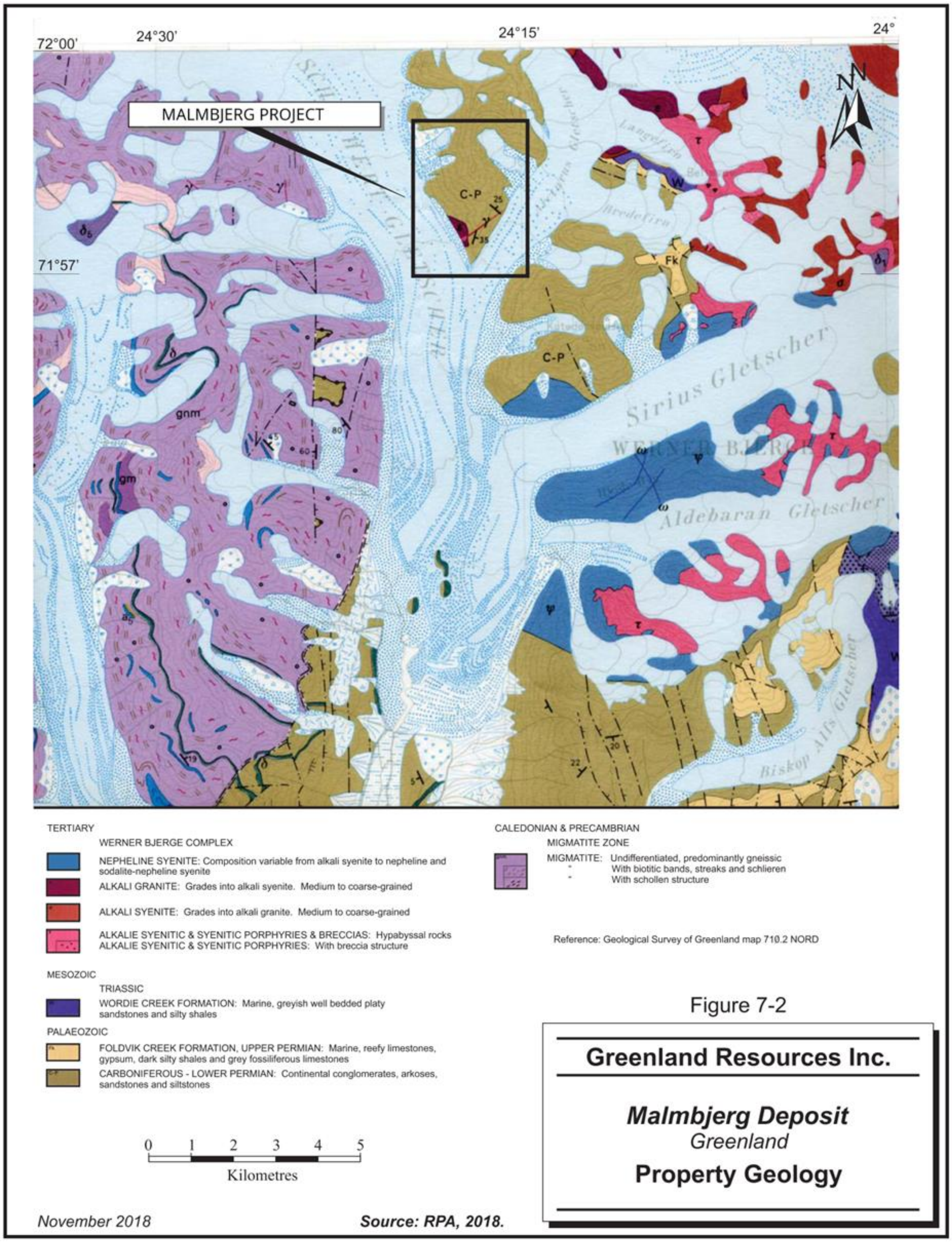


Figure 7-2: Project Geology

A regional-scale north-south-trending fault traverses the area to the west of the Project, underneath the Schuchert glacier. This is the boundary between Archaean-Proterozoic units to the west and the Upper Paleozoic-Cenozoic package to the east. Another fault is thought to lie underneath the Arcturus glacier to the east. There are smaller scale faults observed in the underground workings, but they are not particularly numerous. Principal fracture strike directions are northwest-southeast, east-northeast, and near horizontal. Narrow, sub-horizontal greisen veins are commonly observed throughout the Project.

7.3 Mineralization

Molybdenite occurs as fracture-fillings and disseminations in association with hydrothermal alteration. The Project is broadly dome shaped with an outside diameter of up to 600 m and a height of approximately 150 m. Accessory pyrite occurs as a halo around the molybdenite zone. Other accessory minerals include minor amounts of wolframite, scheelite, and fluorite. Re-assays done in 2021 confirmed ICP results having below DL (<10 ppm) uranium. There is also very minor galena, sphalerite, and chalcopyrite occur in veinlets at the periphery of the Project.

MoS_2 grades tend to level off at approximately 0.35% in the central high-grade core, although local grades of over 1% have been observed. The grades gradually taper off to ppm range with distance outwards and downwards. The mineralization continues up into the sedimentary rocks in the roof of the Project, but the grades are observed to diminish more rapidly than in the intrusives.

Alteration at Malmbjerg occurs as concentric zones of assemblages typical of many porphyry deposits. The innermost zone consists of a silicified zone, which is surrounded by a halo of sericite-K-feldspar alteration, and finally a biotite-magnetite-quartz zone. Extending for up to 500 m from the Project is a large zone of pyrite mineralization that has resulted in a large gossan over the surface exposures surrounding the Project.

8.0 DEPOSIT TYPES

Malmbjerg is a porphyry molybdenum Project similar in style and morphology to the Climax Project, in Colorado, USA. Projects of this type are typically large, measuring in the hundreds of millions of tonnes with molybdenite (MoS_2) contents typically measuring less than 1% of the rock by weight. Late hydrothermal processes related to the intrusions were responsible for alteration and deposition of molybdenum sulphide mineralization. The mineralization occurs as a diffuse zone of molybdenite (± accessory tungsten) in fractures and stockworks in both the intrusives and overlying sandstones.

The mineralization occurs as a diffuse zone of molybdenite (± accessory tungsten) in fractures and stockworks in both the intrusives and sandstones. Molybdenite occurs as fracture-fillings and disseminations in association with hydrothermal alteration. The Project is broadly dome shaped with an outside diameter of up to 600 m and a height of approximately 150 m.

9.0 EXPLORATION

GRI has not conducted any field work on the Project to date. The work described in this section was carried out by previous companies.

9.1 Pre-2005

As stated in Section 6.0 of this Technical Report, the early exploration work was conducted by Nordmine/Nordisk and Amax. Work comprised surface sampling, mapping, prospecting, tunnelling, and diamond drilling. Three exploration drifts, totalling 1,329 m, were driven to facilitate diamond drilling, as the surface relief is too extreme to permit much surface drilling. A total of 22,284 m of drilling in 147 holes were completed in this period (Figure 10-1). Additional details of this work are provided in Section 10.0 of this Technical Report.

Records of the early work are available at the offices of the Danish Geological Survey (GEUS) in Copenhagen, Denmark. InterMoly collected several reports as well as logs and assay data for this work from GEUS. These reports provided the means to reconstruct the drill database and evaluate the early work.

The drilling data from the pre-2005 holes were compiled into a Gemcom database in 2004 by InterMoly personnel. The hole orientations were not recorded in the logs and so were measured from old plans and sections. No lithological data were entered.

GEUS has also stored a number of pulps from the early drill programs, and InterMoly was able to collect a suite of these pulps and re-assay them. The results of this work are discussed in more detail in the Section 12.0 of this Technical Report entitled Data Verification.

9.2 2005

InterMoly carried out drilling, channel sampling, and mapping in 2005 to both confirm the pre-2005 data and expand the resource base. The program comprised 31 holes totalling 4,988 m of NQ2 (4.76 cm core diameter), NQ3 (4.51 cm core diameter), and PQ (8.31 cm core diameter) diamond drilling, 1,824 m of diamond saw channel sampling along the drift walls, bulk sampling, and geological mapping. Five of the holes were intended as twins of all or parts of earlier holes. The sampling program also included measurements of bulk density and collection of specimens for determination of oxide Mo content. The locations of the 2005 holes as well as the channels are shown in Figure 10-1.

Concurrent with the confirmation drilling program, InterMoly conducted geotechnical drilling on the proposed plant, port, and tailings impoundment sites, as well as exploration drilling. These holes do not impact the MRE and will not be discussed in any detail in this report.

9.3 2007

Quadra completed 17 diamond drill holes with an aggregate length of 4,195 m. The locations of these holes are shown in Figure 10-1. Details of this program are provided in Section 10.0 of this Technical Report.

10.0 DRILLING

The current database contains records for 195 diamond drill holes and 10 channel samples collected from the 3 adits (Schuchert, Arcturus, and South), which are treated as drill holes for the purposes of resource estimation. The total length of all drill holes and channels is 33,313.78 m, with 5,455 samples totalling 30,220.18 m of assayed length. The drilling and sampling span almost the entire working history of the Project. Much of it predates NI 43-101, so for review purposes, the work is broadly grouped into that done in the modern era by InterMoly and Quadra, for which NI 43-101 protocols were followed, and that which is considered historic (or pre-2005) and includes exploration by Nordisk (as Nordmine or Nordisk) and Amax (as Amax or Arktisk) as described in Section 6.0 of this Technical Report. All drilling is summarized in Table 10-1. Drillhole locations and traces are shown in Figure 10-1.

Table 10-1: Summary of Drilling at Malmbjerg

Year of Drilling	Owner	Channel	DDH	Total Length (m)
Historic	Nordisk or Amax	--	147	22,284
2005	InterMoly	--	31	4,988
		10	--	1,824
2007	Quadra	--	17	4,218
Total		**10**	**195**	**33,314**

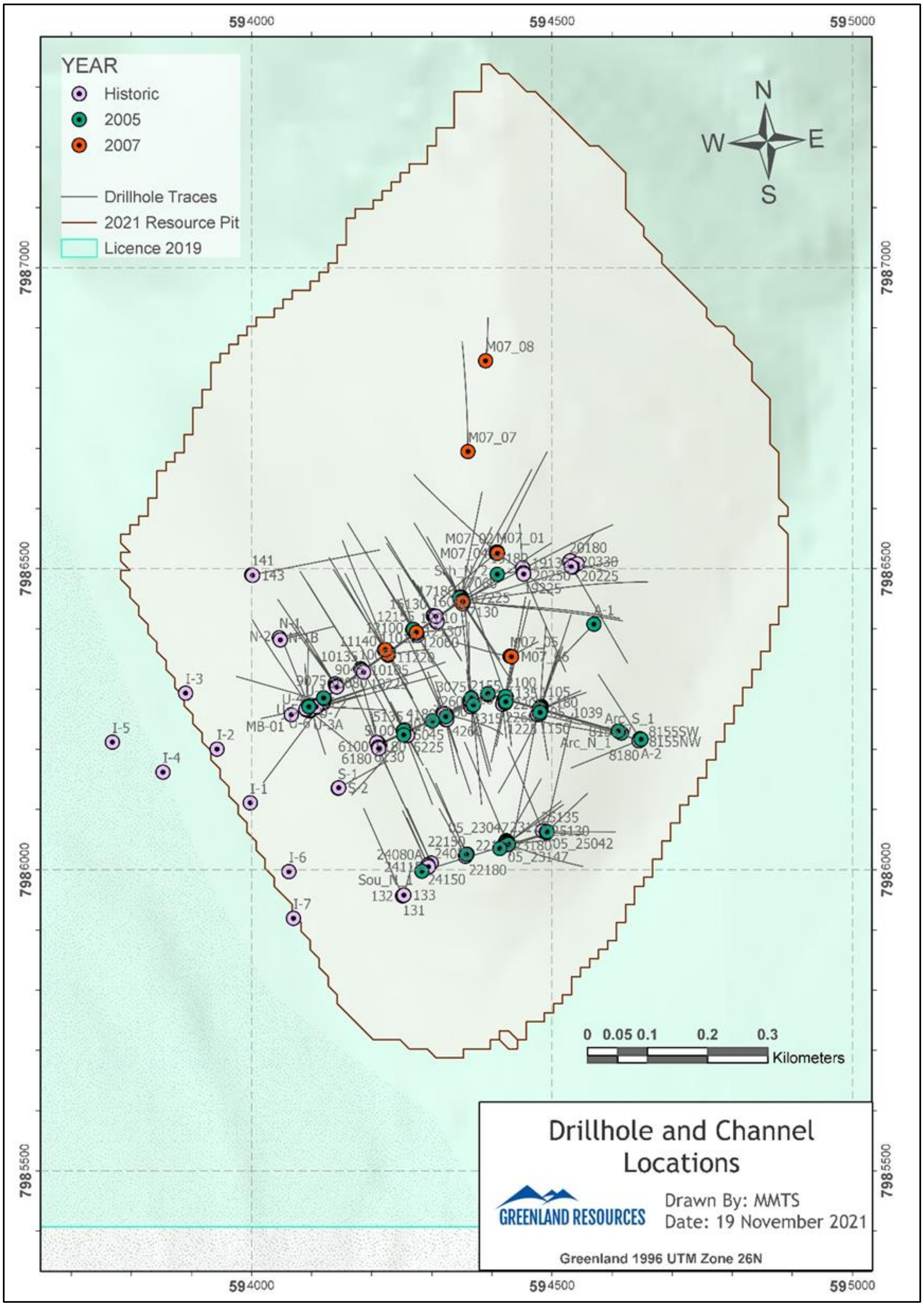


Figure 10-1: Drill Hole and Channel Locations

10.1 Historic Drilling by Nordisk and Amax

A total of 147 holes for 22,284 m are recorded in the database from exploration between 1959 and 1979. Most of the holes were drilled from underground by conventional equipment. Core size was not recorded but from site investigations it appears to have been approximately equivalent to AX (3.5 cm) or BQ (4.0 cm). Collar surveys and acid dip-tests were carried out for the holes, but no downhole azimuth measurements are available in the GEUS archive.

10.2 2005 Drilling by InterMoly

The 2005 drilling included 31 diamond drill holes drilled underground from the 3 adits for 4,988 m. The program was intended as confirmation of the historic drilling, as well as collection for metallurgical and geotechnical data and in-fill gaps of the earlier drilling. 5 holes were twinned to historic holes and the results are discussed in Section 12.0, 20 holes were standard NQ2 (5.05 cm) core drilled for resource estimation only, 5 holes were PQ (8.5 cm) core drilled for metallurgy as well as resource estimation, and 6 holes were NQ3 (4.5 cm) with triple walled core tube drilled for geotechnical data as well as resource estimation. Drilling was carried out by Heath and Sherwood Drilling Inc., of Kirkland Lake, Ontario, using two Boyles 15A underground rigs.

InterMoly also collected 10 diamond saw cut channel samples along both ribs of the development headings for a total of 1,824 m. Channel samples volumes approximated an NQ hole volume by making parallel cuts approximately 3 cm apart to form a slot approximately 0.5 m to 1.0 m above the floor of the drift. Samples were chipped out in 3 m intervals using a hammer and maul. The QP inspected the channels and determined that the sampling was performed in a manner consistent with industry standards.

The 2005 program was successful in confirming the results of the historic drill programs. MoS_2 mineralization was intersected in most of the holes with grades and distribution similar to that encountered in the historic drilling.

10.3 2007 Drilling by Quadra

17 NQ2 holes were drilled in 2007 for a total of 4,218 m. Drilling was from surface by Geotech Drilling of Prince George, British Columbia and underground by Heath and Sherwood of Kirkland Lake, Ontario. The surface holes were testing for material captured in the preliminary pit design, just outside of the interpreted Project boundary. The underground holes were primarily testing for extensions of higher grade material on the northeast margin of the Project.

For both surface and underground, core recovery was excellent, averaging better than 95% and usually better than 97%. Rock quality was observed to be very good with relatively few broken zones. Drill hole collars were surveyed and a majority subject to downhole surveys with a Reflex or Icefield instrument. Some holes were surveyed at 50 m downhole intervals and some had only one reading taken at the bottom of the hole. Both instruments take measurements based on magnetics and are therefore susceptible to errors in the presence of magnetic materials, however the Icefield tool included a magnetometer to help detect anomalous magnetic field effects. The downhole surveys showed slight to moderate deflections and any measurements deemed as clearly spurious were discarded (Rennie, 2007).

11.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

11.1 Historic Sampling Programs

The sample preparation protocols used historically are not available to the QP and are not described in any provided reports; however, some information is available by inspection of the database and the historic core seen during the site visit as discussed in Section 12.0. During the pre-2005 drilling, sampling was primarily conducted on 10 m intervals of split core. It does not appear as though breaks were made in the sampling for changes in lithology. Remnants measuring less than 10 m at the end of the holes were sometimes samples at that remaining interval and sometimes combined with the preceding 10 m sample.

During the early drill programs, samples were analyzed on site using a colorimetric method, an accepted method at that time. QAQC protocols are also not described in any available reports and may or may not have been applied. Rennie (2018) reports that a number of duplicate analyses were carried out at commercial laboratories in Germany and Golden, Colorado, however these results are not available to the QP for review.

A discussion of site security during this period is not available, however the site is very remote with very limited and restricted access.

11.2 2005 and 2007 Sampling Programs

All drill core from the underground program was logged noting rock-types, alteration, structure, and mineralization. Samples were cut by diamond core saw at site. From site, samples were flown to Iceland and then to Acme in Vancouver, B.C. for sample preparation and analysis. Acme, now Bureau Veritas, is an independent laboratory holding ISO 9001 accreditation.

QAQC samples of blanks, field duplicates, and CRMs were included in the sample stream at the planned rate of 1:30 for each. The CRM used was provided by WCM Materials of Vancouver, BC and known as MM-1. Duplicate pulps at the rate of 1 in every 30 were also submitted to International Plasma Labs Ltd. (IPL) in Vancouver for check assays.

Sample analysis was done by ICP spectrophotometry following 4-acid digestion. Additionally, every 10th sample was subjected to whole rock analysis as well as 36 element ICP.

Specific gravity measurements were taken from 10 cm to 15 cm samples approximately every 50 m in 2005 drill holes, 15 m in 2005 channel samples, and 90 m in 2007 drill holes.

11.3 Quality Assurance and Quality Control 2005-2007

QAQC data were obtained from InterMoly archives on 10 August 2021 and provided from GRI on 23 August 2021. The total number of QAQC samples to include blanks, duplicates, and CRMs available in the provided databases is given in Table 11-1, which shows the overall rate of included QAQC samples to be 6.8%, somewhat lower than the current recommended rate of 12.5%, and lower than the intended rate of 10%. The lower rate is affected by the fact that duplicates and blanks were not included in the channel samples, and CRMs were not included in the 2007 drilling.

Table 11-1: QAQC Sample Summary

Year	Primary Samples	Blanks	CRMs	Duplicates	% QAQC samples
2005	2,194	52	80	50	7.7%
2007	1,237	33	0	35	5.2%
Total	**3,431**	**85**	**80**	**85**	**6.8%**

11.4 Blanks

The database contains 85 blanks included blindly in the 2005 and 2007 drilling. The Mo assay results of these are compared to the DL of 0.001% for Mo in the 4-acid digestion with ICP-ES test. Of these only one sample fails at the 5*DL level and none at the 10*DL as shown in Table 11-2.

Table 11-2: Summary of Blanks 2005-2007 Results

Year	Samples	Fails at 5*DL	% Fail at 5*DL	Fails at 10*DL	% Fail at 10*DL
2005	52	1	1.9%	0	0.0%
2007	33	0	0.0%	0	0.0%
Total	**85**	**1**	**1.2%**	**0**	**0.0%**

A plot of the assays in order of year and sample number is given in Figure 11-1 and shows the single failure at the 5*DL level. The results are not indicative of contamination the Mo assays.

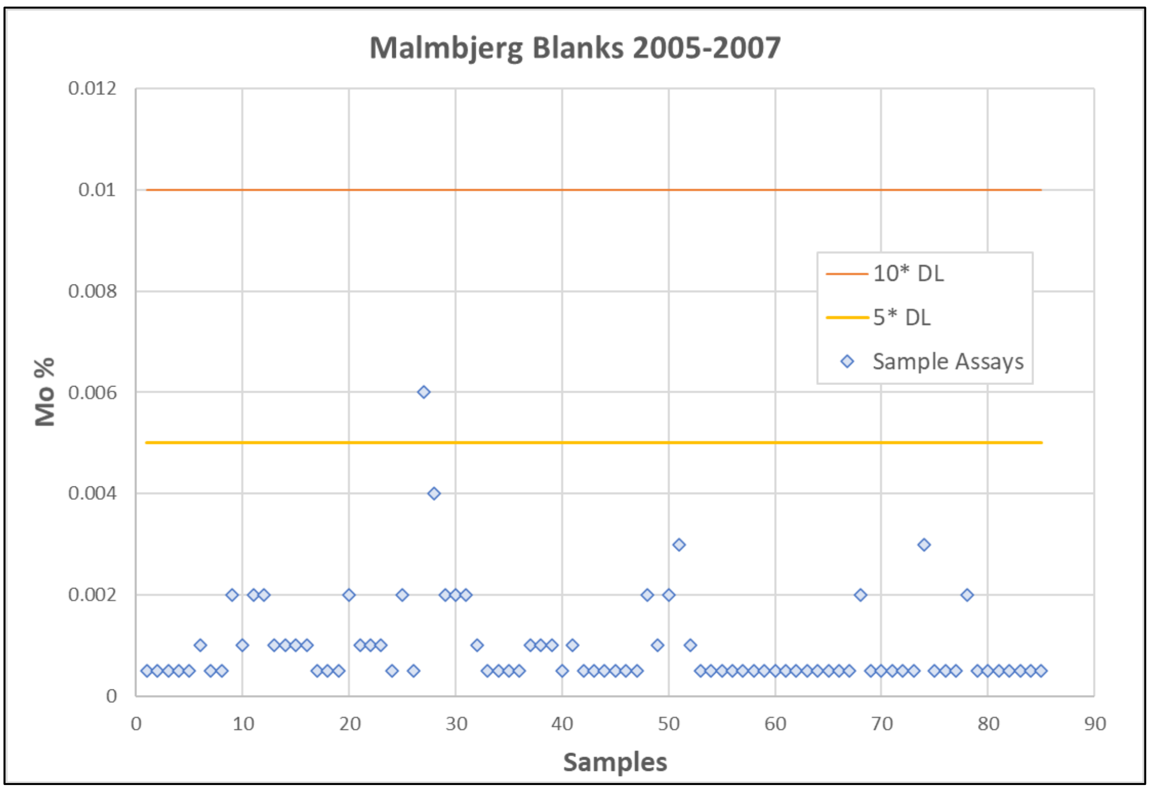


Figure 11-1: Malmbjerg Blanks 2005-2007 (MMTS, 2021)

11.5 Certified Reference Materials

Only one CRM was included in the 2005 drilling, material MM-1 provided by WCM Materials of Vancouver, BC. MM-1 has an expected value of 0.116% Mo, with standard deviation of 0.005.

There are 80 documented samples of CRM MM-1 included in the 2005 drilling. There are sample numbers for CRM samples in the 2007 drilling submittals, however, the laboratory certificates indicate that no samples were received; apparently the samples were not included despite good intentions.

The process control chart for CRM MM-1 in 2005 is given in Figure 11-2 in order of certificate number and sample number. The mean of the CRM assays is slightly below the expected value and there appears to be an overall decreasing trend. It shows no samples at the warning or failure level. There are nine samples in the CRMs from three different certificates with notes indicating they are re-assays. On one of these pairs of certificates it is clear that the original values for MM-1 are in the failure range indicating the QAQC samples were properly monitored and re-assays were completed when required.

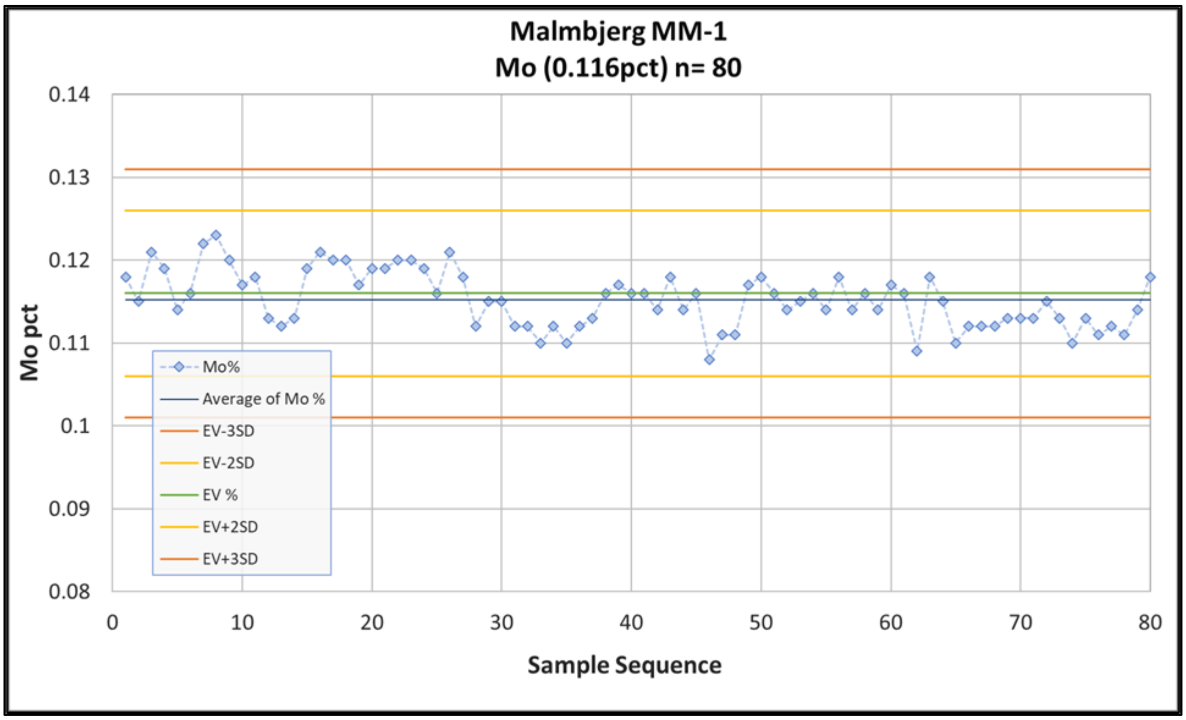


Figure 11-2: Malmbjerg CRM MM-1 (Mo = 0.116%) (MMTS, 2021)

11.6 Duplicates

There are 85 pairs of quarter-core field duplicates collected from drilling in 2005-2007. The simple statistics of these are given in the table below and show little difference in average value.

Table 11-3: Statistics of Quarter-Core Field Duplicates Collected from Drilling in 2005-2007

Duplicate Pairs	Average of Mo % (D1)	Average of Mo % (D2)	Std. Dev. Of Mo % (D1)	Std. Dev. Of Mo % (D2)
85	0.091	0.090	0.076	0.069

A scatter plot of all duplicates pairs is given in Figure 11-3 and shows good agreement between sets with a small positive bias to the primary assay set (D1).

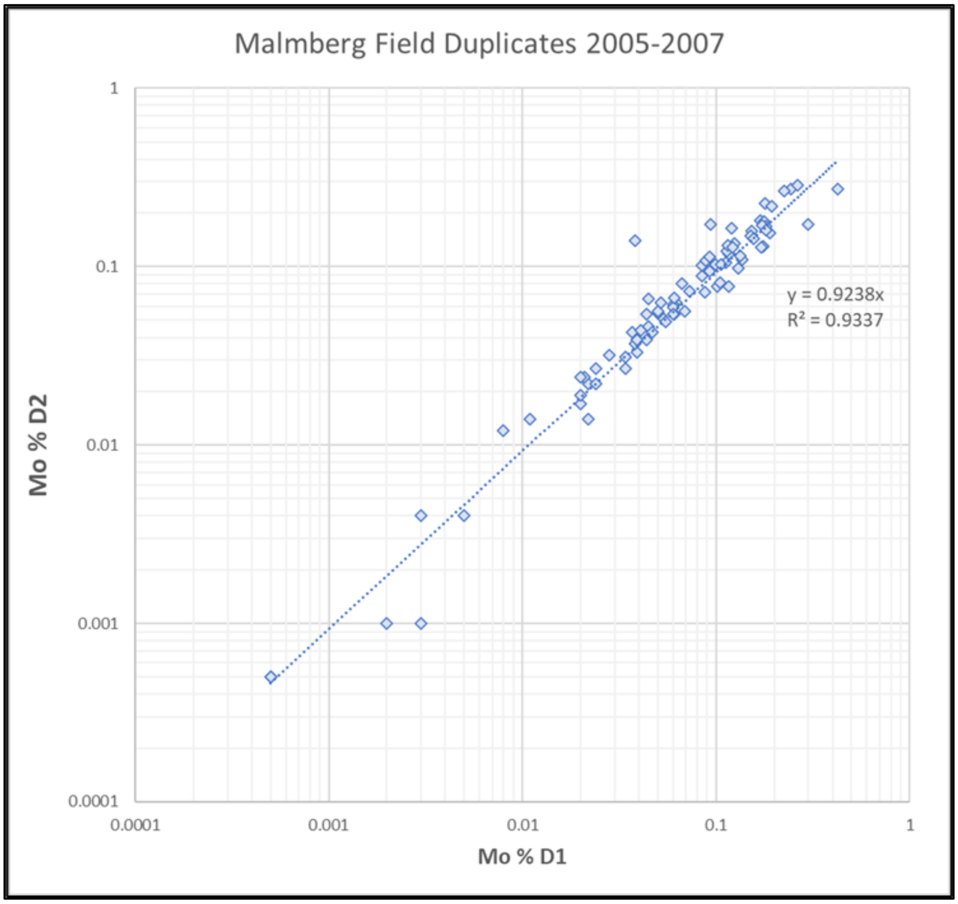


Figure 11-3: Malmbjerg Field Duplicates, All (MMTS, 2021)

This bias is influenced by two outlier pairs and when these are excluded a 1:1 slope with high R-squared value results as shown in Figure 11-4.

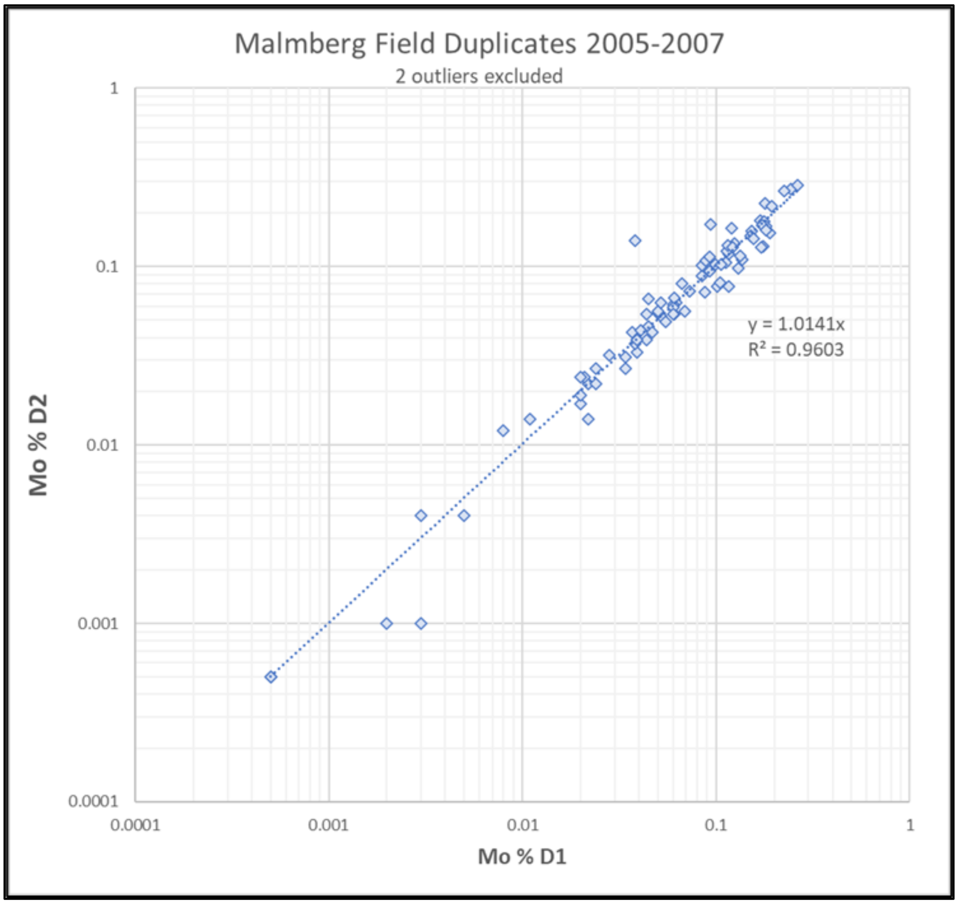


Figure 11-4: Malmbjerg Field Duplicates, Outliers Excluded (MMTS, 2021)

Analysis of the HARD values show that 70% have less than 10% HARD, indicating acceptable field duplicates and a relatively homogenous mineralization.

11.7 Conclusions

Upon review of the sampling, preparation, analysis, and QAQC program at Malmbjerg, the QP concludes the following:

- The sampling, analysis, and security programs are appropriate for resource estimation.
- The analysis of the QAQC samples indicate the analyses are of acceptable accuracy, show a reasonable QAQC program was in place at the time of drilling, and do not give indication of contamination or other errors in laboratory processing.
- The inclusion rate of QAQC samples is lower than current industry standards. For any future drilling, it is recommended that in each batch of 40 samples, QAQC samples comprise two CRMs of different grades, one field duplicate and one preparation duplicate, to comprise 12.5% of the total sample database.

12.0 DATA VERIFICATION

12.1 Site Visit

Sue Bird, a QP according to NI 43-101 guidelines, visited the Malmbjerg Project from 16 August to 23 August in 2021 and verified previous drilling, the geologic interpretation, and the limits to the open pit resource boundaries, which at Malmbjerg is the lateral proximity to the two bounding glaciers. To verify the drill hole database, a total of nine samples were collected on the site visit from two core storage areas for a total of 96 m of core. These were shipped to Bureau Veritas (Acme Labs) in Vancouver, Canada in which results confirmed the historic drilling grades. In addition, verification of the historic drillhole collars in the Arcturus and South adits was completed and documented. The underground channel samples used for the resource estimate were confirmed to be consistent with sampling appropriate for resource estimation along the entire length of the adits. Field observations of the mineralized zone were made, and the geologic interpretation used in the resource modelling was verified. In addition, survey points were taken to adjust the effect the lateral extents of the glaciers had on the limiting resource shell used for the Resource Statement.

Hassan Ghaffari, a QP according to NI 43-101 guidelines, conducted a personal inspection of the Malmbjerg Property from 16 August to 23 August 2021 and inspected the overall Project site.

12.2 Database Verification Performed by the QP

The assay database was provided by the client in August 2021. It was checked when it was loaded into MineSight for geological and grade modeling. There were no rejected data, no missing or zero depth surveys, and no overlaps.

The total number of assay samples in the database, and the percentage and length of sampled intervals is given by year in Table 12-1. Because 66% of the data available for modeling are not supported by certificates or QAQC, it is important that the historic data be validated from multiple angles, including statistically and in comparison, to modern assay results.

Table 12-1: Percent of Samples and Assayed Length by Year

Year	Samples in Database	Total Length of Sampled Intervals (m)	% By Length
Historic	2,023	20,024.81	66%
2005	2,194	6,571.20	22%
2007	1,237	3,624.17	12%
Total	5,454	30,220.18	100%

12.3 Certificate Checks and Database Corrections

The original certificates in .pdf file format were obtained from Bureau Veritas for the Mo assays in the database from assays by Acme in 2005 and 2007. All assays above cut-off grade of 0.08% Mo were checked, comprising greater than half the assays for which certificates are available. There were 1,644 assay certificates checked and no errors were discovered.

The following corrections are noted to the database:

- 592 values from channel samples in the adits had no sample or certificate numbers attached. These were updated using 2005 Access database (malmbjerg.mbd) provided by the client for sample numbers and Channel Samples_interval.xls for the certificate numbers.
- The certificate number in database reading A25081R is corrected to be A502581R.

12.4 2005 IPL Check Assays

Although the QAQC program indicates 1 in 30 pulp samples were sent to IPL for outside laboratory check assays in 2005 and 2007, only samples from 2005 were available to MMTS. The simple statistics of the 69 duplicate pairs assayed by both the primary laboratories, Acme, and IPL are given in Table 12-2. The mean of the Acme results is approximately 4% higher than the mean of the IPL results.

Table 12-2: 2005 IPL Check Assays

Number of Samples	Acme Avg Mo%	IPL Avg Mo %	Acme Std. Dev. Mo%	IPL Std. Dev. Of Mo%
69	0.124	0.119	0.077	0.072

A scatter plot of duplicate pairs is given in Figure 12-1 and shows reasonable correlation between the pairs with an excellent R-squared value. The slope slightly below 1:1 confirms the slightly higher results in the Acme analyses. There are 97% of pairs with less than 10% HARD, exceeding the expectation of 90% for pulp duplicates. The QP does not find the slight high bias to the Acme results to be of great concern, and the Acme assays have been shown to be of acceptable accuracy based on CRM analysis in the previous section.

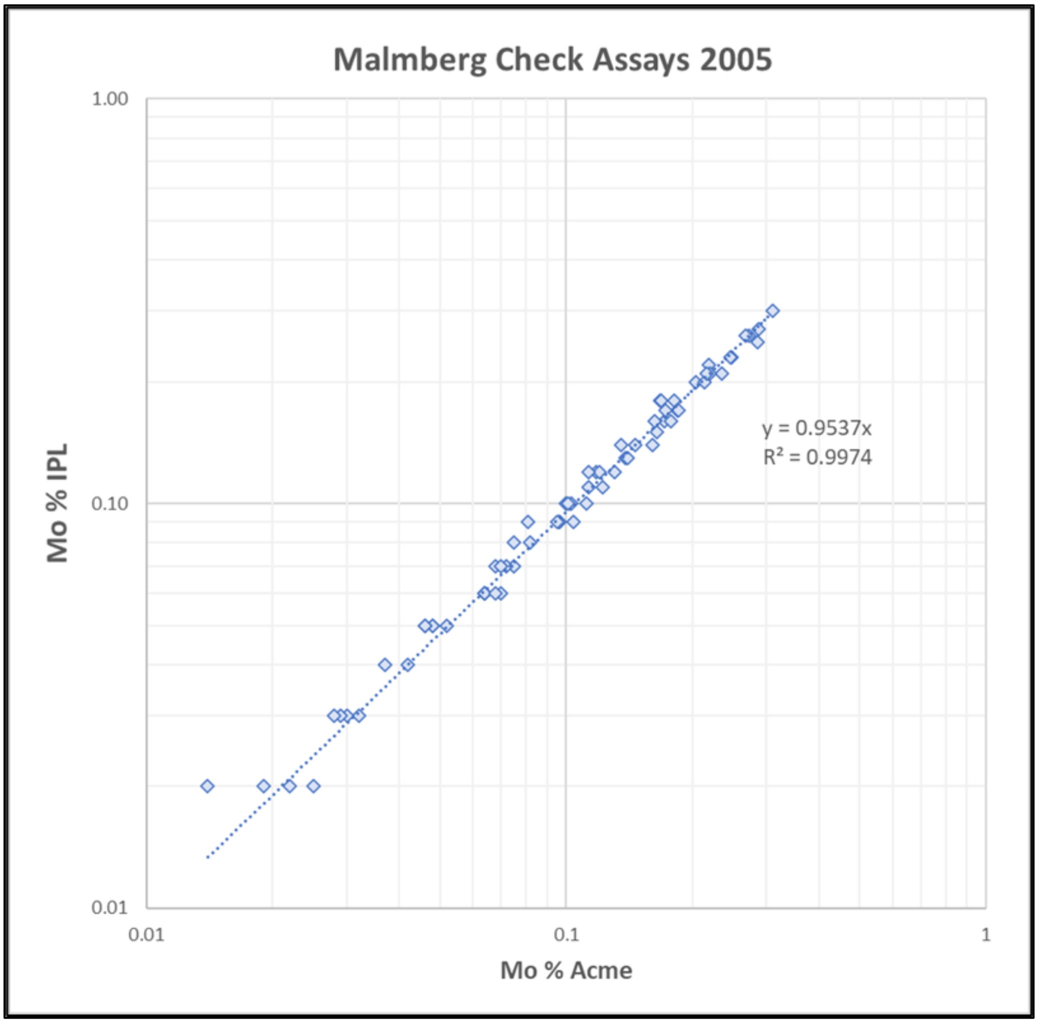


Figure 12-1: 2005 IPL Check Assay Scatter Plot (MMTS, 2021)

12.5 2005 GEUS Pulps Re-Assays

In 2005, InterMoly collected 131 pulps from the historic sampling and had them assayed for comparison to the historic data. Initially the assays were done with Aqua Regia digestion, but based upon a significant low bias, the samples were re-assayed using 4-acid digestion followed by ICP analysis (Rennie, 2018).

19 of the pulps were collected from a single hole, U-3A, and recorded as two separate 5 m halves of the 10 m interval recorded in the database. These samples were analyzed separately as a check on whether sampling half the interval on site in 2021 could yield reasonable results. The other 117 samples indicate they are from full 10 m intervals and are compared separately.

12.5.1 2005 GEUS Pulps Re-Assay Half Interval Analysis

The GEUS Pulps collected by InterMoly from pre-2005 sampling contained 19 samples from a single drillhole (U-3A) which were collected from half the interval noted in the assay database. A table of these samples and assays is given in Table 12-3 for clarity.

Table 12-3: 2005 Pulp Re-Assay Half Interval Samples

Half Interval Pulp Re-assay Sample	1960s Assay Interval	1st or 2nd Half	Mo (%) (2005)	Mo (%) 1960s (Assay Database)
U-3A 00-5 m	U-3A 0-10 m	1	0.138	0.156
U-3A 05-10 m	U-3A 0-10 m	2	0.192	0.156
U-3A 10-15 m	U-3A 10-20 m	1	0.16	0.216
U-3A 15-20 m	U-3A 10-20 m	2	0.237	0.216
U-3A 20-25 m	U-3A 20-30 m	1	0.335	0.282
U-3A 25-30 m	U-3A 20-30 m	2	0.247	0.282
U-3A 30-35 m	U-3A 30-40 m	1	0.25	0.228
U-3A 40-45 m	U-3A 40-50 m	1	0.247	0.222
U-3A 45-50 m	U-3A 40-50 m	2	0.24	0.222
U-3A 50-55 m	U-3A 50-60 m	1	0.222	0.18
U-3A 55-60 m	U-3A 50-60 m	2	0.175	0.18
U-3A 60-65 m	U-3A 60-70 m	1	0.313	0.24
U-3A 65-70 m	U-3A 60-70 m	2	0.258	0.24
U-3A 70-75 m	U-3A 70-80 m	1	0.21	0.246
U-3A 75-80 m	U-3A 70-80 m	2	0.357	0.246
U-3A 80-85 m	U-3A 80-90 m	1	0.278	0.246
U-3A 85-90 m	U-3A 80-90 m	2	0.277	0.246
U-3A 90-95 m	U-3A 90-101 m	1	0.228	0.168
U-3A 95-100 m	U-3A 90-101 m	2	0.172	0.168

The simple statistics of the two half-interval sets and the entire set is given in Table 12-4 below. It is seen that there is very little difference between the means of the sets which indicates little error would be expected from sampling of half intervals. Because only one hole is considered in this analysis, this may not hold true for all mineralogies and the lithology of this hole should be considered. It is notable that the means of the 2005 assays, done by 4-acid digestion with ICP-ES finish, are approximately 9% higher than the historic assays, done by a colorimetric method.

Table 12-4: 2005 GEUS Pulps Half Interval Simple Statistics

Samples	Average of Mo (%) (2005)	Average of Mo (%) 1960s	Std. Dev. of Mo (%) (2005)	Std. Dev. of Mo (%) 1960s	Count of Mo (2005)
1st half of interval	0.238	0.218	0.062	0.040	10
2nd half of interval	0.239	0.217	0.058	0.042	9
All	0.239	0.218	0.058	0.039	19

The scatter plots of the entire set and each half interval set are given in Figure 12-2 through Figure 12-4, and it is seen that there is negligible difference in the slope of the best fit line or the R-squared value between each set.

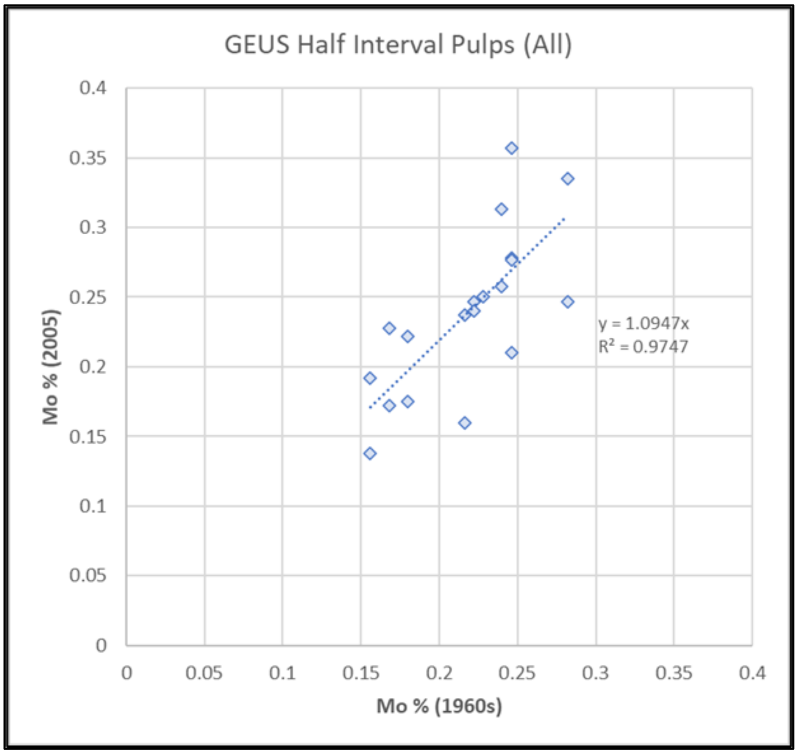


Figure 12-2: 2005 GEUS Pulps Half Interval (All) (MMTS, 2021)

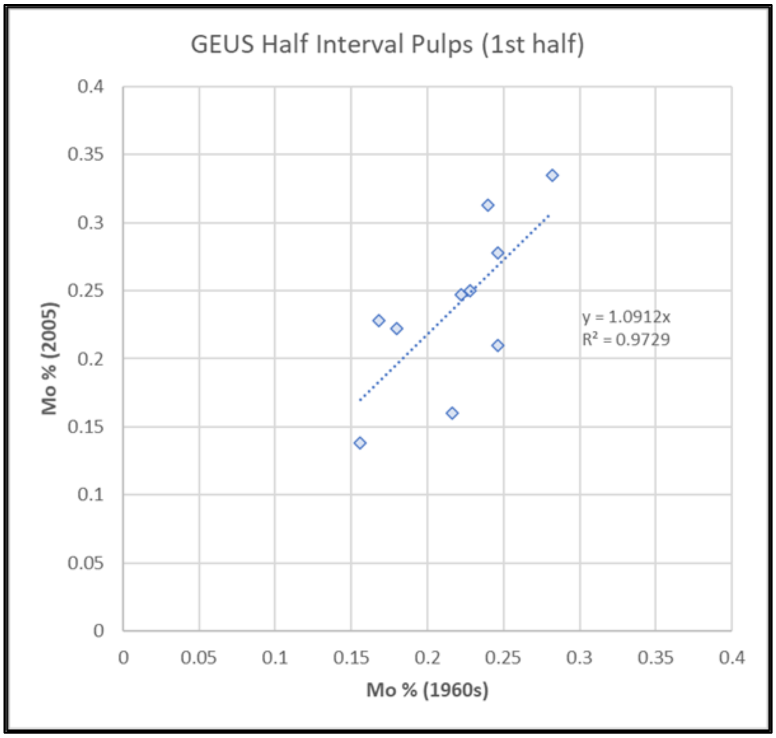


Figure 12-3: 2005 GEUS Pulps Half Interval (1st Half) (MMTS, 2021)

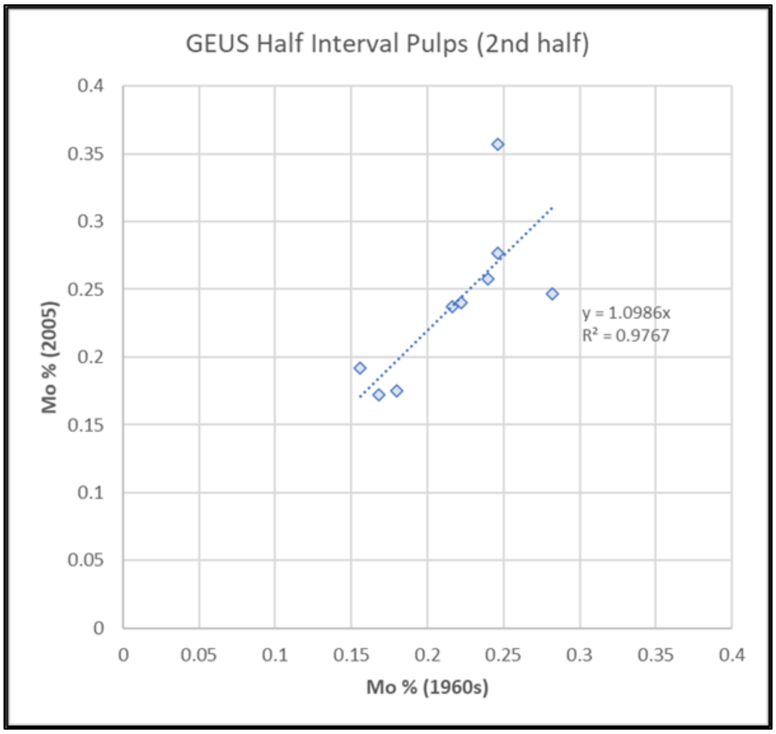


Figure 12-4: 2005 GEUS Pulps Half Interval (2nd Half) (MMTS, 2021)

12.5.2 2005 GEUS – Full 10 m Pulps Re-Assays

There are 117 samples of pulps identified as 10 m intervals matching the 10 m intervals in the database re-assayed in 2005. The simple statistics of the duplicate pairs is given in Table 12-5. For this set the mean of the historic data is approximately 5% higher than the 2005 re-assays.

Table 12-5: 2005 GEUS Pulps Re-Assay Simple Statistics

Number of Pairs	Average of Mo (%) 1960s	Average of Mo (%) (2005)	Std. Dev. of Mo (%) 1960s	Std. Dev. of Mo (%) (2005)
117	0.163	0.156	0.067	0.076

A scatter plot of the duplicate pairs is given in Figure 12-5, the slope slightly less than 1 confirms the lower results in the 2005 assays. The R-squared value is good.

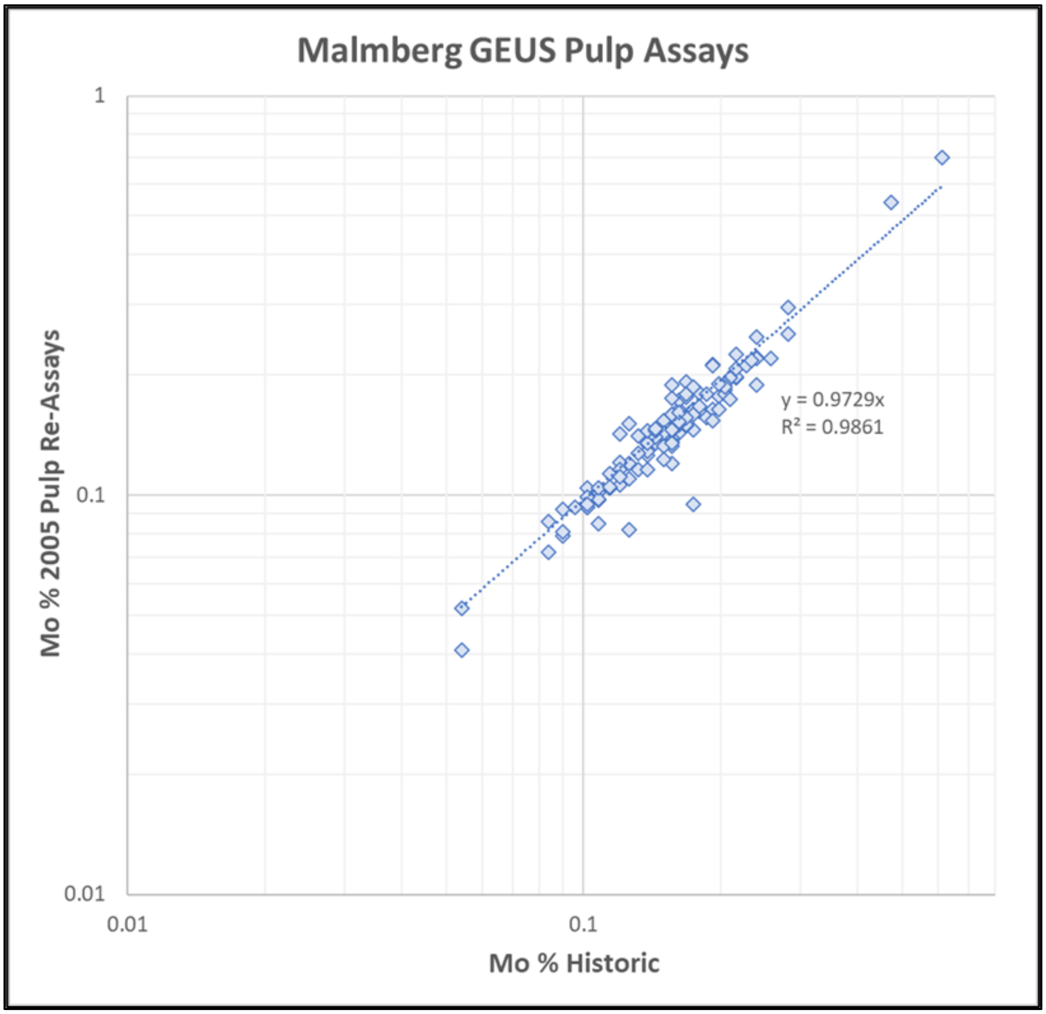


Figure 12-5: 2005 Pulp Re-Assay Scatter Plot (MMTS, 2021)

Analysis of the HARD values shows 94% with less than 10% HARD which exceeds the criteria for pulp duplicates of 90%. The HARD plot is shown in Figure 12-6.

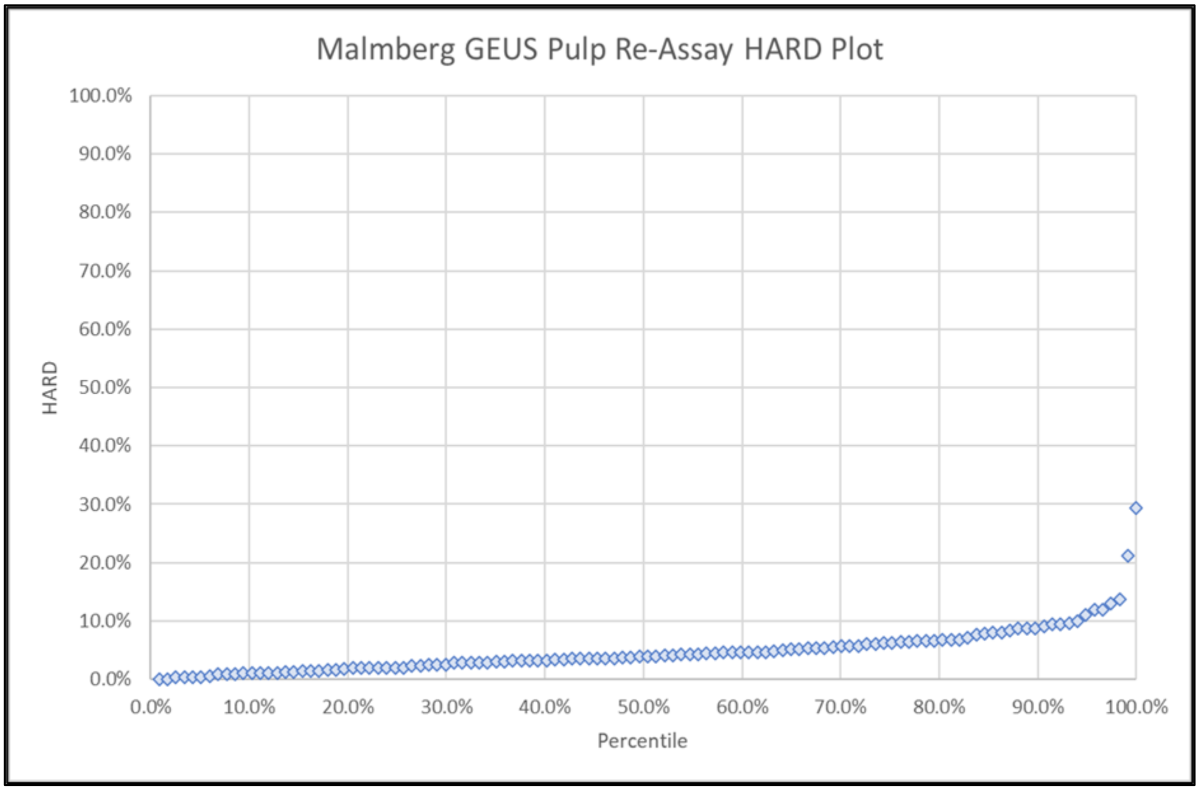


Figure 12-6: 2005 Pulp Re-Assay HARD Plot (MMTS, 2021)

12.6 2021 Core Re-Sample

Upon site visit, Sue Bird, the QP, collected quarter core samples from stored drill core for nine holes. Intervals were selected for significant Mo grades across various lithologies and domains. Although analysis of the 2005 GEUS pulp half intervals showed acceptable results for half interval comparisons, the entire length of each interval was quartered and assayed, totalling 75.7 m. The results of the laboratory analyses as compared to database assay values are presented here.

The simple statistics of the paired samples is given in Table 12-6 and shows good agreement between the weighted mean with the relative difference of the means approximately 1.4%.

Table 12-6: 2021 Core Re-Sample Simple Statistics

Number of Pairs	Average of Mo (%) Original	Average of Mo (%) 2021	SD of Mo (%) Original	SD of Mo (%) 2021
9	0.149	0.147	0.056	0.042

A scatter plot of the assay results for Mo is given in Figure 12-7 and shows the results fall generally upon the 1:1 line shown in green. The best fit line is plotted in blue and shows a nearly 1 slope with good R-squared value.

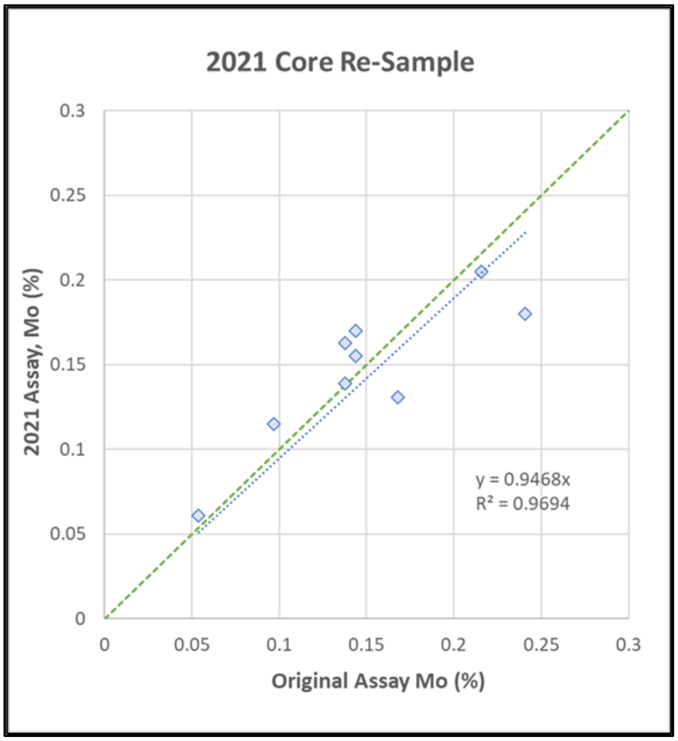


Figure 12-7: 2021 Core Re-Sample Scatter Plot, Mo (MMTS, 2021)

Analysis of the HARD statistic gives 78% with less than 10% HARD which exceeds the 70% criteria for field duplicates. The QP finds that the results of the core re-sampling are acceptable and does not indicate bias or any other issue with the assay database.

12.7 Twinned Holes

The 2005 drilling included five holes intentionally twinned to historic holes. The table of twinned holes is given Table 12-7 and shows close agreement between the collar locations. For four of the five pairs, the historic hole is significantly longer than the 2005 hole, the exception is pair 3, where the 2005 hole is 202.5 m and the historic hole is 140 m.

Table 12-7: 2005 Twinned Holes

Pair	Year	Hole	Easting UTM	Northing UTM	Elevation (m)	Length (m)
1	Historic	3135	594,365.2	7,986,284.6	801.3	230.5
	2005	05_3135	594,365.7	7,986,284.8	800.8	63.0
2	Historic	5135	594,252.4	7,986,230.7	800.3	157.0
	2005	05_5135	594,253.1	7,986,231.0	801.8	50.5
3	Historic	12155	594,271.3	7,986,397.1	717.3	140.0
	2005	05_12155	594,269.4	7,986,399.3	718.7	202.5
4	Historic	23180	594,421.2	7,986,043.6	702.9	171.5
	2005	05_23180	594,422.9	7,986,041.1	703.0	21.0
5	Historic	17155	594,347.5	7,986,452.8	717.3	270.6
	2005	05_17155	594,346.6	7,986,451.9	718.6	99.0

Plots of all pairs were made to assess the Mo assay value agreement along depth of the hole. An example of these plots is given in Figure 12-8 and shows that for the pair 5135 (historic) and 05_5135 (2005) there is reasonable agreement between the pairs considering that the assay interval for the historic holes is approximately 10 m and the interval for the 2005 holes is generally 3 m.

Figure 12-8: Malmbjerg Twinned Holes (5135s) (MMTS, 2021)

All data were filtered to include just the intervals common to both twins, for example in the previous plot, only data to 50 m depth would be considered. The simple statistics of the historic and 2005 data is given in Table 12-8 below. The relative different of the averages is less than 7% with the 2005 assay data biased slightly high. The maximum value of 0.345% is approximately 9% higher in the 2005 data compared to 0.317% in the historic data. There are three intervals with assay values of "0" in the historic data that correspond to intervals with significant Mo values in the 2005 data. There is no way to confirm if these intervals were assayed or if they are below DL in the historical data. When these the interval pairs are excluded, the difference drops to 4.4%.

Table 12-8: Twinned Hole Assay Comparison

Drilling Year	Assay Intervals	Average Interval Length (m)	Mo % Average	Mo % Std. Dev.	Mo % Maximum	Mo % Minimum
2005	103	2.9	0.150	0.062	0.345	0.037
Historic	36	9.4	0.140	0.063	0.317	0.000

The QP concludes that the analysis of the twinned hole assay data indicates that the 2005 assays are comparable to the historic data, and that the historic data may be biased slightly lower.

12.8 Surveys

No additional surveys have been done since 2007 as described in Rennie, 2018. The QP has accepted the collar locations and survey as provided in the database. There is potential for error in the historic collar locations due to the change from mine grid to UTM in 2005, and it is recommended this be investigated in detail and corrected as necessary.

12.9 QAQC Conclusions and Recommendations

The QP concludes that:

- The historic data is acceptable based upon analysis of twinned hole analysis and re-assays.
- The channel samples are acceptable based upon point validation.
- The database is adequate and sufficient in quality for resource estimation.

The QP recommends that:

- A collar survey be done to comprise 10% of all collars with equal spatial distribution.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Introduction

The mineral resource at the Malmbjerg molybdenum deposit is Molybdenite (MoS_2) associated with a granitic intrusion into overlying sediments. Several metallurgical tests on samples from various zones of the Malmbjerg molybdenum deposit have been conducted to support the process plant design. Test programs focused on grindability tests, flotation tests, and mineralogical characterization studies conducted by SGS Lakefield Research Limited (SGS) in 2005, 2006, and 2007. The most recent metallurgical test program was conducted by Base Metallurgical Laboratories Limited (BaseMet) in 2021 and focused on assessing the effect of saltwater on metallurgical performance. Results and interpretations of these metallurgical tests are discussed in the following sections.

13.2 Test Samples

Four distinct test programs have been conducted on the samples from the Malmbjerg molybdenum deposit since 2005.

13.2.1 2005-2006 Test Samples

A total of thirty-three (33) bulk samples were collected during the 2005 drill program and were used for tests in the 2005-2006 test program. The samples weighed between 50 and 150 kg and collectively represented various locations, styles of mineralization, and rock types. The spatial distribution of the bulk samples is shown in Figure 13-1. Samples were collected by blasting from the existing underground workings and from existing NQ and PQ drill-core material. Eight (8) samples were collected near the surface to study the effect of oxidation. The samples were shipped from the drilling site to SGS Lakefield, Ontario, for testing. The rock type and head assays of all the samples are listed in Table 13-1.

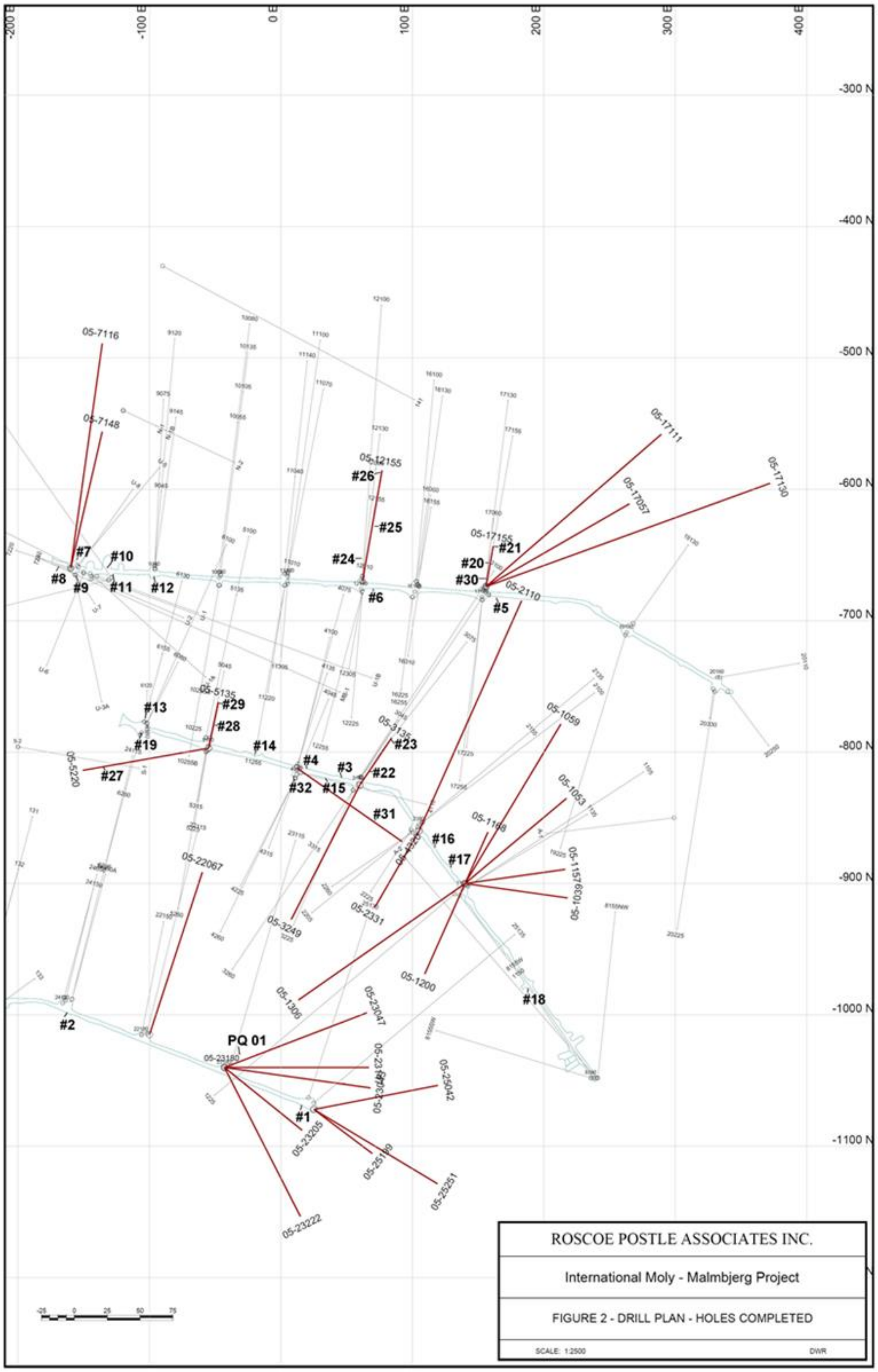


Figure 13-1: Sample Location

Table 13-1: Rock Types and Head Assays of 2005 Drill Core Samples

Sample Id	Type	Mo (%)	Fe (%)	S (%)	Cu (g/t)
BS01	Sediments	*Not available*			
BS02	Sediments	*Not available*			
BS03	Arcturus Porphyry	0.17	4.48	2.00	110
BS04	Perthite Granite	0.14	0.39	0.10	13
BS05	Perthite Granite	0.15	1.32	0.16	26
BS06	Perthite Granite	0.15	1.28	0.19	12
BS07	Perthite Granite	0.095	1.82	0.31	33
BS08	Perthite Granite	0.15	2.21	0.64	75
BS09	Perthite Granite	0.085	0.69	0.10	14
BS10	Perthite Granite	0.17	0.80	0.29	21
BS11	Perthite Granite	0.19	0.92	0.27	18
BS12	Perthite Granite	0.19	1.54	0.21	16
BS13	Perthite Granite	0.14	0.32	0.15	21
BS14	Porphyritic Aplite	0.046	4.78	2.07	200
BS15	Trachyte	0.007	1.93	0.15	< 30
BS16	Perthite Granite	0.11	4.81	3.01	140
BS17	Sediments	0.083	2.83	0.12	16
BS18	Sediments	0.025	2.68	0.21	15
BS19	Perthite Granite	0.14	0.86	0.25	18
BS20	Schuchert Porphyry	0.11	0.48	0.13	17
BS21	Schuchert Porphyry	*Not available*			
BS22	Arcturus Porphyry / Perthite Granite	0.14	0.58	0.16	< 30
BS23	Perthite Granite	0.11	0.91	0.25	25
BS24	Porphyritic Aplite	0.17	2.41	0.20	< 30
BS25	Schuchert Porphyry	0.16	0.60	0.23	20
BS26	Schuchert Porphyry	0.13	0.71	0.30	27
BS27	Perthite Granite	0.32	2.31	0.32	31
BS28	Porphyritic Aplite /Perthite Granite	0.22	0.94	0.17	15
BS29	Perthite Granite	0.12	1.41	0.23	< 30
BS30	Porphyritic Aplite	0.24	0.94	0.22	< 30
BS31	Perthite Granite	0.22	0.53	0.18	10
BS32	Perthite Granite	0.35	0.49	0.30	< 30
BS33	Porphyritic Aplite	0.17	1.06	0.21	< 30
IMPQ-1	Sediments	0.048	3.05	0.14	12

The 2005-2006 test program was divided into two phases. The objective of the Phase 1 test program was to develop the optimum global flowsheet and operating parameters to maximize molybdenum grade and recovery. The Phase 1 test program required the preparation of a master composite representative of the deposit's major rock types. This composite, named 'Master Composite 1 (MC-01)', was prepared using proportions of BS03 to BS06, as listed in Table 13-2. Late in the Phase 1 investigations, it was found that the high iron (pyrite) and sulfur content of BS03 was not representative of the deposit. The rapid mineral scan of the MC-01 sample showed the presence of chalcopyrite as the major copper-bearing mineral.

Table 13-2: Composition of MC-01

Sample Id	% Composition	Mo (%)	Fe (%)	S (%)	Cu (g/t)
BS03	12.5 %	0.17	4.48	2.00	110
BS04	12.5 %	0.14	0.39	0.10	13
BS05	50.0 %	0.15	1.32	0.16	26
BS06	25.0 %	0.15	1.28	0.19	12
MC-01	**100.0 %**	**0.15**	**1.59**	**0.39**	**31**

Numbers may not add due to rounding.

The objective of the Phase 2 test program was to assess the flowsheet developed in Phase 1 on samples and composites throughout the orebody using the remaining twenty-seven (27) samples. An additional composite, named 'Master Composite 2 (MC-02)', was also prepared after the exhaustion of MC-01 to evaluate flowsheet adjustments. The second master composite was prepared using samples in the region likely to be mined early in the mine plan. The composition of the MC-02 is listed in Table 13-3. Unlike MC-01, MC-02 did not include any sample with high iron and sulfide impurities but had a similar molybdenum grade.

Table 13-3: Composition of MC-02

Sample Id	% Composition	Mo (%)	Fe (%)	S (%)	Cu (g/t)
BS13	29 %	0.14	0.32	0.15	21
BS19	29 %	0.14	0.86	0.25	18
BS28	29 %	0.22	0.94	0.17	15
BS29	14 %	0.12	1.41	0.23	< 30
MC-02	**100.0 %**	**0.16**	**0.80**	**0.19**	**15**

Numbers may not add due to rounding.

Five (5) variability composite samples were prepared to represent distinct regions of the deposit. The blending parameters for these samples were set to make the composites of uniform rock type and moderate grade. The description of variability composite samples is presented in Table 13-4. The molybdenum grade of the variability composite samples ranged from 0.016% in VC-4 to 0.192% in VC-3.

Table 13-4: Composition of Variability Composite Samples

Composite Id	Samples Used	Mass (kg)	Mo (%)
VC-1 (Granite, Northwest region of the Deposit)	BS10	30	0.17
	BS11	32	0.19
	BS22	32	0.19
	Total	**94**	**0.18**
VC-2 (Granite, West region of the Deposit)	BS13	24	0.14
	BS19	30	0.14
	BS27	2	0.32
	BS28	30	0.22
	BS29	8	0.12
	Total	**94**	**0.17**
VC-3 (Porphyritic Apalite, North region of the Deposit)	BS30	30	0.24
	BS33	36	0.17
	BS24	28	0.17
	Total	**94**	**0.19**
VC-4 (Schuchert Porphyry, North region of the Deposit)	BS20	60	0.11
	BS25	6	0.16
	BS26	6	0.13
	Total	**72**	**0.12**
VC-5 (Granite, Central region of the Deposit)	BS22	44	0.14
	BS23	44	0.11
	BS31	6	0.22
	BS32	Trace	0.35
	Total	**94**	**0.13**

Numbers may not add due to rounding.

The Phase 1 test program details are presented in the SGS 11088-001-Report 1 (SGS, 2006a). The Phase 2 test program details are presented in the SGS 11088-001-Report 2 (SGS, 2006b).

13.2.2 2007 Test Samples

A shipment comprising 15 bulk sample bags, each weighing approximately 1 t, was received at the SGS laboratory in July 2007. The entire 15 t of the samples were blended, and a 2-t subsample was extracted and shipped to the Köppern GmbH & Co (Köppern) test facility in Freiberg, Germany, for high pressure grinding rolls (HPGR) testing. The remaining 13 t sample was stored for the metallurgical test program. The head assay for the 13-t bulk sample is shown in Table 13-5. The molybdenum grade of the 2007 bulk sample was slightly higher compared to 2005-2006 tests samples. Copper analysis was not performed on this sample.

The main objective of the test program was to confirm the flowsheet and the process metallurgy in a pilot plant environment and to provide engineering data to support an FS level process design. The test program details are presented in the SGS 11696-001-Final Report 1 (SGS, 2008). The HPGR test program details are presented in the Köppern report (Köppern, 2008).

13.2.3 2021 Test Samples

The most recent phase of testing at BaseMet was conducted in 2021 on a new master composite. In total, 18 interval samples weighing a total of 47 kg were received and combined to form a single composite. The objective of the test program was to assess the effect of saline water on the flotation of molybdenite as an alternative to using freshwater on-site or tap water in the laboratory. The head assays for the new composite are listed in Table 13-5. The molybdenum grade of the 2021 bulk sample was slightly lower compared to the 2005-2006 tests samples. Copper analysis was not performed on this sample. The test program details are presented in the BaseMet BL911 – Report 1 (BaseMet, 2021).

Table 13-5: Head Assays for 2007 and 2021 Bulk Samples

Description	Mo (%)	Fe (%)	S (%)
2007 bulk sample	0.21	1.00	0.19
2021 master composite	0.13	1.06	0.19

13.3 Mineralogy

The resource at Malmbjerg is the mineral Molybdenite (MoS_2) which is associated with a granitic intrusion into overlying sediments. Molybdenite mineralization is associated with the granite rocks-Arcturus porphyry, perthite granite and late-stage porphyritic aplite and their sediments. Intense silica alteration is pervasive throughout the deposit and essentially controls the physical characteristics of the rock.

13.3.1 Composite and Variability Samples

A Rapid Mineral Scan (RMS) was performed on the MC-01 sample in 2005 to generate an overall diagnosis of the mineral constituents of the sample and indications on liberation and mineral associations. The results indicated that the sample mainly contains non-opaque minerals (e.g., silicates) with minor amounts (1% to 5%) of pyrite, pyrrhotite, and magnetite, and trace amounts (less than 1%) of molybdenite, wolframite, chalcopyrite, sphalerite, and hematite. The grain size for the major constituent minerals is over 80 µm, and between 40 to 80 µm for most minor minerals, including molybdenite.

QEMSCAN™ analysis was conducted to quantify the sample's constituents accurately and obtain detailed grain sizes and liberation information.

Bulk Modal Analysis (BMA) was conducted on the four constituent samples of the MC-01 (BS03 to BS06) to generate a mineralogical breakdown of each constituent. Each of the four samples was ground to a K_{80} particle size of approximately 200 µm and split into two size fractions of +75 µm and – 75 µm. The BMA results indicated that BS04, BS05, and BS06 samples have similar compositions with about 50% quartz and 45% feldspar. The remaining 5% mainly consists of other Non-Sulphide Gangue (NSG) minerals such as amphibole and mica. BS03 sample is the dominant source of sulphide minerals in the MC-01 (namely 5% sulphides by mass), of which pyrite is the most significant at 4.2% by mass. BS03 also contains much less feldspar (approximately 10%) and about 17% fluoride minerals compared with samples BS04, BS05, and BS06. The fluoride minerals could be potentially problematic if it reports to the concentrate during the processing stage. The remainder of the sample consisted of other aluminum silicate gangue minerals.

The Malmbjerg MC-01 was ground to about 200 µm, separated into +53 µm and -53 µm fractions, and submitted for QEMSCAN™ Trace Mineral Search (TMS) analysis. Over 1,000 molybdenum-containing particles were found and mapped. It was noted that the QEMSCAN™ calculated grade matched that of the head assay (0.15% Mo), giving the results a high degree of statistical confidence. The analysis indicated that molybdenite is present in a bimodal distribution with about 51% of the molybdenite classified as "free" (more than 80% liberation) and about 26% of the molybdenite as "locked" (less than 20% liberation), as shown in Figure 13-2. The remaining molybdenite has a liberation value between 20% and 80%. Most molybdenum associations are with quartz, feldspar, and mica, with very few associations with other sulphide minerals. The mineralogical results conclude that a coarse primary grind (about 200 µm) followed by a moderately fine regrind (about 30 µm) should yield satisfactory results.

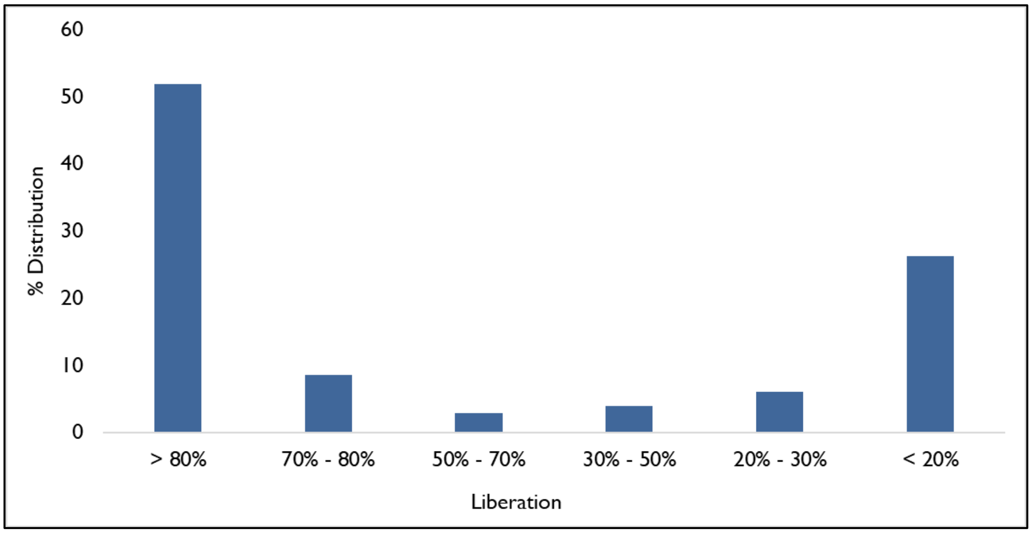


Figure 13-2: Molybdenite Distribution vs. Liberation in MC-01

A QEMSCAN™ study was also conducted on all the variability samples. In addition to the BMA, a TMS was performed on each sample to generate data on the molybdenite content of the samples.

The BMA indicated that quartz and feldspar are the dominant species throughout the deposit, comprising between 70% and 95% of each tested sample. Samples BS15 and BS17 contain less quartz and more feldspar than other samples. Pyrite is the major sulphide mineral with occasional trace amounts of sphalerite and galena. The samples also contain minor quantities (between 2% to 10%) of amphiboles and mica/clay minerals. The final major (between 1% and 20%) mineral group is the one containing the fluoride-bearing minerals, namely fluorite, topaz, and gearksutite. BS14 sample has the highest quantity of fluoride minerals (about 20%), and BS7, BS8, and BS27 contain 5 to 7% fluoride minerals.

The TMS analysis generated the liberation information for all the variability samples. Results showed that most samples contain molybdenite with 50% to 85% liberation. Samples BS14 and BS15 contain no liberated molybdenite. The molybdenite present in BS14 is over 90% locked and the remaining as sub-middling. The BS14 sample is also highly oxidized. The molybdenite present in BS15 is 95%

middling, with only 5% locked or sub-middling. The head grade of the BS15 sample is only 0.007% Mo, and it would be considered an outlier. Other samples containing over 50% of molybdenite in the locked form are BS8, BS11, BS12, BS28, and BS33. Further flotation testing on these variability samples revealed high molybdenum recovery (over 85%) for these samples, indicating that the grinding process would liberate the molybdenite mineral from gangue and will not have any adverse effect on overall processing recovery.

The most common associated mineral class with molybdenite are the hard NSG minerals: quartz, feldspar, amphibole, and trace iron and titanium oxides. The molybdenite-pyrite associations are sporadic, with BS14 and BS17 containing significant quantities (up to 12%) and BS8, BS12, BS16, BS18, and BS25 containing minor quantities (less than 1%). Only a few samples, especially BS8 and BS11, contain molybdenite-fluoride associations (up to 10%).

The QEMSCAN™ BMA was also conducted on the 2021 master composite sample. Table 13-6 shows that molybdenite and pyrite are the main sulphide minerals, with quartz, feldspar, and plagioclase as major non-sulphide gangue minerals.

Table 13-6: Mineral Abundance Summary of 2021 Master Composite

Mineral	2021 Master Composite
Molybdenite (%)	0.26
Pyrite (%)	0.11
Other sulphides (%)	0.04
K-Feldspar (%)	30.8
Plagioclase (%)	11.1
Quartz (%)	46.7
Sericite/Muscovite (%)	3.24
Biotite (%)	1.28
Chlorite (%)	0.71
Clays (%)	2.50
Other silicates (%)	0.65
Oxides (%)	0.72
Carbonates (%)	0.68
Fluorite (%)	0.79
Others (%)	0.40
Total (%)	**100.00**

Numbers may not add due to rounding.

13.3.2 Flotation Test Products

A mineralogical analysis was also conducted on locked cycle flotation test products to understand the association of gangue minerals with molybdenite in concentrate and tailings samples. An X-ray diffraction (XRD) analysis of the cleaner concentrate from a batch flotation test showed quartz and calcite as minor minerals.

QEMSCAN™ mapping on locked cycle test products was also conducted to estimate the quantity of liberated gangue and molybdenite-associated gangue. The results from the QEMSCAN™ modal analysis of the final cleaner concentrate and second and third cleaner tailings from the locked cycle flotation test are presented in Table 13-7. The results showed that the predominant gangue minerals in the concentrate are sulphide minerals (about 8%), especially pyrite and sphalerite, and quartz (3.1%). The remaining diluents are other assorted aluminum silicates, carbonates, and iron oxides.

Table 13-7: Modal Analysis of Products from Locked Cycle Flotation Test on MC-01

Mineral	Final Concentrate	Third Cleaner Tails	Second Cleaner Tails
Molybdenite (%)	86.52	20.69	5.63
Pyrite (%)	4.82	22.68	12.66
Copper sulphides (%)	1.01	1.44	0.32
Galena (%)	0.89	0.44	0.17
Sphalerite (%)	2.13	1.12	0.52
Other sulphides (%)	0.01	0.25	0.15
Feldspars (%)	0.33	8.14	23.32
Amphiboles (%)	0.09	7.62	4.60
Quartz (%)	3.10	14.28	29.10
Mica or clays (%)	0.23	8.92	11.41
Carbonates (%)	0.33	11.30	9.07
Sulphates (%)	0.14	0.37	0.30
Phosphates (%)	0.00	0.01	0.01
Fe and Mn oxides (%)	0.31	2.38	2.39
Ti oxides (%)	0.03	0.19	0.28
Others (%)	0.08	0.17	0.09
Total (%)	**100.00**	**100.00**	**100.00**

Numbers may not add due to rounding.

It was found that the molybdenite-gangue association in the final concentrate is minimal (about 3.1%), with the molybdenite-NSG association being the highest at 1.7%. About 13.4% of the final concentrate is gangue minerals, and it is split evenly between NSG, pyrite, and other sulphide minerals. The NSG is predominantly quartz (about 67%) with lesser feldspar, amphibole, mica, various trace oxide, and carbonate minerals. The NSG most likely entered the concentrate through entrainment and would be rejected in the cleaner column flotation stages if cleaner flotation were used during testing. The test results confirmed that the micaceous minerals would not be a problem in the final concentrate, which, because of the flakey nature of the particles, would have a natural tendency to be concentrated into the final flotation concentrate.

A mineralogical study was also conducted on pilot-plant flotation test products from the 2007 test program to establish suitable upgrading conditions for the column flotation tests. Two size fractions (+37 µm and -37 µm) of the first cleaner concentrate product were examined. The mineralogical results are summarized in Table 13-8.

The +37 µm sample consists mainly of NSG, molybdenite, and trace to minor amounts of chalcopyrite, covellite, digenite, sphalerite, tetrahedrite, Fe-Ti-oxides, and –oxy-hydroxides. The -37 µm sample consists mainly of molybdenite, less NSG minerals, and trace to minor amounts of chalcopyrite, covellite/digenite, enargite, tetrahedrite, sphalerite, pyrite, pyrrhotite and marcasite, as well as Fe-Ti-oxides and oxy-hydroxides.

Table 13-8: Mineral Assemblage in the First Cleaner Concentrate

Mineral	+ 37 µm (+ 400 mesh)	- 37 µm (- 400 mesh)
Molybdenite (%)	25	70
Chalcopyrite (%)	< 0.5	< 0.5
Covellite/Digenite (%)	< 0.5	< 0.5
Bornite (%)	Trace	--
Tetrahedrite (%)	Trace	Trace
Enargite (%)	--	Trace
Sphalerite (%)	< 0.5	Trace
Pyrite (%)	~ 3	< 3
Pyrrhotite (%)	Trace	Trace
Marcasite (%)	--	Trace
Fe-Ti-oxides and –oxy-hydroxides (%)	< 0.2	< 0.2
NSG (%)	70	26

The liberation of molybdenite is good to excellent, namely over 88% in the +37 µm size fraction and over 99% in the -37 µm size fraction. Molybdenite formed middling particles with NSG minerals, rarely with pyrite and occurred as minor inclusions in NSG minerals in the +37 µm size fraction. The main gangue minerals include pyrite and NSG minerals. The liberation of copper minerals is over 75% in both samples. The results conclude that the final product cleaner concentrate requires a regrind to a particle size P_{80} of 30 µm (100% passing less than 50 µm).

13.4 Comminution Test Program

Grindability tests, including BMW_i, RMW_i, Bond abrasion index (A_i), and SAG mill comminution (SMC) tests, were conducted on samples submitted for testing in 2005. Julius Kruttschnitt (JK) drop weight tests were performed on three composite samples as part of the variability study. The constituents of the composite samples are listed in Table 13-9. A summary of the grindability test results is presented in Table 13-10.

Table 13-9: Constituents of the Composite Samples Used for the JK Drop Weight Test

Composite Name	Ore Type	Constituents
Comp A	Perthite Granite	BS29 (50%) + BS32 (50%)
Comp B	Porphyritic Aplite	BS24 (50%) + BS30 (50%)
Comp C	Schuchert Porphyry	BS20 (100%)

13.4.1 Rod and Ball Milling

As presented in Table 13-10, the variability in the RMW_i and BMW_i values is relatively low, with relative standard deviations of 10% and 8%, respectively. The RMW_i and BMW_i varied from 10 to 16 kWh/t, with an average of 12.6 and 12.7 kWh/t, respectively, indicating a moderately soft sample.

The abrasion indices are more widely spread (from 0.1 to 1.0 g) with average and median values of 0.687 and 0.756 g, respectively, and a relative standard deviation of 30%. The Malmbjerg ore is more abrasive than average, with about 85% of the dataset values falling in the top 70% abrasive materials of the SGS database.

Table 13-10: Summary of the Comminution Test Result

Sample Name	Drop Weight Test				Specific Gravity	RMW_i (kWh/t)	BMW_i (kWh/t)	A_i (g)
	A	b	A x b	t_a				
BS01	--	--	--	--	--	13.0	11.8	--
BS02	--	--	--	--	--	12.5	11.5	--
BS03	89.4	0.48	42.9	--	2.72	10.6	10.9	0.638
BS04	92.5	0.42	38.9	--	2.59	13.4	13.3	0.763
BS05	100.0	0.35	35.0	--	2.60	12.3	13.5	0.763
BS06	100.0	0.40	40.0	--	2.61	13.1	12.1	0.818
Comp A	100.0	0.34	34.0	0.19	2.60	--	--	--
Comp B	100.0	0.30	30.0	0.17	2.64	--	--	--
Comp C	100.0	0.32	32.0	0.17	2.64	--	--	--
BS07	85.7	0.60	51.4	--	2.58	10.8	12.8	0.603
BS08	77.6	0.63	48.9	--	2.80	11.8	11.9	0.583
BS09	77.8	0.68	52.9	--	2.57	11.5	12.5	0.563
BS10	84.9	0.52	44.1	--	2.64	12.7	13.1	0.726
BS11	86.7	0.50	43.4	--	2.65	11.9	12.7	0.646
BS12	85.0	0.51	43.4	--	2.59	11.1	12.4	0.798
BS13	100.0	0.40	40.0	--	2.59	12.8	13.7	0.858
BS14	85.0	0.52	44.2	--	2.97	12.2	12.2	0.201
BS15	56.1	0.95	53.3	--	2.48	12.1	12.2	0.118
BS16	93.3	0.50	46.7	--	2.83	11.0	12.6	0.719
BS17	85.4	0.44	37.6	--	2.64	15.3	10.7	0.547
BS18	95.6	0.35	33.5	--	2.39	14.8	14.0	0.648
BS19	87.1	0.47	40.9	--	2.65	13.5	12.4	0.772
BS20	100.0	0.36	36.0	--	2.62	13.3	14.1	0.893
BS22	83.9	0.50	42.0	--	2.58	13.3	12.8	0.851
BS23	85.7	0.52	44.6	--	2.59	12.4	13.0	0.809
BS24	100.0	0.35	35.0	--	2.57	14.9	15.9	0.970
BS25	88.7	0.41	36.4	--	2.59	12.1	11.9	0.824
BS26	94.1	0.40	37.6	--	2.59	11.7	12.6	0.750

table continues…

Sample Name	Drop Weight Test				Specific Gravity	RMW_i	BMW_i	A_i
	A	b	A x b	t_a		(kWh/t)	(kWh/t)	(g)
BS27	75.8	0.62	47.0	--	2.63	10.3	13.1	0.746
BS28	96.6	0.43	41.5	--	2.55	11.6	12.7	0.820
BS29	92.2	0.43	39.6	--	2.64	12.9	13.2	0.846
BS30	100.0	0.37	37.0	--	2.58	14.8	12.9	0.762
BS31	87.8	0.46	40.4	--	2.60	12.6	13.5	0.833
BS33	95.0	0.39	37.1	--	2.56	14.2	12.3	0.201
IMPQ01	82.3	0.43	35.4	--	2.72	14.0	11.0	0.541
Average	**89.8**	**0.47**	**40.7**	**0.18**	**2.62**	**12.6**	**12.7**	**0.687**
Median	**89.4**	**0.43**	**40.0**	**0.17**	**2.60**	**12.6**	**12.7**	**0.756**
Relative SD	**11%**	**27%**	**14%**	**7%**	**4%**	**10%**	**8%**	**30%**

13.4.2 SAG Milling

The drop weight test results on the three composite samples were similar, with A x b values varying from 30 to 34. The composite samples were hard, with respect to resistance to impact breakage (A x b), and very hard in terms of resistance to abrasion breakage (t_a). The A x b values for all the tested samples varied from 30.0 to 53.3, with a relative standard deviation of 14%, which is relatively low. The average and median A x b values are 40.7 and 40.0, respectively, indicating a moderately hard ore. Figure 13-3 shows that the Malmbjerg samples roughly fall within the lower half of the overall JKTech database distribution (medium to hard).

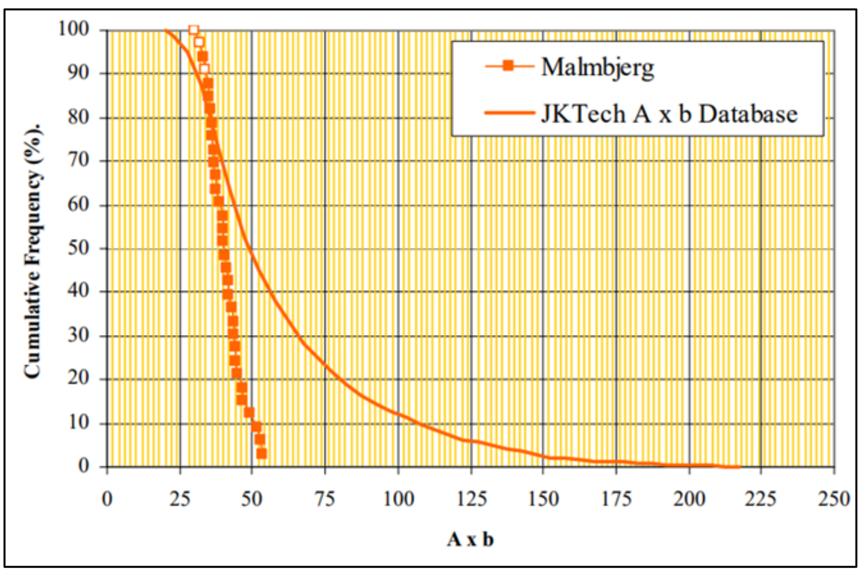


Figure 13-3: Cumulative Frequency Curves of A x b Values

13.4.3 SABC Circuit Simulations

In 2006, the comminution test data was used to develop a standard Semi-Autogenous-Ball Mill-Crusher (SABC) circuit computer model using the JKSimMet software. The model was based on the following base design criteria:

- Throughput of 15,000 t/d at 92% availability
- F_{80} of 150 mm
- Target P_{80} of 140 µm

The circuit simulations were conducted for 12.7 mm and 6.3 mm SAG screen sizes, and the F_{80} of 100 mm was also investigated. The maximum achievable SAG mill throughput at 13% ball charge was also simulated. The power requirement of the ball mill circuit was calculated using the Bond work index and the third theory of comminution after correction for the fines in the SAG product with the phantom cyclone technique. The results obtained from simulations are presented in Table 13-11.

The scoping simulation concluded that:

- The SAG mill and overall power requirements are generally high due to the low A x b values as measured on the composite samples.
- Composite B is significantly more competent than A and requires 5% to 12% more power in the SAG mill and 6% to 11% more power in the overall SABC circuit.
- A reduction in screen size, from 12.7 to 6.3 mm, would reduce the overall power requirement by 3% to 4%.
- A finer SAG feed F80 of 100 mm, which would require a more aggressive preparation (blasting, crushing, and screening), would reduce the overall power consumption by 5% to 6%.

The scoping simulations show that at the median hardness, a 9.75 m x 4.57 m (32' x 15') EGL SAG mill will be adequate to achieve the desired throughput. The 9.75 m x 4.57 m EGL SAG mill will also be adequate for treating Composite A type material but would be too small for Composite B type material.

Overall, a 10.36 m x 4.57 m (34' x 15') EGL SAG mill with 10 MW installed power and a ball mill with 5 MW installed power would be adequate for a 15,000 t/d circuit.

Table 13-11: SABC Circuit Simulations Summary

Serial No.	Ore Type	Specific Gravity	SAG Mill Circuit									Ball Mill Circuit		Overall		
			SAG Mill Size	Feed Rate @92% Availability		F_{80}	Ball Charge	Screen Size	T_{80}	Gross Power		Gross Power		Total Gross Power		W_{io}
			(dia x EGL)	t/h	t/d	mm	% vol	mm	µm	kW	kWh/t	kW	kWh/t	kW	kWh/t	kWh/t
1	B	2.64	34' X 15'	679	15,000	150	10	12.7	1,799	8,378	12.3	4,843	7.1	13,221	19.5	22.6
2	B	2.64	34' X 15'	755	16,670	150	13	12.7	1,922	9,071	12.0	5,542	7.3	14,613	19.4	22.7
3	B	2.64	34' X 15'	679	15,000	100	8	12.7	1,879	7,703	11.3	4,794	7.1	12,497	18.4	21.7
4	B	2.64	34' X 15'	852	18,812	100	13	12.7	2,212	9,071	10.6	6,361	7.5	15,432	18.1	21.4
5	B	2.64	34' X 15'	679	15,000	150	11	6.3	985	8,537	12.6	4,215	6.2	12,752	18.8	22.0
6	B	2.64	34' X 15'	732	16,163	150	13	6.3	1,075	9,071	12.4	4,685	6.4	13,756	18.8	22.0
7	B	2.64	34' X 15'	679	15,000	100	8	6.3	974	7,833	11.5	4,155	6.1	11,988	17.6	20.8
8	B	2.64	34' X 15'	822	18,150	100	13	6.3	1,177	9,071	11.0	5,377	6.5	14,448	17.6	20.7
9	A	2.60	34' X 15'	679	15,000	150	9	12.7	1,547	7,890	11.6	4,431	6.5	12,321	18.1	21.3
10	A	2.60	34' X 15'	852	18,812	150	13	12.7	1,966	9,036	10.6	5,876	6.9	14,912	17.5	20.5
11	A	2.60	34' X 15'	679	15,000	100	7	12.7	1,655	7,353	10.8	4,417	6.5	11,770	17.3	20.4
12	A	2.60	34' X 15'	956	21,108	100	13	12.7	2,186	9,036	9.5	6,695	7.0	15,731	16.5	19.4
13	A	2.60	34' X 15'	679	15,000	150	9	6.3	848	7,994	11.8	3,781	5.6	11,775	17.3	20.3
14	A	2.60	34' X 15'	825	18,216	150	13	6.3	1,047	9,036	11.0	4,931	6.0	13,967	16.9	19.8
15	A	2.60	34' X 15'	679	15,000	100	7	6.3	858	7,448	11.0	3,768	5.5	11,216	16.5	19.5
16	A	2.60	34' X 15'	922	20,358	100	13	6.3	1,143	9,036	9.8	5,643	6.1	14,679	15.9	18.8
17	Median	2.60	32' X 15'	679	15,000	150	10	12.7	1,601	6,957	10.2	4,325	6.4	11,282	16.6	19.3
18	B	2.64	32' X 15'	679	15,000	150	16	12.7	1,996	8,434	12.4	5,022	7.4	13,456	19.8	23.0
19	A	2.60	32' X 15'	679	15,000	150	11	12.7	1,764	7,347	10.8	4,562	6.7	11,909	17.5	20.5

13.4.4 High-Pressure Grinding Rolls Testing

In September 2007, Köppern was contracted to conduct high-pressure comminution test work. A 2-t subsample from the 2007 sample was shipped to Köppern's test facility in Freiberg, Germany. A series of pilot-scale HPGR tests were carried out to demonstrate the suitability of using HPGR in processing the Malmbjerg molybdenum ore. The tests were conducted using both stud and Hexadur® lining.

The single-pass HPGR tests indicated that:

- Increasing specific pressing force from 2.1 and 3.1 N/mm^2 increased the production of the fine particles (- 6 mm).
- The specific pressing force had negligible influence on the specific throughput constant.
- The specific energy consumption increased with increasing specific pressing force.
- Increasing the feed moisture content from 2.8% to 6.0% (w/w) had negligible influence on the production of the fine particles, specific throughput constant, and the specific energy consumption.
- The results obtained from Hexadur® lining were similar to the results obtained from stud lining.

Closed-circuit HPGR tests were also conducted to estimate the circulating load for steady-state closed circuit HPGR operation at 6 mm closing screen aperture size. The test results reported a circulating load of 34% with specific energy consumption of 1.31 kWh/t and a specific throughput constant of 232 ts/hm^3.

The results were sufficiently encouraging and resulted in the incorporation of HPGR equipment into the design of the comminution circuit, in place of the SABC process equipment used during the 2008 study – although the 2021 FS design reverted to the SABC circuit to reduce the footprint, conveyors and process complexity and locate the comminution equipment on barges.

13.5 Flotation Testing

13.5.1 Batch Tests

13.5.1.1 Rougher Flotation Tests

Preliminary rougher kinetic tests were performed in 2005 on 2 kg MC-01 sample charges to investigate the effect of grind size and collector dosage. The flotation tests were performed using diesel fuel as a collector, pine oil as a frother, and ethoxylated tall oil (OP6) as a surfactant. The test results indicated that the flotation kinetics for molybdenum is generally quite fast, with 75% to 85% recovery achieved within the first two minutes. The effect of grind size on molybdenum recovery is shown in Figure 13-4. Results showed a detrimental effect of the coarser grind over 200 µm on flotation performance as predicted by the mineralogical evaluation. The molybdenum recovery at 100 µm was lower than at 160 µm, primarily due to a low mass pull.

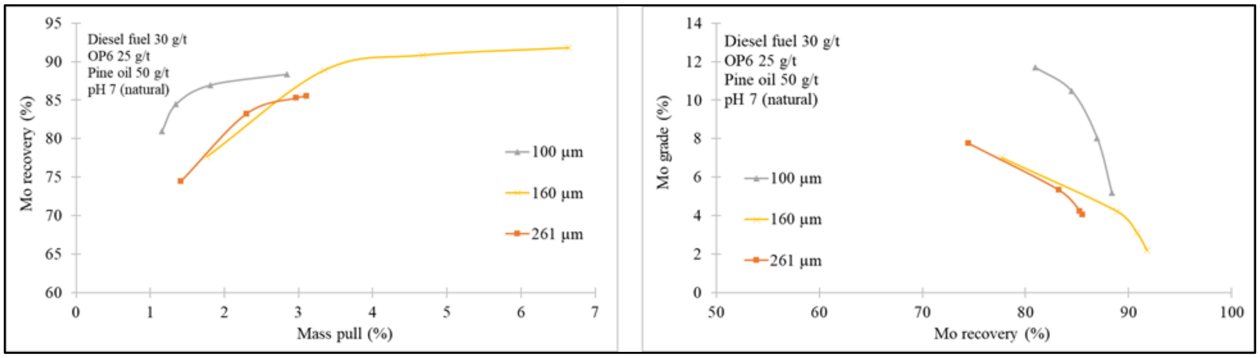


Figure 13-4: Effect of Grind Size on Molybdenum Recovery

The initial target of approximately 90% final molybdenum recovery was identified for the Malmbjerg deposit. A rougher recovery of 92% or higher would be required to achieve this target, indicating a rougher concentrate grade of 3% to 6% molybdenum and a mass pull of about 4%. The grind size would be an economic trade-off between the additional power required for a finer grind against the reduction in recovery. A 150 µm to 200 µm P_{80} grind size was tentatively identified from the initial rougher flotation tests.

Two additional rougher kinetic tests were performed where diesel fuel was supplemented with sodium isobutyl xanthate (SIBX) collector. Figure 13-5 shows that adding xanthate increased the molybdenum recovery from about 88% to about 95%; however, it also significantly increased the sulphur recovery. As discussed in Section 13.3.1, mineralogy has confirmed the presence of various sulphide minerals such as pyrite, sphalerite, and galena in the samples. Adding xanthate recovered all the sulphide minerals that would be detrimental to achieving a high final grade molybdenum concentrate; hence, the addition of xanthate collector reagents was ruled out of the flowsheet for the rougher stage.

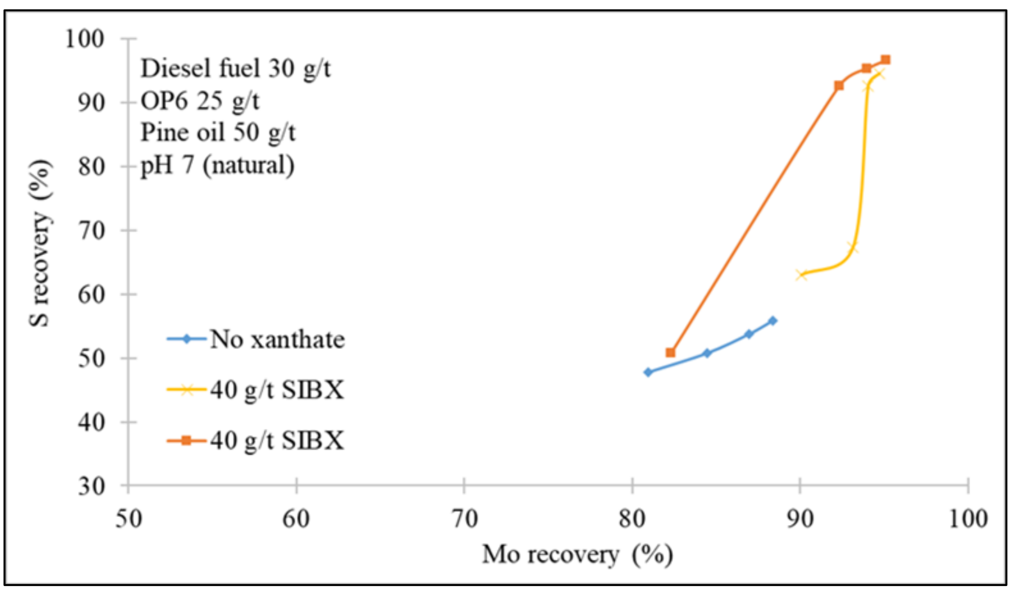


Figure 13-5: Effect of Adding Xanthate Collector on Molybdenum and Sulphur Recovery

A single rougher flotation kinetic test was performed on each variability sample. As the grindability testing had shown a relatively small variance in ore hardness, the grinding time and reagent scheme was kept constant in each test. The rougher kinetics curve for each variability sample is shown in Figure 13-6.

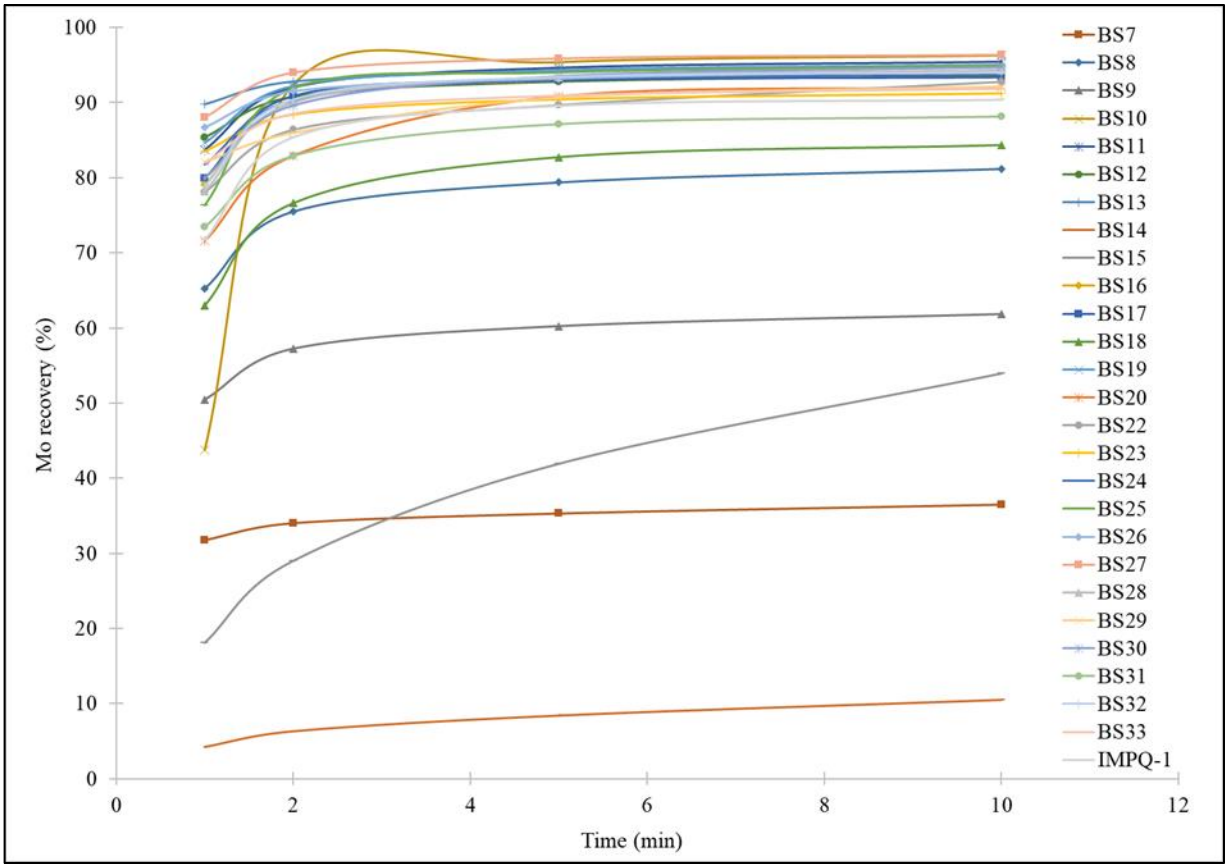


Figure 13-6: Rougher Kinetics Curves of Each Variability Sample

Most of the samples achieved good molybdenum recovery (over 90%). Only four samples (BS7, BS9, BS14, and BS15) exhibited inferior metallurgy (less than 80% molybdenum recovery). The low recoveries in BS7, BS9, and BS14 are most likely due to the presence of molybdenum in oxide form, whereas the low recovery in BS15 is most likely be attributed to a very low head grade (0.007% Mo). The total recoveries achieved in these four samples relate to the relative proportion of Mo oxide within each sample, as shown in Table 13-12.

Table 13-12: Samples with Poor Metallurgical Performance

Sample Id	Total Mo, %	Total Mo Oxide, %	Relative Oxide, %	Rougher Recovery, %
BS7	0.095	0.052	54.7	36.5
BS9	0.085	0.028	32.9	64.8
BS14	0.046	0.041	89.1	10.5
BS15	0.007	0.002	28.6	53.9

The flotation tests conducted on the variability samples also showed the variation in the metallurgical performance between individual drill core samples and their respective grades. Figure 13-7 shows the correlation between the molybdenum feed grade of the variability samples and their rougher recoveries. The highly oxidized and waste samples mentioned in Table 13-12 are excluded from the plot. It should be noted that the particle size of the flotation feed was not constant for all samples. However, the grinding time and reagent scheme was kept constant in each test.

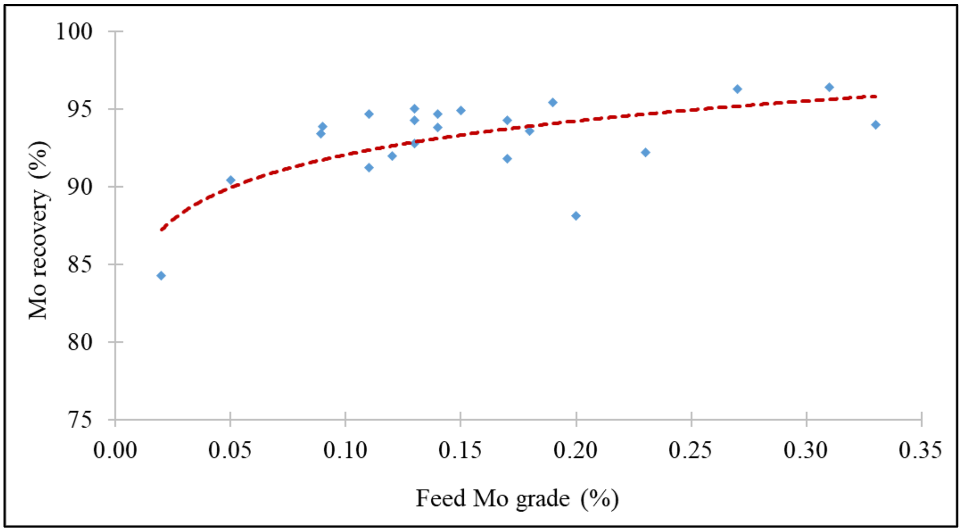


Figure 13-7: Rougher Recovery vs Feed Molybdenum Grade of Variability Samples

A series of rougher kinetic tests were performed in the 2007 test program to understand the effect of fuel oil addition point, OP6, frother selection, and primary grind on the rougher and subsequent cleaner performance. Figure 13-8 shows the mass and molybdenum recovery for varying operating conditions.

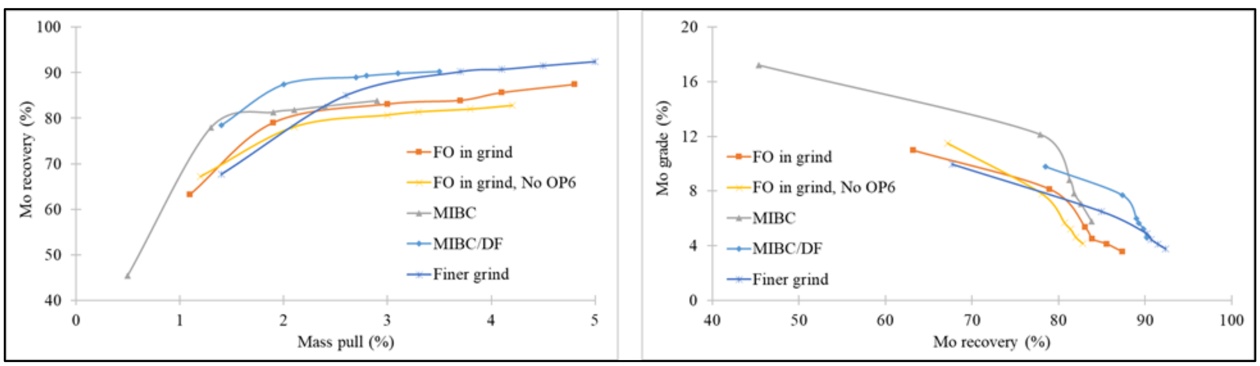


Figure 13-8: Effect of Operating Conditions on Rougher Molybdenum Recovery

The results indicated that adding fuel oil directly to the grinding stage instead of the conditioning stage increased the molybdenum recovery by 4.6% (85.6% compared to 81%). The removal of OP6 reduced the molybdenum recovery by 3.6% (82.0% compared to 85.6%). Using MIBC instead of pine oil as frother reduced the rougher mass recovery and molybdenum recovery; however, using a stronger frother mix of a 2:1 ratio of MIBC:DF250 slightly increased the mass recovery to 3.1% while increasing the molybdenum recovery to over 90%. A finer grind to 145 µm compared to 200 µm increased the mass recovery to 4.5% while increasing the molybdenum recovery to 91.5%.

Three additional rougher flotation tests were conducted to establish the reagent conditions for future pilot plant flotation trails. The results obtained from these tests are shown in Figure 13-9. The results indicated that using a blend of MIBC:DF250 yielded 1.5% higher molybdenum rougher recovery and slightly higher molybdenum grade in the rougher concentrate. The blend of frothers appeared superior compared to MIBC only and was selected for the pilot plant.

The addition of OP6 increased the mass pull into the rougher concentrate from 2.8% to 3.5% while increasing the molybdenum recovery by 3.4%, thus, deciding whether OP6 is required for optimal performance of the flotation procedure was less straightforward. For the pilot plant campaign, it was decided not to use OP6, and in order to attempt to compensate for the anticipated reduction in the molybdenum recovery, additional fuel oil would be added to the circuit.

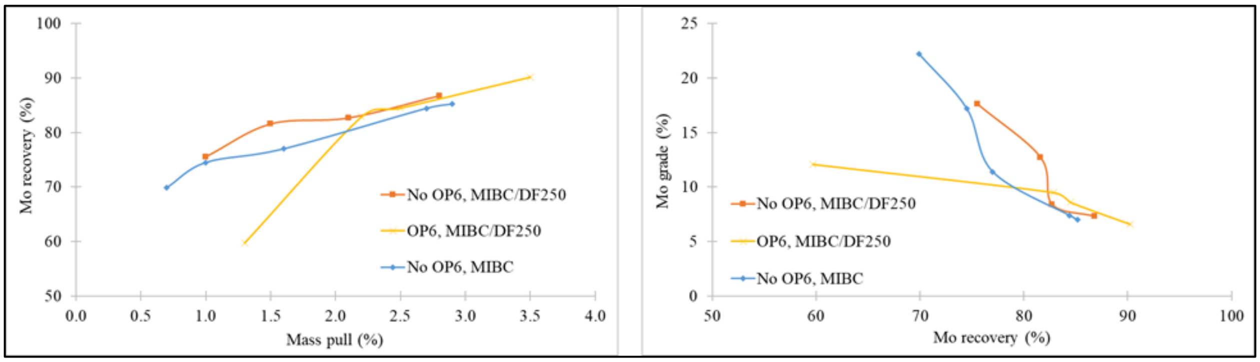


Figure 13-9: Effect of Reagent Scheme on Rougher Molybdenum Recovery

Overall, laboratory testing in 2007 supported the earlier results obtained, namely that the sample's response was consistent with the previously tested sample from the deposit. Fuel oil additions to the mill and stage additions in rougher stages appeared beneficial to rougher recovery. Additions of a surfactant did not indicate significant recovery improvements. A MIBC:DF250 frother combination showed enhanced selectivity over gangue flotation and improved rougher kinetics without negatively affecting molybdenum recovery compared with only using pine oil or MIBC.

13.5.1.2 Cleaner Flotation Tests

Following the rougher tests, five batch cleaner tests were performed on 2 kg MC-01 sample charges with a target primary P_{80} grind size of 200 µm. The reagent regimes were consistent and consisted of 60 g/t diesel fuel, 25 g/t OP6, and 50 g/t pine oil. Lime was introduced to the cleaner stage to increase the pH to 10.5 to assist pyrite rejection. A regrind of the rougher concentrates for 13 minutes in a pebble mill was used with a target P_{80} grind size of 20 µm to 30 µm. However, due to the use of a 2 kg sample feed charge for testing, the first cleaner concentrates were typically in the range of 10 grams; hence, regrinding was not practical.

Due to the difficulties in cleaner tests using only 2 kg charges, a series of cleaner tests were conducted using 10-kg MC-01 sample charges to generate sufficient rougher concentrate to conduct a five-stage cleaning test. The test results reconfirmed that a 140 µm P_{80} grind size performs better than the 200 µm grind size in terms of rougher recovery. With respect to concentrate grades, the 10 kg feed allowed five cleaning stages and produced a final concentrate with over 52% Mo in the best case.

A series of cleaner kinetics tests were conducted under various conditions to further optimize the cleaner circuit design. The rougher conditions for each test were constant: a primary P_{80} grind size of 188 µm, 30 g/t diesel fuel, 50 g/t of pine oil, and 25 g/t of OP6. Figure 13-10 shows the effect of regrinding on the cleaner molybdenum recovery. The effect of pH adjustment with lime and soda ash was also evaluated. The results indicated that regrinding the rougher concentrate increases the liberation of molybdenite from the gangue minerals and improves the concentrate grade. Using the soda ash as the pH modifier provided the best grade-recovery relationship, most likely due to the enhanced dispersant effect of soda ash relative to lime. However, soda ash is a costly reagent and was not studied further.

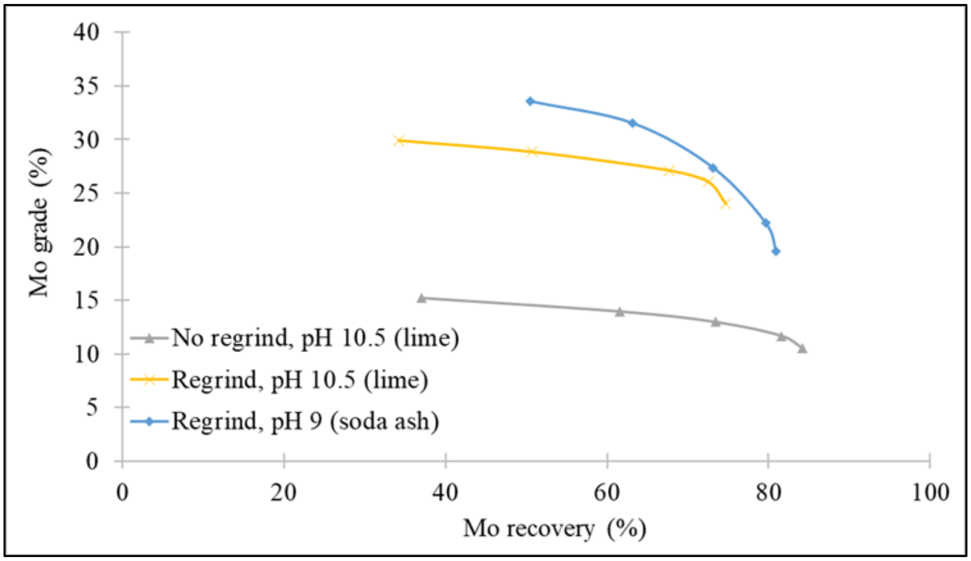


Figure 13-10: Effect of Regrinding on Cleaner Molybdenum Recovery

A test conducted using kerosene as an alternative collector and sodium hydrosulphide as a depressant floated a large amount of gangue and provided the worst grade vs. recovery curve. These reagents were not tested further.

Flotation tests were also conducted on MC-02 to confirm the optimum pH and collector dosage. The effect of pH on the molybdenum recovery is still somewhat inconclusive, as the best results were obtained at a pH of 10, shown in Figure 13-11. The test at a pH of 10.5 provided the worst results. Overall, the lower pH of 9.5 was selected for the remaining optimization work. It is recognized that the role of pH needs to be better understood. It is suggested that, in a plant scenario, pH could be varied depending on the iron (pyrite) content in the feed to maximize molybdenum recovery.

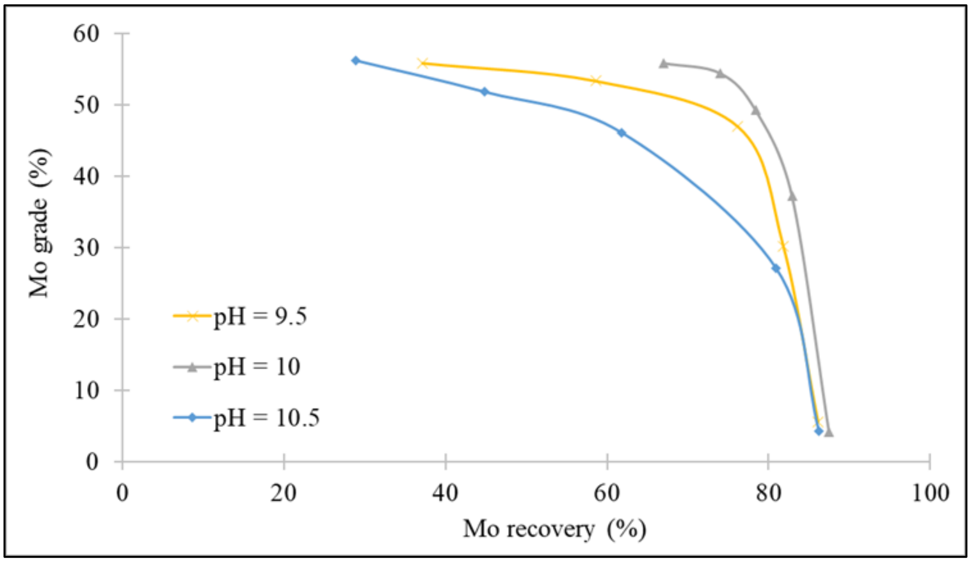


Figure 13-11: Effect of pH on Cleaner Molybdenum Recovery

The effect of collector (diesel fuel) dosage on performance is presented in Figure 13-12. The results suggested that high rougher and cleaner performances can be achieved at a lower collector dosage, most likely due to diesel fuel being carried over into the cleaners at the high dosage rates and causing more entrainment and/or spurious flotation of gangue minerals. It should be noted that these results are also not entirely conclusive as a repeat of 40 g/t, conducted for repeatability purposes, gave inferior results to the original test. An addition rate of 40 g/t was chosen as the best dosage from all the data, although this may need to be increased in the plant if rougher recovery is lower than anticipated.

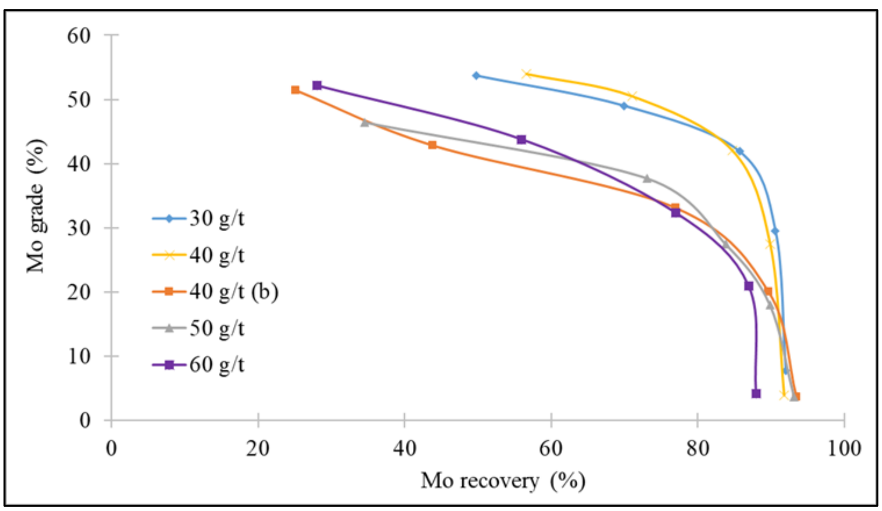


Figure 13-12: Effect of Collector Dosage on Cleaner Molybdenum Recovery

Batch cleaner flotation tests were also performed on each of the variability composite samples (VC1 to VC5) to check if each sample could be cleaned to an acceptable concentrate grade. Each sample's grind size was calibrated to a P_{80} of 140 µm. The grade-recovery curve for each composite sample is shown in Figure 13-13. Except for the variability composite sample VC 1, the concentrate grades obtained for all the other composite samples were over 53% Mo with reasonably good recoveries. The molybdenum grade and recovery for sample VC 1 were low, most likely due to high iron content in the feed, suggesting that this sample might be slightly more problematic to process than others.

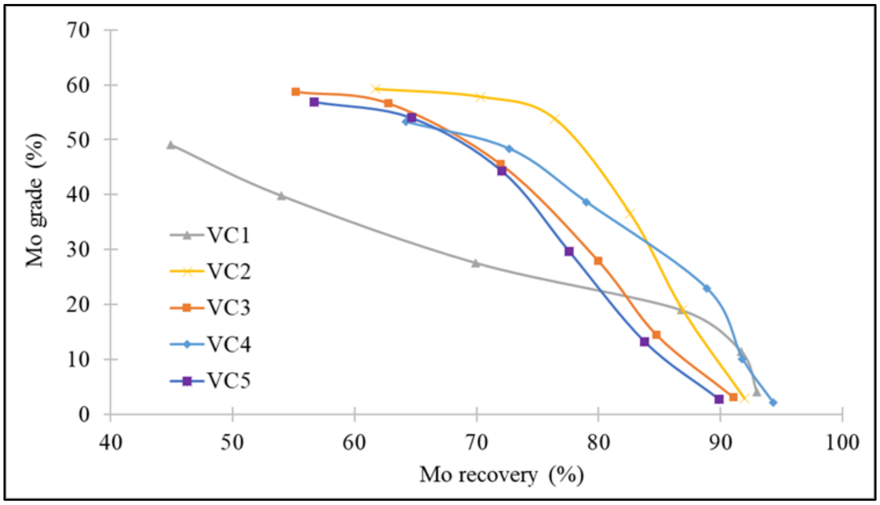


Figure 13-13: Cleaner Molybdenum Recovery for Variability Composite Samples

The rougher stage recoveries from the series of batch cleaner tests on variability composite samples are plotted along with the rougher recoveries for individual variability drill core samples in Figure 13-14. The rougher stage floatation recovery for variability composite samples was in agreement with the flotation recovery for individual variability samples.

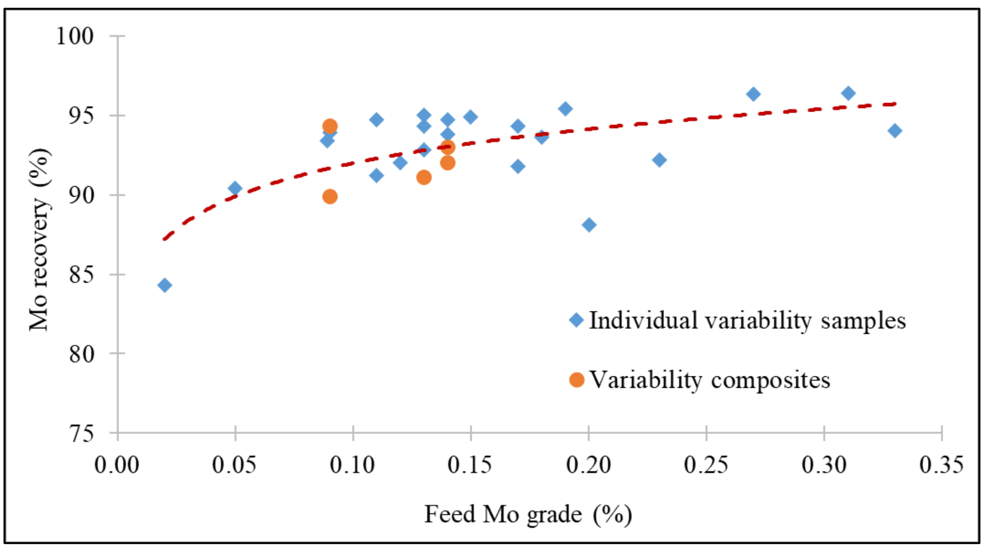


Figure 13-14: Rougher Flotation Recovery for Individual Variability Samples and Variability Composite Samples

Nine batch cleaner tests were conducted in 2007 to study the effect of grind size, reagent dosages, flotation times, and mass pull rates on the rougher and cleaner performance. The results obtained from the test work are presented in Figure 13-15. In all the tests, lime was added to increase the pH to 9.5 to reject pyrite from the rougher concentrate in the cleaner stages.

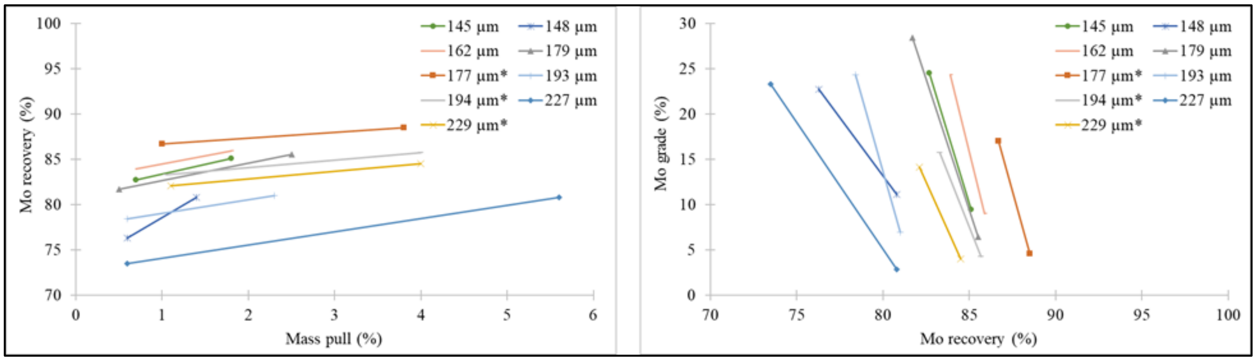


Figure 13-15: Effect of Reagent Scheme on Rougher Molybdenum Recovery (*Tests Conducted to Achieve over 3% Mass Pull)

The test results indicated that the rougher recovery is negatively affected at grind sizes significantly coarser than 80% passing 180 µm, as evident from the molybdenum recovery at 200 µm and higher. However, the reagent dosage might influence the results. The results also indicated that increasing the mass pull to about 4% increased the molybdenum recovery to 88.5% at the coarser P_{80} grind size of 177 µm. The cleaner concentrate grade ranged between 22.7% and 28.4% Mo at molybdenum recoveries between 73.5% and 83.9%. Increasing the mass pull to over 3% reduced the concentrate molybdenum grade due to gangue entrainment, but not as a result of pyrite dilution. Hence, the cleaner concentrate grade could be improved if gangue minerals were successfully rejected and/or depressed.

13.5.2 Locked-Cycle Flotation Tests

Locked-cycle flotation tests were performed on MC-01 and five variability composite samples. The results obtained from the locked cycle tests are presented in Table 13-13.

Table 13-13: Summarized Results from the Locked Cycle Flotation Tests

Description	MC#01 – 1*	MC#01 – 2	VC # 1	VC # 2	VC # 3	VC # 4	VC # 5
Feed grade	0.15	0.15	0.18	0.17	0.19	0.12	0.14
Rougher conc. Wt. (%)	3.73	6.78	4.2	5.3	5.9	6.2	5.7
Rougher conc. Grade (% Mo)	3.26	1.78	3.1	2.5	2.0	1.3	1.5
Rougher conc. Mo recovery (%)	86.9	92.9	91.9	92.3	92.6	92.2	90.6
Rougher tail. Wt. (%)	96.27	93.22	95.8	94.7	94.1	93.8	94.3
Rougher tail. Grade (% Mo)	0.019	0.010	0.012	0.012	0.010	0.007	0.009
Rougher tails. Mo recovery (%)	13.4	7.1	8.1	7.7	7.4	7.8	9.4
Cleaner tail. Wt. (%)	3.47	6.55	4.0	5.0	5.7	5.9	5.6
Cleaner tail. Grade (% Mo)	0.149	0.128	0.26	0.21	0.091	0.083	0.11
Cleaner tails. Mo recovery (%)	9.8	16.9	7.4	7.4	4.1	5.6	6.3

table continues…

Description	MC#01 – 1*	MC#01 – 2	VC # 1	VC # 2	VC # 3	VC # 4	VC # 5
Final conc. Wt. (%)	0.26	0.23	0.2	0.2	0.2	0.2	0.2
Final conc. Grade (% Mo)	**45.95**	**50.12**	**48.6**	**51.8**	**47.4**	**34.9**	**50.1**
Final conc. Mo recovery (%)	**85.3**	**88.7**	**84.5**	**84.9**	**88.5**	**86.6**	**84.3**
Final tail. Wt. (%)	99.74	99.77	99.8	99.8	99.8	99.8	99.8
Final tail. Grade (% Mo)	0.024	0.018	0.022	0.022	0.015	0.012	0.015
Final tail. Mo recovery (%)	17.1	13.8	15.5	15.1	11.5	13.4	15.7

*180 µm P_{80} grind size
Numbers may not add due to rounding.

The locked cycle test 1 on MC-01 (MC#01 – 1) suffered from a lack of stability as the concentrate grade decreased with each cycle. This was primarily attributed to the returning of cleaner 2 tails to the cleaner 1 regrind, which possibly resulted in overloading of the mill leading to ineffective regrinding. Potentially the excessive use of frother also contributed by causing a high degree of entrainment, and there were practical difficulties in performing the test. Hence, this test was not further analyzed.

The locked cycle test 2 on MC-01 (MC#01 – 2) achieved significant gains in molybdenum recovery compared to the batch cleaner tests while reaching a final concentrate grade up to about 52% Mo. The metal loss in cleaner tailings was most likely due to slimes generated during over-grinding as no classification on the reground product was performed during the tests. It is recommended that efficient classification systems be used in the plant design to prevent slime losses to the cleaner tailings.

A similar trend for cleaner molybdenum grade and recovery was observed for the locked cycle tests on variability composite samples. The molybdenum rougher stage recovery for batch cleaner tests was comparable to that for the locked cycle tests. On average, a difference of 0.15% in the molybdenum rougher stage recovery was observed between the batch and locked cycle flotation tests on variability composites samples which can be considered within experimental error.

13.5.3 Pilot-Plant Flotation Tests

Based on the outcomes of the batch and locked cycle flotation tests, a pilot plant flotation test program was conducted on approximately 12 t of the bulk sample in 2007-08. The primary objectives of the pilot plant campaign were to:

- Confirm the rougher and the first cleaner portion of the flowsheet in a continuous pilot plant environment
- Prove the relationship between primary grind and rougher molybdenum recovery
- Produce concentrate suitable for the demonstration of column cleaning to produce saleable high concentrate grades
- Generate products to conduct Modified Flotation Tests (MFT) and build a FLEET model to determine circuit mass balances

The metallurgical targets for the pilot plant were:

- Molybdenum rougher recovery of over 90%
- First cleaner molybdenum recovery of over 85%

- First cleaner concentrate grade over 20% Mo
- Pyrite tailings with less than 0.1% sulphur so that the pyrite concentrate could be deposited separately from the final flotation tailings due to environmental concerns

The pilot plant flowsheet is presented in Figure 13-16. The sample was ground in a mild steel (MS) shell ball mill followed by classification using screens (500 µm or 300 µm) to achieve the desired size target 180 µm or 140 µm P_{80}. Fuel oil collector was added to the ball mill feed. The screen oversize was returned to the mill feed, and the screen undersize was pumped to the rougher flotation stage. Fuel oil was also added mid-way along the rougher bank. The rougher tailings were subjected to a pyrite rougher flotation stage using PAX as a collector.

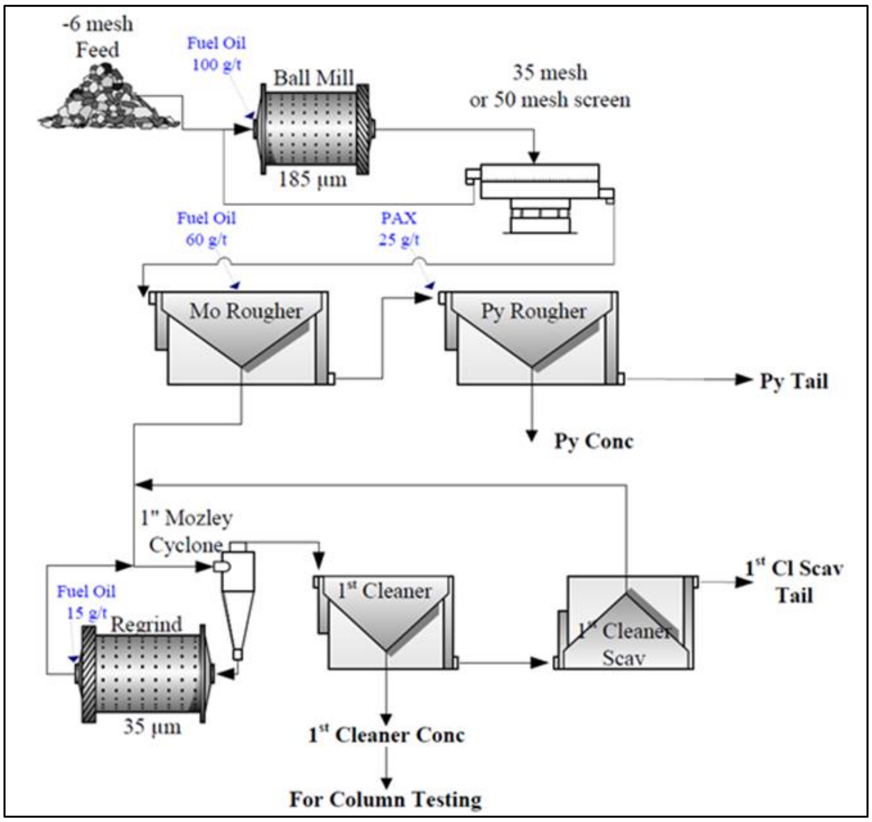


Figure 13-16: Pilot Plant Flowsheet

The rougher concentrate was reground in a Denver ball mill operating in a closed circuit with a Mozely cyclone to achieve a grind size of 35 µm P_{80}. Lime was added to the regrind mill to target a pH of 9.5. A small quantity of fuel oil was added to the regrind circuit. The cyclone underflow was returned to the regrind mill, and the overflow was fed to the first cleaner bank. The first cleaner tailings were subjected to a scavenger flotation stage, and the first cleaner scavenger concentrate was combined with the rougher concentrate. After the pilot plant campaign, the first cleaner concentrate was collected in pails for batch column testing.

A total of six shift-long runs (PP-01 to PP-06) and one extended 43.5-hour run (PP-07) were carried out. The first three runs, PP-01 to PP-03, operated at the finer grind P_{80} of 140 µm, while the runs PP-

04 to PP-06 evaluated the coarser grind size P_{80} of 180 µm. The extended PP-07 run was carried out at the coarse product size.

The average rougher and cleaner molybdenum grade-recovery for two runs with a finer primary grind (PP-02 and PP-03) and two runs with a coarser primary grind (PP-05 and PP-06) is presented in Table 13-14. The data suggest that a finer primary grind yields a molybdenum recovery improvement of approximately 2.6 % in rougher flotation and 4.3 % in cleaner flotation. Although a finer primary grind was desirable from a metallurgical point of view, a decision was made to operate the extended run at the coarser grind after considering other factors, such as grinding cost, that affected the operating cost and therefore the feasibility of the Project.

Table 13-14: Summarized Results from the Coarse and Fine Primary Grind

Description	Grind Size, µm	Rougher			Cleaner		
		wt., %	Grade, %	Recovery, %	wt., %	Grade, %	Recovery, %
Fine grind	147	4.2	5.2	**92.1**	6.5	3.2	**89.5**
Coarse grind	199	0.7	31.3	**88.7**	0.6	32.7	**84.3**

The average molybdenum grade and recovery into the rougher concentrate and first cleaner concentrate for the six extended run surveys are listed in Table 13-15. The average grind size of the pilot plant run was 189 µm. The average first cleaner concentrate yielded a 24.4% Mo grade at 87.8% recovery during the extended run. For this series of tests, the average final tailings after the pyrite flotation step contained 0.035 % sulphur, which was well below the maximum target value of 0.1%.

Table 13-15: Average metallurgical results from 48-hour pilot plant run

Description	wt., %	Grade, %	Recovery, %
Feed	100.0	0.22	100.0
Rougher concentrate	5.3	3.71	91.7
Rougher tails	94.7	0.019	8.3
First cleaner concentrate	**0.8**	**24.4**	**87.8**
Cleaner scavenger tails	4.6	0.18	3.8

13.5.4 Molybdenum Cleaning Tests Using the Pilot Plant Concentrates

13.5.4.1 Batch Cleaner Tests

After completing the pilot plant campaign, the first cleaner concentrate of the various runs was combined and blended. The pilot plant first cleaner concentrate had a P_{80} of approximately 100 µm. The regrinding of the molybdenum concentrate for the subsequent cleaner tests was performed in a laboratory pebble mill. The cleaner tests evaluated the flotation performance at various regrind sizes ranging from no regrind to a regrind P_{80} size of 27 µm. Additional tests were performed to assess the effect of fuel oil collector addition and multi-stage cleaning. A summary of the metallurgical results of all the cleaner tests is presented in Figure 13-17.

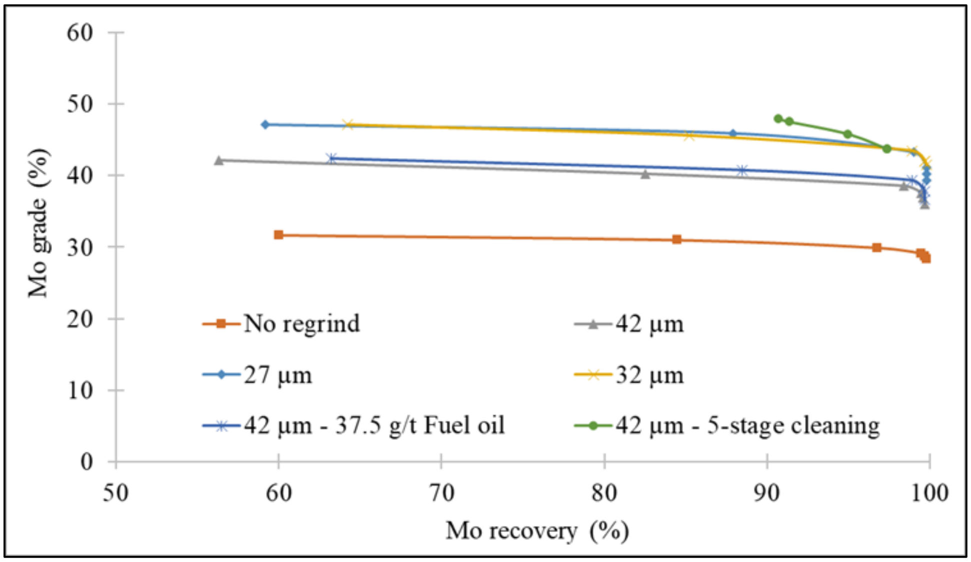


Figure 13-17: Molybdenum Grade-Recovery for Batch Cleaner Tests

The tests data clearly illustrate that a regrind size of approximately 80% passing 30 µm is required to achieve a high-grade concentrate (over 47% Mo). As the grind size increases from 32 µm to 42 µm, the concentrate grade decreases by approximately 5%. The test with fuel oil addition revealed that the fuel oil has no apparent benefit. The multi-stage cleaning test showed significant improvement in the concentrate grade. Overall, a regrind P_{80} no coarser than 30 µm with no reagent additions and multiple cleaning stages would likely produce a concentrate with over 50% Mo. As the molybdenum grade is highly sensitive to the final grind size, an efficient classification system is needed to achieve the required concentrate grade.

13.5.4.2 Batch Column Tests

Approximately 60 kg of the first cleaner concentrate from the pilot plant tests were subjected to batch column testing to investigate the possibility of producing high-grade molybdenum concentrate using column cells in the cleaner flotation stages. As established previously, the pilot plant concentrate was reground to the P_{80} grind size 30 µm. The batch column was operated for three days at operating parameters. A high slurry feed rate (2.0 L/min) was selected during day one, resulting in poor stage recovery. The feed rate was reduced to 1 L/min on day two to increase the column residence time. The increased residence time increased to molybdenum recovery to 50% with a concentrate grade of 40% Mo. The concentrate produced on day two was subjected to another cleaning stage on day three. The second stage cleaning produced a concentrate with approximately 53% Mo with over 63% recovery. The averaged result from each day is listed in Table 13-16. The two stages of bulk column flotation demonstrated that appropriate concentrate molybdenum grades could be achieved. However, the overall recovery was lower than expected.

Table 13-16: Summary of Column Floatation Test Results

Description	Cleaning Stage	Feed Grade, %	Conc. Grade, %	Conc. Recovery, %
Day 1	First	24.4	42.4	18.9
Day 2	First	24.4	41.9	47.6
Day 3	Second	41.5	52.9	63.2

13.5.5 Flotation Economic Evaluation Tool Study

A study was performed to quantify the flotation kinetic characteristics of the pilot plant samples and to perform a preliminary FLEET investigation. The FLEET simulation was used to develop a proposed plant flowsheet designed to treat 30,000 t/d of rougher feed at a primary P_{80} grind size of about 180 µm.

The proposed circuit flowsheet was developed based on evaluations of the flotation kinetic parameters of each of the mineral species and analysis of the pilot plant data. The model predicts that a high-grade molybdenum concentrate of 54.1% Mo at 83.6% molybdenum recovery could be achieved under the proposed design conditions.

13.5.6 Saltwater Flotation Tests

Batch flotation tests using saltwater were conducted on the 2021 master composite to understand the effect of water salinity on molybdenite flotation. All tests included grinding with 40 g/t lime and 40 g/t kerosene collector to a target P80 of 180 µm.

Initially, four batch rougher kinetics tests were performed at varying salinity levels to assess its effect on molybdenum recovery. The results, presented in Figure 13-18, show that the molybdenum recovery decreased with increasing water salinity. The rougher flotation recovery at 0 parts per thousand (ppt) salinity level was comparable to the results obtained in the 2005-06 and 2007 test programs.

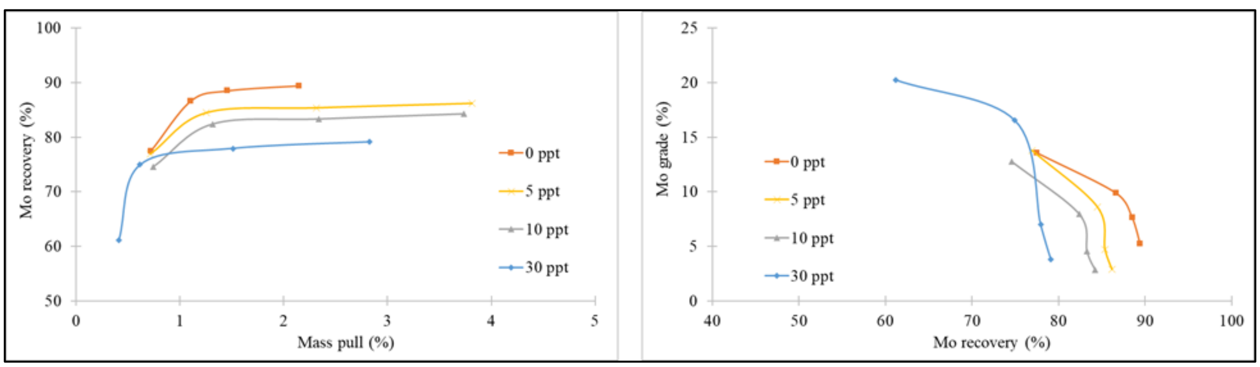


Figure 13-18: Effect of Water Salinity Levels on Rougher Molybdenum Recovery

A significant deviation in the redox potential of the pulp was observed during the flotation tests with saltwater compared to the standard test, which used laboratory tap water. The use of MS grinding media instead of stainless-steel grinding media was recommended for the next stage of flotation testing. A series of flotation tests were performed using MS grinding media. The effect of grinding media on molybdenum recovery is presented in Figure 13-19. The results indicated that the use of MS grinding media improved the molybdenum recovery and provided results similar to the tap water even at a water salinity level of up to 30 ppt. Typical seawater salinity during the mine operation is expected to be 13-32 ppt. Compared to the stainless-steel grinding media, a significant improvement in the molybdenum recovery was observed when using the MS grinding media.

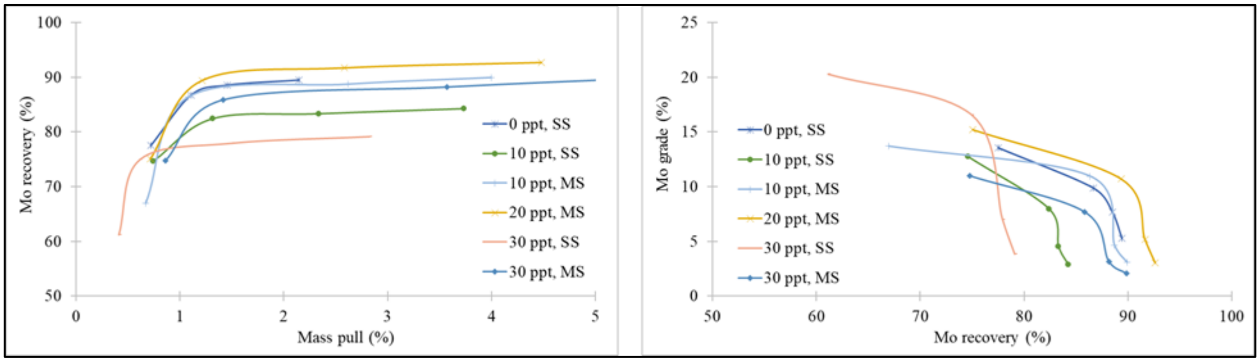


Figure 13-19: Effect of MS and SS Grinding Media on Rougher Molybdenum Recovery

Following the satisfactory results obtained from batch rougher flotation tests using MS grinding media, one batch cleaner flotation test was performed using a 4-kg charge to access the potential upgradation at the cleaner stage using a higher slurry pH value. The rougher concentrate was reground to a P80 of 21 µm and was subjected to a two-stage cleaning process. A final concentrate with 75% molybdenum recovery and 0.18% mass recovery was achieved at a grade of 52.9 % Mo. The result obtained from the batch cleaner tests in saltwater and results obtained from variability composites flotation tests in tap water is presented in Figure 13-20. The metallurgical performance at 20 ppt salinity did not significantly differ from the tap water results.

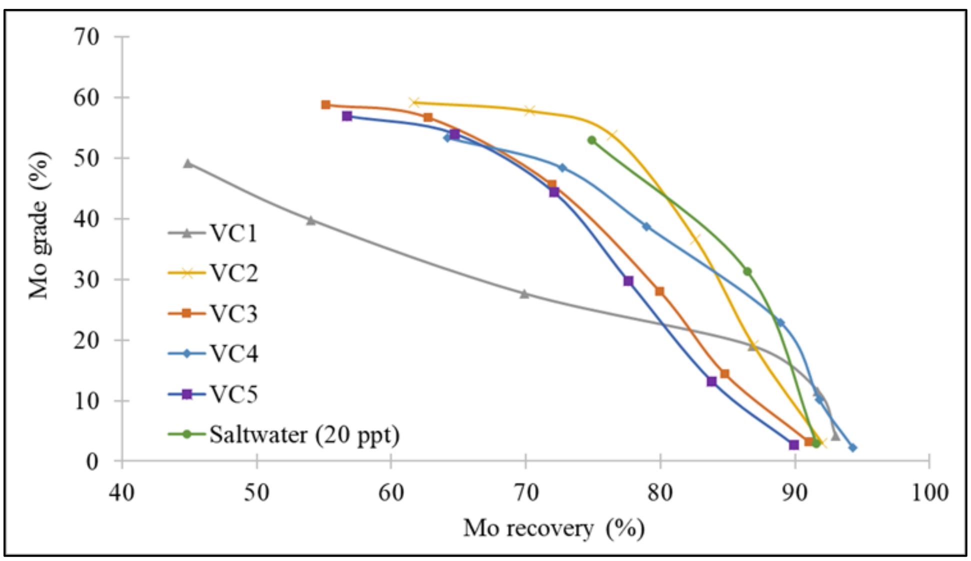


Figure 13-20: Comparison of Batch Cleaner Flotation Tests Results Using Salt and Tap Water

Further pilot-plant flotation test is recommended using saltwater to verify the bench-scale test results and produce samples for downstream concentrate and tailings dewatering test in saltwater. Also, the effect of slurry pH during the cleaning stages requires characterization.

13.6 Multi-Element Scan of Flotation Products

A multi-element analysis was conducted on the concentrates produced from the flotation tests using the variability composite samples. In most cases, the concentrate analyzed was from the locked cycle test (LCT); however, the concentrate from the batch test was used in some cases. In addition, the concentrate produced from the locked cycle flotation tests on the MC-01 sample, MC#01 - 2, and final concentrate from the column flotation test were also analyzed. The results are shown in Table 13-17.

Table 13-17: Multi-Element Scan Results for Concentrates of Variability Composites, MC#01 – 2 and Final Concentrate from Column Flotation Test

Element	Unit	MC#01 – 2	VC#01	VC#02	VC#03	VC#04	VC#05	Column Flotation
		Cycle E	LCT	LCT	LCT	Batch	LCT	Final conc.
Aluminum	%	0.57	0.11	0.13	0.25	0.16	0.15	0.45
Antimony	g/t	<10	<70	<70	<20	<20	<70	<40
Arsenic	g/t	<150	<50	<50	<50	<50	<50	520
Barium	g/t	90	32	12	26	17	14	12
Beryllium	g/t	2.0	<2	5.0	2.0	<1	<2	<0.2
Bismuth	g/t	170	1,500	320	<50	<50	110	97
Cadmium	g/t	73	30	<10	<10	13	<10	21
Calcium	%	0.62	3.10	0.89	2.40	2.90	1.50	0.28
Chromium	g/t	<50	<30	<30	<60	<60	<30	36
Cobalt	g/t	48	<4	<4	<4	<4	<4	53
Copper	g/t	4,500	3,600	2,200	9,700	2,700	4,100	4,000
Iron	%	4.29	1.00	0.52	1.80	0.63	0.87	1.20
Lead	g/t	5,500	3,700	2,200	450	460	1,700	1,000
Lithium	g/t	35	<5	<5	<5	<5	<5	<5
Magnesium	g/t	710	300	370	750	350	340	330
Manganese	g/t	940	190	200	320	130	170	320
Molybdenum	%	44.2	48.0	51.0	47.0	48.0	51.0	-
Nickel	g/t	1,300	<40	88	64	36	130	<50
Phosphorous	g/t	<200	<200	<200	<200	<200	<200	<200
Potassium	%	0.36	0.07	0.09	0.14	0.08	0.11	0.35
Selenium	g/t	<50	<90	<90	<80	<80	<90	<80
Silver	g/t	<10	<50	<50	<10	<10	<50	<10
Sodium	g/t	460	280	130	310	200	210	720
Strontium	g/t	63	37	20	47	21	30	20
Thallium	g/t	<30	<30	<30	<30	<30	<30	<30
Tin	g/t	830	210	40	<40	<40	96	<0.002
Titanium	g/t	420	77	74	120	85	62	150
Vanadium	g/t	<4	<4	<4	<4	<4	<4	12
Yttrium	g/t	47	120	44	100	120	65	30
Zinc	g/t	13,000	6,000	2,500	1,800	3,100	2,400	5,600

The results show that the flotation concentrates with lower molybdenum grade contained a significantly higher concentration of aluminum and calcium, indicating gangue entrainment, and copper and iron, indicating sulphide mineral recovery. The use of column flotation in the plant should minimize the impact of entrained silicates, but further consideration should be given to sulphide depression, which may prove beneficial in maintaining high molybdenum grades.

The multi-element scan of the final concentrate from the column flotation test (third cleaner concentrate) showed that no penalty element in the concentrate would be considered detrimental to the marketability. Approximately 0.5% Cu, 0.1% Pb, and 0.5% Zn were present in the final concentrate, which is considered non-detrimental, and no other impurity elements of concern were observed, although an analysis for mercury and fluorine was not conducted.

A full metal scan was also conducted on the rougher concentrate obtained from the flotation tests conducted on variability samples. It showed that some samples contain significant amounts of fluorine in the rougher concentrate, the highest being BS22 at 5.56%. The test results indicate that fluorine levels can be maintained at acceptably low concentrations through gangue control/depression in the cleaner circuit. However, the fluorine content in the final concentrate should be confirmed.

13.7 Solid-Liquid Separation Testing

13.7.1 Thickening Tests

13.7.1.1 Flotation Tailings

A series of small-scale scoping tests were performed to investigate several flocculant types. Magnafloc 351 provided the best results and was adopted for the subsequent settling tests performed on the final flotation tailings from the locked cycle test on the MC-01 sample. The final tailing is approximately 95% rougher tailings and 5% cleaner tailings. The objective of the settling tests was to determine optimum flocculant dosage and determine the size of the tailings thickener. The first three tests were preliminary and were performed on rougher flotation tailings to help plan the test program. Eight additional tests were conducted on locked-cycle flotation test tailings and were focused on understanding the effect of various flocculant dosages and feed density.

The test conditions and summarized results from settling tests are presented in Table 13-18. The best conditions obtained from the tests were 15 g/t of Magnafloc 351 at a feed pulp density of 20% solids (test 10). Under these conditions, a thickener underflow unit area of 0.004 m2/t/day with an underflow density of 62.5% solids was established.

Table 13-18: Settling Test Conditions and Results on Flotation Tailings

Description	Unit	Test 4	Test 5	Test 6	Test 7	Test 8	Test 9	Test 10	Test 11
Feed solids	% wt.	**15**	**20**	**25**	**30**	20	20	20	20
Magnafloc 351	g/t dry	15	15	15	15	**5**	**10**	**15**	**20**
Initial settling rate	m^3/m^2/day	917	788	500	332	259	552	804	882
Final underflow solids	% wt.	59.5	60.8	61.5	62.5	67.9	65.8	62.5	62.4
Underflow unit area	m^2/t/day	0.013	0.015	0.016	0.018	0.035	0.020	0.016	0.019
Hydraulic unit area	m^2/t/day	0.0055	0.0043	0.0047	0.0052	0.0136	0.0063	0.0042	0.0039
Supernatant clarity, 10 mins		Clear	Clear	Clear	Clear	Cloudy	Slight cloudy	Clear	Clear
Supernatant clarity, 30 mins		Clear	Clear	Clear	Clear	Cloudy	Slight cloudy	Clear	Clear
Supernatant clarity, final		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear

13.7.1.2 Flotation Concentrate

Similar to settling tests on tailings, a series of small-scale scoping tests were performed to investigate several flocculant types. Magnafloc 455 provided the best results and was adopted for the subsequent settling tests performed on the final flotation concentrate from the column test. Standard Kynch tests (with rakes) were carried out at variable feed pulp densities and varying Magnafloc 455 dosages. Thickener sizing was carried out using the Talmadge and Fitch method.

The test conditions and summarized results from the program are presented in Table 13-19. The best conditions obtained from the tests were 50 g/t of Magnafloc 455 at a feed pulp density of 15% solids (test 2). Under these conditions, a thickener underflow unit area of 0.024 m^2/t/day with an underflow density of 54% solids was established. Similar results are expected from Magnafloc 351.

Table 13-19: Settling Test Conditions and Results on Final Column Flotation Concentrate

Description	Unit	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8
Feed solids	% wt.	**9**	**14**	**19**	**24**	14	14	14	14
Magnafloc 455	g/t dry	52	52	52	52	**31**	**42**	**62**	**83**
Initial settling rate	m^3/m^2/day	1,813	936	512	295	614	786	910	1,543
Final underflow solids	% wt.	51	54	56	55	55	56	54	54
Underflow unit area	m^2/t/day	0.022	0.024	0.029	0.028	0.031	0.028	0.028	0.016
Hydraulic unit area	m^2/t/day	0.005	0.005	0.007	0.008	0.008	0.007	0.006	0.003
Supernatant clarity, 10 mins		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Supernatant clarity, 30 mins		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Supernatant clarity, final		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear

13.7.2 Pressure Filtration Tests

Pressure filtration tests were performed on the final column flotation concentrate to estimate the final cake moisture content and filtrate capacity. The tests produced a filtered cake with approximately 19.5% moisture (by wt.) at a dry solid capacity between 760 kg/m^2/h and 1,000 kg/m^2/h, and a filtrate capacity between 1,400 L/m^2/h and 1,800 L/m^2/h, which varied inversely proportional to the cake thickness. Due to limited sample availability, filtration tests were only completed at a low feed solids density (52% by wt.). A summary of the test results is presented in Table 13-20.

Table 13-20: Summary of Pressure Filtration Test Results

Description	Unit	Test 1	Test 2	Test 3
Feed pressure	psi	100	100	100
Cake thickness	mm	57	43.5	37
Feed solids	% wt.	52	52	52
Final cake moisture	%	19.7	19.6	19.2
Dry solids capacity	Kg/m^{2}h	767	936	1,001
Filtrate capacity	L/m^{2}h	1,398	1,686	1,774

13.8 Other tests

13.8.1 Gravity Recovery of Tin and Tungsten Oxide

A Knelson concentration test was performed on the rougher tailings obtained from the VC1 locked cycle flotation test as this composite sample contained approximately 0.01% tin (Sn) and 0.015% tungsten oxide (WO_3). However, the Knelson tailings were below the DL for tin, the Knelson concentrate contained only 0.025% Sn and 0.13% WO_3, and no metal balance could be completed. Hence, no follow-up test was performed.

13.9 Summary

A comprehensive metallurgical test program has been performed for the Malmbjerg deposit since 2005 to provide information for process design. A summary of metallurgical and process characteristics used to inform Project design is summarized below:

- Molybdenite is the primary mineralized mineral, whereas quartz and feldspar are the dominant mineral species. Pyrite is the major sulphide gangue mineral with trace amounts of sphalerite and galena. Minor quantities of amphiboles, mica/clay minerals and fluoride minerals, fluorite, topaz and gearksutite are also present in the deposit.
- About 51% of the molybdenite is classified as “free,” and about 26% as “locked” at a particle size of 200 µm. Most molybdenum associations are with quartz, feldspar, and mica, with very few associations with sulphides. The mineralogical results conclude that a coarse primary grind (about 200 µm) followed by a moderately fine regrind (about 30 µm) should yield satisfactory results.
- The grindability tests report the average A x b value of 40.7, indicating a moderately hard sample to SAG milling. The average RMW_i and BMW_i values are 12.6 and 12.7 kWh/t, respectively,

indicating a moderately soft sample to ball milling. The average and median abrasion indices values are 0.69 g and 0.76 g, respectively, indicating a relatively abrasive ore.

- The scoping simulations using JKSimMet software showed that a 10.36 m by 4.57 m (34' x 15') EGL SAG mill with 10 MW installed power and a ball mill with 5 MW installed power would be adequate for a 15,000 t/d grinding circuit and to achieve a primary grind size P_{80} of 140 µm. This has been revised to two lines of 10.36 m x 5.21 m EGL SAG mills with 8 MW installed power and 6.1 m x 9.1 EGL ball mills with 4.2 MW installed power to process 35,000 t/d.
- Minimal impact on the rougher recovery was observed by varying primary P_{80} grind size from 145 µm to 180 µm. It was also observed that additions of the fuel oil collector reagent to the mill and stage additions in the rougher cells were beneficial to the rougher recovery. A MIBC/DF250 frother combination enhanced selectivity over gangue flotation and improved rougher kinetics without negatively affecting molybdenum recovery compared with the use of pine oil frother.
- The variability study indicated that the Malmbjerg deposit could be processed using the developed flowsheet with the confidence of achieving the desired molybdenum recoveries and concentrate grades. Problematic ore will be where molybdenum is present as oxide, which is not recoverable by flotation and areas with high iron (pyrite) content, although this would be controlled by increasing the pH value in the cleaner flotation circuit.
- The pilot-plant flotation test confirmed the relatively coarse primary grind P_{80} of 180 µm. The molybdenum recovery at the rougher stage was about 92% at a 5 to 6% mass pull. The first cleaner concentrate grade was 24% Mo with a recovery of about 88%. The QEMSCAN™ analysis of the final concentrate from the locked cycle flotation test concluded that the diluents in the concentrate were liberated molybdenite and a combination of sulphide minerals, gangue quartz, and feldspar.
- A regrind P_{80} of less than 30 µm and two stages of bulk column cleaning of the first cleaner concentrate from the pilot plant tests produced a final concentrate with a grade of 52% Mo. The flowsheet is not dissimilar to other existing molybdenum operations and uses well-proven techniques in flotation. The FLEET model predicts that a high-grade molybdenum concentrate of 54.1% Mo at 83.6% molybdenum recovery and 0.32% mass pull could be achieved at 0.21% molybdenum feed grade. The impact of feed grade changes on metallurgical performance is discussed in Section 13.10.
- The multi-element scan of the final flotation concentrate showed no deleterious elements that would pose significant problems for the marketability of the concentrate. Approximately 0.5% Cu and 0.5% Zn were present in the final concentrate, which is considered non-detrimental.
- The saltwater test program showed a negative effect of increasing water salinity level on the molybdenum recovery using SS grinding media. However, changing the grinding media to MS mitigated the adverse effect of saltwater. The batch cleaner flotation test produced a final concentrate with about 53% Mo, comparable to the concentrate grades obtained previously using tap water in the 2005-06 test campaign.

13.10 Projected Metallurgical Performance

Using the batch flotation tests on individual variability samples and locked-cycle flotation tests on the variability and master composite samples, the metallurgical performances of the ore at varying feed molybdenum grades have been projected.

The average recovery loss between the rougher and final cleaner stage in the locked-cycle flotation tests was estimated to be about 6.2%. The rougher flotation recovery for each batch variability test was reduced by 6.2% to estimate the expected final cleaner recoveries at varying feed grades, as shown in Figure 13-21.

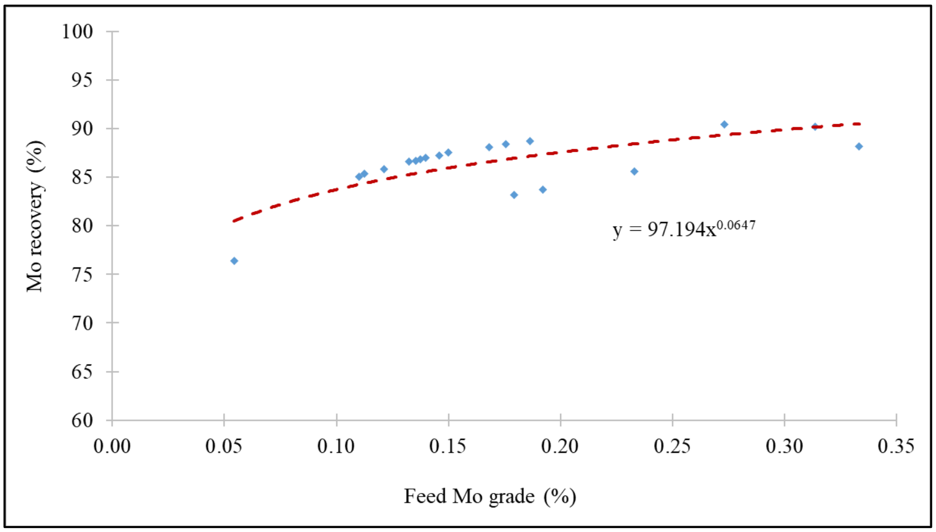


Figure 13-21: Molybdenum Recoveries at Varying Feed Grades

The comparison between the projected molybdenum recoveries (blue dotted line) and the actual results obtained from the locked cycle tests, pilot plant test, FLEET study, and expected plant performance at the ROM grade is shown in Figure 13-22. All the results are in agreement with the projected performance.

The metallurgical performance projection for the LOM is further elaborated in Section 17.0.

Further test work is recommended to understand the metallurgical performances in saltwater for various mineralization samples. Recommendations are detailed in Section 26.0.

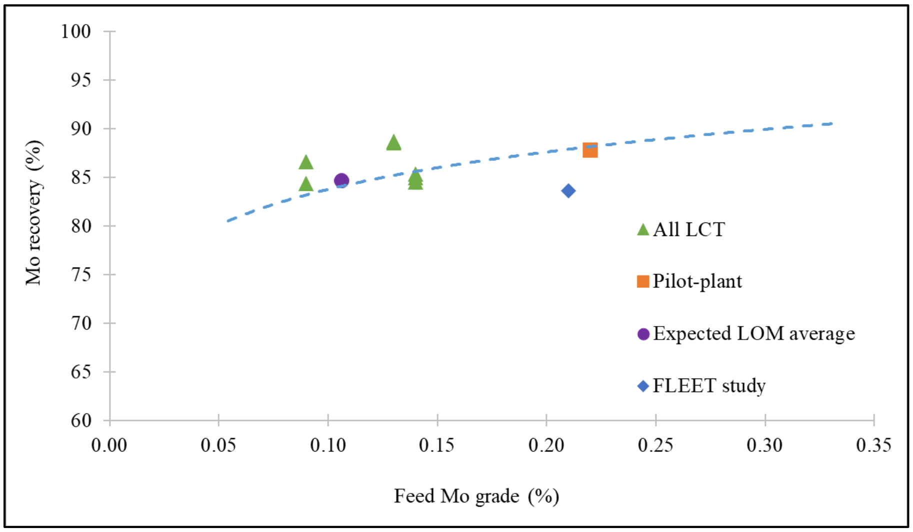


Figure 13-22: Projected Molybdenum Recoveries

14.0 MINERAL RESOURCE ESTIMATE

The MRE has been prepared by Sue Bird, P.Eng., of MMTS. The MRE has been done using the 2019 CIM Best Practice Guidelines and is reported using the 2014 CIM Definition Standards. Table 14-1 below summarizes the total model resource for the Malmbjerg Project, which has an effective date of 12 October 2021. The base case cut-off grade within the "reasonable prospects of eventual economic extraction" constraining pit is an MoS_2 grade of 0.08%, which corresponds to NSR of $14.79/t using the base case prices and smelter terms as defined later in the section. This base case cutoff more than covers the processing, G&A, and tailings costs of $12.50/t milled and roasted.

The MineSight program of Hexagon Inc. has been used to interpolate the modelled grades using Ordinary Kriging (OK). Table 14-2 summarizes a range of MoS_2 cut-off grades to show the sensitivity of the resource estimate to variations in cut-off, with the base case highlighted.

Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. These mineral resource estimates include inferred mineral resources that are considered too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves. It is reasonably expected that most inferred mineral resources could be upgraded to Indicated.

The following factors, among others, could affect the MRE: commodity price and exchange rate assumptions; pit slope angles and other geotechnical factors; assumptions used in generating the LG pit shell, including metal recoveries; and mining and process cost assumptions.

Table 14-1: Malmbjerg MRE (Effective Date 12 October 2021)

Class	Tonnage (kt)	Tonnage (Mt)	Grade MoS_2 (%)	NSR ($/t)	Mo (Mlb)
Measured	128,137	128	0.20	37.63	345
Indicated	153,310	153	0.16	28.90	317
M&I	281,447	281	0.18	32.87	661
Inferred	33,170	33	0.10	17.77	42

Table 14-2: Sensitivity of the MRE to Cut-off Grade (Base Case Highlighted)

Class	Cut-off (MoS_2 %)	Tonnage (kt)	Tonnage (Mt)	Grade MoS_2 (%)	NSR ($/t)	Mo (Mlb)
Measured	0.06	134,744	135	0.20	36.42	351
	0.07	131,724	132	0.20	36.98	348
	0.08	**128,137**	**128**	**0.20**	**37.63**	**345**
	0.09	125,017	125	0.21	38.18	341
	0.10	122,104	122	0.21	38.67	337
	0.12	115,478	115	0.21	39.72	328
	0.14	104,391	104	0.22	41.39	309
	0.16	91,958	92	0.23	43.25	284
Indicated	0.06	197,560	198	0.14	25.33	357
	0.07	177,182	177	0.15	26.86	340
	0.08	**153,310**	**153**	**0.16**	**28.90**	**317**
	0.09	132,804	133	0.17	30.96	294
	0.10	114,668	115	0.18	33.10	271
	0.12	93,487	93	0.20	36.07	241
	0.14	80,811	81	0.21	37.98	219
	0.16	67,363	67	0.22	40.03	193
M&I	0.06	332,304	332	0.16	29.82	708
	0.07	308,906	309	0.17	31.18	688
	0.08	**281,447**	**281**	**0.18**	**32.87**	**661**
	0.09	257,821	258	0.19	34.46	635
	0.10	236,772	237	0.19	35.97	609
	0.12	208,965	209	0.21	38.08	569
	0.14	185,202	185	0.22	39.90	528
	0.16	159,321	159	0.23	41.89	477
Inferred	0.06	66,686	67	0.08	15.41	73
	0.07	52,738	53	0.09	16.32	61
	0.08	**33,170**	**33**	**0.10**	**17.77**	**42**
	0.09	20,724	21	0.10	19.07	28
	0.10	6,275	6	0.13	23.12	10
	0.12	1,727	2	0.18	32.83	4
	0.14	1,267	1	0.20	36.18	3
	0.16	1,154	1	0.20	37.03	3

Notes for Table 14-1 and Table 14-2:

1. Resources are reported using the 2014 CIM Definition Standards and were estimated using the 2019 CIM Best Practices Guidelines.
2. The Mineral Resource has been confined by a "reasonable prospects of eventual economic extraction" pit using the following assumptions to calculate the NSR: $18/lb Mo; 99% payable Mo, 0.15% losses and $824/wmt offsites roasting costs (roasting, transport, and insurance); a 2.5% NSR royalty; and uses an 86.4% metallurgical recovery
3. Costs for the "reasonable prospects of eventual economic extraction" pit are: mining costs of $3.05/t for mineralized material and $2.50/t for waste; G&A cost of $3.00/t; and process costs of $8.00/t. These parameters were derived from engineering studies carried out in the concept study in 2018.

4. Average bulk densities used were 2.62 t/m^3 for intrusive host rocks and 2.67 t/m^3 for sedimentary rocks.
5. Pit slope angles are assumed at 45º.
6. A site inspection and core review was undertaken during 15 August to 25 August 2021 by Sue Bird, P.Eng. an "independent qualified person" as such term is defined in NI 43-101.
7. Conversion from MoS_2 to Mo is 0.599 based on the respective atomic weights.
8. Numbers may not add due to rounding.

14.1 Key Assumptions and Data used in the Estimate

The total Malmbjerg Project area comprises a database of 195 drillholes and 10 channel samples, totalling more than 30,000 m of assayed length. A summary of the drillholes by year is provided in Table 14-3. Data prior to 1960 did not have certificate of QAQC information available. This historic data has been validated by comparisons of pulps and core, as detailed in Section 12.0.

Table 14-3: Summary of Assay Data used for the Resource Estimate

Year	Channels			DDH			Total		
	#	Length (m)	Interval (m)	#	Length (m)	Interval (m)	#	Length (m)	Interval (m)
Historic – 1960s	--	--	--	147	22,284	19,968	147	22,284	19,968
2005	10	1,824	1,758	31	4,988	4,795	41	6,812	6,553
2007	--	--	--	17	4,218	3,511	17	4,218	3,511
Total	10	1,824	1,758	195	31,490	28,274	205	33,314	30,032

14.2 Geologic Modelling

Three-dimensional (3D) wireframe solids based on geology have been used to constrain the grade interpolations and to define the orientation of mineralization. A high grade central core and lower grade halo is based on the deposit type and geology as Climax style porphyry Mo deposit with overlying sediments. Several post-mineral dikes between 5 m to 15 m thickness have been modelled in 3D and are assumed to have zero grade with their volume removed from the resource. Figure 14-1 below illustrates a N-S slice through the center of the Project to show the high and low grade zones modelled and used in the interpolations. The mineralized shapes have been clipped to the bedrock surface.

Domains with soft boundaries have also been used to adjust the variogram and search orientations to follow the domed structure of the Project. In addition, an oxide layer has been created 20 m below the bedrock surface to account for potentially oxidation, with the recoverable sulphide MoS_2 grade within this zone lowered by 33%.

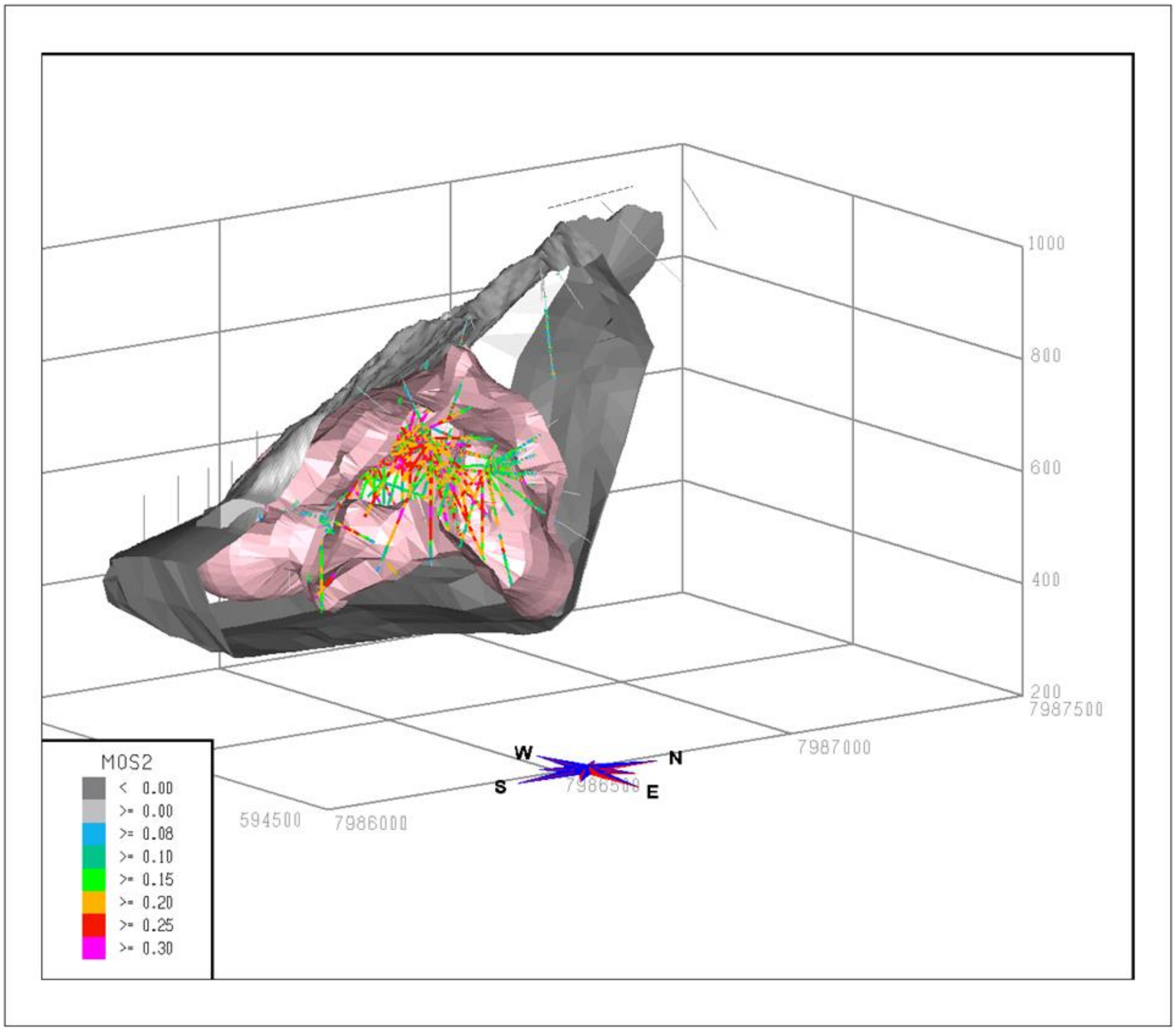


Figure 14-1: Illustration of the Modelled High Grade Core and Lower Grade Mineralized Halo (MMTS, 2021)

14.3 Compositing and Outlier Restrictions

Compositing of MoS_2 grades have been done as 10 m fixed length composites. Small intervals less than 5 m are merged with the up hole composite if the composite length is less than 5 m. The length of 5 m is chosen to be half the size of the block height, and longer than the majority of assay lengths, as illustrated in Figure 14-2. Zone and dike boundaries are honored during compositing.

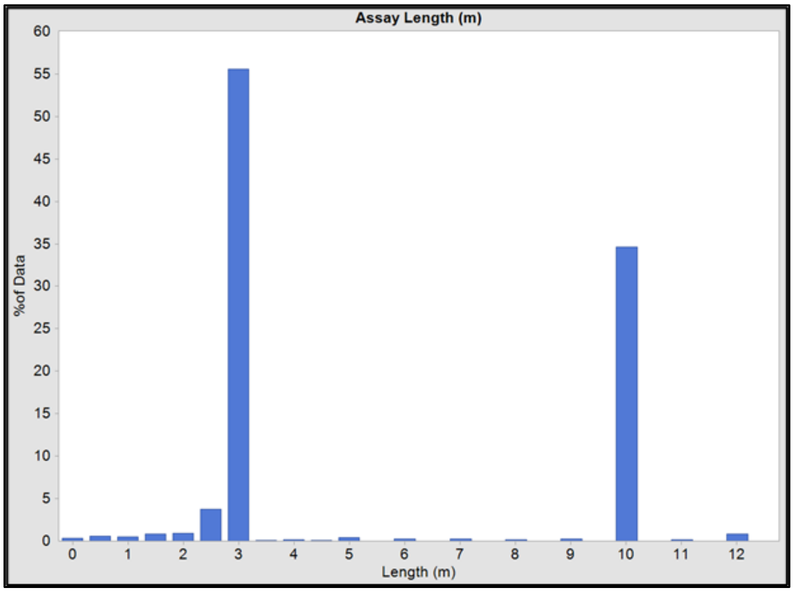


Figure 14-2: Histogram of Assay Lengths (m) (MMTS, 2021)

To ensure that compositing did not introduce a bias, the composite statistics have been compared to the assay statistics, as summarized in Table 14-4. The weighted mean grades of MoS_2 remain virtually identical after compositing, meaning that no bias has been introduced.

Table 14-4: Assay and Composite Statistic Comparison

Source	Parameter	High Grade Core			Lower Grade Halo			Dikes
		Domain 1	Domain 2	Domain 3	Domain 1	Domain 2	Domain 3	
Assays	# Samples	516	1303	2115	68	320	949	133
	# Missing	1	11	17	3	9	41	2
	Min	0.065	0	0	0.03	0	0	0
	Max	0.789	1.02	3.075	0.309	0.305	0.512	0.38
	Wtd mean (%)	0.241	0.226	0.209	0.092	0.079	0.069	0.147
	Wtd CV	0.409	0.405	0.445	0.438	0.503	0.718	0.734
Composites	# Samples	394	913	1111	53	125	352	95
	# Missing	5	8	3	97	4	84	1
	Min	0.07	0	0	0.035	0.001	0.001	0
	Max	0.6	1.02	1.111	0.19	0.215	0.27	0.38
	Wtd mean (%)	0.241	0.226	0.209	0.092	0.080	0.068	0.147
	Wtd CV	0.391	0.381	0.356	0.399	0.423	0.590	0.722
Difference (%)		0%	0%	0%	0%	1%	-1%	0%

Cumulative probability plots (CPPs) are used to define capping values and potential outlier restrictions during interpolations. As shown in the above table, the Coefficient of Variation (CV) values are very low within each of the modelled zones. Therefore, capping of the assay values was not considered to be necessary. Outlier restriction of the composited data was used instead to limit high grade outliers during interpolation. Figure 14-3 illustrates the CPPs of the composites by domain and zone (H = high grade core, L = lower grade halo). Table 14-5 summarizes the outlier restriction values, as well as the distances that the outliers are capped for each zone, domain, and each pass of the interpolation.

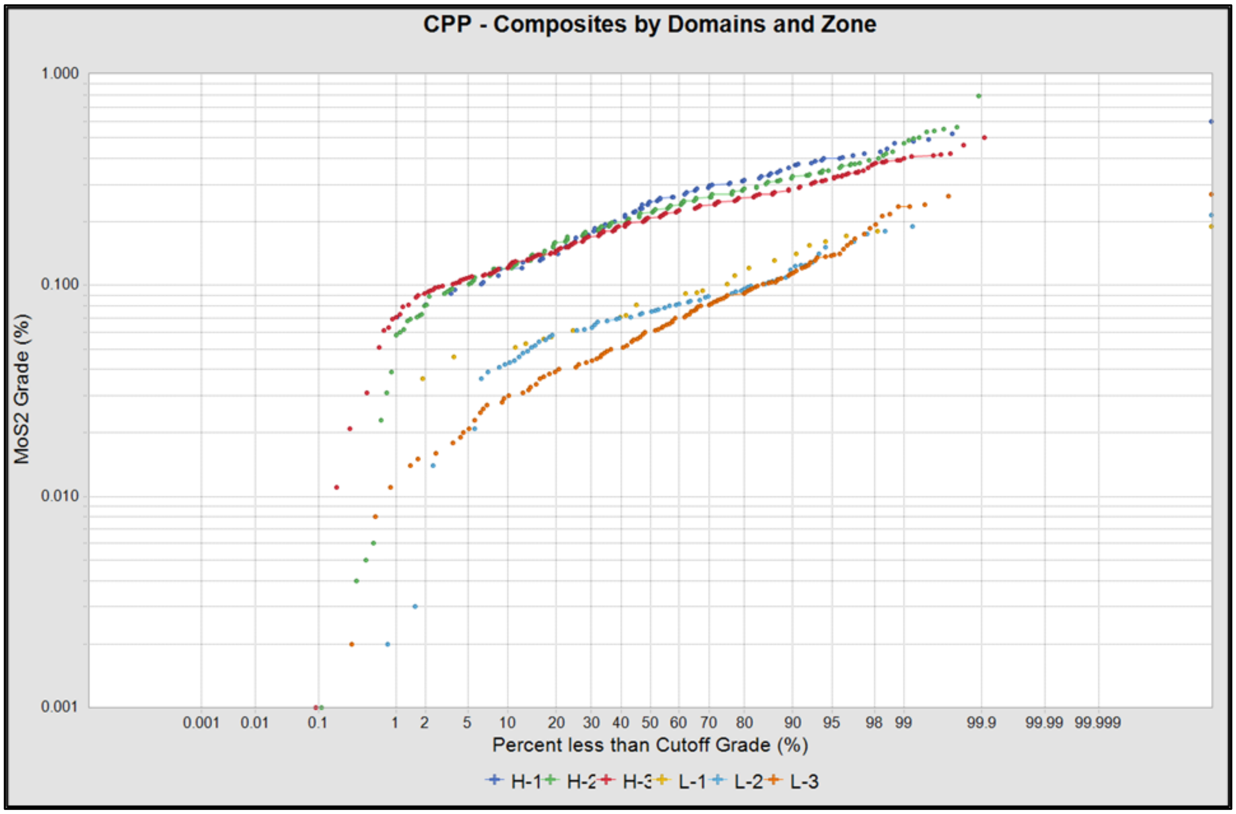


Figure 14-3: CPP plots of the Assays MoS_2 Grade Distribution by Domain and Zone (MMTS, 2021)

Table 14-5: Summary of Outlier Restriction during Interpolations

Zone	Domain	Outlier Restriction (%)	Distance (m)	
			Pass 1-3	Pass 4-5
High grade core	1	0.55	15	5
	2	0.6	15	5
	3	0.6	15	5
Lower grade halo	1	0.2	15	5
	2	0.2	15	5
	3	0.25	15	5

14.4 Variography

Correlograms have been created for each domain within the Project. Figure 14-4 and Figure 14-5 illustrate the variogram models for Domains 1 and 3 respectively. These illustrate the low nugget and good structure of the variograms, as well as the changing orientation of the major axis from dipping southwest in the southern "nose" of the Project to dipping northeast into the mountain in the north portion of the Project. A summary of the spherical correlogram parameters is given in Table 14-6.

Table 14-6: Summary of Variogram Parameters by Domain

DOMAIN	Rotation (GSLIB-MS)		Axis	Total Range (m)	Nugget	Sill1	Sill2	Sill3	Range 1 (m)	Range 2 (m)	Range 3 (m)
1	ROT	45	Major	280	0.05	0.25	0.2	0.5	40	220	280
	DIPN	45	Minor	220					20	120	220
	DIPE	0	Vert	120					15	80	120
2	ROT	0	Major	220	0.18	0.3	0.2	0.32	50	120	220
	DIPN	0	Minor	220					50	120	220
	DIPE	0	Vert	220					50	120	220
3	ROT	50	Major	300	0.05	0.3	0.3	0.35	100	120	300
	DIPN	-45	Minor	180					20	120	180
	DIPE	0	Vert	200					30	180	200

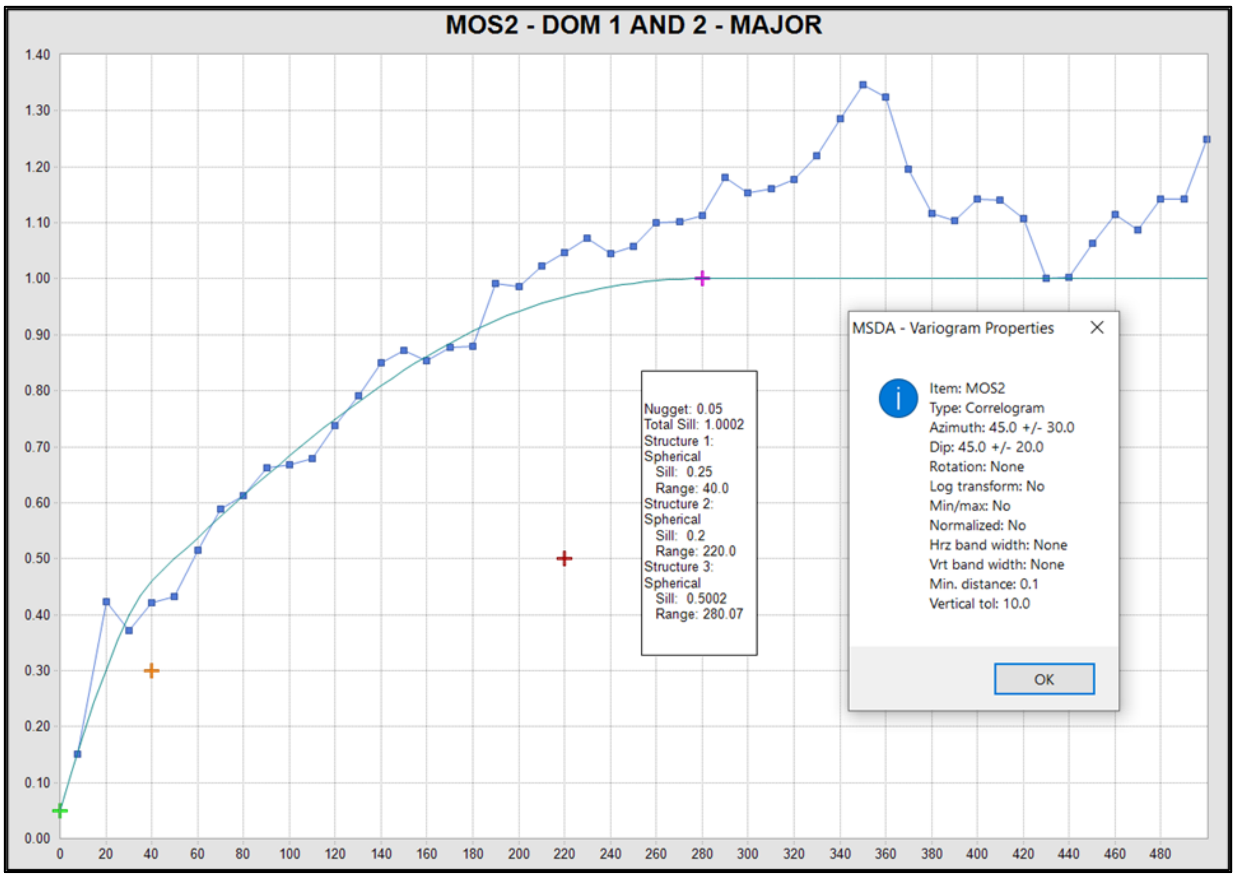


Figure 14-4: Correlogram for Domain 1 – Major Axis (MMTS, 2021)

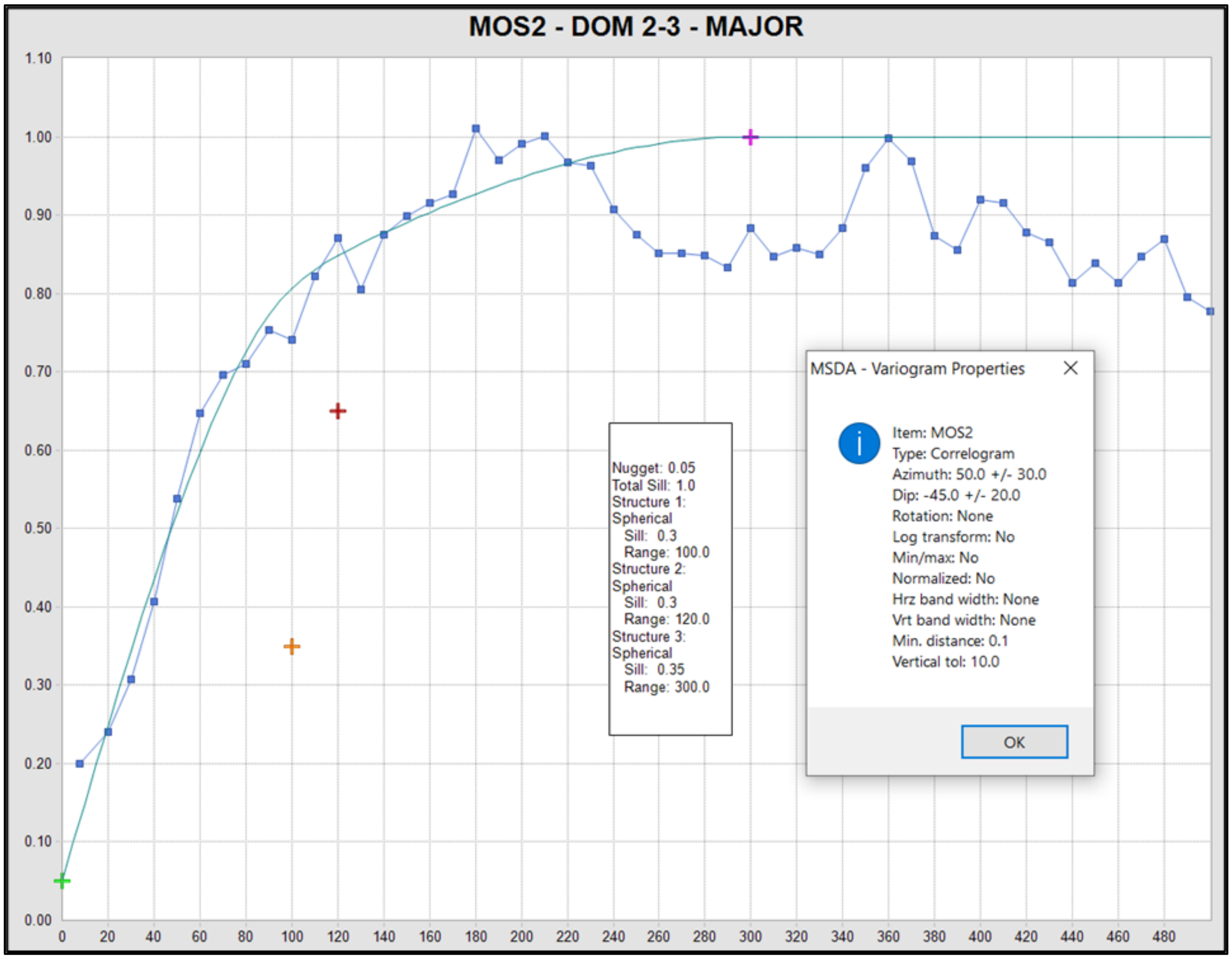


Figure 14-5: Correlogram for Domain 3 – Major Axis (MMTS, 2021)

14.5 Block Model Interpolations

The block model limits and block size for each deposit are as given in Table 14-7. Units are in UTM Zone 26.

Table 14-7: Block Model Limits

Direction	Minimum	Maximum	Distance (m)	Block Size (m)	# blocks
Easting	593,595	595,245	1,650	15	110
Northing	7,985,590	7,987,510	1,920	15	128
Elevation	282	1,422	1,140	12	95

Interpolation of MoS_2 values is done by OK in five passes based on the variogram parameters. Interpolations used soft boundaries between the domains, with composites shared across domain boundaries. Between the high grade core and lower grade surroundings, composites and block codes are required to match to reduce smoothing. Search parameters are summarized in Table 14-8 by domain.

Table 14-8: Search Rotation and Distances

DOMAIN	Rot	Dist1	Dist2	Dist3	Dist4	Dist5
1	45	40	80	160	280	450
	45	20	40	80	220	300
	0	15	30	60	120	180
2	0	50	100	165	220	450
	0	50	100	165	220	300
	0	50	100	165	220	180
3	50	75	150	225	300	450
	-45	20	40	80	180	300
	0	30	60	120	200	180

Additional search criteria on composite selection are summarized in Table 14-9. Search criteria are used to ensure that more than one drillhole is used for all passes, and more than one quadrant is used for the first two passes, as well as to limit smoothing of grade by limiting the maximum number of composites to be used.

Table 14-9: Additional Search Criteria

Search Criteria	Pass(es)		
	1-2	3-4	5
Minimum # composites	4	4	4
Maximum # composites	16	16	6
Maximum per Drillhole	3	3	3
Maximum per Quadrant	3	8	16

14.6 Classification

Classification is based on the variogram parameters, with the required average distance to the nearest two drillholes required to be less than the distance of the range at 80% of the sill (R80 value) of the major axis for each domain as summarized in Table 14-10. For Measured, the required distances if 50 m between drillholes, relating to the range at about 50% of the sill (R50) for the major axis of each domain. An illustration of the block classification is provided in Figure 14-6.

Table 14-10: Classification Criteria

Deposit	1	2	3
Measured	120	80	90
Indicated	50	50	50

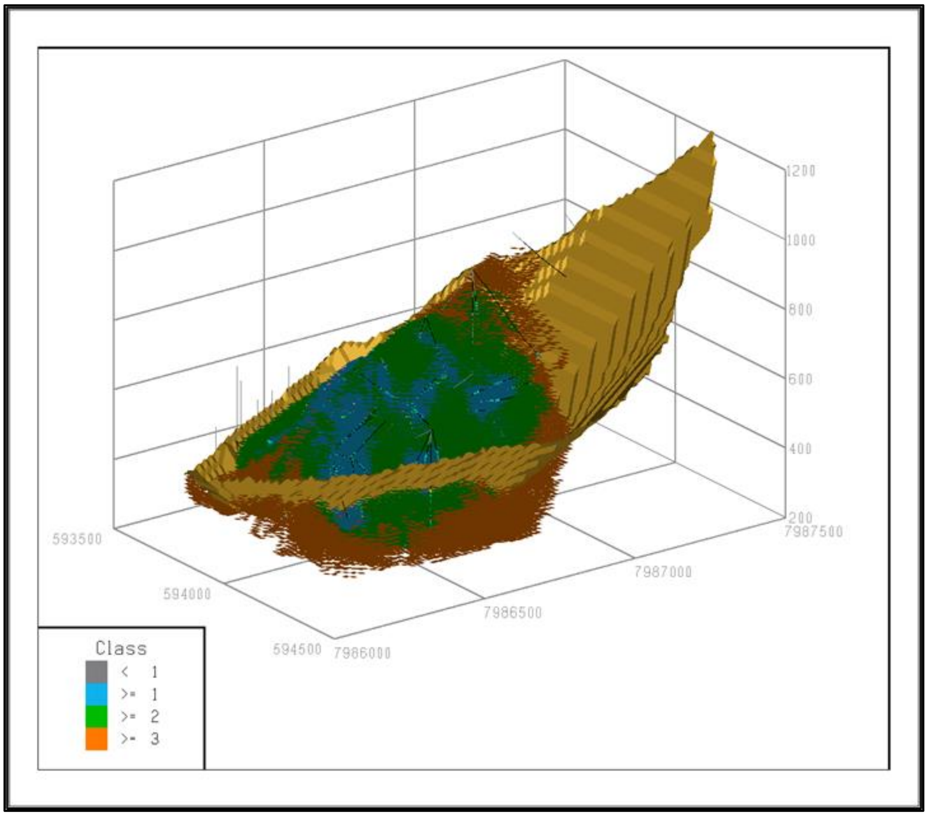


Figure 14-6: Three-dimensional View of the Classification, Drillholes and Resource Pit (MMTS, 2021)

14.7 Block Model Validation

14.7.1 Comparison of Global Grades

Interpolations have also been completed using the nearest neighbour method in order to essentially de-cluster the composite data for grade comparisons with the modelled grades. Table 14-11 gives a summary of the mean grades for de-clustered composites (NN interpolation), and OK grades at a zero cut-off. The comparison shows a difference in grades of less than 1% between the model and the de-clustered data.

Table 14-11: Comparison of Model Grade with De-clustered Composites within the Resource Pit

Source	Parameter	High Grade Core	Lower Grade Halo	All
OK Model	Num Samples	31,419	39,777	71,196
	Wtd mean MoS (%)	0.203	0.072	0.130
	Wtd CV	0.278	0.356	0.598
De-clustered Composites	Num Samples	31,419	39,777	71,196
	Wtd mean MoS (%)	0.201	0.071	0.129
	Wtd CV	0.399	0.605	0.700
Difference		0.5%	1.1%	0.8%

14.7.2 Comparison of Tonnage and Grades

The comparison of tonnage and grade is illustrated succinctly in the plots of tonnage-grade curves. The NN values for MoS_2 are plotted and compared to the modelled OK values in Figure 14-7. The distributions show good correlation, confirming that the modelled grades and change of support are not bias.

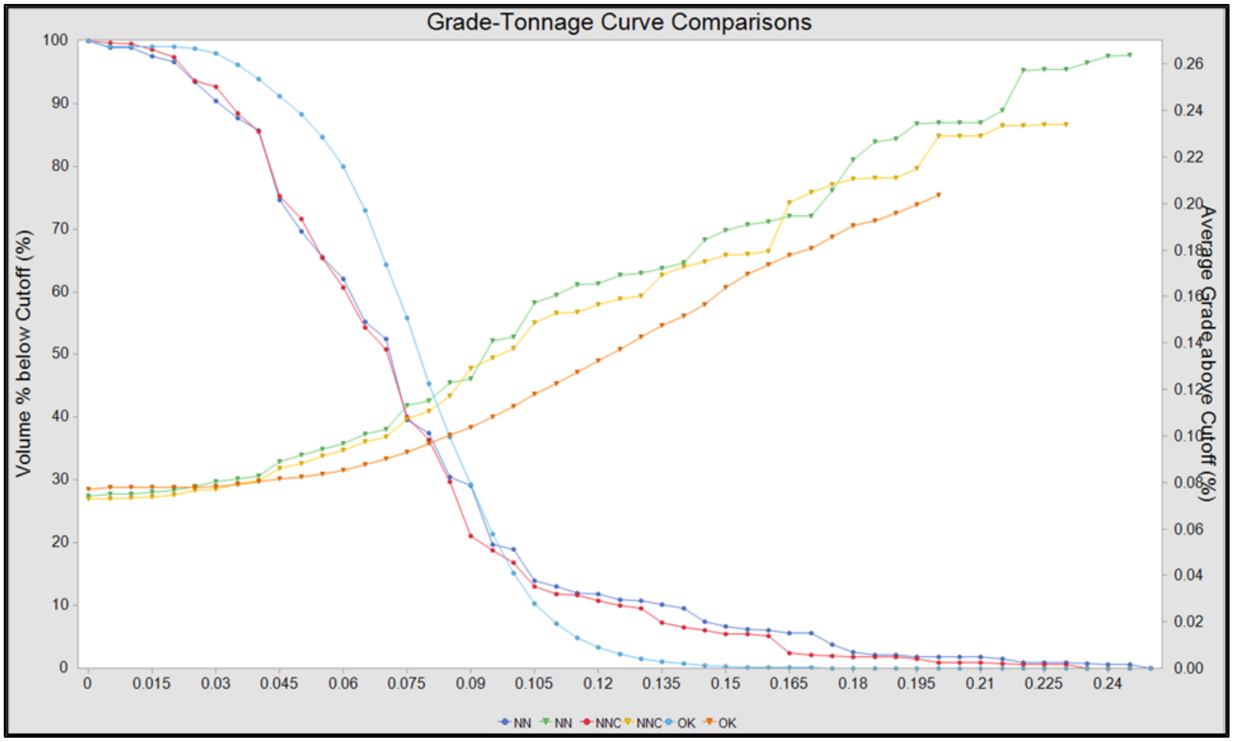


Figure 14-7: Tonnage-Grade Curves for Mo – Comparison of Interpolation Methods (MMTS, 2021)

14.8 Visual Validation

A series of E-W, N-S sections and plans have been used to inspect the OK block model grades with the original assay data. Figure 14-8 is a N-S section through the center of the Project, and Figure 14-9 is an E-W section through the center. Both sections plot the assay grades, the modelled grades, the resource pit, topography, bedrock, and oxide surfaces. The figures demonstrate the climax type dome geometry of the mineralization, with the modelled MoS_2 grades matching the assay grades. It can also be seen that the resource is limited by the glaciers laterally and by the extent of drilling both laterally and at depth. Plots throughout the model confirmed that the block model grades corresponded well with the assayed grades.

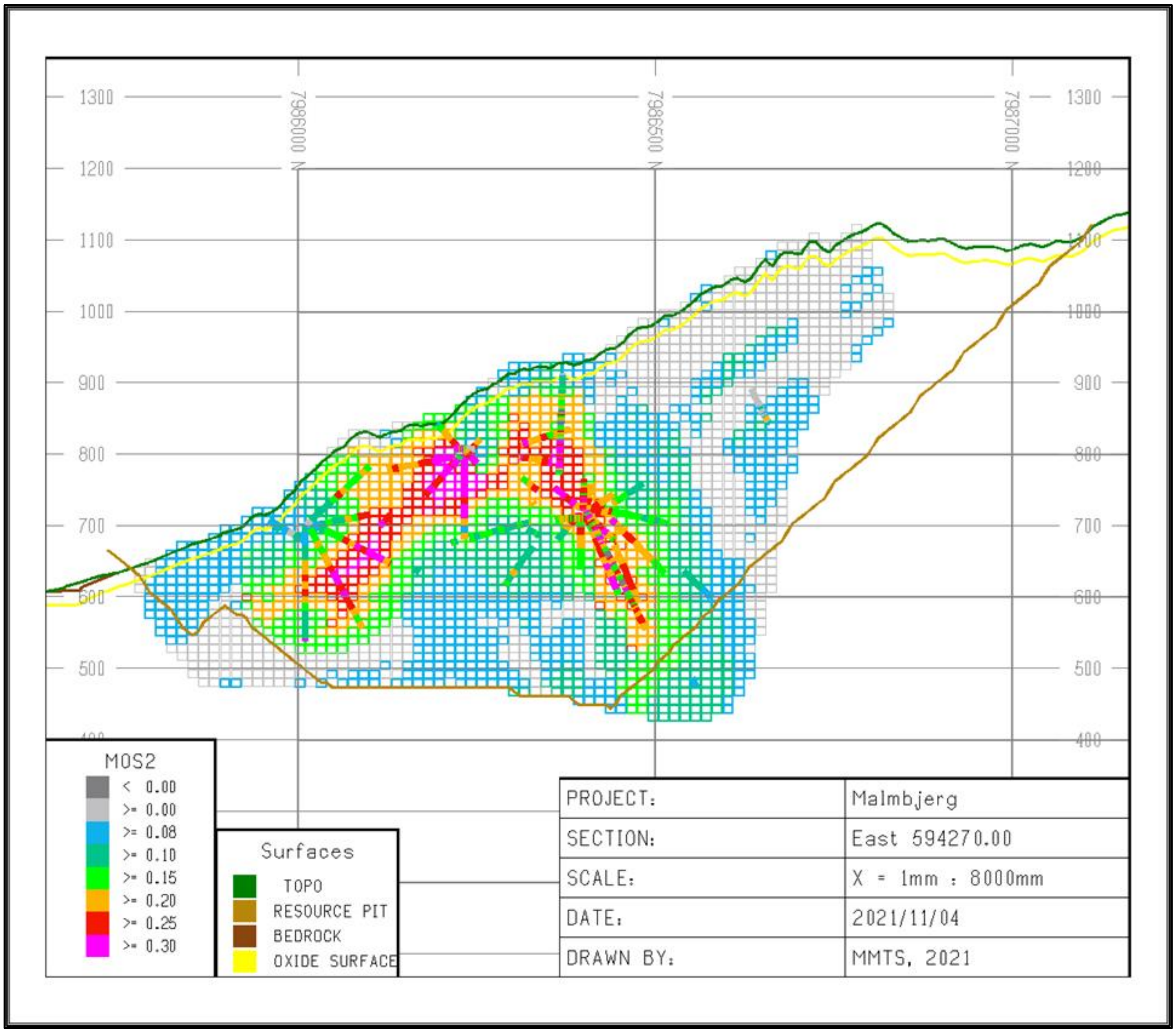


Figure 14-8: Visual Validation of MoS_2 at 594270E – Drillholes +/- 25 m

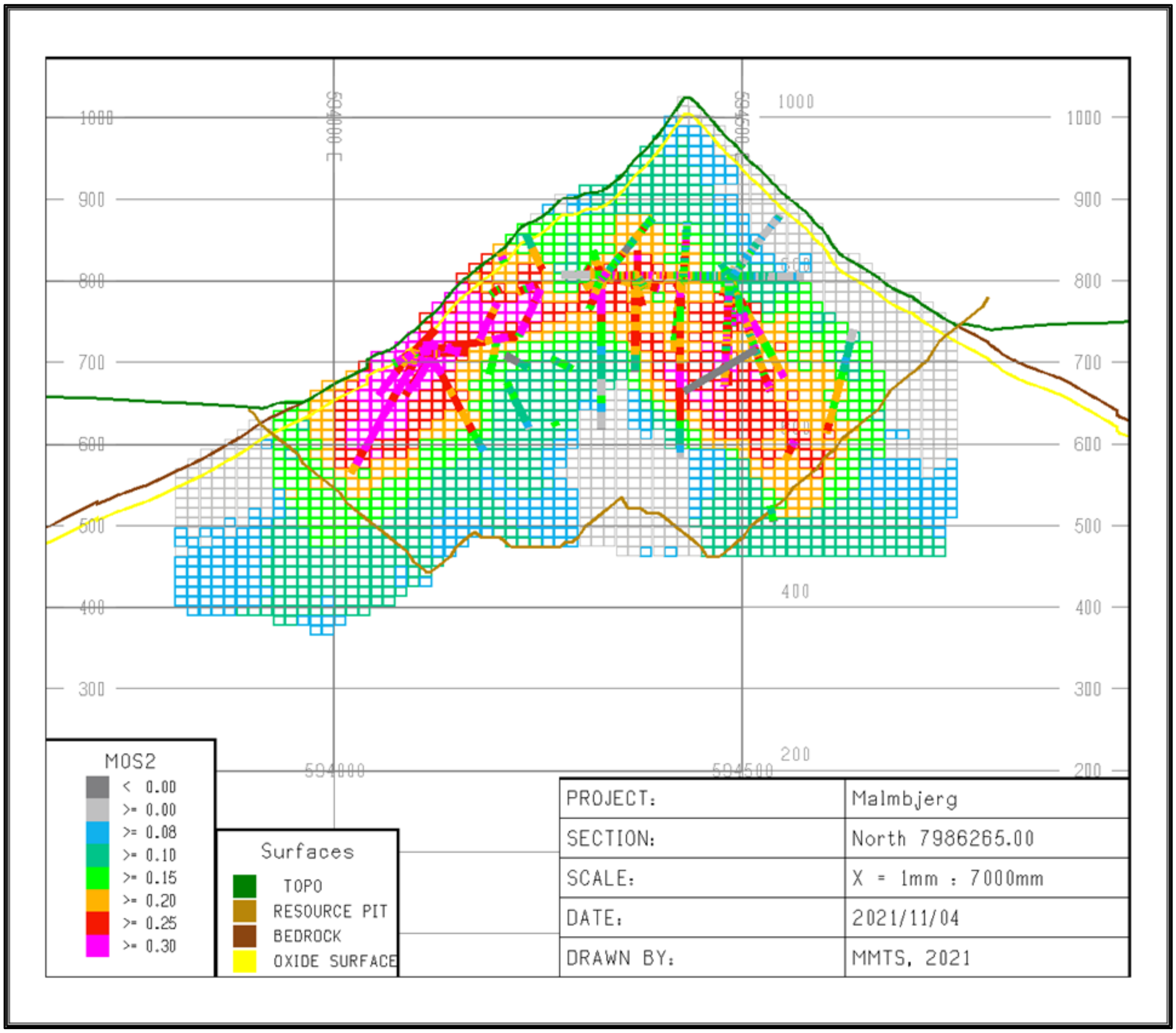


Figure 14-9: Visual Validation of MoS_2 at 7986265N – Drillholes +/- 25 m

14.9 Reasonable Prospects of Eventual Economic Extraction

As defined by NI 43-101, the resource confining pit and/or underground shapes define a boundary for continuous mineralization with suitable grades and with a reasonable expectation that an engineered plan will produce an economic plan. The NSR calculation prices and all economic inputs to determine the open pit resources, as well as the metallurgical recoveries, are summarized in Table 14-3.

Table 14-12: Economic Inputs and Metallurgical Recoveries

Parameter	Value
Base Case Mo Price	$18/lb
Recovery	86.40%
Overall Pit Slope	45°
Mining Cost	$3.05/t mineralized material
Mining Cost – waste	$2.50/t waste
Processing Costs	$8.00/t milled
Rehandle Costs	$1.50/t
G&A	$3.00/t milled
Royalty	2.50%
Payable	99.00%
Roasting Loss	0.15%
Off-site Costs	$824/t milled
Net Smelter Price Mo	$16.20/lb
Pit Case used for the Confining Shape	100% price case
Base Case Cut-off Grade	0.08% MoS_2

The pit delineated resource is given in Table 14-1 and Table 14-2 for the Malmbjerg Project. Process recoveries, as well as mining, processing, and off-site costs have been applied in order to determine that the pit resource has a reasonable prospect of economic extraction. The 0.08% MoS_2 cut-off yields a M&I resource of 281 Mt at 0.18% MoS_2 for a total M&I Mo content of 661 Mlb.

14.10 Third Party Review of the Block Model

Mr. Michael O'Brien, P.Geo., a senior geologist of Tetra Tech, has completed a third-party review of the Mineral Resource block model. No major discrepancy was found in the block model.

14.11 Factors That May Affect the Mineral Resource Estimate

Areas of uncertainty that may materially impact the MRE include:

- Commodity price assumptions
- Metal recovery assumptions
- Mining and processing cost assumptions

There are no other factors or issues known to the QP that materially affect the estimate other than normal risks faced by mining projects in terms of environmental, permitting, taxation, socio-economic, marketing, and political factors.

14.12 Risk Assessment

A description of potential risk factors is given in Table 14-13 along with either the justification for the approach taken or mitigating factors in place to reduce any risk.

Table 14-13: List of Risks and Justifications / Mitigations

#	Description	Justification / Mitigation
1	Classification Criteria	Classification based on the Range of the Variogram and therefore the variability of the mineralization within each deposit.
2	Mo Price Assumptions	Based on current price and projected price (Merchant Research and Consulting, 2021).
3	Capping	Mean grade comparisons, CPP, and grade-tonnage curves show model validates well with assay and composite data throughout the grade distribution.
4	Processing and Mining Costs	Based on current study and previous pre-feasibility study.

15.0 MINERAL RESERVE ESTIMATE

The methodology for estimating mineral reserves for the Project is discussed in this section.

The Mineral Reserve estimates have been prepared under the direction of a QP, using accepted industry practices. P&P mineral reserves are effective 8 February 2022 and based on M&I mineral resources only (Section 14.0).

Mineral reserves are derived with Hexagon MinePlan3D® software, using a phased pit design, estimated glacier-ablated topography, and block model developed by MMTS.

MMTS developed the LOM production schedule within the pit phase designs using Hexagon MinePlan Schedule Optimizer (MPSO) with a grade optimization strategy using variable cut-off grades and stockpiles. The cut-off grade (CoG) is a calculated Net Smelter Return (NSR) grade measured in $/t. Reserves are reported as the total tonnes and grades that are sent to the concentrator, either directly or as rehandle from a stockpile, by the end of the scheduled mine plan.

The pit phase designs and LOM production schedule are discussed in further detail in Sections 16.2 and 16.7, respectively.

The Mineral Reserve estimate summarized in Table 15-1 has been confined by the scheduled LOM Pit Designs that demonstrate that extraction could reasonably be justified.

Table 15-1: Malmbjerg Mineral Reserves (MMTS, 2022)

Description	Reserve Tonnes (Mt)	Diluted Grade (% MoS_2)	In-Situ Mo (Mlb)
Proven	123	0.202	328
Probable	122	0.151	243
TOTAL	**245**	**0.176**	**571**

1. The Mineral Reserves statement is prepared by Jesse Aarsen, P.Eng. (who is also an Independent QP), reported using the 2014 CIM Definition Standards and the 2019 CIM Best Practices Guidelines, and have an effective date of 8 February 2022
2. Mineral Reserves are mined tonnes and grade, the reference point is the primary crusher prior to transport via the rope conveyor to the processing plant
3. Mineral Reserves are reported at a cut-off NSR of $11.14/t NSR (diluted). The cut-off value covers the processing + G&A costs of $8.34/t, ore transport costs of $0.14/t, and stockpile rehandle costs of $1.25/t
4. NSR cut-off grade assumes $18/lb Mo, block recoveries from the model, 99% MoS_2 payable, 0.15% roasting losses, $1/lb roasting charges, $1,290/t concentrate off-site costs, and 2.5% royalty
5. The average molybdenum metallurgical recovery is 84.6%
6. Conversion from MoS_2 to Mo is 0.599 based on the respective atomic weights
7. Mined tonnes and grade are based on an SMU of 15 m x 15 m x 12 m, including additional mining losses estimated for the removal of isolated blocks (bounded by waste on four sides)
8. Mineral Reserves are converted from M&I Mineral Resources through the process of pit optimization, pit design, production scheduling and are supported by a positive cash flow model
9. The estimate of Mineral Reserves may be materially affected by environmental, permitting, legal, title, socio-political, marketing, or other relevant issues
10. Rounding as required by reporting guidelines may result in summation differences

15.1 Mine Area Description

The Malmbjerg mine area, as shown in Figure 15-1, is situated on a steep mountainous ridge at the confluence of two active glaciers, Schuchert Glacier on the west side and Arcturus Glacier on the east. The mine area consists of the open pit mine, Rock Storage Facility (RSF), stockpiles, primary crusher, and associated roads and infrastructure. Crusher ore will be transported from mine area to concentrator at port by Rope Con conveyor system (Section 16.6 for ore transportation methodology).

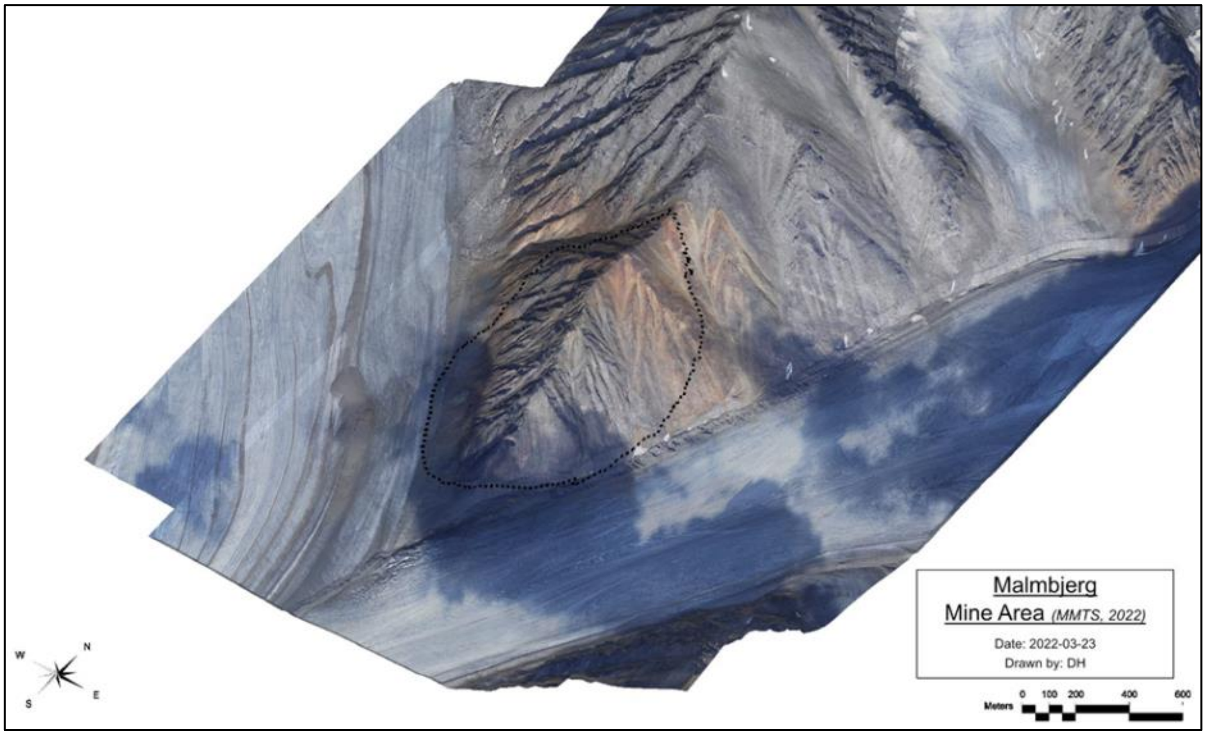


Figure 15-1: Malmbjerg Mine Area

15.1.1 Mining Datum

As of 12 October 2021, the mine area is in NAD83 UTM Zone 26N and used a composite topography surface that estimates surface elevations due to glacial ablation.

15.1.2 Glacial Ablation

The composite topography surface used for the mineral reserve estimate and mine planning work utilizes a 2007 LiDAR survey as baseline DEM. This DEM was then modified with glacial ablation estimates modelled according to field observations, historical air photos, and freely available satellite imagery, as well as best available climate and weather data. The resulting surface represents a reasonable estimate of the surface topography as of 12 October 2021.

The ultimate pit is restricted from mining into the Schuchert and Arcturus Glacier, as estimated by the glacial ablation. It is expected that ablation will continue to affect the surface topography between the effective date of this report to any future mine operation start-up. As glacial ablation continues, it may provide opportunities to expand the deposit; however, this opportunity is not investigated or included in this report.

15.2 Mine Planning Model

15.2.1 3D Block Model and MinePlan Project

A 3D Block Model (3DBM) was developed by MMTS and published on 12 October 2021 as part of the NI 43-101 Mineral Resource Estimate Report for the Malmbjerg property. The same 3DBM was used for the reserve estimate and mine planning purposes. The 3DBM was loaded into Hexagon MinePlan 3D software. Some items from the resource model were excluded where not pertinent to mine planning activities. The 3DBM for mine planning uses 15 m x 15 m x 12 m blocks and is not rotated.

Table 15-2: Mine Planning 3DBM Limits (MMTS, 2021)

	Min	Max	Block size (m)	# of Blocks
x	593595	595245	15	110
y	7985590	7987510	15	128
z	282	1422	12	95

A partial list of relevant mine planning 3DBM items is given in Table 15-3.

Table 15-3: Mine Planning 3DBM Relevant Items (MMTS, 2021)

Model Item	Source	Units	Description
TOPO	Resource model	%	% below topo
BTOPO	Resource model	%	% below bedrock
TOT%	Resource model	%	Total % within mineralized domains
SG	Resource model	t/m^3	Weighted average sg
CLASS	Resource model	n/a	Resource class
$SMOS_2$	Resource model	%	MoS_2 “grade item” adjusted by sulphide & oxide zones
STOPO	Calculated	%	% below “start” surface (post dozer push topography)
REC%	Calculated	%	Metallurgical recovery
NSR_1	Calculated	$/t	NSR “grade item”
REH%	Calculated	%	Total % of block considered as rehandle
DEDGE	Calculated	n/a	Number of “dilution edges”
DNSR	Calculated	$/t	Diluted NSR grade item
$DMOS_2$	Calculated	%	Diluted MoS_2 grade item
$RMOS_2$	Calculated	%	Recovered MoS_2 grade item

15.2.2 Metallurgical Recoveries

The mine planning model uses a variable metallurgical recovery equation as a function of MoS_2 grade provided by Tetra Tech. The formula for calculating metallurgical recovery is:

$$\mathbf{REC\% = 94.024054 \times SmoS_2^{0.0647}}$$

In cases where this formula would result in metallurgical recoveries greater than 90%, REC% is capped at a maximum of 90%.

The REC% item is also used to calculate the recovered grade in the 3DBM, which is calculated by multiplying REC% by $DMOS_2$ (the diluted MoS_2 grade item).

15.2.3 Net Smelter Return

Cut-off grades for mine planning and reserve estimates are based on NSR. The NSR is calculated as follows for mineral reserves (the same formula applies to mineral resources, but mineral resource estimates use different metal prices):

$$\mathbf{NSR = NSP\$/lb \times unit\text{-}factor \times REC\% \times MoS_2}$$

The parameters are included in Table 15-4.

Table 15-4: NSR Parameters (MMTS, 2021)

Parameter	Value	Units
Net Smelter Price (NSP)	$9.70	$/lb
Unit-Factor	2,204.62	lb/t
REC%	Variable (see Section 15.2.2)	%
MoS_2	$SmoS_2$ item from 3DBM	%

15.2.4 Mining Loss and Dilution

The mining loss and dilution methodology used for the mine planning and reserve estimate is based upon the number of lateral waste contact edges on each ore block of the 3DBM. At the time of the loss and dilution study, ore blocks were defined as any block with an NSR greater or equal to $16/t.

Ore blocks with one to three waste contact edges experience an increasing amount of dilution. In bulk mining methods, ore blocks with four edges are typically wasted and accounted as a mining loss.

The CoG used in the production schedule is lower than the CoG used for the loss and dilution study. This will result in different blocks being applied with loss and dilution; however, the relative impact remains the same in the range of CoG considered. Therefore, the loss and dilution estimates remain a reasonable conservative estimate.

Table 15-5: Mining Loss and Dilution due to Contact Blocks (MMTS, 2022)

Dedge	Ore kt	Block Dilution (Diln%)	Diluted tonnes added (kt)
1 edge	13,953	14.6%	2,032
2 edges	9,719	29.2%	2,831
3 edges	1,748	43.8%	764
Total (kt)	25,420	22.2%	5,628
% of Diluted Blocks	12.6%	Avg. Dilution = (Total Block Dilution 22.2% x % of Diluted Blocks 12.6%)	
Malmbjerg total (kt)*	202,457	2.79%	
4 edges	741	Contact Block Loss = 0.37%	

*denotes in situ M&I blocks within the full extent of the 3DBM where NSR >= $16/t

Approximately 13% of the reserve blocks have edge block dilution, and 87% of reserve blocks experience no mining dilution. Therefore, it would be inappropriate to use an average dilution factor. Instead, the block model is coded to reflect mining dilution on a block-by-block basis.

Diluted grades are calculated as follows:

$$\mathbf{DNSR = (1\text{-}DEDGE \times Diln\%) \times NSR + (DEDGE \times Diln\%) \times NSRDilnGrade}$$
$$\mathbf{DMOS_2 = (1\text{-}DEDGE \times Diln\%) \times SMOS_2 + (DEDGE \times Diln\%) \times SMOS_2DilnGrade}$$

Dilution grades are estimated by determining the average grade of the envelope of material around the mineralized blocks. For the Project, the average grade of this material is $10.33/t (0.061% MoS_2).

In addition to mining losses due to four-edge contact block loss, carry-back losses and misdirected loads must also be considered. Carry back losses assume that for nine months of the year, an estimated 10% of the truck boxes will have a build-up of frozen ore. It is assumed that once cleaned out, frozen ore will not be able to be salvaged. Therefore, this material will be counted as a mining loss for the purpose of reserve reporting, equal to approximately 0.56%. An allowance of approximately 430 misdirected loads per year results in a further 0.78% loss.

Total mining loss = carry back loss + misdirected loads + contact block loss

Table 15-6 shows the summary of loss and dilution for the Project.

Table 15-6: Summary of Total Mining Loss and Dilution (MMTS, 2022)

Project	Carry-back Loss	Misdirected Loads Loss	Contact Block Loss	Total Loss	Dilution
Malmbjerg	0.56%	0.78%	0.37%	1.71%	1.71%

With total loss equal to dilution, the quantity of ore tonnes is unaffected. Therefore, only diluted grades are applied to the reserves.

15.3 Geotechnical considerations

Geotechnical conditions are estimated from a geotechnical database developed from past site investigation programs completed in 2005 and 2007, previous geological models developed by InterMoly and RPA, geotechnical drill holes, and characterization of the rock mass.

The geotechnical domains defined for the purposed of the slope stability analysis are:

- Sediment: primarily arkose and conglomerate sandstones and cover the north and east sides of the deposit area.
- Intrusive: perthite granite, arcturus porphyry, aplite and schuchert porphyry, and is situated along the west side of the deposit.

Slope stability analysis was undertaken for each pit design sector to determine the appropriate slope angles for given sections of the open pit. The achievable slope geometry is controlled by the azimuth of the pit wall and rock domain.

Geotechnical domains are illustrated in Figure 15-2, where underlying pit designs in the figure are from the FS done in 2006 and do not represent the final pit designs described in this report.

MMTS created 3D slope sector zone solids based on the geotechnical domains described in the 2007 geotechnical report (KP, 2007). The pit slopes shown in Table 15-7 follow the bench configuration and slope angles prescribed for each geological domain. Slope designs are based on 12 m benches with 24 m vertical distance between benches (double benching).

Table 15-7 Pit Slope Inputs (KP, 2007)

Domain	Azimuth Range (º)	Bench Face Angle (º)	Inter Ramp Angle (º)	Overall Angle (º)
North Sector (sediments and intrusives)	320 to 62	70.0	50.0	45.0
Southeast Sector	62 to 185	70.0	53.0	50.0
Southwest Sector	185 to 320	70.0	50.0	50.0

Additionally, in-pit haul roads and geotechnical berms are added to the pit slopes and flatten the inter-ramp angles out to a shallower overall slope in the north and southeast sectors. Geotechnical berms are placed in the north wall to achieve the overall slope angle objectives.

The implementation of slope design also requires effective slope depressurization, good-controlled blasting and excavation practices, and regular inspection and systematic slope monitoring.

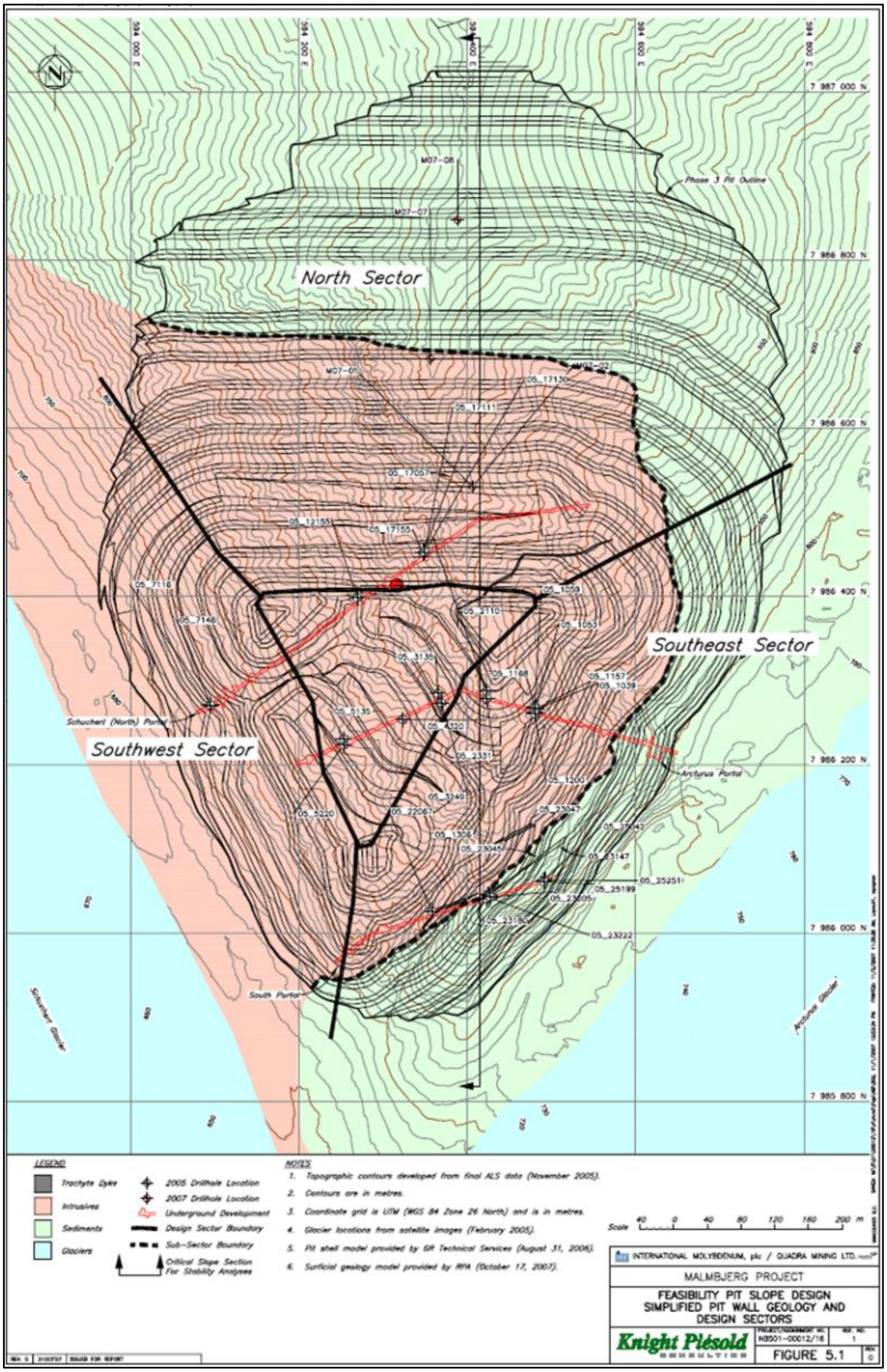


Figure 15-2: Open Pit Geotechnical Domains

16.0 MINING METHODS

16.1 Economic Pit Limit

The economic pit limit is selected after evaluating Lerch-Grossmann (LG) pit cases generated with Hexagon Mining's MineSight Economic Planner (MS-EP) software. This evaluation is based on the mine planning 3DBM described in Section 15.2.1. For this FS, only M&I class resources are given an economic value. M&I Resources contained within pit phase designs are upgraded to P&P Reserves once a schedule demonstrates that economic extraction is possible.

The evaluation of the ultimate economic pit limit is carried out by generating sets of pit shells of varying revenue assumptions to test the deposits' geometric/topographic sensitivity.

Typically, the ultimate economic pit limit is selected where an incremental increase in pit size does not significantly increase the pit-delineated resource; in other words, where the expansion of the pit shell has limited potential for a positive economic margin. The selected (undiscounted) ultimate pit limit is chosen where the incrementally larger pits produce marginal or negative economic returns.

16.1.1 Pit Optimization Parameters

The pit optimization parameters are shown in Table 16-1.

Table 16-1: Pit Optimization Parameters (MMTS, 2021)

Parameters	Value	Units
NSP MoS_2 (base case)	213.92	$/t
Metallurgical Recovery	From 3DBM (Section 15.2.2)	%
Process Cost + G&A	11.00	$/t
Ore Mining Cost	3.05	$/t
Waste Mining Cost	2.50	$/t
Incremental Mining cost (for mining below pit rim)	0.04	$/t per bench below 756 elevation
Overall Slope Angles		
North Sector (az 320 to 62)	45	°
Southeast Sector (az 62 to 185)	50	°
Southwest Sector (az 185 to 320)	50	°

16.1.2 Pit Optimization Cases

A series of LG pit surfaces have been created to assess the incremental economics of increasing the mining limits. By varying the NSP from low to high values, the geometry of the mineralized deposit is tested, where low NSP requires high grades and/or low strip ratios to generate an economic pit shape, and high NSP can generate incremental revenues to mine deeper, higher strip ratio material or lower grade zones. The larger pit shapes create larger mineable resources capable of supporting larger capital expenditure, but the extra material has lower economic margins (revenues minus cost), whereas the smaller pit shapes have higher margins but create a smaller project with lower initial capital.

Note: Varying the NSP is not a price sensitivity study since all in-pit mine plan quantities within the various shapes are calculated at the base case metal price NSPs and corresponding NSR cut-off grade.

The LG pit optimization cases are shown graphically in Figure 16-1, as the percent of NSP cases plotted against millions of tonnes of ore where 100% is the base NSP listed in Table 16-1. The pit optimization uses a restriction that prevents it from mining outside of the resource pit, which in turn is restricted from mining into the glaciers.

Figure 16-1: Pit Optimization Cases (MMTS, 2021)

16.1.3 Economic Pit Limit Assessment

From the results of the pit optimization, a selection of LG pit shells is chosen for further analysis to assess the economic pit limit. In Figure 16-1, inflection points are observed at the 42%, 60%, and 100% cases. An inflection point on this curve is an indicator of a potential pit limit, where the larger geometry of the next incremental NSP percent increase yields diminished returns in terms of ore tonnes.

The in-situ quantities and grades for the selected pit shells shown in Figure 16-2 and Figure 16-3 are summarized in Table 16-2.

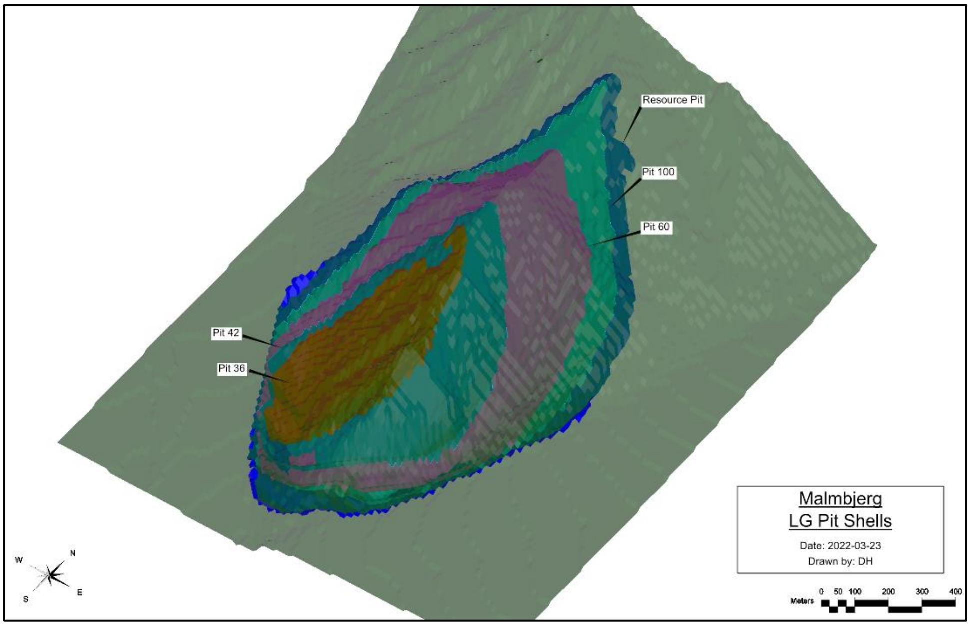


Figure 16-2: Plan View of Selected Malmbjerg LG Pit Shells (MMTS, 2021)

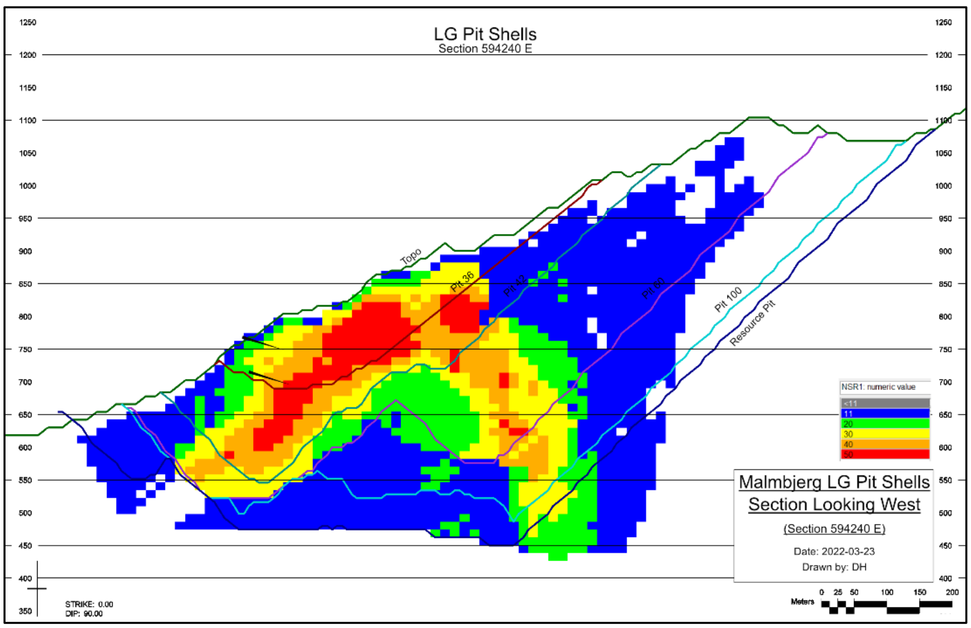


Figure 16-3: NS Section (at Easting 594240) Through Selected Malmbjerg LG Pit Shells (MMTS, 2021)

Table 16-2: LG Pit Shell Quantities (MMTS, 2022)

NSP Case	Potential Mill Feed[1] Total				Waste	Grand Total	S/R	Years[2]
	Mt	$SmoS_2$ %	NSR ($/t)	Rec %	Mt	Mt		
36%	28.5	0.22	40.42	84.8	5.4	33.9	0.2	2.2
42%	109.1	0.19	35.43	84.1	35.7	144.8	0.3	8.5
60%	229.7	0.18	32.89	83.7	140.2	369.8	0.6	18.0
100%	293.0	0.17	30.95	83.4	242.7	535.8	0.8	22.9

[1] Potential Mill Feed identified as blocks with NSR >= $11/t
[2] Assumes a throughput of 12.8 Mt/a

From these results, the 36% pit was selected as a guide for the first phase of mining. The 42% pit was also identified as a potential second phase of mining. A discounted analysis was performed to determine if the final phase should target the 60% pit or something larger. On a discounted basis, the 100% case does not represent a significant increase in pit economics; however, it does extend the mine life by an additional five years.

The ultimate pit limits were selected based on a subsequent LG run at a 95% NSP case and a total processing cost of $17/t. The total processing costs reflected the increased ore transport costs associated with long-hauling ore on a glacier haul road to the process facilities at Mesters Vig Inlet. Later, the RopeCon conveyor ore transport method was selected as the base case, and the processing costs dropped to $8.48/t. At the end of the Project, a check was completed to ensure that the ultimate pit limit remained valid at this lower processing cost. Using the $11.14/t NSR cut-off stated in the mineral reserve, the 95% (at $17/t) pit shell provides a valid economic limit with a 20-year mine life, while remaining inside the resource pit limits and the original 100% NSP case.

16.2 Pit Phase Designs

16.2.1 Pit Contents

The final detailed pit designs include three pit phases. The pit contents by phase and grade bin are summarized in Table 16-3.

Table 16-3: Malmbjerg Open Pit Contents by Phase (MMTS, 2022)

Cut-off	Phase 1			Phase 2			Phase 3			Grand Total		
dNSR		$dMOS_2$	dNSR		$dMOS_2$	dNSR		$dMOS_2$	dNSR		$dMOS_2$	dNSR
$/t	Mt	%	$/t	Mt	%	$/t	Mt	%	$/t	Mt	%	$/t
0	15.5	0.04	5.87	15.0	0.04	6.49	11.0	0.04	5.87	41.5	0.04	6.10
9	5.2	0.06	10.09	6.3	0.06	10.04	5.8	0.06	10.16	17.3	0.06	10.09
11	5.5	0.07	12.07	6.5	0.07	11.98	7.2	0.07	11.99	19.2	0.07	12.01
13	5.9	0.08	14.03	6.7	0.08	14.02	8.0	0.08	14.03	20.6	0.08	14.03
15	2.9	0.09	15.49	3.5	0.09	15.47	4.2	0.09	15.52	10.7	0.09	15.49
16	1.1	0.10	16.47	1.0	0.10	16.50	1.3	0.10	16.50	3.3	0.10	16.49
17	0.9	0.10	17.48	1.0	0.10	17.49	1.5	0.10	17.51	3.4	0.10	17.50
18	1.1	0.11	18.48	0.8	0.11	18.48	1.6	0.11	18.50	3.4	0.11	18.49
19	1.2	0.11	19.48	0.9	0.11	19.50	2.1	0.11	19.53	4.3	0.11	19.51
20	4.8	0.13	22.43	6.0	0.13	22.71	13.7	0.13	22.56	24.5	0.13	22.57
25	3.2	0.15	27.52	6.5	0.15	27.52	14.7	0.15	27.54	24.4	0.15	27.53
30	10.9	0.21	37.80	23.1	0.21	38.38	48.9	0.21	37.68	82.8	0.21	37.89
45	10.6	0.30	55.90	18.7	0.28	51.24	19.1	0.27	50.36	48.5	0.28	51.91
Total	**68.7**	**0.13**	**23.48**	**96.0**	**0.15**	**27.22**	**139.1**	**0.16**	**28.92**	**303.9**	**0.15**	**27.15**

16.2.2 Pit Slope Geotechnical Design Criteria

KP completed geotechnical site investigation programs within the Malmbjerg deposit area in 2005 and 2007, in support of a feasibility level pit slope design for the previous owner.

The KP 2007 feasibility pit slope design was based on a simplified geotechnical model that comprises of the inferred distribution for the two major geological domains encountered, i.e., Sediments (Arkosic and Conglomeratic Sandstones) and Intrusives (Perthite Granite, Arcturus Porphyry, Aplite, and Schuchert Porphyry). The intact rock strengths were generally found to be high and the rock mass quality is typically good. Large-scale structural features across the deposit area were unknown. Discontinuities within the Sediments unit typically parallel the bedding and dip at shallow angles, whereas discontinuities in the Intrusives unit are steeply dipping. The horizontal in situ stresses are expected to be low as an extensional tectonic model has been hypothesized for the Project area.

Three major pit design sectors, North, Southeast and Southwest, were defined based on the spatial distribution of the geological domains and the proposed wall orientations. The KP recommended pit slope design parameters and application criteria are summarized in Table 16-4. These geotechnical design criteria were applied to the current feasibility study open pit design.

Table 16-4: Recommended Pit Slope Angles (KP, 2007)

Design Sector	Pit Wall Geology	Max. Wall Height	Overall Slope Angle	Inter-ramp Angle	Bench Face Angle	Bench Height	Bench Width
		m	°	°	°	m	m
North	Sediments	650	45	50	70	24	11.5
	Intrusives			50	70	24	11.5
Southeast	Sediments	300	50	50	70	24	11.5
	Intrusives			53	70	24	9.5
Southwest	Intrusives	150	50	50	70	24	11.5

16.2.3 In-pit Haul Roads

Two-way in-pit haul roads of 32 m widths are designed to support the use of 230-t payload haul trucks. Haul road grades are limited to a maximum of 8%. Access ramps are not designed for the last bench above the pit bottom elevation, assuming that the ramp segment accessing the pit bottom will be removed using retreat mining. The bottom two ramped benches of the pit use one-way haul roads of 23 m width and 12% grade since bench volumes and traffic flow are reduced.

16.2.4 Pit Phasing

Ultimate pit limits are split into phases or pushbacks to target higher economic material earlier in the mine life with lower strip ratios. A minimum pushback width of 75 m is used between each phase.

The Malmbjerg pit is split into three phases. The first two phases target higher-grade lower-strip ratio areas of the pit defined by the 36% and 42% NSP cases of the optimization runs described in Section 16.1.2. The third phase targets the ultimate pit limit discussed in Section 16.1.4. The phases proceed from highest economic margin to lowest, within the selected ultimate pit limit.

16.2.5 Pit Designs

Pit designs are configured on 12 m bench heights, with berms placed every two benches or double benching. Bench face angles, inter-ramp angles, and bench widths are unique to each prescribed geotechnical sector. The phased Malmbjerg pit designs are discussed below and shown in Figure 16-4 to Figure 16-6. Section views through the deposit showing the NSR are shown in Figure 16-7 to Figure 16-11. These figures show only the in-situ highwall component of the pit phases. Switchbacks are planned to be placed with dumped material. External road designs and switchbacks dumped on topography are not shown in these figures.

- Phase 1 – This phase contains approximately four years of mill feed. The phase mines from 1,098 m to the phase bottom at 594 m. The ramp runs down the highwall of the pit providing access to multiple external ramps and access for phase 2 mining. The bottom of the pit is accessed by a ramp that exits onto an external haul road at the 678 m and 726 m elevation.
- Phase 2 – This phase pushes out the northeastern portion of the previous phases with enough room for another pushback. The phase contains approximately six years of mill feed. The phase mines from the crest at 1,194 m to the phase pit bottom at 606 m. The main ramp runs down the highwall of the pit connecting to the same external ramps as phase 1 and allowing access for phase 3 mining. The bottom of the pit is accessed from a ramp that exits onto an external haul road at the 678 m and 738 m elevation.
- Phase 3 – This phase pushes out the pit to the ultimate limits in the north, northeast, and northwest. The phase contains approximately 10 years of mill feed and mines from the pit crest at 1,098 m elevation down to the pit bottom of 522 m elevation. The phase is accessed by ramps left in phase 2 highwalls connecting to external ramps located on the mountainside. The bottom of the phase is accessed from a ramp that exits onto an external haul road at 720 m elevation. Geotechnical berms are left behind on the 786 m, 930 m, and 1,074 m benches. Future design iterations should implement wider benches and shallower overall slope in the southeast wall as per KP recommendations from a review of the 2022 pit designs. Pit slope sensitivity analysis show that the ultimate pit limit is not sensitive to slope angle changes in this area, therefore these changes will not materially impact the ore tonnages.

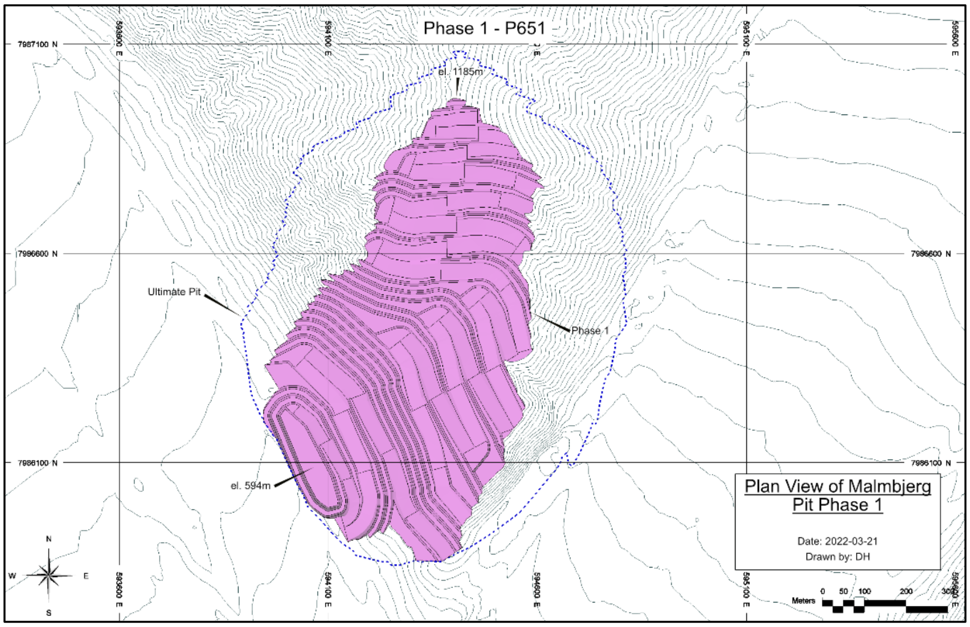


Figure 16-4: Phase 1

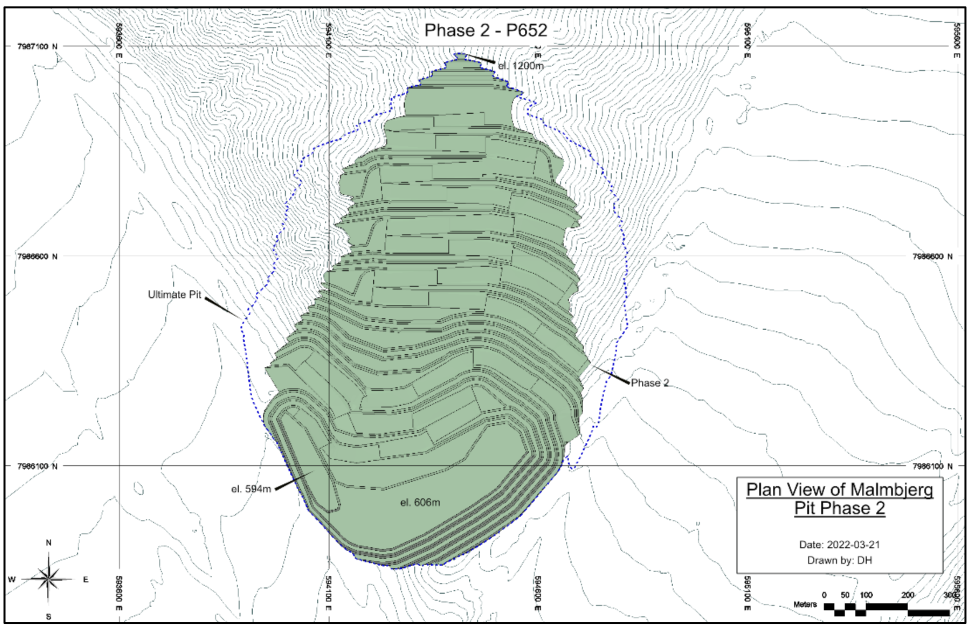


Figure 16-5: Phase 2

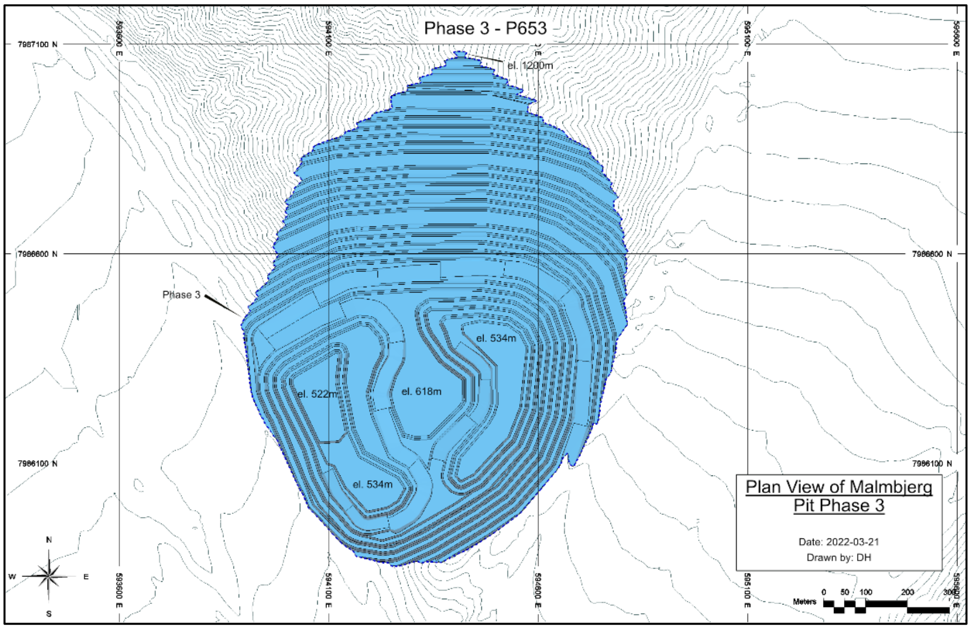


Figure 16-6: Phase 3

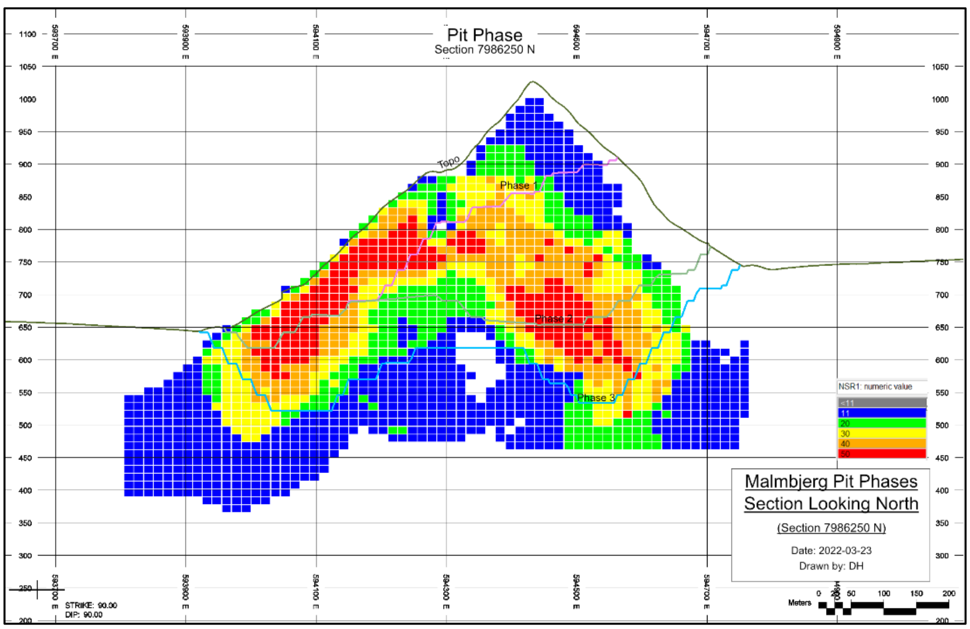


Figure 16-7: Section View EW 7986250

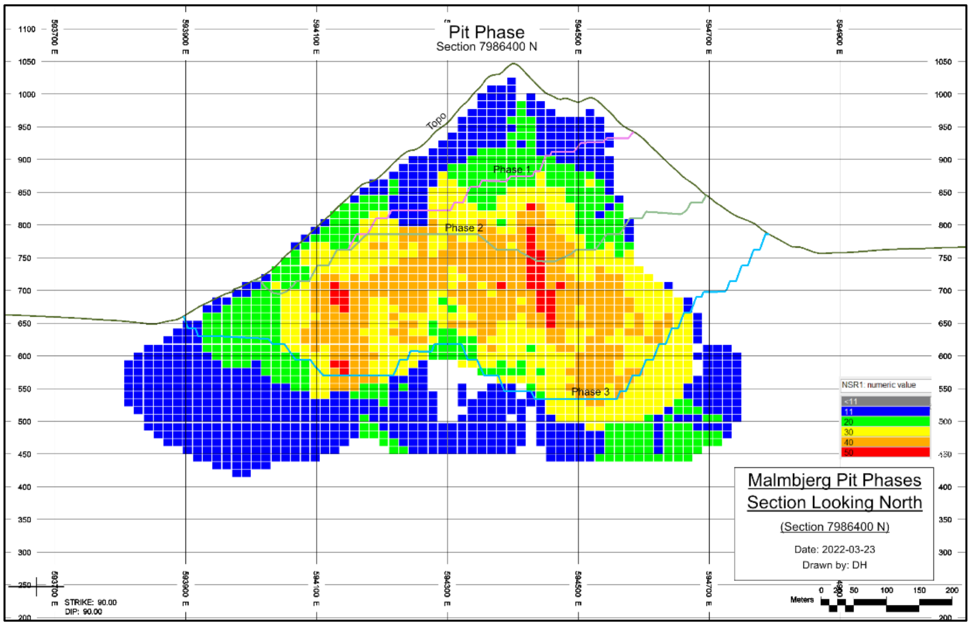


Figure 16-8: Section View EW 7986400

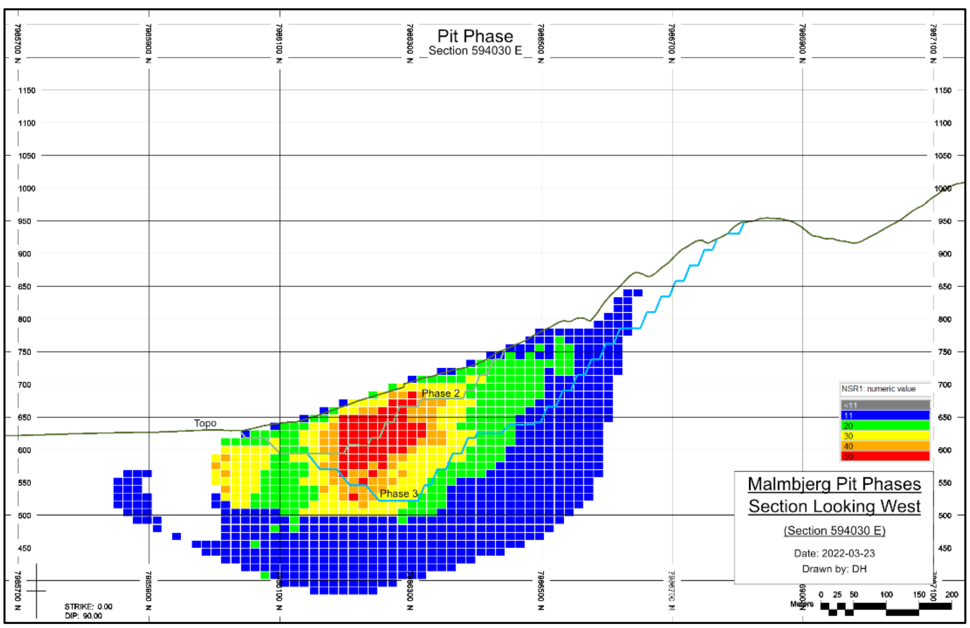


Figure 16-9: Section View NW 594030

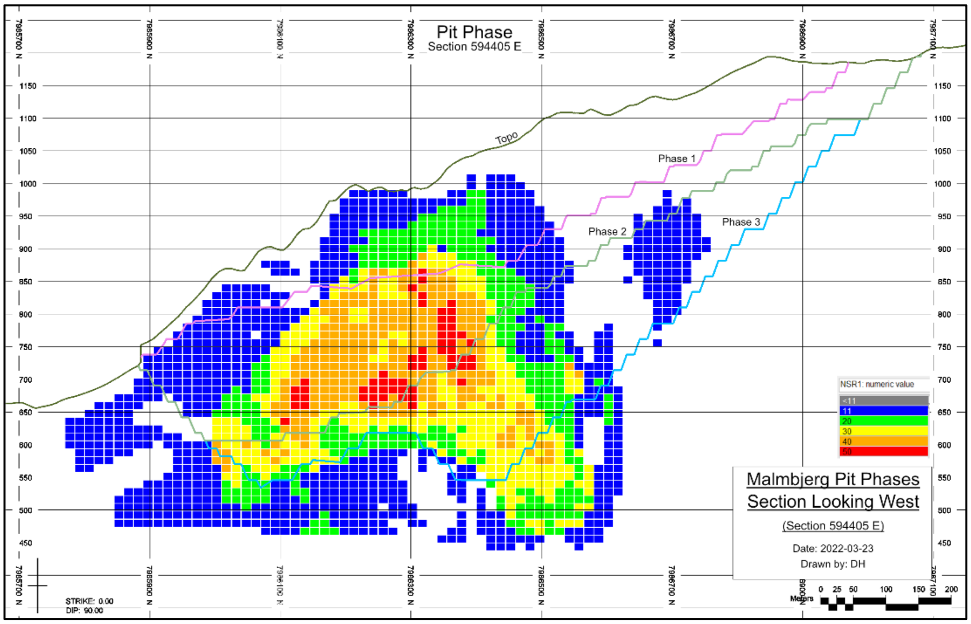


Figure 16-10: Section View NW 594405

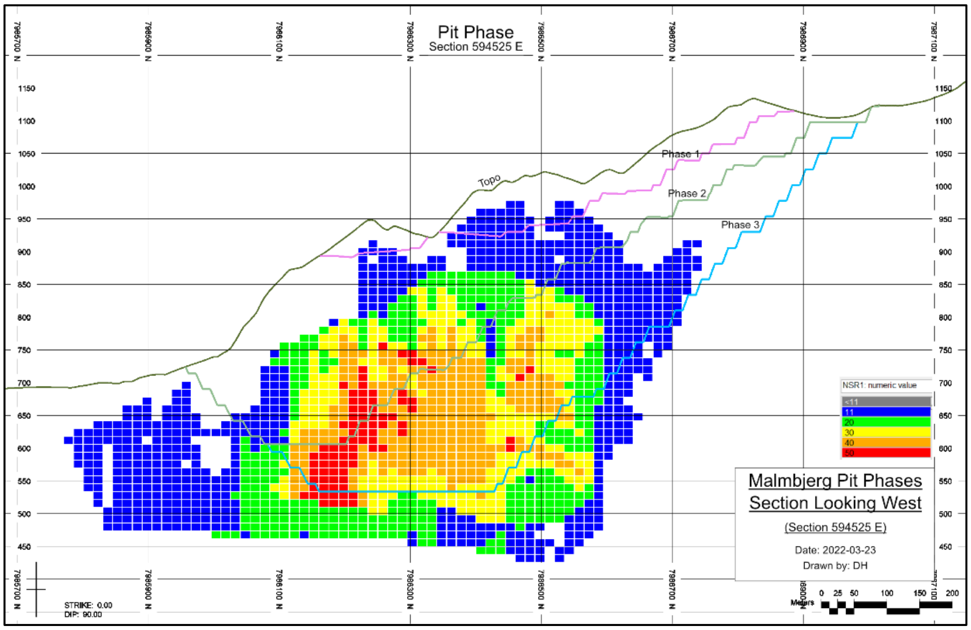


Figure 16-11: Section View NW 594525

16.3 Mine Development

Personnel, equipment, and consumables will be transported from the port to the mine along a 42 km, 12 m wide gravel and glacier road. Construction will limit all excess fill material by utilizing balanced cut/fill construction where possible. Where fill is required, it can be sourced from nearby borrow pits and quarries. No surface or fill material will be used once the road is fully located on the glaciers; vehicles will drive on a glacier road that is maintained with dozers and graders. The maximum grade on the glacier access road is 8%. The glacier access road will be maintained throughout the Project life. Further description of the glacier access road is provided in Glacier Access Road report prepared by MMTS (MMTS, 2022).

A 15,000 m^2 pad will be constructed for a temporary accommodations camp within the footprint of the Schuchert permanent camp pad. The temporary pad will house personnel, fuel, and other items necessary for the initial construction of the mine. A 100 m^2 pad will be constructed along the glacier access road for the storage of package explosives. The pad will be at the necessary stand-off distance from the camp, mine, and glacier access road.

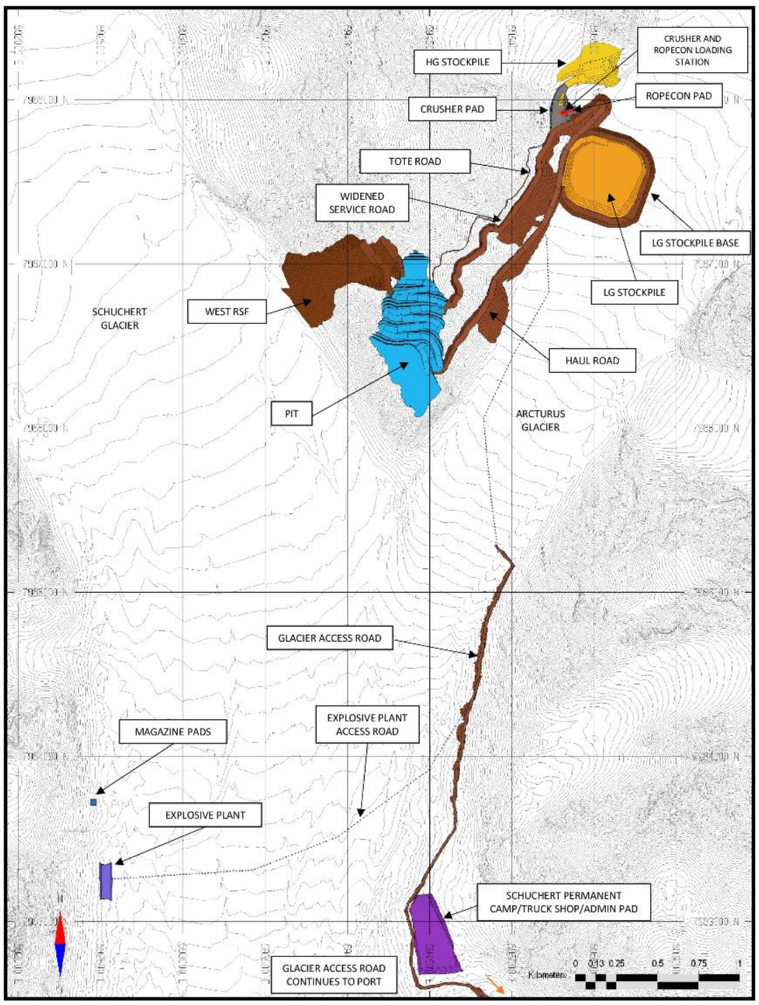


Figure 16-12: Mine Development Activities Completed

The top benches of the pit will be accessed by a 2.4 km, 4 m wide road cut into the mountainside (tote road). The tote road is a 12-14% road, built from the bottom of the slope upwards by drilling and blasting horizontal holes. The material will be cast off the side by cast blasting and dozers or excavators. The tote road will be able to accommodate shuttling of equipment sized no wider than 3.8 m to the top of the pit. The tote road will connect to the glacier access road near the crusher pad.

The upper benches of the pit (1,182 m elevation to 1,158 m elevation) will be drilled and blasted, and material cast off the west side of the mountain by cast blasting, dozers, and excavators. Most of this material will be rehandled in lower benches. At 1,158 m elevation, a wide enough area will have been established for load and haul mining.

Mining equipment access to the pit will be provided by a 2.6 km, 15 m wide road cut into the side of the mountain (service road). The service road will be built from the top of the mountain downwards by drilling and blasting horizontal or downfacing holes. The material will be cast off the side by dozers and excavators. The max grade of the completed service road is 8% and can accommodate single lane traffic for equipment up to 5 m wide and shuttle of equipment up to 10 m wide. The service road will connect to the glacier access road near the crusher pad.

Mining of benches 1,158 m elevation to 1,098 m elevation will first utilize a fleet of smaller development mining equipment consisting of drills, haul trucks, front-end loaders, excavators, and dozers. Mined rock will be delivered to other development activities or to the West RSF. Once a suitable area is established, production mining shovels and haul trucks can begin mining and hauling to the West RSF. Production haul trucks are restricted to hauling only to the West RSF until the service road has been widened to full haul road width.

A pad for the RopeCon conveyor infrastructure will be constructed at the south end of Cirque A (RopeCon conveyor pad). Haul trucks will provide fill material sourced from the pit. Dozers and excavators will use the mine rock to create a 2,700 m^2 pad. It is assumed that this pad will be constructed with fill material and on in-situ rock with minimal ice removal. The RopeCon conveyor pad is located at 904 m elevation.

As mine development operations ramp up, expansion of the camp pad to 75,000 m^2 and construction of the explosive plant pad and magazine pads will be required. The camp pad will be accessed via the glacier access road. The explosive plant and magazines will be accessed by a 5 m wide glacier road that connects to the glacier access road near the camp.

The service road will be widened from 15 m to 32 m to accommodate dual-lane traffic for mine haul trucks from the pit to the south end of Cirque A and the glacier access road. The widened service road will be built from the top of the slope downwards by drilling and blasting horizontal or down holes. The material will be cast off the side of the widened service road by dozers and excavators. When excess fill is required, haul trucks will deliver rock from the pit.

A pad for the crusher loading station and a ROM stockpile needs to be constructed above the RopeCon conveyor loading station. In-situ rock on the south end of Cirque A will be drilled and blasted; dozers and excavators will move and place the blasted rock. Excess fill from the pit will be hauled down the widened service road with haul trucks and placed by dozers and excavators. The crusher pad is located at 938 m elevation.

Geotechnical, avalanche, and water controls that need to be included during the detail design phase are described in Mine Construction Details report prepared by MMTS (MMTS, 2022).

16.4 Mine Operations

Mine operations are planned to be typical open pit operations in steep, mountainous, and snow-covered terrain.

Grade control – blast hole sampling: an ore control system is planned to provide field control for the loading equipment to selectively mine ore-grade material separately from the waste.

In-situ rock will be drilled and blasted on 12 m benches to create suitable fragmentation for efficient loading and hauling of material. Various drill and blast patterns and powder factors are planned for wet and dry conditions and highwall/trim blasting to prevent overbreak and maintain the stability of the high walls.

Blasting activities are planned to be entirely under a contract service agreement with the explosive supplier. Dry conditions are proposed to be done using a bulk Ammonium Nitrate Fuel Oil (ANFO) product and wet conditions with a blended emulsion product. On average, an estimated 20% of blast holes are expected to be wet. The explosive plant will be located southwest of the pit. Powder factor targets are 0.28 kg/t for the production blasting of wet and dry holes.

Loading of ore and waste will be completed with hydraulic mining shovels and front-end wheel loaders on 12 m benches.

Rock will be hauled out of the pit to scheduled destinations with off-highway rigid frame haul trucks.

Mine pit services will include the following:

- haul road, pit access roads and ramps and pit floors maintenance
- stockpile management
- in pit dewatering
- equipment, fuel, and lube services
- temporary lighting
- personnel and consumables transportation
- mine rescue and safety
- gravel and glacier road maintenance

Direct mining operations and mine fleet maintenance are planned as an Owner's fleet. Mining operations are based on 365 operating days with two 12-hour shifts per day. An allowance of 10 shutdown days is built into the mine schedule to allow for adverse weather conditions or equipment mechanical availability issues.

The total number of hourly mine operations personnel, including hourly maintenance personnel, peaks at 167 persons. Due to shift rotation, only one-quarter of personnel will be on shift at a given time. Salaried personnel peaks at 48 persons and will be required for mine operations, including mine and maintenance supervision, mine engineering, and geology.

16.4.1 Grade Control Measures

Grade control is planned with a typical blast-hole sampling methodology. The Malmbjerg deposit is relatively homogeneous, and as such, the expected burden and spacing between blast-holes will provide enough detail to separate ore and waste appropriately.

16.4.2 Mine Equipment

Production drilling will be carried out with 250-mm diesel rotary drills. Highwall drilling will be provided by 90-mm diesel DTH drills and 50-mm track drills.

Hydraulic front shovels (34 m^3 bucket) are proposed for material loading based on their efficient pass match to the haul trucks and productivity on 12 m benches. A front-end wheel loader (22 m^3 bucket) is proposed to rehandle the stockpile when required and back up the shovels.

Rigid frame mine haul trucks (230 t payload) are proposed to move material from the pit to the destinations outlined in the production schedule. Additions to the fleet are required for year 3 as the stripping ratio increases. Rigid fame mine haul trucks (90 t payload) are proposed to supplement the fleet and assist mine development.

Graders (5.5 m blade) and gravel/water trucks (90 t payload) will be used to maintain and clear the external and internal haul roads, the glacier access road, and the explosive plant access road.

450 kW track dozers are included for site development, pit floor clean-up, and maintaining rock storage facilities; 260 kW track dozers are included for site development, supporting in pit mining activities, and maintaining pads and access roads; and 165 kW track dozers are included for site development and providing rock cleaning of berms and roads. A wheel dozer (370 kW) is included to support pit mining and pit floor clean-up. Front-end wheel loaders (7.0 m^3 bucket) and hydraulic excavators (4.5 m^3 and 3.0 m^3 bucket) are included for site development, pit support, pit, pad, and road clean-up, ditching tools, snow removal, and backup loaders for the main fleet. Articulated haul trucks (40 t payload) equipped with 45,000 L tanks will be used for mobile fuel/lube support. Various small mobile equipment pieces are proposed to handle all other pit service and maintenance functions. Pits will be dewatered with diesel pumps. A jaw crusher located near the pit will provide crushed rock for surfacing of roads and pads and stemming material.

Maintenance activities will generally be performed in the maintenance shop located next to the camp south of the pit. Mining equipment requirements are summarized in Table 16-5 and Table 16-6.

Note: Pit mining is completed in year 11 and ore is supplied from stockpiles until the end of mine life.

Table 16-5: Primary Mining Equipment

Description	Y-3	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12-20
Drilling															
Diesel Rotary Drills (250 mm holes)	0	2	2	3	3	3	3	3	3	2	2	1	1	1	0
Diesel DTH Drill (90 mm holes)	3	3	3	1	1	1	1	1	1	1	1	1	1	1	0
Top hammer Tracked Drill (50 mm Holes)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Loading															
Diesel Hydraulic Shovel, 34 m^3 bucket	0	1	2	2	2	2	2	2	2	1	1	1	1	1	1
Front End Loader 22 m^3 Bucket	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hauling															
Rigid Frame Haul Truck, 230 t payload	0	4	5	10	10	13	13	13	13	10	8	6	6	4	3
Rigid Frame Haul Truck, 90 t payload	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3

Table 16-6: Support Mining Equipment

Unit	Function	Maximum Units
Motor Grader (5.5 m blade)	Haul Road and Site Road Maintenance	2
Water/Gravel Truck (90 t)	Haul Road and Site Road Maintenance	2
Track Dozer (450 kW)	Stockpile Maintenance, Site Prep, Pit Maintenance	3
Track Dozer (230 kW)	Pit Maintenance, Shovel Support, Snow Clearing, Site Prep	2
Track Dozer (160 kW)	Pit Maintenance, Shovel Support, Snow Clearing, Site Prep	1
Wheel Dozer (370 kW)	Shovel Support	1
Wheel Loader (7 m^3)	Pit Maintenance, Shovel Support, Snow Clearing, Site Prep, Crusher Loading	1
Hydraulic Excavator (4.5 m^3)	Pit Support, Site Prep Crusher Loading, Ditching	1
Hydraulic Excavator (3.0 m^3)	Ditching, Site Prep	1
Fuel and Lube Truck (40 t)	Fuel/Lube Support for Shovels, Drills, Dozers, etc.	2
Shuttle Bus	Employee Transportation	8
Pickup Trucks	Staff Transportation	18
Light Plants (8 kW)	Pit Lighting	8
Water Pumps (100 m^3/h)	Pit Sump Dewatering	6
On-Highway Dump Truck	Utility Material Movement	2
Flatbed Picker Truck	Material Transport, Pump Crew Support	1
Emergency Response Vehicle	Mine Safety and First Aid	1
Maintenance Trucks	Mobile Maintenance crew and tool transport	3
Mobile Crane (30 t capacity)	Mobile Maintenance material handling	1
Crawler Crane (120 t capacity)	Material handling at Port	1
Float Trailer (150 t capacity)	Equipment Transport	1
Forklift and Tire Handler (15 t capacity)	Shop Material and Tire Handling	1
Scissor Lift	Maintenance Support	1
Mobile Manlift	Mobile Maintenance Support	1
Jaw Crusher	Stemming and Surface Material	1

16.5 Mine Infrastructure

16.5.1 External Haul Roads

Mine haul roads external to the open pits are designed to haul ore and waste materials from the open pits to the scheduled destinations. The external mine haul roads are designed with the following key inputs:

- 32 m wide haul roads that incorporate a dual running width and berm on the outside edge of the haul road
- Sized to handle 230 t payload rigid frame haul trucks, double lane travel
- 8% maximum grade

The external haul roads are shown in Figure 16-13.

Figure 16-13: External Haul Roads

External haul roads can be initially pioneered as single lanes and widened to full width with suitable waste rock from the pit.

16.5.2 Waste Rock Storage Facilities

Waste rock storage facilities (WRSF) designs have been completed that demonstrate the capacity of storing all non-ore materials from the Malmbjerg open pit. Almost half of the non-ore materials will be used to construct the low-grade ore stockpile base. The remaining will be sent to the West RSF located to the northwest of the Malmbjerg pit. All WRSF are dumped at the angle of repose (1.3H:1V). These facilities are shown in Figure 16-14 and Figure 16-15.

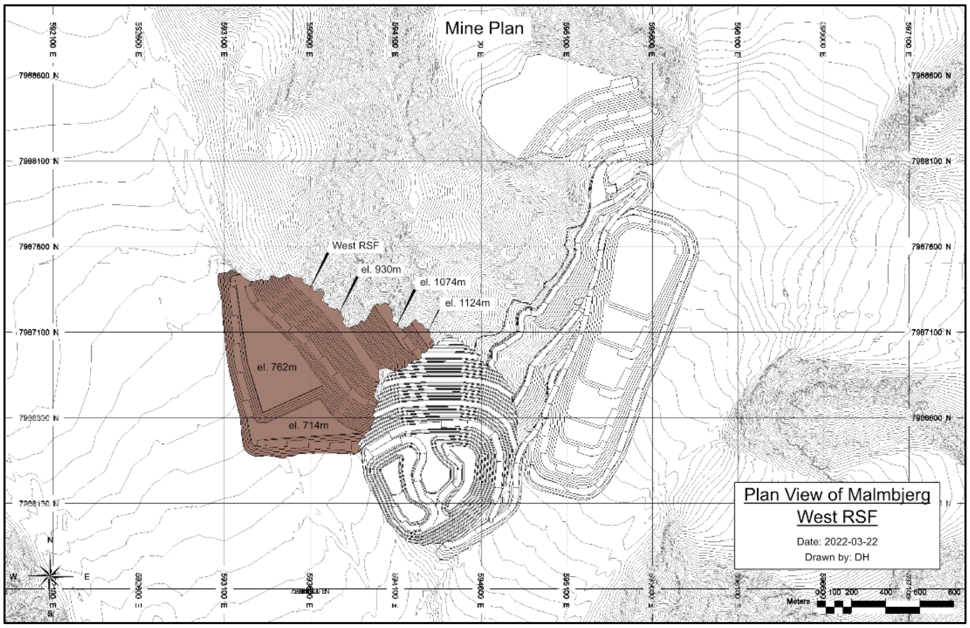


Figure 16-14: West RSF

The West RSF will be located outside of the designed open pit limits and is planned to contain six lifts:

- Dozer Push Waste (1,158 m): Leftover material from the development dozer push activity.
- Short Haul Waste (1,122 m): short-haul dump that provides rock storage for mining of benches from 1,124 m and 1,074 m elevations. It will be accessed by internal ramps in the pit.
- Top Lift 1 (1,074 m): Provides waste rock storage for upper benches in the pit. The material is end dumped downslope to toe into rock on the edge of the Schuchert Glacier.
- Top Lift 2 (930 m): The top lift #2 buttresses the top lift. The material will be end dumped downslope to the edge of the Schuchert Glacier. The lift will expand northwest along the 930 m elevation as required, preventing the lift from toeing onto the Schuchert Glacier. When complete, a haul road will be pushed down the face to provide access from the pit to the bottom lifts of the West RFS.
- Bottom Lift 2 (762 m): built on top of the Schuchert glacier. It can be built in 10 m lifts or by end dumping off the haul road that has been pushed into the Top Lift 2, at the 762 elevation.
- Bottom Lift 1 (714 m): built bottom up in 10 m lifts on top of the Schuchert glacier and will buttress the top lifts. It is accessed by internal pit ramps and a haul road running up the face of the bottom lift.

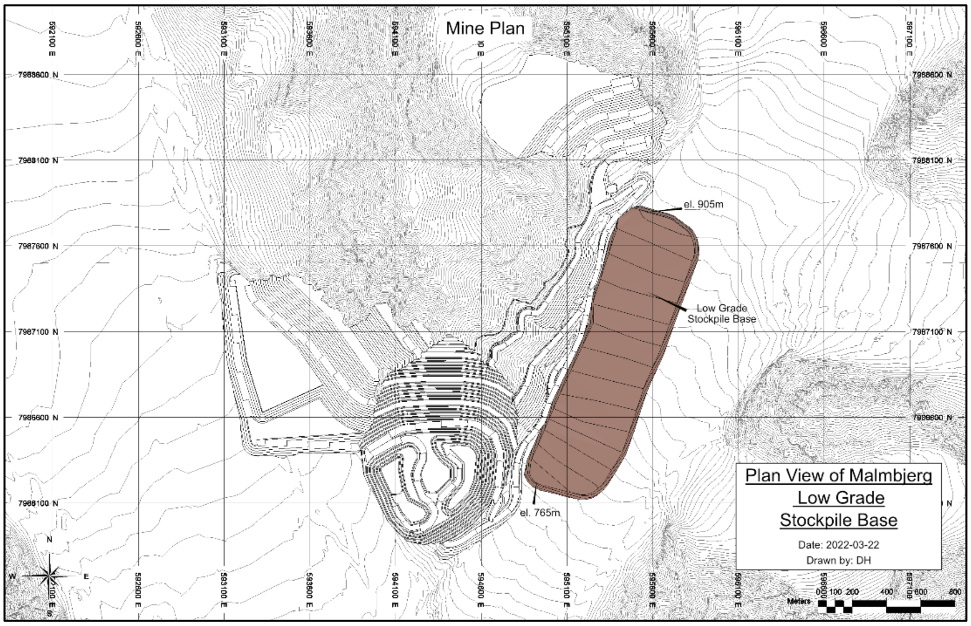


Figure 16-15: Low-Grade Stockpile Waste Base

The waste base for the low-grade stockpile will be constructed on top of the Arcturus glacier. The waste base will prevent loss of the low-grade ore to the glacier melt and is designed at a fill height of 20 m above the glacier ice surface level. A contingency of excess material is sent to the base to account for the base sinking into the glacier. Waste rock will be directed to the stockpile base as needed to provide enough area for the low-grade stockpile storage throughout the mine life.

16.5.3 Ore Storage Facilities

When the ore is mined from the pit, it will either be delivered to the crusher, the ROM stockpile located next to the crusher, the high-grade ore stockpile, or the low-grade ore stockpile.

Throughout the life of the mine operations stockpiled ore will be directed to two locations:

- Ore grade above $20/t NSR will be stockpiled in a high-grade ore stockpile (Figure 16-16) located to the northwest of the crusher in Cirque A.
- Ore grade between $11/t and $20/t NSR will be stockpiled in a low-grade ore stockpile (Figure 16-17) located on a base of waste rock on top of the Arcturus glacier.

Stockpiled ore is planned to be rehandled back to the crusher before the end of the mine life.

Figure 16-16: High-Grade Ore Stockpile

The high-grade stockpile (HGSP) will be built as bottom up in 10 m lifts, placed at 25° (2.1H:1V) overall angle. The stockpile will be located on ice or rock and include water drainage ditches as each lift is constructed. It will be accessed by a haul road running up the face of the stockpile.

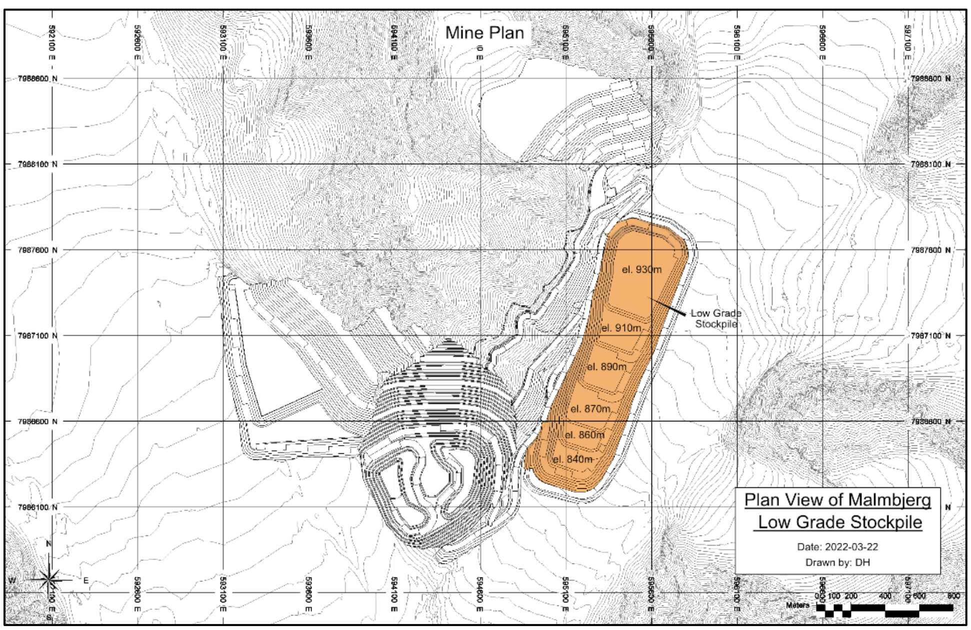


Figure 16-17: Low-Grade Ore Stockpile

The low-grade ore stockpile will be built on top of the waste base as it expands throughout the mine life. The stockpile will be built bottom up on the base in 10 m lifts dumped out at the angle of repose (1.3H:1V). It will be accessed by temporary ramps in each lift and external haul roads.

16.6 Ore Transport Method

Ore from the open pit or the stockpiles is delivered to the primary crusher. Crushed ore is then loaded onto the RopeCon conveyor for delivery to the concentrator. This ore transport method is discussed in Section 18.6.

16.7 LOM Production Schedule

The mine production schedule is developed with Hexagon's MinePlan Schedule Optimizer (MPSO), a comprehensive schedule optimization tool for open-pit mines. Annual production requirements, mine operating considerations, product prices, recoveries, destination capacities, equipment performance, and operating costs are used to determine the optimal production schedule. Scheduling results are presented by period, as well as cumulatively. The production schedule includes:

- Tonnes and grade mined by period, broken down by ore, stockpile, and waste material type, bench, and mining phase
- Truck and shovel operating hours by period
- Tonnes transported by period to different destinations (primary crusher, stockpiles, and rock storage facilities)

"Time 0" in the mine schedule refers to the mill start date; the first full year of operation is defined as Year 1. The total mine schedule is run with annual time periods.

A schematic of the general process flow for the production schedule is shown in Figure 16-18, and includes the following elements:

- Series 5 Detailed Pit Design Phases
- Low-Grade Stockpile (LGSP) – NSR cut-off of $11/t
- HGSP – NSR cut-off of $20/t
- Primary Crusher (CRUSHER) – NSR cut-off of $11/t (direct feed or stockpile reclaim)
- WRSF
  - SHORT – 17 Mt capacity
  - UPP1 – 30 Mt capacity
  - UPP2 – 50 Mt capacity
  - LOW1 – 9.6 Mt capacity
  - LOW2 – 63.6 Mt capacity
  - LOW3 – 33 Mt capacity

- Construction Fill Requirements
  - Pads and miscellaneous fill – 40 Mt requirement
  - Haul road fill (RUPP) – 1.1 Mt requirement
  - Haul road fill (RMID) – 1.8 Mt requirement
  - Haul road fill (RLOW) – 2.3 Mt requirement
- Low-Grade stockpile waste base fill (LGSP BASE) – 33.8 Mt minimum requirement

The various WRSF locations (Figure 16-18) depict destinations for waste rock from suitable benches and pit phases, minimizing haul cycle times and cost by increasing level and downhill loaded hauls and reducing uphill loaded hauls wherever possible.

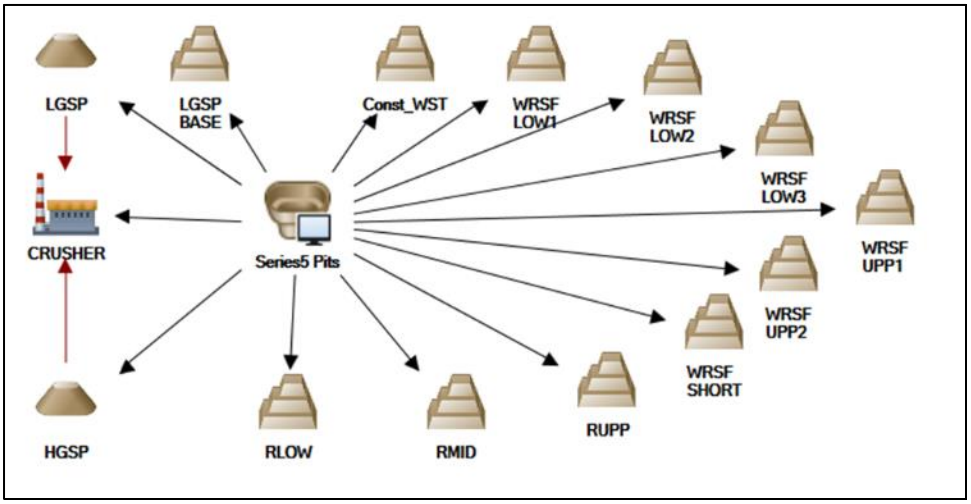


Figure 16-18: MPSO General Open Pit Mine Process Flow

16.7.1 Production Schedule Criteria

The primary scheduling objective is to maximize the open pit NPV by running multiple iterations of possible mine plans within the established scheduling criteria. The metal prices, the daily mill throughput tonnages, and some operating unit costs are fixed throughout the mining schedule; other mining costs vary based on hauling distances, cycle times, and the waste stripping tonnes in each period to release the targeted mill feed. Variable mining costs for loading and hauling are calculated by the schedule, with equipment availability reduced as a function of unit hours.

The best economic solution in each period is one that has the lowest cost and highest-grade mill feed material.

The open-pit production schedule uses the open pit contents outlined in Table 16-2 (loaded into MPSO by phase and bench), the annual mill feed targets, and the Haulage Process Flow destinations to run multiple iterations seeking the optimal NPV to meet the targeted production. The setup for MPSO includes many scheduling parameters, which can be modified to a high level of detail. The key scheduling parameters used in MPSO for the Malmbjerg production schedule are defined in Table 16-7.

Table 16-7: MPSO Key Scheduling Criteria (MMTS, 2022)

Criteria	Value
Phase mining Sequence	Ph1 → Ph2 → Ph3
Mill Throughput (Y1 ramp-up)	9.88 Mt/a (26.3 ktpd)
Mill Throughput	12.78 Mt/a (35 ktpd)
Maximum Material Movement (Pre-production)	20 Mt/a (one shovel)
Maximum Material Movement (Y1)	40 Mt/a (two shovels)
Maximum Material Movement (Y2+)	60 Mt/a (three shovels)
Vertical advance rate	11 benches per period per phase
Stockpile Reclaim	First-in-last-out, no restrictions by period
Maximum Trucks Hours	75,000 per period (30,000 in PP YR-2)
Truck Operating Cost (230 t trucks)	$350 per op. hr
Shovel operating Cost (34 m^3 shovels)	$720 per op. hr
Fixed Ore Mining Cost	$3.05/t
Fixed Waste Mining Cost	$2.50/t
Stockpile rehandle Cost	$0.50/t
Total Processing Costs	$8.57/t
Estimated Mine Capital investment	$889 million
Discount Rate	8%
Schedule Optimization Window	three periods simultaneously

Note: Economic criteria used for MPSO scheduling was based on the best available data and estimates at the time and are only used as a general guideline for the schedule to calculate NPV. Tonnes and grades from the optimized production schedule are then loaded into a mining cost model and subsequent Project cash flow model to determine final Capex and Opex values (Section 21.0).

16.7.2 Haulage Cycle Times

The mine load and haul fleet have been selected from previous studies. The preferred fleet of shovels and haul trucks is the 34 m^3 bucket diesel-hydraulic shovels matched with 230-t payload diesel haul trucks. These units were chosen in the past due to bench height and shovel productivity.

Haulage profiles are estimated from phase centroids at various benches to designated dumping points for each scheduled period. These haul profiles are inputs to a haul cycle simulation program, and the resulting cycle times are used to estimate required hauler operating hours in each scheduled period.

16.7.3 LOM Production Schedule Details

The optimized open pit production schedule is summarized in Table 16-8.

Table 16-8: Malmbjerg Production Schedule (MMTS, 2022)

Period	years	Y-2	Y-1	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
Mill Feed	kT	--	--	9,880	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780
	d MoS_2	--	--	0.2090	0.2520	0.2450	0.2670	0.2170	0.2180	0.2320	0.2310	0.2270
	d Mo	--	--	0.1252	0.1509	0.1468	0.1599	0.1300	0.1306	0.1390	0.1384	0.1360
	d NSR	--	--	38.05	46.50	44.99	49.33	39.58	39.86	42.46	42.27	41.56
	Recovery	--	--	85.2%	86.1%	85.7%	86.5%	85.3%	85.3%	85.3%	85.7%	85.5%
Waste Mining	kT	17,685	16,749	30,081	30,613	19,983	24,262	29,544	14,034	1,832	770	125
Ore Mining	kT	--	12,098	18,361	22,185	34,254	26,283	23,540	30,385	24,844	19,622	12,916
Stockpile Reclaim	kT	--	0	1,558	2,202	763	4,455	5,485	511	0	1,982	2,844
HGSP Balance	kT	--	1,975	4,060	5,247	19,762	26,688	25,989	34,520	43,719	49,180	48,836
LGSP Balance	kT	--	10,123	16,518	24,737	31,696	38,272	49,732	58,806	61,671	63,052	63,532
Stockpile Balance	kT	--	12,098	20,578	29,983	51,457	64,961	75,721	93,326	105,390	112,232	112,368
Period	**Y10**	**Y11**	**Y12**	**Y13**	**Y14**	**Y15**	**Y16**	**Y17**	**Y18**	**Y19**	**Y20**	**LOM**
Mill Feed	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	5,067	244,987
	0.2210	0.1660	0.1440	0.1530	0.1710	0.0880	0.1060	0.0840	0.0830	0.0850	0.0790	0.1765
	0.1324	0.0994	0.0863	0.0916	0.1024	0.0527	0.0635	0.0503	0.0497	0.0509	0.0473	0.1057
	40.29	29.78	25.54	27.22	30.82	15.10	18.56	14.48	14.32	14.65	13.58	31.93
	85.1%	83.7%	82.6%	83.0%	84.2%	80.7%	82.1%	81.0%	80.7%	81.2%	79.7%	84.6%
Waste Mining	152	64	0	0	0	0	0	0	0	0	0	185,892
Ore Mining	14,945	5,554	0	0	0	0	0	0	0	0	0	244,987
Stockpile Reclaim	0	7,555	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	5,067	134,662
HGSP Balance	50,040	42,485	29,705	16,925	5,117	5,117	0	0	0	0	0	0
LGSP Balance	64,493	64,822	64,822	64,822	63,850	51,070	43,407	30,627	17,847	5,067	0	0
Stockpile Balance	114,533	107,307	94,527	81,747	68,967	56,187	43,407	30,627	17,847	5,067	0	0

16.8 End of Period Maps

16.8.1 Mine Pre-Production Periods

The mine pre-production period includes all activities related to open-pit mining, after the construction period (MMTS, 2022), but prior to mill-startup (time 0). In relation to the production schedule, this represents Year -2 and Year -1.

Year -2 is summarized in Figure 16-19, which shows the development of the main haul road up the east side of the ridge to the open pit. At the beginning of this period, mining equipment is brought up on a single-lane service road to the 1,158 m bench of phase 1 of the open pit (established previously by dozers during the construction period). The mine fleet shovel and trucks mine phase one down to the 1,026 m bench by the end of the period. There is no ore mined during this period, and 17.7 Mt of waste are short hauled to the West RSF or used to widen the service road into dual-lane haul road width. The crusher pad is also constructed during this period.

Year -1 is summarized in Figure 16-20, including the development of a second dual-lane haul road roughly halfway up the east side of the ridge and continued mining of Phase 1 down to the 906 m bench. The uppermost benches of Phase 2 are also pre-stripped in this period, down to the 1,134 m bench. Only a small portion of the 16.8 Mt of waste mined in this period reports to the West RSF. The rest is used to construct the second haul road and the base pad for the LGSP. Of the 12.0 Mt of ore mined during this period, approximately 10 Mt reports to the LGSP, placed directly on the pad as it becomes available. 2 Mt is placed in the HGSP located in Cirque A, north of the crusher pad. A small ROM stockpile is also established next to the primary crusher in preparation for mill start up.

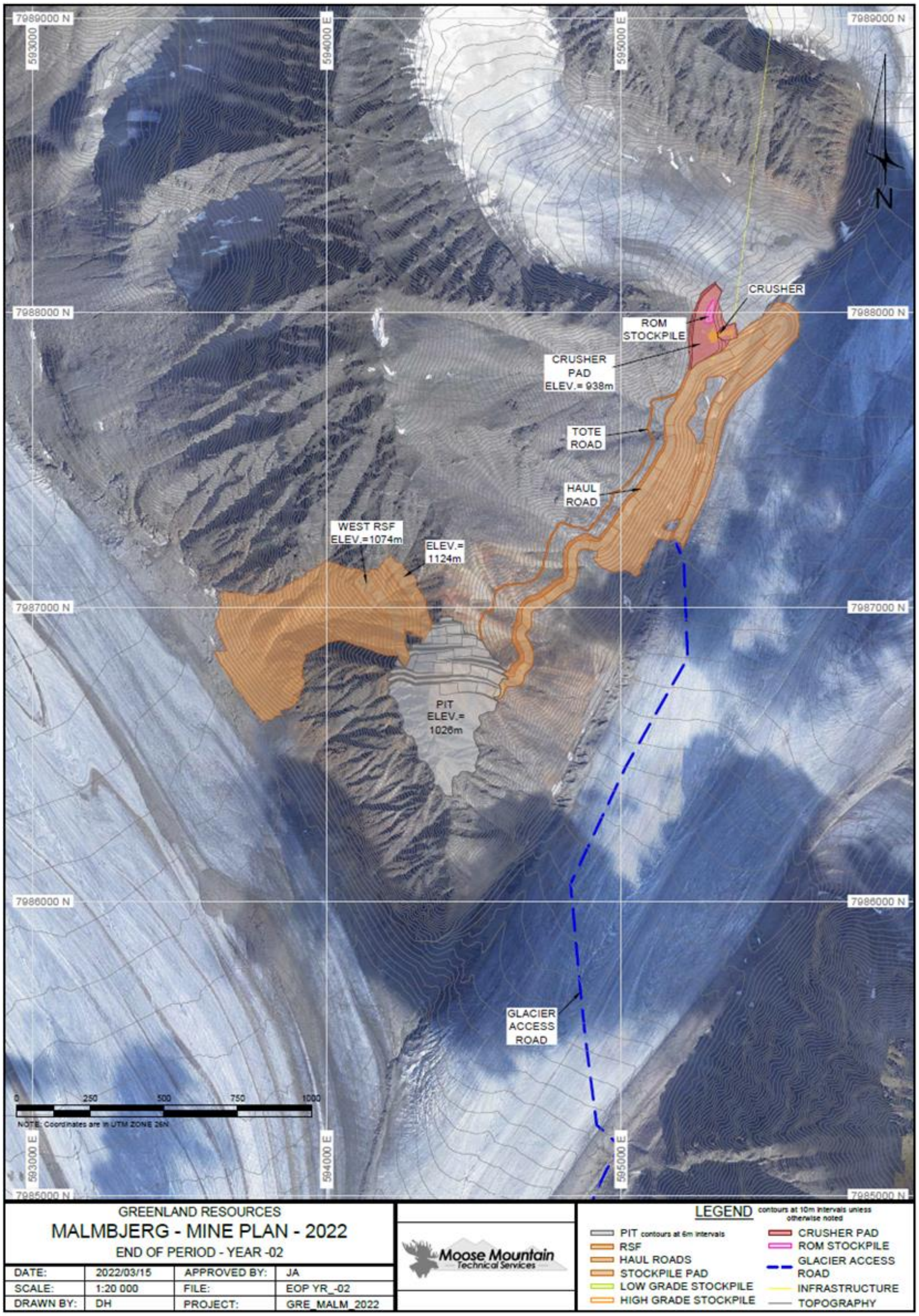


Figure 16-19: Mine EoP Y-2

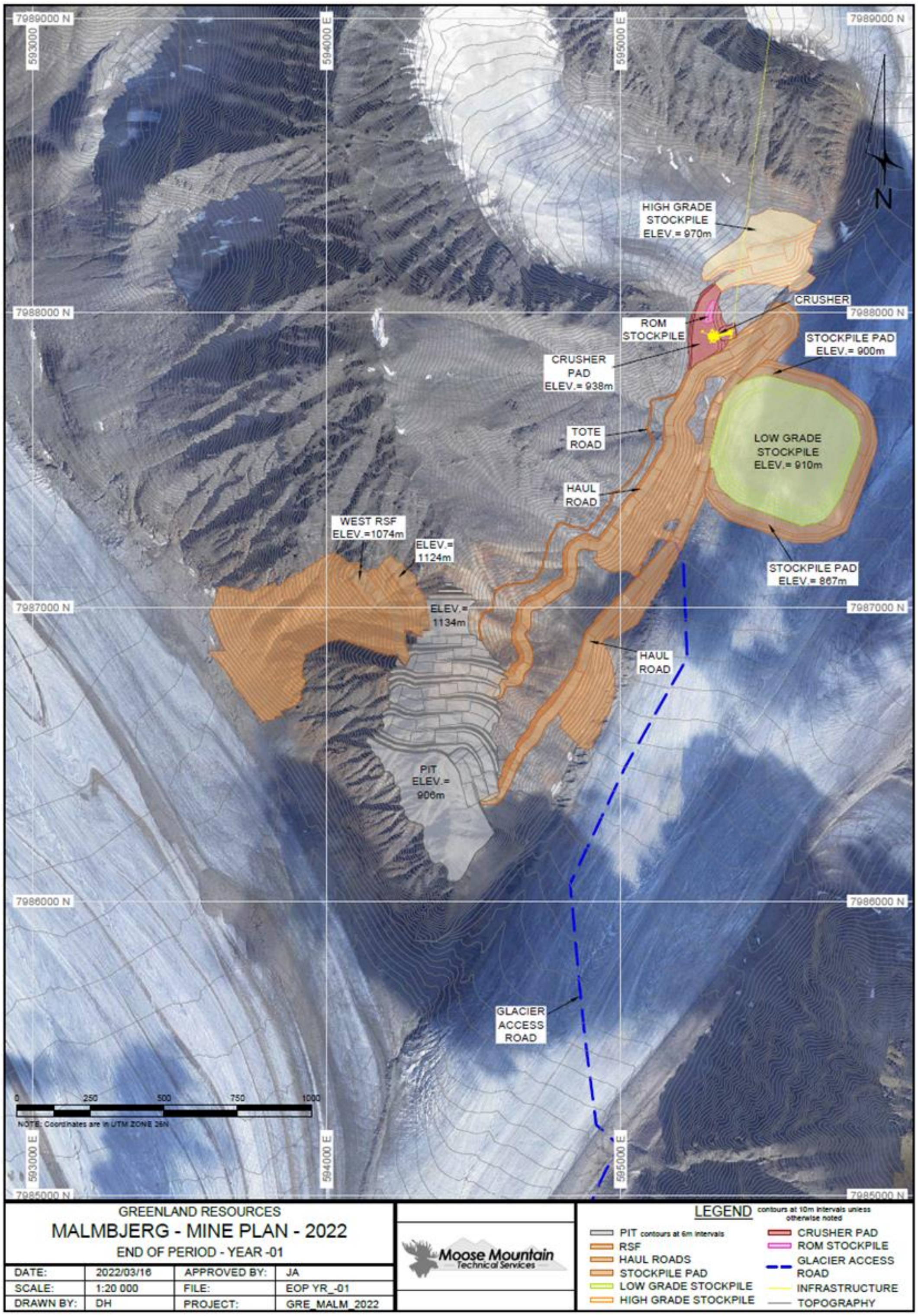


Figure 16-20: Mine EoP Y-1

16.8.2 Mine Production Periods

Mine production years occur after mill start-up (time 0). The first three years of mine production are summarized in Figure 16-21 to Figure 16-23.

Year 1 continues mining in phase 1 down to the 774 m bench, while phases 2 and 3 are simultaneously pre-stripped down to the 1,002 m bench. Waste reports either to the LGSP pad base or the West RSF expansion. Phase 1 ore and waste must be hauled up the highwall ramp, while phases 2 and 3 use a mixture of the upper and middle haul roads. In total, 16.5 Mt of ore reports to the LGSP, placed on top of the existing LGSP in a 20 m lift, while 4 Mt of ore reports to the HGSP. There is 1.6 Mt of stockpile reclaim in the first year of mining.

Year 2 mines phase 1 down to the 642 m bench and sees phases 2 and 3 split from one another, mined to 870 m and 954 m benches, respectively. A third haul road, running along the west side of Arcturus Glacier, connects to the lower benches of phase 1. The LGSP base continues to expand to the south to stay ahead of the LGSP placement. Significant amounts of waste are sent to two expansions to the WRSF, one as a top-down wrap around at an elevation of 930 m and the other built bottom-up on the edge of the Schuchert Glacier at an elevation of 678 m, acting as a buttress to the upper portions of the WRSF. 24.7 Mt of ore is placed on the LGSP, filling to the south from the 930 m elevation. The HSGP continues to be placed bottom-up, with 5.2 Mt of ore bringing it up to an elevation of 1,010 m. There is 2.2 Mt of stockpile reclaim in this period.

In Year 3, phase 1 is mined out to its final pit bottom at 594 m, while phase 2 continues mining down to the 738 m bench and Phase 3 mines to the 930 m bench. Waste is placed primarily in the West RSF, with a wraparound ramp-down being dumped to access a lower buttress at 738 m. The previous buttress is expanded up to the 690 m elevation. A portion of waste is used to continue the expansion of the LGSP pad. 31.7 Mt are sent to the LGSP, where a second lift, with its own ramp access, is established on the south end at 920 m. 19.8 Mt are sent to the HGSP, raising its elevation by 80 m, up to 1,090 m. Less than 1 Mt of stockpile material is reclaimed in this period.

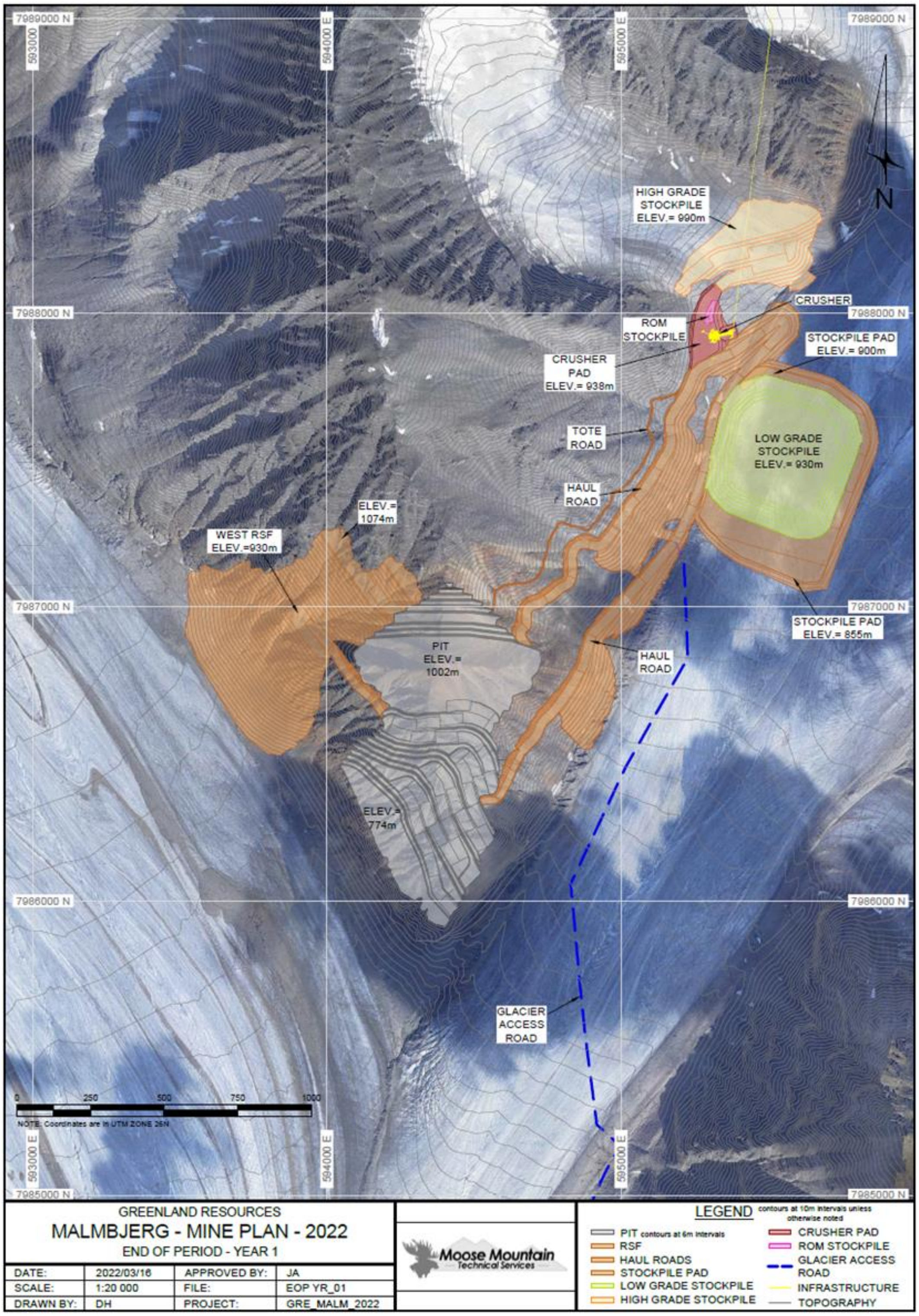


Figure 16-21: Mine EoP Y1

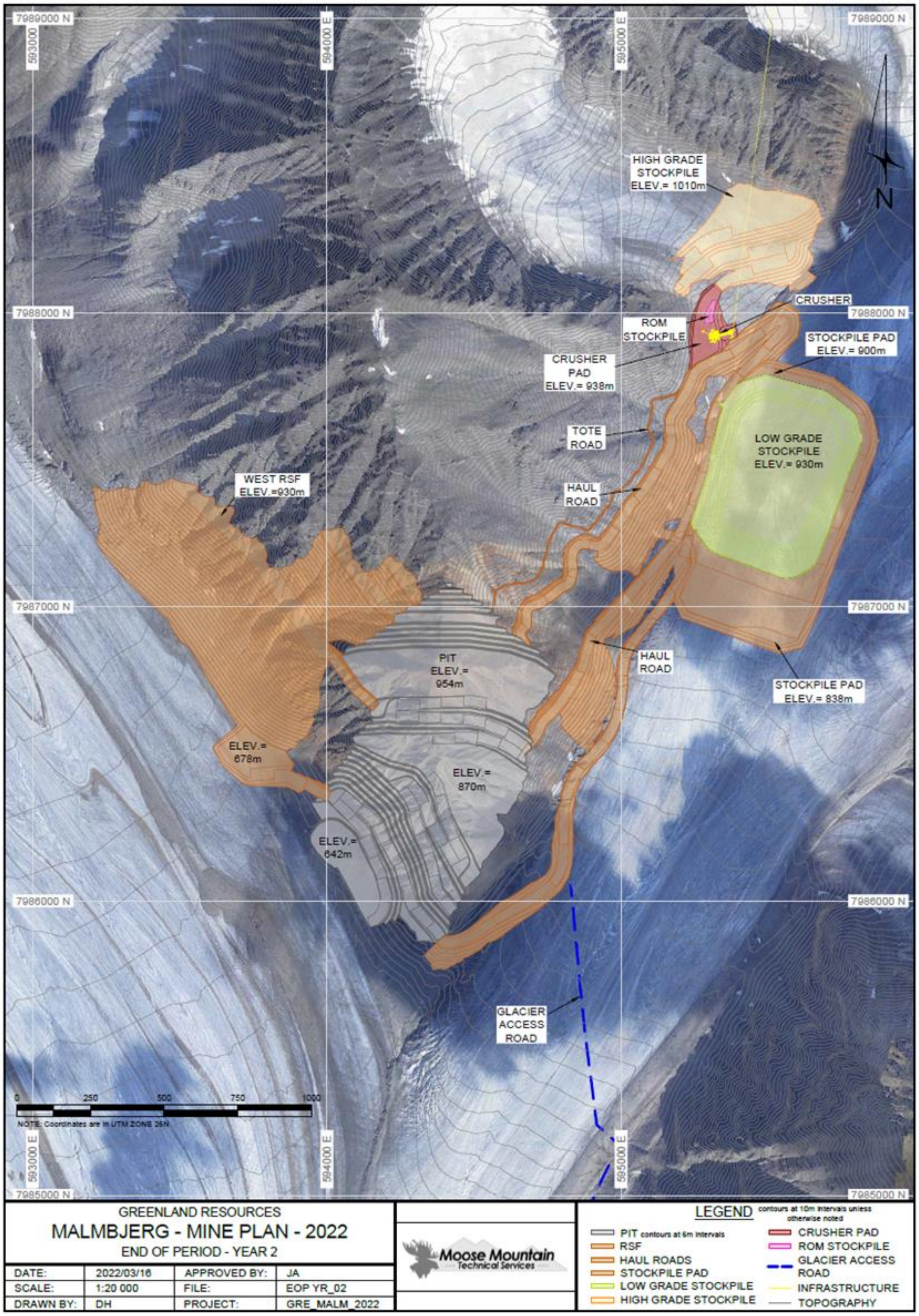


Figure 16-22: Mine EoP Y2

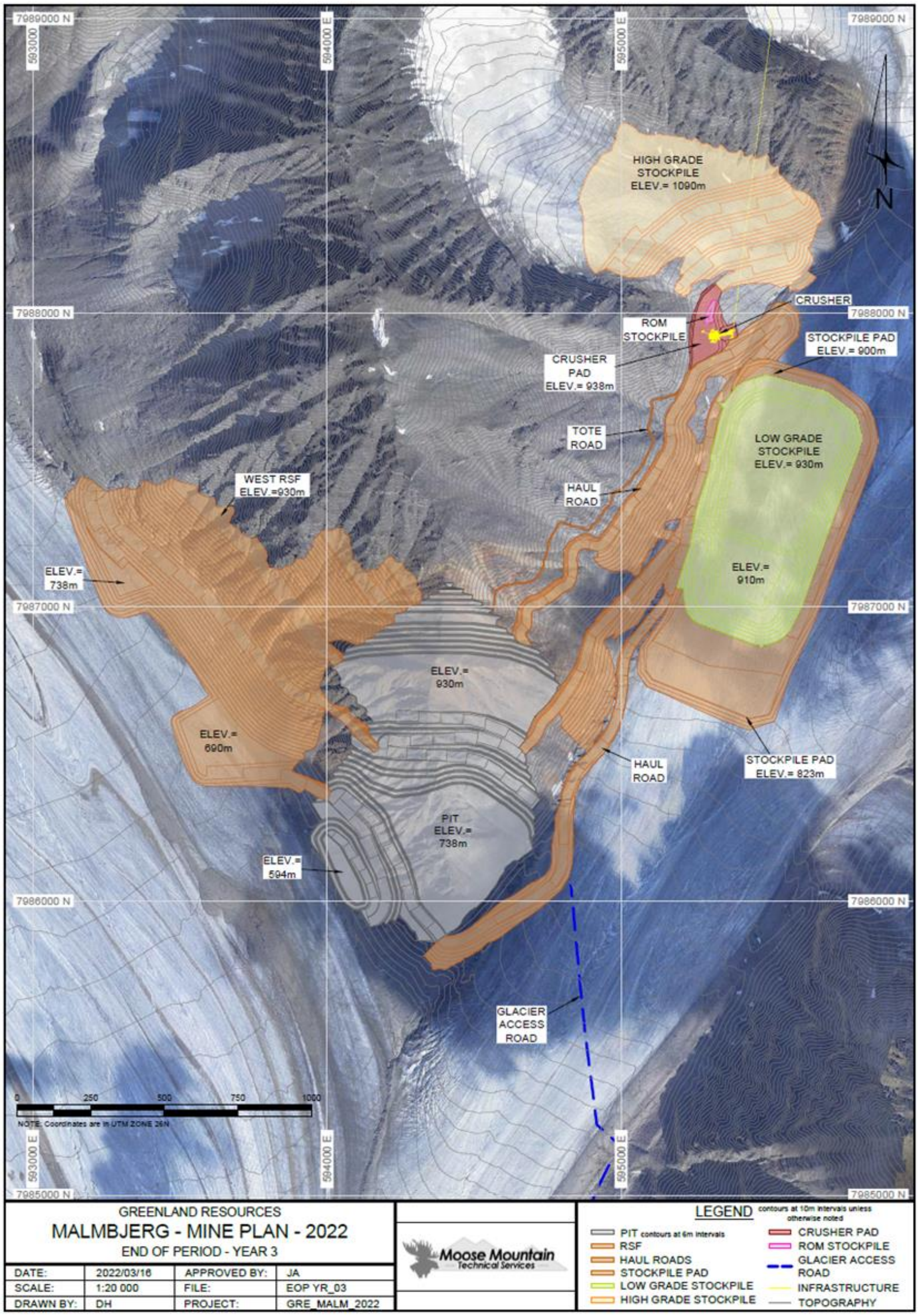


Figure 16-23: Mine EoP Y3

A selection of various key points in the production schedule are summarized in Figure 16-24 and Figure 16-25, and the LOM is shown in Figure 16-26.

Year 6 is a key period as the west RSF has been developed to its full footprint, with any additional waste placed in the lower buttress area at the 700 m elevation. By this point, phase 2 has been mined out to its final pit bottom at 606 m, while phase 3 has been mined down to the 702 m bench. The LGSP has also reached its full footprint, with a series of lifts stepping down to the south. Any additional material placed on the LGSP uses the final lift at the 810 m elevation. The LGSP contains 58.8 Mt by the end of this period. The HGSP has reached an elevation of 1,120 m as it continues to be built bottom-up into Cirque A. By the end of the period, it contains 34.5 Mt of material.

Year 11 is significant as open-pit mining is completed during this period, with phase 3 mined out to the final pit bottom at 522 m. The west RSF also reaches its maximum size, with the lower buttress reaching its final elevation at 714 m. In this period, the mine transitions into a stockpile reclaim operation. The LGSP reaches its peak during this period, containing 64.8 Mt of low-grade ore. Open-pit mining does not carry through to the end of the year, and the remaining balance of mill feed required is drawn down from the HGSP, which opened Year 11 at its peak of 50 Mt. By the end of the period, 42.5 Mt of high-grade ore remain in Cirque A, at an elevation of 1,140 m. This year also represents the combined peak stockpile for the entire LOM, at 114.5 Mt.

Processing of ore is completed in year 20, at which time all stockpiled ore has been reclaimed from both the HGSP and LGSP. Any required mine reclamation activities take place following this period.

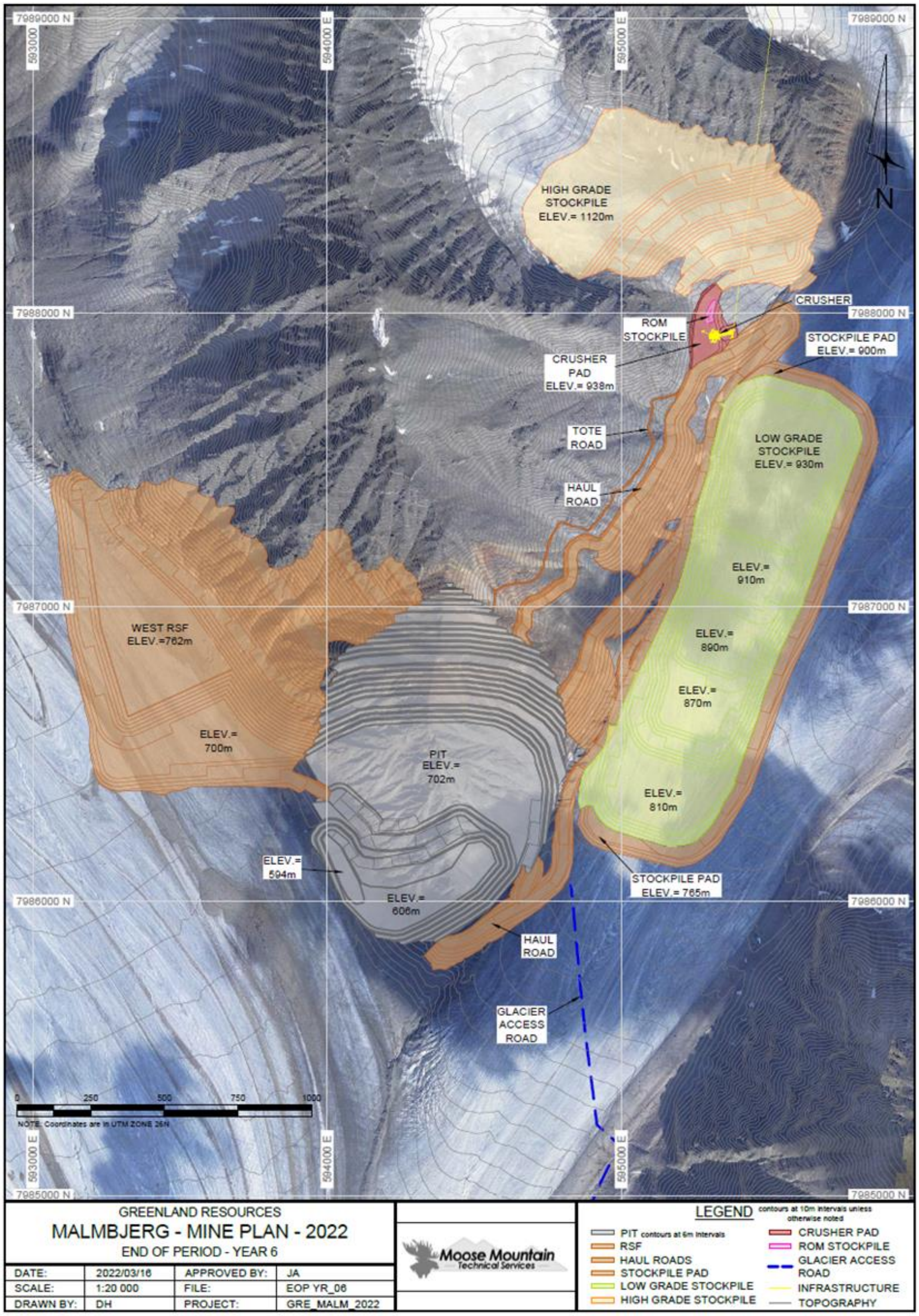


Figure 16-24: Mine EoP Y6

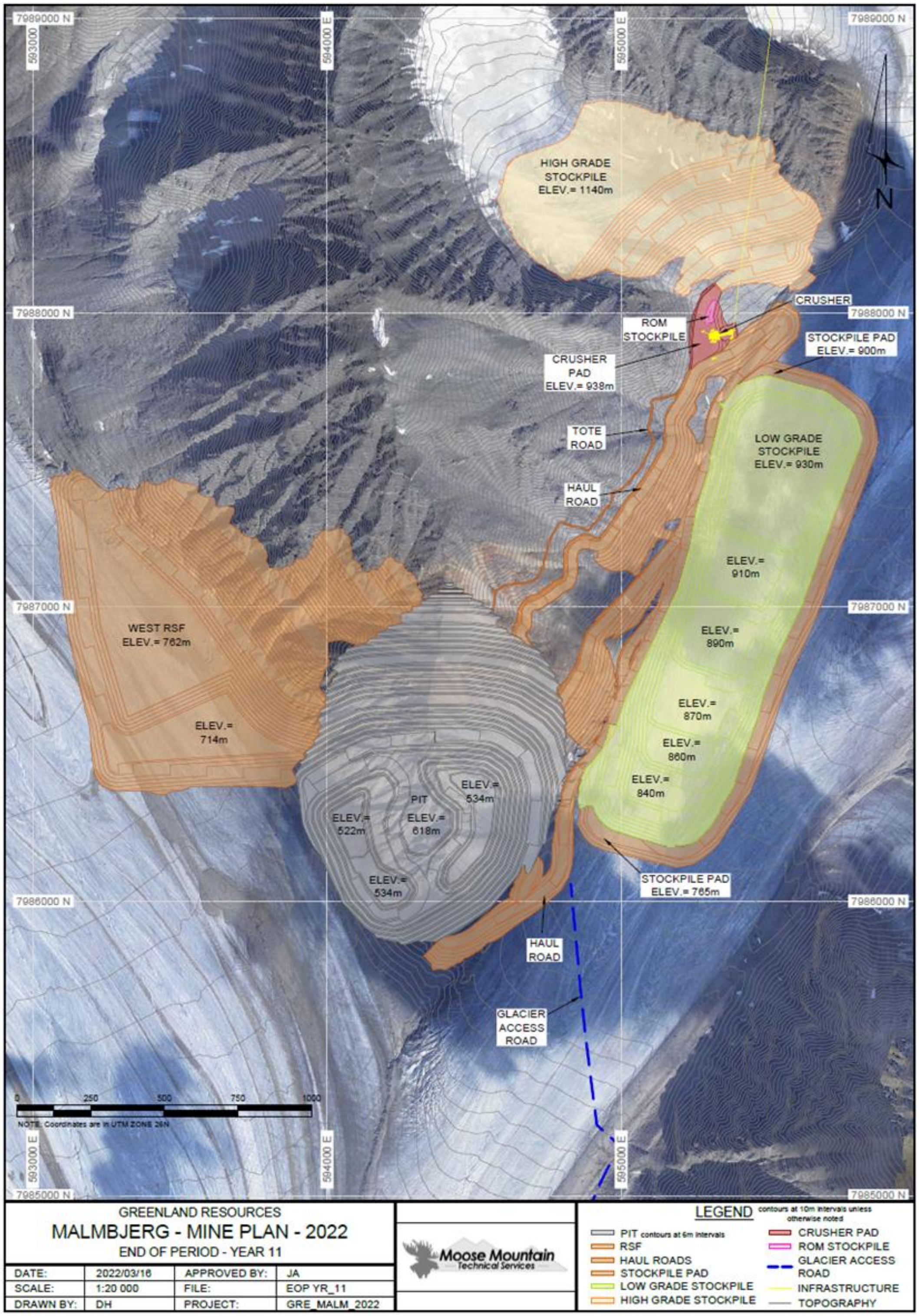


Figure 16-25: Mine EoP Y11

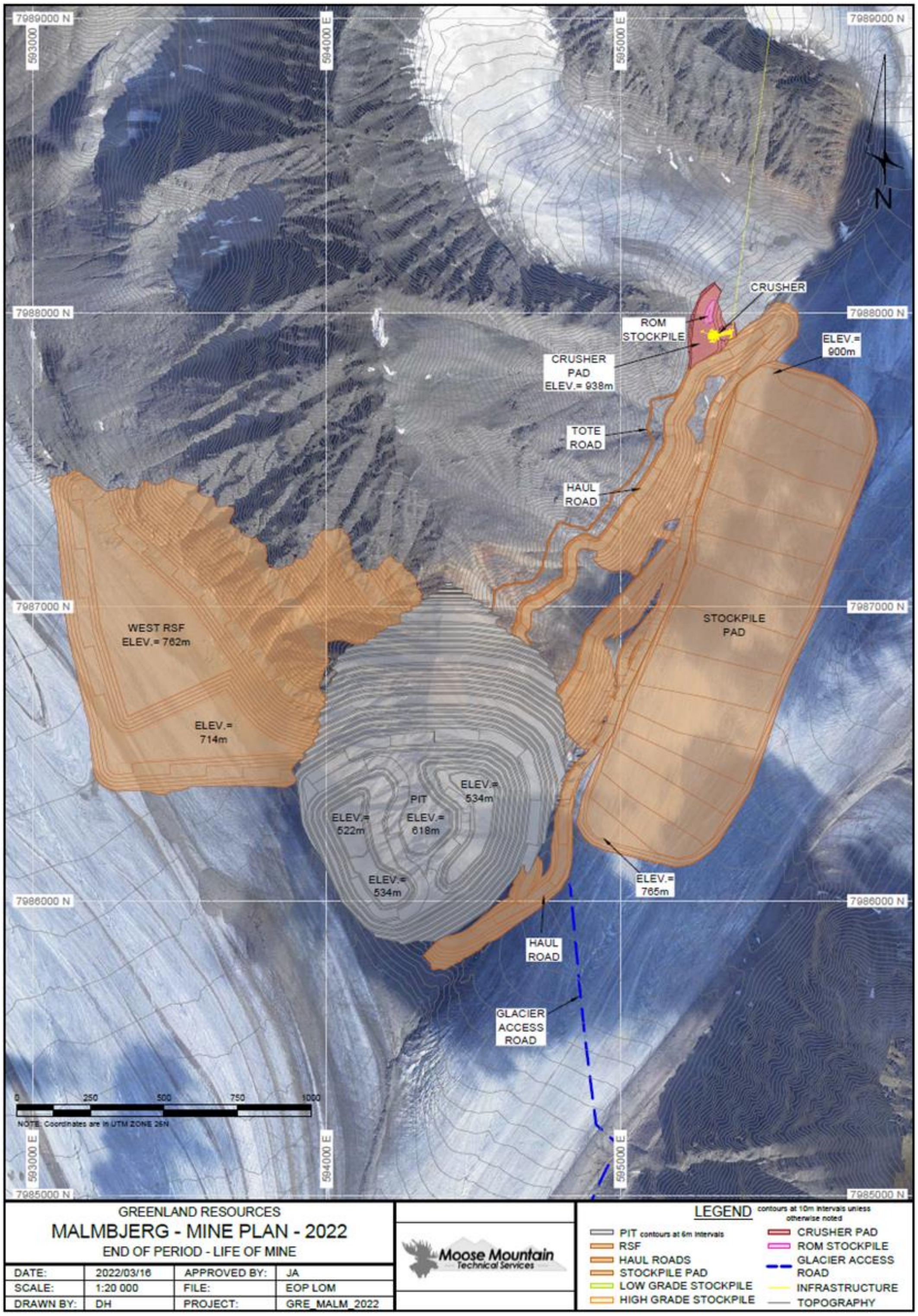


Figure 16-26: LOM EoP

17.0 RECOVERY METHODS

17.1 Introduction

The mineral resource at the Malmbjerg deposit is Molybdenite (MoS_2), which is associated with a granitic intrusion into overlying sediments. The dominant non-sulphide gangue minerals are quartz and feldspar with minor quantities of amphiboles and mica/clay minerals. Pyrite is the primary sulphide gangue mineral with occasional trace amounts of sphalerite and galena.

The deposit will be mined using conventional truck-shovel, open-pit mining equipment and processed in a conventional grinding and flotation plant, producing a molybdenum concentrate and tailings, which will be deposited in the TMF. This section outlines the major design criteria and describes the unit processes of the flowsheet.

17.2 Flowsheet Development

The processing plant has been designed to process ore from open-pit mine production and stockpiling of the Malmbjerg deposit at a nominal throughput of 35,000 t/d to produce market-grade Mo concentrate. The LOM average mill feed grade will be 0.11% Mo, and the anticipated average LOM Mo recovery will be 84.6%. The LOM average annual production will be approximately 20,290 t/y of average Mo concentrate at a grade of 54% Mo. The mill flowsheet design has been based on the results of comminution and flotation test work programs carried out in 2005, 2006, 2007, and 2021.

A conventional comminution and flotation process will be used for the recovery process. A single gyratory crusher operating as the primary crushing unit will reduce the ROM ore to a particle size of approximately 80% passing 125 mm. A 21.7 km RopeCon conveyor will transfer the crushed ore from the primary crusher to a 35,000 t live crushed ore stockpile at the port site. The crushed ore will be reclaimed from the live stockpile in two parallel lines to two SABC grinding circuits located inside the grinding process barge to further reduce the crushed ore particle size to approximately 80% passing 180 µm.

The ground ore will be fed to a train of rougher/scavenger flotation cells. The Mo concentrate will be upgraded using two stages of regrinding and three stages of cleaner flotation to produce the final concentrate containing approximately 54% Mo. The final concentrate will be thickened, pressure filtered and then dried to a final moisture content of 2% w/w. The dried concentrate will be bagged prior to being packed into shipping containers for storage and shipping.

The flotation and cleaner tailings will be thickened prior to disposal in the TMF, located at Noret 17 km north of the concentrator, by the tailings pump station located on the tailings thickening process barge via an overland tailings pipeline. The water recovered from the tailings thickener will be reused within the process plant at the port site. TMF supernatant will be pumped back to the process plant at Port Site by the on-barge reclaim water pump station at TMF via an overland reclaim water pipeline. Tailings thickener overflow and reclaimed water will be combined for reuse in the grinding and flotation circuits. Details of the tailings and reclaim water pump stations, and overland pipelines can be found in Section 18.0.

The simplified overall process flowsheet is shown in Figure 17-1. The reagents added to the flotation circuit will be lime for pH control, diesel oil (kerosene) as the collector reagent, W31 as the frother reagent and Magnafloc 351 as the concentrate and tailings flocculant. Chemical, analytical, and metallurgical laboratories are a part of the overall process design to support the operation; however, the laboratories will be placed and ventilated so that the risk of sample contamination caused by fugitive dust from the process plant can be kept at a minimum.

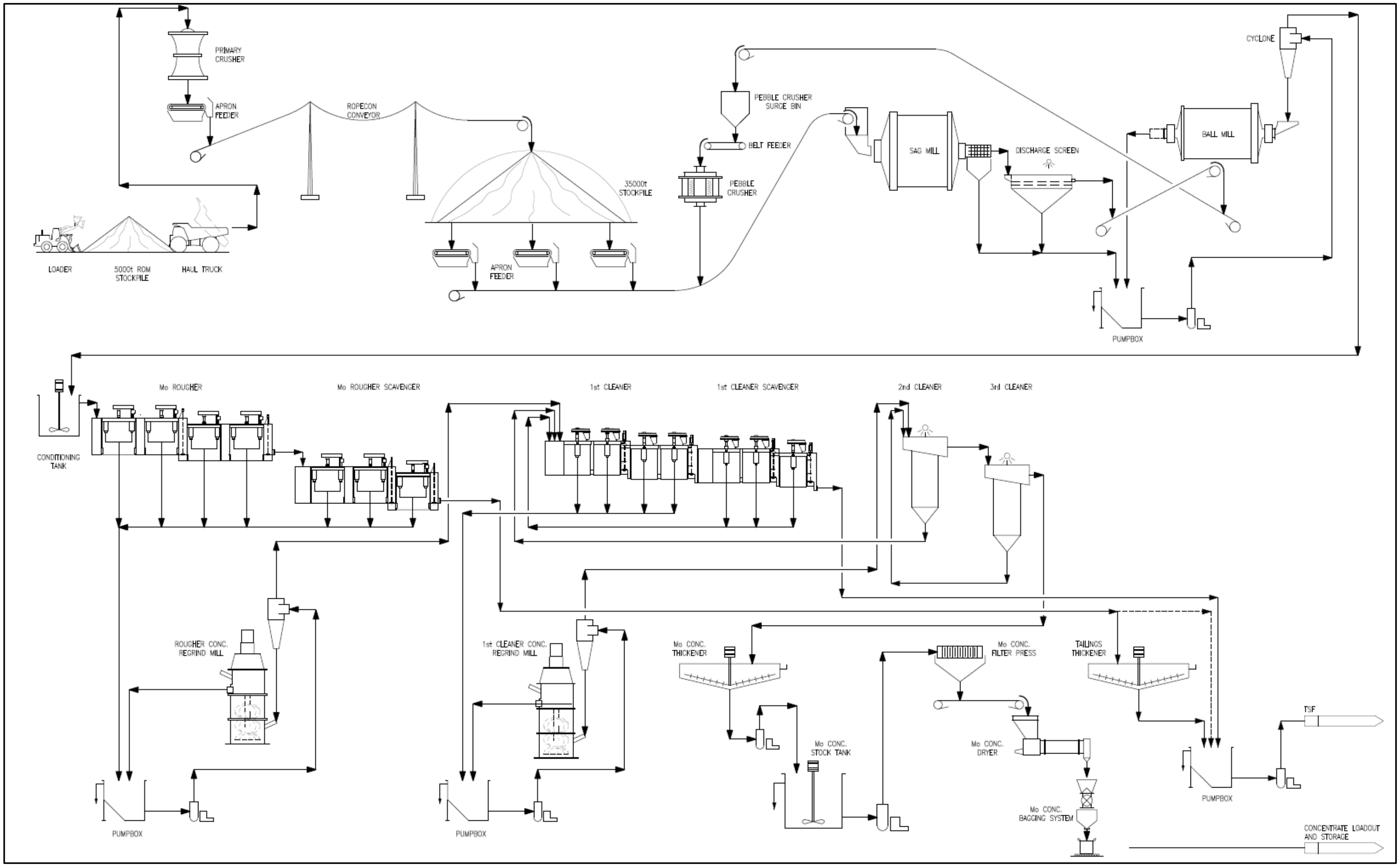


Figure 17-1: Simplified Process Flowsheet

17.3 Process Design Criteria

The processing plant is designed to process mill feed at a nominal throughput of 35,000 t/d for an average annual throughput of 12.8 Mt. The major criteria used for the design of the processing plant are listed in Table 17-1.

Table 17-1: Major Plant Design Criteria

Description	Unit	Value	Source
Type of the Deposit	--	Molybdenite	--
Ore characteristics			
Specific gravity	g/cm^3	2.6	5
Bulk density	t/m^3	1.5	1
Moisture content	%	2.8	1
JK breakage parameter A x b	--	40.0	5
Bond ball mill work index	kWh/t	12.7	5
Bond rod mill work index	kWh/t	12.6	5
Abrasion index	g	0.76	5
Operating schedule			
Shift/day	--	2	1
Plant hours/shift	h	12	1
Plant hours/day	h	24	1
Days/year	days	365	1
Plant availability/utilization			
Overall plant feed	Mt/y	12.8	1
Overall plant feed	t/d	35,000	1
Crushing plant availability	%	65	2
Grinding and Flotation plant availability	%	92	2
Crushing rate	t/h	2,244	3
Grinding & Flotation rate	t/h	1,585	3
Crushing product size, K_{80}	mm	125	5
Flotation feed size, K_{80}	µm	180	5
Rougher concentrate regrind size, K_{80}	µm	60	5
Cleaner concentrate regrind size, K_{80}	µm	25	5

1. Client
2. Industry/Experience
3. Calculation
4. Mass balance
5. SGS Met lab

The sizing and selection of the primary and pebble crushers and the grinding mills are based on the comminution test work results and SABC circuit simulation results performed by SGS. Regrind mill sizing is based on the BMW_i and the estimated tower mill to ball mill efficiency factor. The flotation cells were sized based on optimum flotation residence time determined by laboratory test work and scale-up factors. The concentrate and tailings thickeners were sized based on settling test results.

17.4 Process Description

The processing of the porphyry molybdenum ore will include crushing, grinding, flotation, and dewatering as the main operations producing a marketable Mo concentrate.

17.4.1 Primary Crushing and Conveying

ROM ore will be transported from the open pit mine to the primary gyratory crusher by 240 t haul trucks. The ore will be screened through a static grizzly screen with a 1,000 mm aperture, and the grizzly oversize will be broken using a hydraulic rock breaker.

The gyratory crusher will crush the grizzly screen undersize to a particle size of 80% passing 125 mm at an average throughput of 2,244 t/h and dropped on an apron feeder. The apron feeder discharge will be conveyed using a sacrificial belt conveyor to the RopeCon conveyor feed chute. The RopeCon conveyor will convey the crushed ore from the mine site to the port site. At the port site, the RopeCon conveyor discharges the crushed ore onto the live crushed ore stockpile.

The main equipment installed at the crushing facilities will be:

- One 1.372 m x 1.905 m gyratory crusher with 600 kW installed power
- A hydraulic rock breaker
- One 2.1 m wide x 8.0 m long apron feeder
- One 1.35 m wide x 38.0 m long sacrificial belt conveyor

The RopeCon conveyor will consist of four sections to navigate around the rough terrain of the Malmbjerg Project site. The total length of the system will be approximately 21.7 km. The RopeCon conveyor will discharge the crushed ore onto the live crushed ore stockpile.

Dust collectors will be installed at the crushing facility to control fugitive dust generated during crushing and conveying. The sacrificial belt conveyor will be equipped with a belt scale, metal detector and a magnet/metal separator to protect the RopeCon conveyor against damages caused by metal pieces.

17.4.2 Crushed Ore Stockpile and Reclaim

The total live capacity of the crushed ore stockpile is approximately 35,000 t. The crushed ore stockpile will be covered. The ore will be reclaimed from the live stockpile in two parallel lines, each feeding a grinding line in the grinding process barge. Two parallel lines allows the process plant to run at 50% capacity when one grinding train is down.

Each line will be equipped with three 1.2 m wide x 7.2 m long reclaim apron feeders (two operating and one standby) operating at a nominal rate of 396 t/h per feeder. The stockpile reclaim area will also be equipped with a dust collection system to minimize the spread of dust generated during ore handling and transportation to the mill. The stockpile reclaim tunnel area will be equipped with sumps and pumps to recycle any spillage.

The reclaimed ore from the apron feeders will be discharged on two parallel 1.05 m wide x 119.1 m long belt conveyors. Each conveyor will be equipped with a weightometer to measure the fresh feed flow rate to the SAG mill.

17.4.3 Primary Grinding and Classification

The crushed ore from the stockpile will be fed into two SAG mills on the grinding process barge by two separate SAG mill feed conveyors. Two separate automatic ball charging systems will be provided to add grinding media to the SAG mills at a controlled rate. The SAG mills will be equipped with 76 mm discharge pebble ports to remove undersize materials, including critical size pebbles. The mill discharge from each SAG mill will be screened by a SAG mill trommel and then a double deck vibrating screen with a 25 mm aperture size for the top deck and a 12.5 mm aperture size for the bottom deck. The trommel and screen undersize will flow by gravity to a pump box and be pumped to the secondary grinding circuits via the cyclones. The SAG mill area will be equipped with sloped floors, sumps, and pumps to drain, collect and recycle any spillage.

The oversized material from the vibrating screens will be conveyed to a common pebble crusher feed surge bin. Each surge bin feed conveyor will be equipped with two cleaning magnets and one metal detector to remove/detect any tramp metal to protect the pebble crushers. The pebble crusher feed surge bin will have a live capacity of 400 t. The pebbles will be reclaimed by two 1.5 m wide x 11.5 m long belt feeders, which will feed the pebble cone crushers. The crusher will crush the pebbles to a particle size of 80% passing 12.5 mm. The crushed pebbles will be directed to the SAG mill feed conveyors.

The major equipment of the primary grinding and classification circuit are:

- Two 10.36 m diameter x 5.21 m EGL SAG mills, each with 8 MW installed power
- Two 3.6 m wide x 7.3 m long double deck vibrating screens
- Two pebble (cone) crushers, each with 370 kW installed power

17.4.4 Secondary Grinding and Classification

The secondary grinding circuit will include two balls mills, each in reverse closed circuit with one cyclone cluster. The secondary grinding circuit will grind the SAG mill product to a particle size of 80% passing 180 µm. The major equipment items in the secondary grinding circuits are:

- Two 6.1 m diameter x 9.1 EGL ball mills, each with 4.2 MW installed power
- Two cyclone clusters, each consisting of six 710 mm diameter cyclones (five operating and one standby)
- Particle size analyzer

The SAG mill screen undersize from each primary grinding circuit will be gravity fed to the cyclone feed pump box. The SAG mill circuit product and the ball mill discharge will be pumped to the respective cyclone cluster. The cyclone underflow will flow by gravity to the ball mills, while the cyclone overflow will be sent to the downstream flotation circuit at a pulp density of approximately 42.5% (w/w).

A particle size analyzer will be installed to monitor the particle size of the cyclone overflow and to facilitate the production of ground slurry at the required particle size. Two separate automatic ball charging systems will be provided to add grinding media to the ball mills at a controlled rate. The ball mill area will be equipped with sumps and pumps to recycle any spillage.

17.4.5 Rougher Flotation and Regrinding

The cyclone overflow will be fed to a 300 m^3 conditioning tank. Kerosene collector reagent and W31 frother will be added to the conditioning tank at the required dosage rates. Process water will be added to the tank to reduce the slurry pulp density to 38% (w/w). The conditioned slurry will be fed to the rougher flotation bank.

The rougher flotation bank will consist of four 300 m^3 tank cells for rougher flotation and three 300 m^3 tank cells for rougher scavenger flotation. The concentrate from the rougher and the rougher scavenger flotation cells will be gravity fed to the rougher concentrate regrind cyclone feed pump box. The rougher scavenger tailings will flow to the tailings thickener feed pump box.

The rougher and rougher scavenger flotation will be operated at natural pH of 7. The reagents for the rougher and scavenger flotation are kerosene as collector and W31 as frother.

The rougher and rougher scavenger concentrate regrind circuit will consist of one tower mill in reverse closed circuit with one cyclone cluster and grind the concentrate to a particle size of 80% passing 60 µm. The major equipment in the rougher concentrate regrind circuit are:

- One tower mill with 500 kW installed power
- One cyclone cluster, with four 400 mm diameter cyclones (three operating and one standby)

The rougher and rougher scavenger concentrate will flow to the regrind cyclone feed pump box. The flotation concentrate and the tower mill discharge will be pumped to the hydrocyclone cluster. The cyclone underflow will flow by gravity to the tower mill while the cyclone overflow, at a pulp density of approximately 25% (w/w), will be fed to the cleaner flotation circuit.

An automatic ball charging system will be provided to add grinding media to the tower mill at a controlled rate. A particle size analyzer will be installed to monitor the particle size of the cyclone overflow and to facilitate the production of ground slurry at the required particle size. Kerosene will be added to the cyclone pump box to aid with cleaner flotation, whereas lime will be added to increase the pH to 9.5 to facilitate pyrite depression. The rougher flotation area and the rougher concentrate regrind area will be equipped with sumps and pumps to recycle any spillage.

17.4.6 Cleaner Flotation Circuit

The reground rougher concentrate will be upgraded by three stages of cleaner flotation which will upgrade the rougher and rougher scavenger concentrate to 54% Mo using conventional flotation cells for the first cleaner and first cleaner scavenger flotation stage, a column cell for the second cleaner flotation stage and a column cell for the third cleaner flotation stage. The first cleaner flotation concentrate will be reground before the second cleaner flotation. Major equipment in the cleaner flotation circuit will be:

- Four 30 m^3 first cleaner flotation tank cells
- Three 30 m^3 first cleaner scavenger flotation tank cells
- One tower mill with 150 kW installed power
- One cyclone cluster, with three 200 mm diameter cyclones (two operating and one standby)
- One 2.75 m diameter x 8.7 m height column flotation cell as the second cleaner
- One 1.75 m diameter x 5.9 m height column flotation cell as the third cleaner

The reground concentrate from the rougher regrind circuit will be fed to the first cleaner flotation cells. The first cleaner flotation concentrate will flow to the cleaner concentrate regrind cyclone pump box. The first cleaner flotation tailings will be recycled to the first cleaner scavenger flotation cells. The cleaner scavenger flotation concentrate will be recirculated back to the first cleaner flotation cells, whereas the first cleaner scavenger flotation tailings will report to a pump box and then pumped to the final tailings discharge pump box from where tailings will be sent to the TMF.

The concentrate from the first cleaner flotation will flow to the first cleaner concentrate regrind cyclone feed pump box. The flotation concentrate and the tower mill product will be pumped to the hydrocyclone cluster. The cyclone underflow will flow by gravity to the tower mill while the cyclone overflow, at a pulp density of approximately 18% (w/w), will be delivered to the second cleaner flotation stage. Lime and kerosene will be added to the cyclone pump box to aid with cleaner flotation. An automatic ball charging system will be provided to add grinding media to the tower mill at a controlled rate. A particle size analyzer will be installed to monitor the particle size of the cyclone overflow and to facilitate the production of ground slurry at the required particle size.

The first cleaner regrind cyclone overflow will be subjected to further cleaning in the second cleaner flotation column. The second cleaner flotation concentrate will feed the third cleaner flotation column to produce the final concentrate, and the second cleaner flotation tailings will be recirculated back to the first cleaner flotation. The third cleaner flotation concentrate will be sent to the concentrate dewatering circuit, and the third cleaner flotation tailings will be recirculated back to the second cleaner flotation. Fresh spray water will be added to both column cells to wash away entrained gangue minerals. The second and third cleaner flotation will be carried out at a pulp pH of 9.5 and a pulp density of about 18% (w/w). W31 will be added to the columns as required to maintain the froth bed.

The cleaner flotation and the column flotation area will be equipped with sumps and pumps to recycle any spillage.

17.4.7 Concentrate Dewatering and Drying

The final molybdenum concentrate from the flotation column will be treated by three dewatering stages, thickening, filtration, and drying. The key dewatering equipment will include:

- One 9 m diameter high-rate thickener
- One 28 m^2 pressure filter with 36 plates with dimensions of 900 mm x 900 mm

- One 5 kW rotary dryer

The molybdenum concentrate will be pumped to a high-rate concentrate thickener at a solid feed rate of about 3.8 t/h. Flocculant will be added to the thickener feed to assist with the settling of fine particles. The thickener overflow will be recycled to the process water tank for reuse. The thickener underflow will be pumped to the pressure filter at 60% solids (w/w) via a concentrate slurry stock tank. The concentrate dewatering area will be equipped with sumps and pumps to recycle any spillage.

The filtered concentrate cake from the pressure filter is expected to have a moisture content of about 15% (w/w). The filtered cake will be conveyed to a standard rotary dryer to reduce the moisture content to approximately 2%. The water filtrate discharged from the filter will be recycled to the concentrate thickener to recover the fine solids in the filtrate. The final dried molybdenum concentrate will be discharged into a storage bin prior to packaging using a bagging system.

17.4.8 Concentrate Packaging and Transportation

An automated bagging system will package the dried concentrate into 1-t tote bags. The bags will be weighed and sampled before being packed into sea containers for storage and shipment. The molybdenum concentrate production is approximately 84 t/d or 84 concentrate bags.

17.4.9 Tailings Handling and Process Water Supply

Two flotation tailings streams will be produced from the processing plant, the rougher scavenger flotation tailings and the first cleaner scavenger flotation tailings. The first cleaner scavenger flotation tailings will be directly pumped to the tailings pump box.

The rougher scavenger tailings will be processed in a 36 m diameter tailings thickener to recover process water. Flocculant will be added to the thickener feed to assist with the settling of fine particles. The thickener overflow will be recycled to the process water tank for reuse. Thickener underflow, at 55% solids (w/w), will be pumped to the tailings pump box. The material from the tailings pump box will be pumped to the TMF. The tailings thickener area will be equipped with sumps and pumps to recycle any spillage.

The supernatant from the TMF will be reclaimed and pumped to the process water tank at the port site for reuse. Tailings storage is detailed in Section 18.7.

17.5 Reagents and Consumables

The type of reagents and major consumable consumption rate for the process plant are summarized in Table 17-2.

Table 17-2: Reagents and Major Consumables Consumption

Reagent/Consumable	Consumption (g/t of Mill Feed)
Lime	40
Kerosene	60
W31	50
Flocculant	15
SAG mill grinding media	400
Ball mill grinding media	550
Rougher Flotation Tower Mill Grinding Media	25
Cleaner Flotation Tower Mill Grinding Media	15

17.5.1 Reagent Handling and Storage

Reagents are added to the flotation circuit to enhance selective floatability during the flotation process, while flocculants are added to facilitate the settling of solids in the dewatering circuit. To ensure containment in the event of an accidental spill, all reagents will be prepared and stored in a separate, self-contained area within the concentrator building, will be designed to accommodate 110% of the content of the largest tank. The reagents will be delivered by individual metering pumps or centrifugal pumps to the required addition points. All the reagents will be prepared using filtered freshwater. The covered and curbed reagent storage and preparation area will be located adjacent to the flotation area. The reagent system will include unloading and storage facilities, mixing tanks, transfer pumps, and feeding equipment. The storage tanks will be equipped with level indicators and instrumentation to ensure that spills do not occur during normal preparation operations. Appropriate ventilation, fire, and safety protection will be provided at the facility. Material safety data sheets (MSDS) will be provided to the operating staff as a source of training and reference. Each tank, reagent line and addition point will be labelled in accordance with Workplace Hazardous Materials Information Systems (WHMIS) standards. All operational personnel will receive WHMIS training and additional training for the safe handling and use of the reagents.

17.5.1.1 Collector

Collector (kerosene) will be received in liquid form, either in bulk tankers or drums. Kerosene will be stored in tanks located inside the concentrator building on a sloped concrete floor surrounded by a concrete berm. It will be added to the flotation process without dilution by individual metering pumps. The containment area will be equipped with sumps and pumps to recycle any spillage.

17.5.1.2 Frother

The frother (W31) will be received in liquid form, in either bulk tankers or drums. The frother will be added without dilution by metering pumps.

17.5.1.3 Lime

Pebble lime will be delivered by bulk bags and stored in a dedicated silo. It will be retrieved from the silo by a screw conveyor and slaked. The slaked lime slurry at 20% solids will be stored in an agitated tank and distributed via a pressurized lime loop throughout the processing plant.

17.5.1.4 Flocculant

Flocculant (Magnafloc 351) will be received in bags on site. A flocculant screw feeder will feed the flocculant eductor using freshwater addition. The mixed solution will be transferred and stored in an agitated flocculant holding tank. The packaged flocculant mixing system will run automatically based on the solution level of the holding tank. Flocculant will be made up to 0.5% solution strength and added via metering pumps to the thickeners.

17.5.1.5 Other reagents

Antiscalants, as required, will be added to minimize scale build-up in water lines. This reagent will be delivered in liquid form and metered directly into the intake of the reclaim water pumps.

New flotation reagents will occasionally be tested to determine their effect on metal recovery and concentrate grading. These reagents will be handled in accordance with MSDS requirements. A facility for mixing and dosing these test reagents will be provided.

17.5.2 Consumables

The major consumable items for the comminution circuit will be grinding media and crusher and mill liners. Grinding media will be used in the SAG, ball and regrind tower mills at different sizes. The liners are the essential component of the gyratory crusher, pebble (cone) crushers, SAG mills, ball mills and regrind tower mills. Other consumables include screen decks, filter cloths, concentrate bags and laboratory supplies. Maintenance spares for crushing, grinding, flotation, reagents, and assaying will also be provided.

17.6 Assay and Metallurgical Laboratory

An assay laboratory will provide all the routine assays for the mine, the processing plant, and the environmental and geological departments. The main instruments will include:

- Atomic absorption spectrophotometer (AAS)
- A Leco furnace
- An inductively coupled plasma mass spectrometer

The metallurgical laboratory will undertake all necessary tests to monitor metallurgical performance and, more importantly, to improve process flowsheet and efficiency. The laboratory will be equipped with:

- Laboratory jaw and cone crusher
- Dust collection system
- Laboratory ball mill

- Ring and puck pulverizer
- Ro-Tap® sieve shaker and test sieves
- Oven-style moisture determination equipment
- Sedimentation devices and laser particle sizer
- Denver D12 rougher flotation machine with the necessary cells for flotation test work
- Laboratory cleaner flotation cells (2 and 5 L)
- pH meters
- Convection oven
- Weighing devices
- Filtering units (pressure/vacuum filters)
- Fume hoods with extraction fans
- Bulk sample preparation equipment including drying ovens, laboratory glassware, and reagents

Appropriate samplers will be available for routine bulk sampling and plant surveys for process control and metallurgical accounting.

17.7 On-Line Sample Analysis

The plant will rely on automatic sampling and analysis of various flotation streams. The system will provide the necessary information for process control and provide sufficient sample quantities for checking/standardization and possible metallurgical test work. The process streams that will be sampled periodically are:

- Rougher flotation feed
- Rougher/rougher scavenger concentrate (rougher concentrate regrind feed)
- Rougher scavenger tailings
- Cleaner flotation feed (rougher concentrate regrind cyclone overflow)
- First cleaner concentrate
- First cleaner scavenger concentrate
- First cleaner scavenger tailings
- Second cleaner flotation feed (first cleaner concentrate regrind cyclone overflow)
- Second cleaner concentrate
- Second cleaner tailings
- Third cleaner concentrate

- Third cleaner tailings

The information obtained from these samplers will provide metal recoveries and grades of all process streams and thus enabling an overall process metal and performance balance. The analyzed and excess sample slurries will be collected in the sample return tank and returned to the slurry feed stream to the rougher flotation circuit.

17.8 Water Supply and Compressed Air

Two separate water supply systems for fresh and process water will support the mine and port site operations.

17.8.1 Fresh and Potable Water Supply System

A freshwater supply system will be installed to provide fresh water and potable water to the mine and port sites. Freshwater will be pumped from wells at the port site, supplied to a freshwater storage tank and distributed by pumping. All the freshwater pipelines outside heated buildings will be buried below the freezing level. Freshwater will be pumped from wells at the mine site. Freshwater will be used primarily for the following:

- Firewater for emergency use
- Reagent preparation
- Gland and seal water
- Mill cooling water
- Dust suppression
- Potable water supply

The freshwater tank will always be full and capable of providing at least two hours of firewater in an emergency. The potable water will be treated via chlorination and ultraviolet lamps and stored in a tank prior to delivery to various service points.

17.8.2 Process Water

Process water will consist of the reclaimed water from the concentrate and tailings thickener overflows, reclaim water pumped back from the TMF and fresh make-up water. Fresh and reclaimed water will be directed to a process water storage tank and will flow by gravity to the distribution points in the processing plant. As with fresh water, process water supply and distribution pipelines outside the heated buildings will be buried below the freezing level.

The concentrator has been designed to use salt water. The process water plan has been designed as a zero environmental harm operation as all process water will be recycled and not discharged to the environment.

17.8.3 Air Supply

Separate air service systems will supply air to the following areas:

- Flotation: Low-pressure air for flotation cells will be provided by three 24,930 m^3/h air blowers (two operating, one on standby).
- Filtration: Dedicated air compressors will provide high-pressure air required for filter pressing and drying of concentrate.
- Crushing: A separate air compressor will also provide high-pressure air for the dust suppression system and other services.
- Stockpile: High-pressure air will be provided by a separate air compressor.
- Plant services: High-pressure air will be provided at the mine and port sites separately by two separate air compressors.
- Instrumentation: Instrument air will be generated at the mine and port sites separately from two dedicated oil-free air compressors which will be dried and stored in a dedicated air receiver.

17.9 Process Control and Instrumentation

The plant control system will consist of a distributed control system (DCS) with a personal computer (PC) based operator interface stations (OISs) located in two separate control rooms. The DCS, in conjunction with the OIS, will perform all equipment and process interlocking, control, alarming, trending, event logging, and report generation. DCS input/output (I/O) cabinets will be located in electrical rooms and interconnected via a plant-wide fibre-optic network.

A separate control system/control room will be required in the power generation plant with components provided by the power generation system vendor.

Field instrumentation will consist of microprocessor-based “smart” type devices. Instruments will be grouped into process areas and wired to local field instrument junction boxes within those areas. Signal trunk cables will connect the field instrument junction boxes to DCS I/O cabinets.

Intelligent-type motor control centers (MCCs) will be located in the electrical rooms throughout the plant. The MCC remote operation and monitoring will be via DeviceNet (or other approved industrial communications protocol) interface to the DCS.

Programmable logic controllers (PLCs) or other third-party control systems supplied as a part of mechanical packages shall be interfaced to the plant control system via ethernet network interfaces.

A supervisory expert control system is proposed to control product particle size and optimize the fresh mill feed tonnage in the grinding circuit. Expert supervisory control will be developed to optimize the set-points for controllers at the regulatory level. Mill solid concentration variable-ratio control, dilution water flow rate control, and level control will be carried out at the regulatory level to reach the control targets. The set-point modification by expert control for dilution water controller will provide optimal dynamic performance. The set-point adjustment for the feed rate controller will ensure long-term stability in the particle size even if the mill feed hardness should change.

Further expert system data from the DCS shall be provided to optimize pit blast patterns.

The plant control room will be staffed by trained operations personnel 24 hours a day.

17.9.1 Primary Crushing Facility

A control room in the primary crushing building will be provided with a single OIS. All primary crushing and conveying operations (including RopeCon conveyor and discharging onto the crushed mill feed stockpile) will be controlled and monitored from this location. Control and monitoring functions will include the following:

- Plugged chute detection at all transfer points
- Zero-speed switches, side-travel switches, emergency pull cords, and belt rip detection of all conveyors
- Weightometers on selected conveyors to monitor feed rates and quantities
- Equipment bearing temperatures and lubrication system status
- Instrumentation packages
- Monitoring of in-pit crushing

17.9.2 Process Plant

A central control room in the port site process plant will be provided with three OISs. Control and monitoring of all processes in the process barges will be conducted from this location. Control and monitoring functions will include, but are not limited to, the following:

- Grinding feed conveyors (zero-speed switches, side-travel switches, emergency pull cords, belt scales, metal detectors, and plugged chute detection)
- Grinding mills (mill speed, bearing temperatures, lubrication systems, motors, and feed rates)
- Grinding particle size monitoring and control by particle size analyzers for the primary and secondary grinding circuits
- Cone crushers (speed, bearing temperatures, lubrication systems, motors, and feed rates)
- Pump box, tank, and bin levels
- Variable speed pumps
- Cyclone feed density controls
- Water storage and distribution
- Air compressors
- Instrumentation packages
- Flotation cells (level controls, reagent addition, and airflow rates)
- Froth monitoring cameras
- X-ray analyzers and samplers

- Column cells (level controls and reagent addition)
- Concentrate and tailings thickeners (drives, slurry interface levels, underflow density, and flocculants addition)
- Concentrate filter, dryer, and loadout
- Reagent handling and distribution systems
- Tailings disposal system
- Water storage, reclamation, and distribution, including tank-level automatic control (via ethernet remote I/O)
- Air compressors
- Instrumentation packages

17.9.3 Remote Monitoring

Closed-circuit television (CCTV) cameras will be installed throughout the process plant, with monitors in the control room. The CCTV monitoring locations will include primary crushing facilities, stockpile conveyor discharge point, stockpile reclaim tunnel, pebble crushing area, and concentrate loadout area.

17.10 Annual Production Estimate

The annual production estimate will vary according to the mining production plan and the metallurgical performance outlined in Section 13.0. The annual metal production estimates based on the mine production plan and metallurgical performance outlines in Section 13.0 are presented in Table 17-3. The average head grade for the first five years of production is 0.143% Mo with an anticipated average recovery of 86%. The average head grade is reduced to 0.05% Mo towards the end of mine-life - years 15 to 20 - thus decreasing the expected molybdenum recovery.

Table 17-3: Projected Metal Production

Year	Ore milled (kt)	Head Grade (% Mo)	Recovery (%)	Concentrate Production (t)	Concentrate Grade (% Mo)	Contained Metal (klb Mo)
Year 1	9,880	0.125	85.2	19,520	54.0	23,238
Year 2	12,780	0.151	86.1	30,781	54.0	36,645
Year 3	12,780	0.147	85.7	29,788	54.0	35,463
Year 4	12,780	0.160	86.5	32,767	54.0	39,009
Year 5	12,780	0.130	85.3	26,242	54.0	31,241
Year 6	12,780	0.131	85.3	26,384	54.0	31,410
Year 7	12,780	0.139	85.3	28,086	54.0	33,436
Year 8	12,780	0.138	85.7	28,086	54.0	33,436
Year 9	12,780	0.136	85.5	27,519	54.0	32,761

table continues…

Year	Ore milled (kt)	Head Grade (% Mo)	Recovery (%)	Concentrate Production (t)	Concentrate Grade (% Mo)	Contained Metal (klb Mo)
Year 10	12,780	0.132	85.1	26,668	54.0	31,748
Year 11	12,780	0.099	83.7	19,717	54.0	23,473
Year 12	12,780	0.086	82.6	16,880	54.0	20,096
Year 13	12,780	0.092	83.0	18,015	54.0	21,447
Year 14	12,780	0.102	84.2	20,426	54.0	24,317
Year 15	12,780	0.053	80.7	10,071	54.0	11,990
Year 16	12,780	0.064	82.1	12,341	54.0	14,692
Year 17	12,780	0.050	81.0	9,646	54.0	11,483
Year 18	12,780	0.050	80.7	9,504	54.0	11,314
Year 19	12,780	0.051	81.2	9,788	54.0	11,652
Year 20	5,067	0.047	79.7	3,543	54.0	4,218
Total	**244,987**	**0.106**	**84.6**	**405,772**	**54.0**	**483,070**

Numbers may not add due to rounding

17.11 Staffing

Personnel requirements are developed based on the operational requirements, shift, equipment attendance, safety, training, and maintenance requirements. Average annual staffing requirements are provided in Table 17-4. The staffing is based on two crews operating two 12-hour shifts per day on a 2-week fly-in/fly-out basis. The primary crusher crew will be based at the mine site, while other crews will be based at the port site.

Table 17-4: Plant Staffing Requirements

Description	Shifts	Staff
Mill Management		
Mill Superintendent	Day	1
Mill Superintendent Assistant	Day	1
Chief Metallurgist	Day	1
General Foreman	Day	1
Senior Metallurgist	Day	1
Metallurgist	Day	2
Mill Operations		
Shift Supervisor	Day/Night	4
Training Foreman	Day/Night	2
Primary Crusher Operators	Day/Night	4
Crusher Helpers	Day/Night	4

table continues…

Description	Shifts	Staff
Mill Control Room Operators	Day/Night	4
Grinding Operators	Day/Night	8
Flotation Operators	Day/Night	4
Dewatering, Drying, Packaging	Day/Night	4
Reagent Operators	Day/Night	2
Laborer/Training	Day/Night	8
Metallurgical and Assay Laboratory		
Senior Assayer	Day	2
Metallurgical Technician	Day/Night	4
Assayers	Day/Night	4
Sample Bucker	Day/Night	4
Mill Maintenance		
Maintenance Superintendent	Day	1
General Foreman	Day	1
Mill Maintenance Foremen	Day	2
Millwrights	Day/Night	8
Apprentices	Day/Night	8
Welder	Day/Night	4
Electrical Foreman	Day/Night	2
Electricians	Day/Night	4
Instrumentation Technicians	Day/Night	2
Apprentices	Day/Night	4

18.0 PROJECT INFRASTRUCTURE

The Project is located in central-east Greenland approximately 30 km from tidewater. The deposit forms part of Hostakken Mountain with a wedge-shaped point at the confluence of the Arcturus and Schuchert Glacier. The Project occurs within the 82 km^2 Mineral Exploration Licence No 2018/11. The nearest village is Ittoqqortoormiit, which lies some 190 km southeast. A Project location map is provided in Section 1.0.

Modular structures to house fixed Project components have been designed and utilized wherever possible to reduce Project Capex costs, reduce Project development schedule, improve processing plant commissioning period, and improve overall Project economics.

The Project site layout comprises of the mine site, port site, Noret TMF, BGMV, Schuchert Airport, and connective access roads between these sites, as presented in Figure 18-1.

The mine site consists of open pit, haul roads, truck shop, accommodation camp, ore stockpiles, mine waste storage, primary crusher, RopeCon conveyor loading stations, Schurchert Airstrip, ancillary buildings, service utilities, and a network of access roads connecting these infrastructure. The mine site layout is presented in Figure 16-12 (Section 16.0).

The port site comprises of the port facilities, marine infrastructure, container storage yard, fuel storage and fuel farm, processing concentrator barges, live ore stockpile and reclaim, accommodation camp vessel, ancillary buildings, service utilities and a network of access roads connecting these infrastructure. The port site layout is presented in Figure 18-2.

As shown in Figure 18-1, major Project infrastructure located outside the mine and port sites are: TMF (~8 km north of port site), BGMV (~12 km north-northwest of port site), and Schuchert Airstrip (~10 km south of mine site).

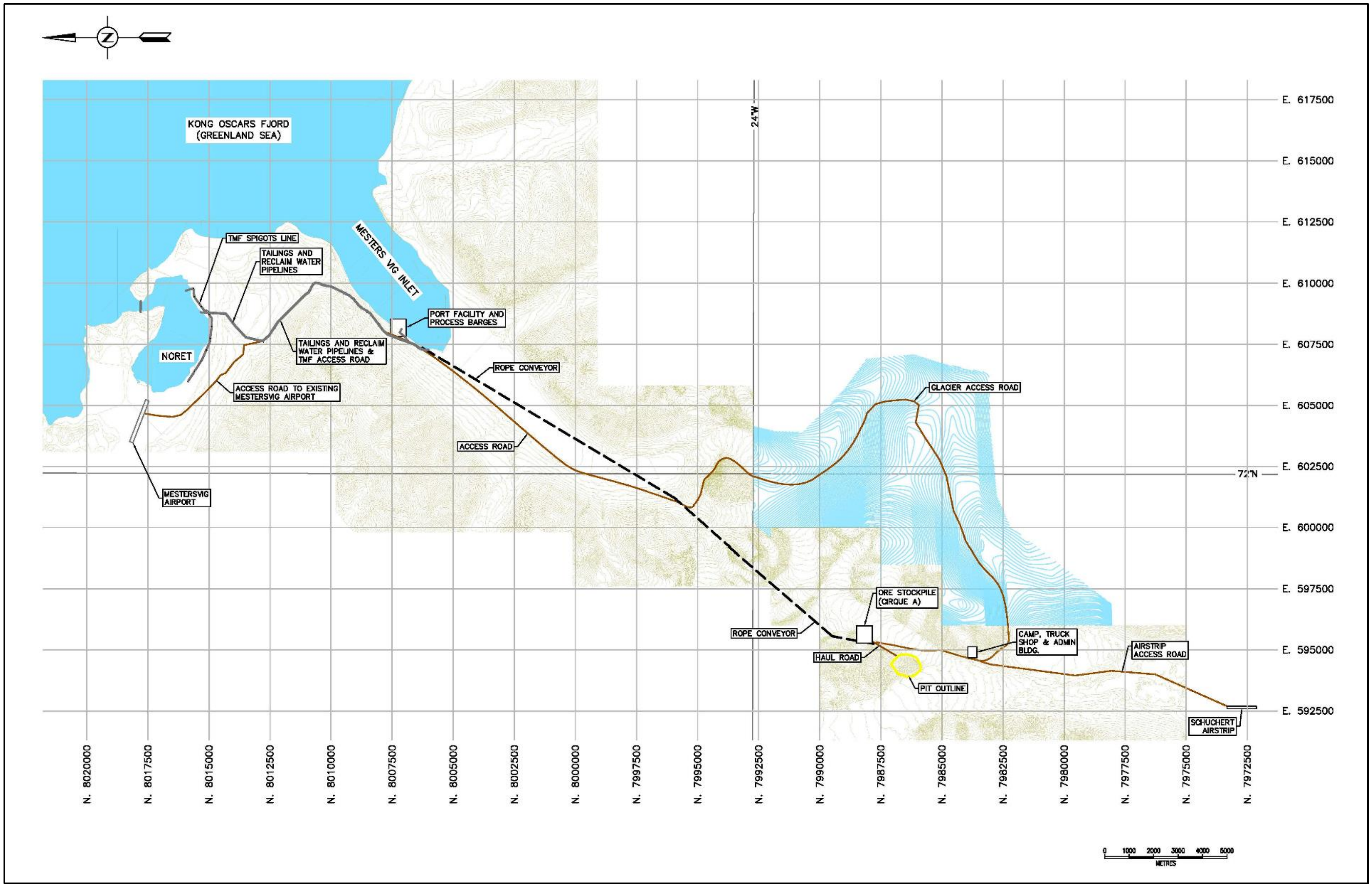


Figure 18-1: Overall Site Layout

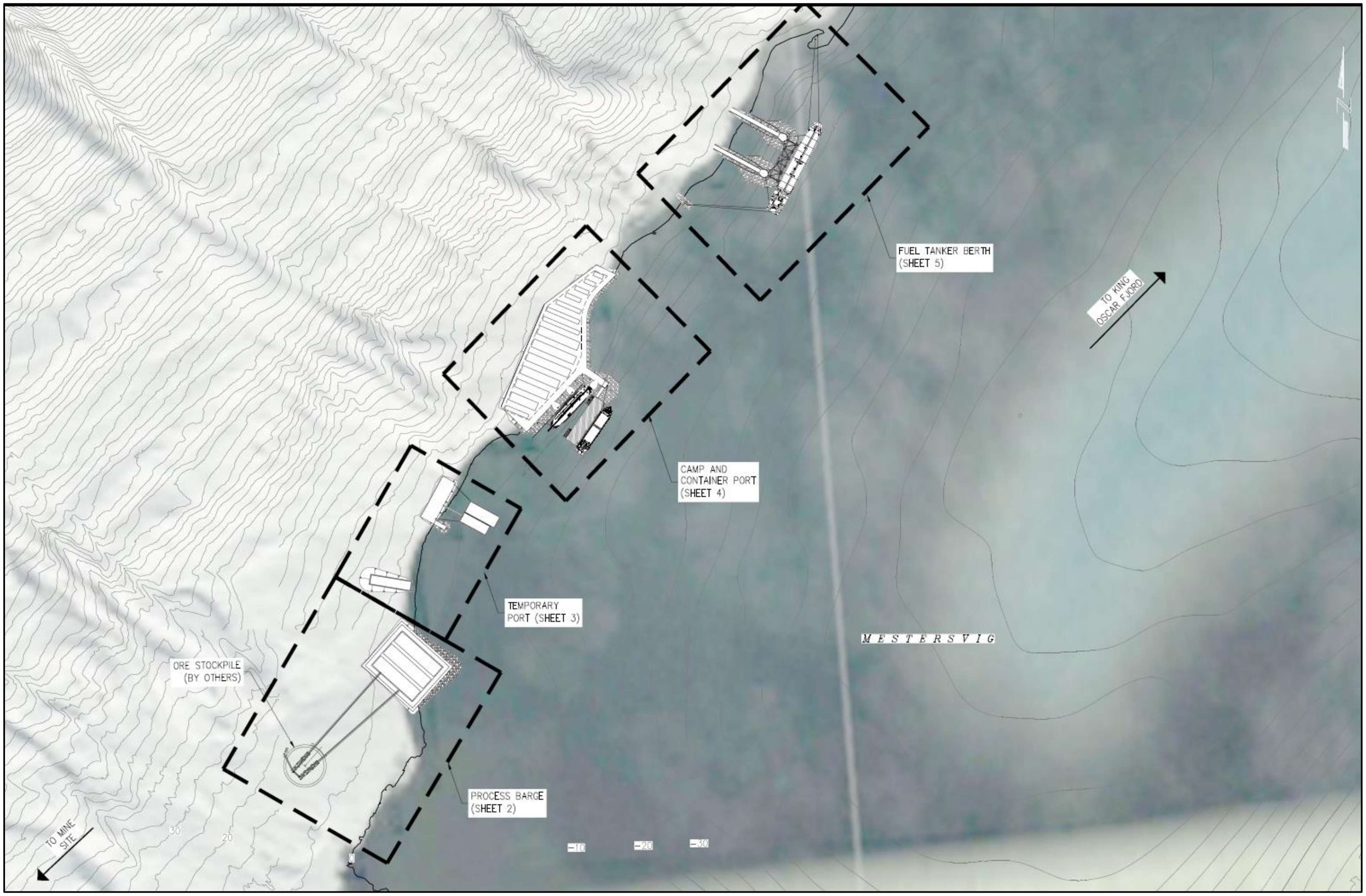


Figure 18-2: Site Layout – Port Site

18.1 Access and Glacier Roads

Major access and glacier road locations and alignments are presented in Figure 18-1. There are five major access roads onsite:

1. Port to Mine site access/glacier road (42 km), which consists of a 16 km access road from port to glacial base and a 26 km glacier road from glacial base to mine. This road will facilitate personnel and material movement between port and mine site during construction and operations.
2. Port site to TMF access road (11 km). This road provides access between the port and TMF and maintenance access to the TMF/reclaim water pipelines and the booster pump station. This road also serves as an access road from port to BGMV. The BGMV access road spur (junction) is located approximately 8 km from port site, where the BGMV access road begins.
3. BGMV access road (6 km) from TMF access road junction to BGMV. This road connects BGMV and Port site to TMF access road to facilitates personnel and material movements between BGMV and port site.
4. Site roads to various facilities located within proximity of mine site.
5. Haul roads between open pit, primary crusher, and truck shop.
6. Access road from the accommodation camp at the Mine Site to the Schuchert Airstrip (9 km)

Initially, a pioneering road from port to mine site will be constructed during the Project pre-development season with pioneering mining equipment. The pioneering road will also provide a means of moving pioneering equipment, machines, building materials and fuel from port to mine site. Pioneering and access roads will also be built from port to TMF and BGMV during predevelopment and construction.

18.1.1 Port to Mestersvig Airport Access Road

The port to BGMV access road serves as the main access roadway alignment from the port site to BGMV. The alignment consists of two sections: the first section, from the port site to the tailings line maintenance road junction, is a combined road and pipe corridor with 18 m road width accounting for the tailings and reclaim water pipelines; the second section, from the tailings line maintenance road junction to BGMV, has a 14 m road width as there are no pipelines in this section. The total length of the road from the port site to BGMV is approximately 13.6 km. All road sections have an allowance for safety berms.

The port site to the BGMV access road includes 29 drainage culverts to channel surface water runoff, with a total length of 842 m. In addition to drainage culverts, the geohazard report from KP identifies eight fluvial channel crossings and nine thermal erosion crossings on this road alignment.

A multiplate span is provided on the 18 m wide road section between the port and the tailings booster station at the approximate station 12+200m. The multiplate is nominally 4 m in diameter and 65 m in length. An allowance has been made for 10% of the road length to have a 2 m permafrost blanket in this road section, between the port and tailings booster station.

18.1.2 Port to TMF Access Road

The port site to TMF access and maintenance road provides access from port to the TMF. This roadway alignment consists of a typical section of 10 m road width accounting for the tailings and reclaim water pipelines and safety berms. The primary purpose of the tailings pipeline is to hydro-transport tailings slurry from the concentrator to the TMF. The reclaim water pipeline transports the reclaimed process water from the TMF to the concentrator at the port site. A booster station for the reclaim water pipeline is also incorporated on the tailings line maintenance road. The total length of the tailings line maintenance road is approximately 2.7 km. All road sections have an allowance for safety berms. Due to its native grade composition, the tailings line maintenance road does not require allowance for permafrost blanket.

18.1.3 Port to Mine Site Access Road (Non-Glacial Section)

The port road connection to the glacier road is an approximately 15.3 km segment. The glacier road connects the mine site infrastructure road network which comprises of the Schuchert Airstrip road, Camp road, and the mine site road. All road sections are designed with a 5 m running surface width, rock berms on either side of the road, and are designed to a maximum grade of 8%.

The port road includes 18 drainage culverts to channel surface water runoff, with a total length of 348 m. In addition to drainage culverts, the geohazard report identifies 10 fluvial channel crossings and 13 thermal erosion crossings on this road alignment.

Two galvanized steel multi-plate spans are provided on the 5 m wide road section between the port and the glacier. the first multiplate span is provided at the approximate station 13+400m. The multiplate is nominally 4 m in diameter and 50 m in length. The second multiplate span is provided at the approximate station 19+900m. This multiplate is 4 m in diameter and 90 m in length. An allowance has been made for 10% of road length to have a 2 m permafrost blanket in this road section, between the main port road and the Mellem Glacier (segment 2 of Figure 18-3).

18.1.4 Port to Mine Site Access Road (Glacial Section)

The access road from port site to mine site includes a 24 km segment that is located on top of a glacier. The width of the glacier access road is determined by the width of the largest piece of equipment that will be shuttled up the glacier access road. The design width of the road will provide adequate room for berms or ditches when necessary. Table 18-1 lists width design specifications for the glacier road. Figure 18-3 shows the alignment and the different segments.

Table 18-1: Design Specifications for Glacier Road

Description	Unit	Value
Largest Vehicle Width (230 t hauler)	m	8.3
Berm Width (one berm)	m	3.7
Access Road Total Width	m	12
Max Access Road Grade	%	12

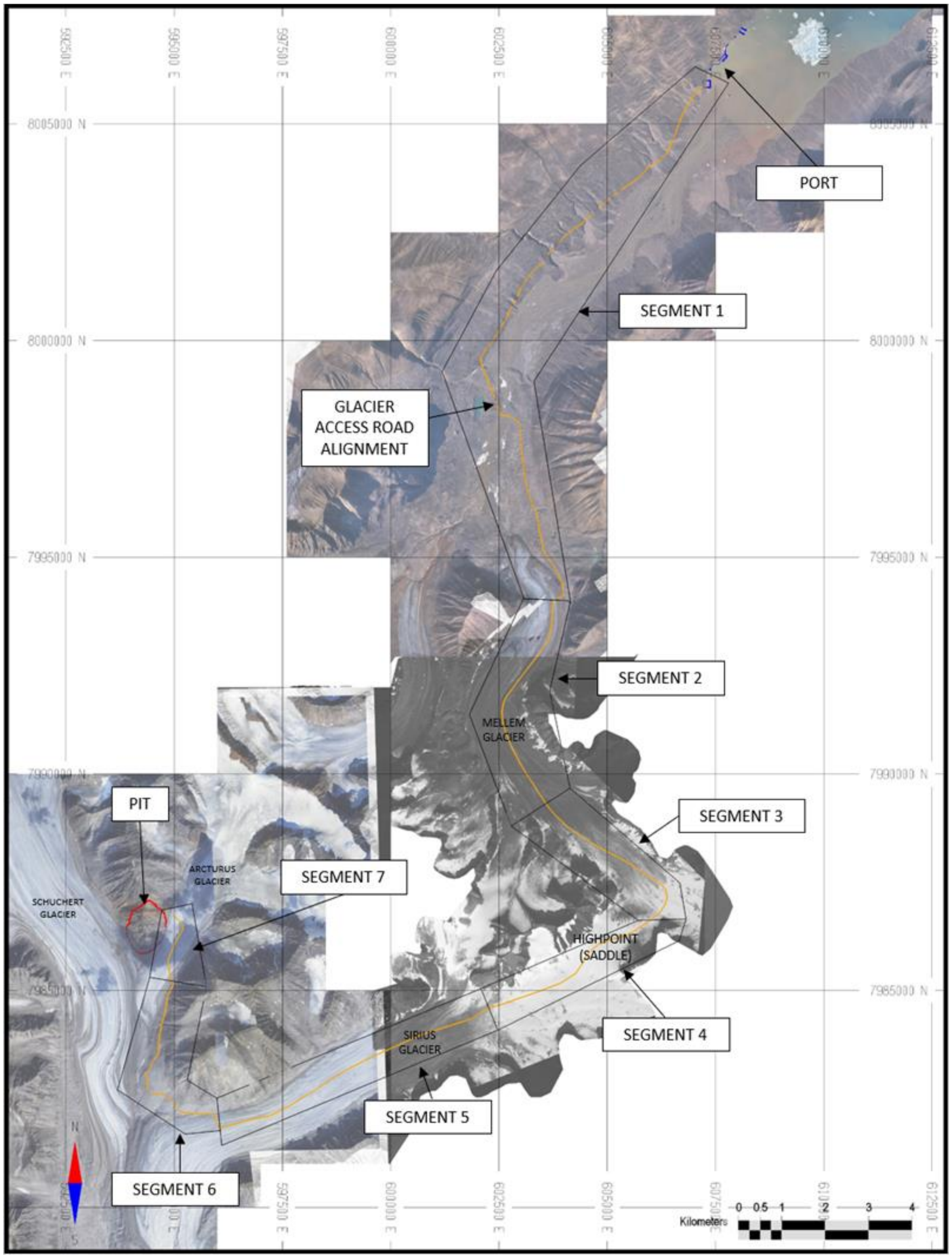


Figure 18-3: Glacier Access Road Alignment and Segments

18.1.5 Mine Site to Schuchert Airstrip Access Road

This access road serves as the main access roadway alignment from the ROM ore stockpile and camp facility to the Schuchert airstrip. This roadway alignment consists of a typical section of 10 m road width from the ROM ore stockpile to the Schuchert airstrip. The length of this access road from Schuchert Airstrip to camp facility is approximately 9.2 km. The total length of this access road from Schuchert Airstrip to explosive facility is approximately 11.2 km. All road sections have an allowance for safety berms. An allowance has been made for 10% of road length to have a 2 m permafrost blanket in this road section of South Road.

18.2 Airport and Airstrip

18.2.1 Mestersvig Airport

BGMV is a Danish naval base manned year-round by Joint Arctic Command that is located at N 72°14.00' W 23°55.00' on the Northwestern coast of King Oscar Fjord. The airport is 13.6 km from port site by road. The airport is located near the Stauning Alps mountainous area. The airport is used infrequently with little winter maintenance and few permanent personnel.

This design report explores the upgrading the airport to permit for year-round operations for passenger and freight service.

18.2.1.1 Airport Description

BGMV has the following characteristics as detailed in the Danish Military Aviation Information Publication (AIP), updated in November 2021 (Danish Military, 2021). There are no customs, immigration, health, sanitation, or air traffic services at the site. Currently, aviation fuel can be purchased by civilian aircraft operator at BGMV if required, however, there is no aircraft handling services. Danish base military personnel can provide limited cargo handling capabilities upon request. There are no emergency services on site.

The runway (14-32 magnetic) is published as being 1,800 m (5,906 ft) long and 45 m (148 ft) wide. The runway is surfaced with gravel and the AIP indicates the surface is soft during freeze/thaw shoulder seasons. The site is not used during the thaw period. The runway slopes upward at an average rate of 0.44% from south to north. The runway ends do not have defined turn pads. The runway may only be utilized with prior permission required from the operator. The declared distances, including the take-off run available, take-off distance available, accelerate stop distance available, and landing distance available, are published as 5,906 ft. This does not include the application of any safety areas or obstructions which reduce the true distances as detailed further in this section.

The runway does not have International Civil Aviation Organization (ICAO) recommended conforming safety areas (graded areas) along the runway edges and runway ends. The safety areas along the sides of the runway extend approximately 45 m from the runway centreline (ICAO recommends 75 m). The runway ends have no safety area (ICAO recommends 150 m). Due to the lack of conforming safety areas, the AIP cautions that any operator must apply their own requirements for safety areas in accordance with their company rules. Typically, for a non-certified airport in Canada, the safety areas would extend a minimum of 30 m from the runway centreline along the runway edge and 60 m beyond the runway ends. The taxiway and apron are surfaced with gravel and located at the southeast end of the runway along the west side. The area is poorly defined and includes some associated support infrastructure. The control tower and non-directional beacon are located west of the apron along with associated military buildings and infrastructure. The existing apron aircraft parking area is within the ICAO Obstacle Limitation Surfaces (OLS) and parked aircrafts do not meet runway/apron obstacle separation requirements.

There is no airfield lighting at the airport and the runway is restricted to daytime use. The runway is defined with markers (up to 3.6 m high). There is no approach lighting or any other visual aids such as Precision Approach Path Indicators (PAPI). There is one wind direction indicator (windsock).

The only Instrument Approach is an RNAV (GNSS) RW 32 LNAV Instrument Approach Procedure (IAP) for Runway 32 with a Minimum Descent Altitude (MDA) of 570 ft (174 m) or 492 ft (150 m) above the airport Touchdown Zone Elevation (TDZE) for Category C aircraft. This IAP includes a circling approach with limits down to an altitude of 1,360 ft (415 m).

The site is bordered on three sides by watercourses that appear braided and unconstrained. It is imperative that further studies for flooding and erosion are undertaken prior to a decision to use this site. It is likely some armoring, diversion, and diking will be required for the long-term protection of the site.

18.2.1.2 Runway, Taxiway, and Apron Design

Table 18-2 summarizes the current and proposed physical airfield characteristics. The table also lists deviation from standards is required.

Table 18-2: Comparison of Critical Current and Proposed Physical Characteristics at BGMV

Standard	Current Characteristics	ICAO Annex 14 – 8th Edition - Code C – Non-Instrument (NI)	Mitigations/Upgrade Requirements
Physical Characteristics		Proposed	
Runway Width	45 m	45 m	Runway width remains the same. Upgrade only. Add a runway turn pad at the threshold of runway 14. Runway requires upgrading to be able to operate year-round.
Runway End Strip	0 m	60 m proposed	Runway end strip or safety area should be provided and requires a limited amount of fill and re-grading.
Runway End Safety Area (RESA)	0 m	0 m proposed. Deviation required as ICAO recommends 90 m beyond runway end strip	Reference TP312 5th Edition for elimination of RESA for limited use, private, non-certified runways.
Width of Runway Strip	(undefined)	75 m from runway CL	This will define the beginning of the Transitional Surface for obstacle protection along the runway environment.
Runway Safety Area (Graded Area along the runway)	Approximately 45 m from runway centreline	45 m from runway CL proposed. Will require a deviation from the 75 m recommended by ICAO	Runway edges will require re-grading to match runway upgradation gravels.
Taxiway Width	(undefined)	23 m	Capable of operations with Code C or occasional Code D aircraft. Upgrading required.

table continues…

Standard	Current Characteristics	ICAO Annex 14 – 8th Edition - Code C – Non-Instrument (NI)	Mitigations/Upgrade Requirements
Physical Characteristics		**Proposed**	
Taxiway Strip Width	(undefined)	26 m from taxiway CL	Taxiway is sited to avoid obstructions within 26 m of the taxiway centreline.
Taxiway Safety Area (Graded Area)	(undefined)	12.5 m from CL and 5 m from the Edge of the taxiway	Taxiway edges require grading and fill for 5 m from the new taxiway edge.
Runway Hold Position	(undefined)	The hold position will be established at 75 m from the Runway CL.	No impact.

The runway will be 1,750 m (5,742 ft) long, 45 m (148 ft) wide, and will have a gravel surface capable of operating year-round including the thaw periods. The design aircraft is the Boeing 737-200 with gravel kits. It could also include operations with other Code C aircraft like the RJ85 and the Dash 8 Q-400. The facilities will also allow operations with a Lockheed C-130 Hercules (Code D). This may require special operational procedures for taxiing and aircraft parking.

The taxiway will be 23 m (75 ft) wide with a gravel surface and will be capable of operating year-round. The taxiway is designed for Code C aircraft however has been designed to allow use by Code D aircraft such as the Hercules C-130.

The Apron will have a gravel surface and a layout able to accommodate two 737-200 power-in/power-out parking positions with one of the positions intended for a disabled aircraft. Apron layout will also allow a single Hercules C-130 power-in/power-out parking position. Apron design will include containment of glycol during de-icing operations.

18.2.1.3 Runway and Taxiway Safety Area Grading

The runway safety areas within the strip should be upgraded to meet strength and grading requirements for 60 m beyond the runway end and 45 m either side of the extended runway centreline. A deviation will be required along the runway sides as ICAO recommends safety area grading to 75 m from the runway centreline. A deviation will also be required for the RESA recommended by ICAO (90 m beyond the runway 60 m graded strip end) as there is insufficient room at the site. Implementation of the ICAO RESA recommendation would result in a reduced runway length to 1,570 m (5,150 ft, too short for the 737-200). The taxiway graded areas will be upgraded to provide a conforming graded area to 5 m from the taxiway edge.

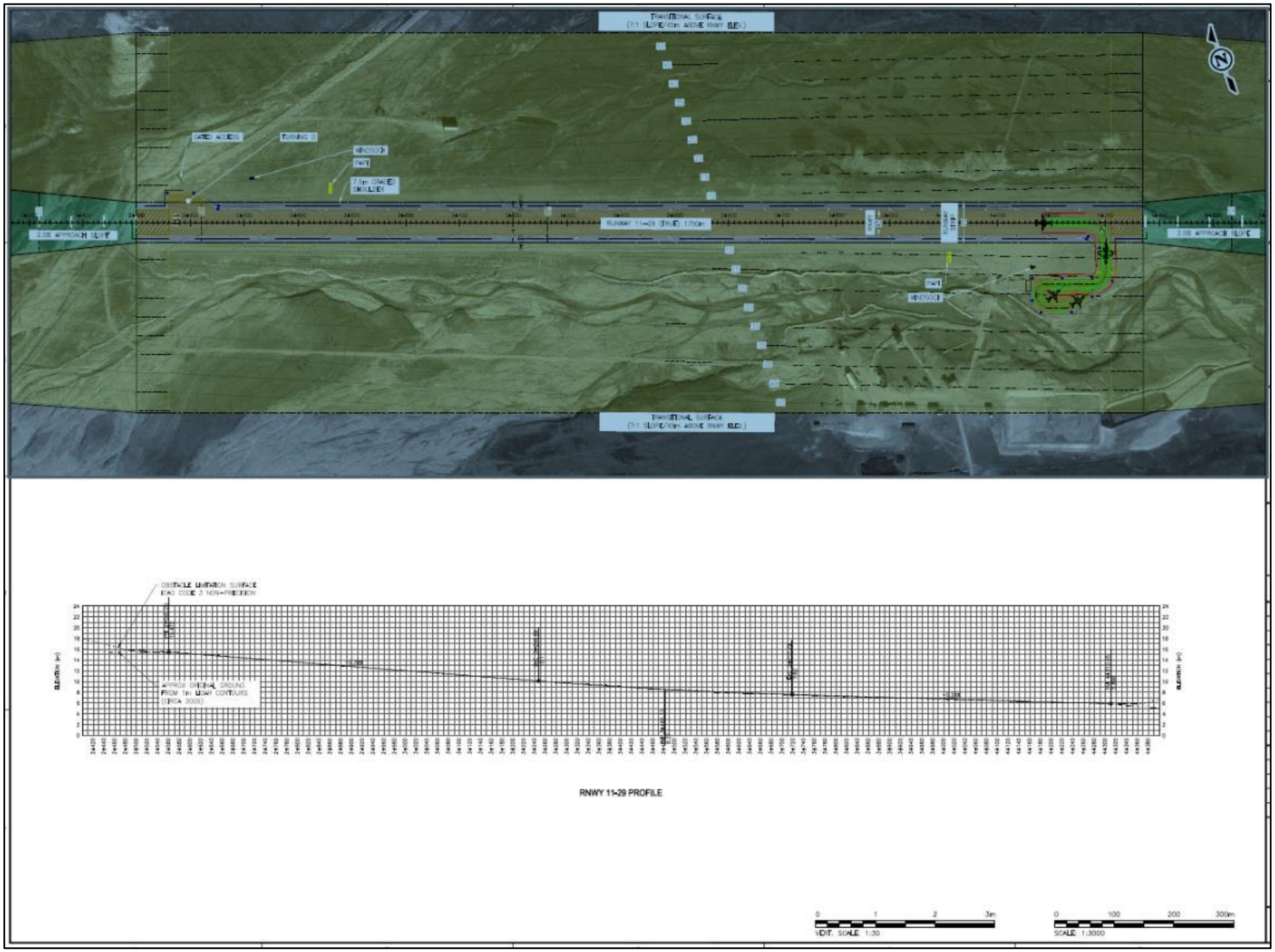


Figure 18-4: BGMV General Arrangement After Upgrading

18.2.1.4 Runway, Taxiway, and Apron Upgrading Methodology

Previous reports and the Military AIP indicate that the surfaces are unusable during thaw periods. This is likely due to poor drainage and insufficient granular structure. The following recommendations should be verified by a facility condition assessment and geotechnical studies. Upgradation of the runway, taxiway, and apron will likely require the following:

- Scarification of the existing surfaces to allow integration with new gravels.
- Overlay of the existing surface with 300 mm of new granular base material.
- Creation of a turn pad at the threshold of runway 14.
- Granular base material tying the upgraded higher runway surface to the graded areas along the runway and taxiway.
- The runway and taxiway surfaces will be compacted and shaped to form a crown with 2.5% slopes to improve drainage of the operational surface. The crown slope exceeds the ICAO recommended maximum of 2%; however, it has been found that 2.5% results in better drainage and surface longevity. Transport Canada has adopted 2.5% as their new maximum slope for gravel runways in the north.
- The apron will be graded to maximum slopes of 1% to ensure accurate aircraft fuel readings.
- The apron will include an area for de-icing fluid containment and storage during aircraft de-icing operations.

Based on limited information, it appears that the ICAO recommended OLS for a Code 3 NI runway are achievable at BGMV.

The existing road at the threshold of runway 14 will require controls to prevent vehicle traffic when the runway and approaches are in use by aircraft. This will require radio control of all vehicle traffic, signage, and possibly automated gates on both sides of the runway approximately 150 m from the extended runway centreline.

18.2.1.5 Airfield Lighting and Electrical

There is no airfield lighting at BGMV. To improve reliability and safety, we recommend the following electrical and lighting facilities. The following airfield lighting facilities are to be included to provide a reliable and safe airfield lighting system for regular operations day and night. All the electrical conductors servicing the lighting will be installed in conduit with pull pits at each light or facility.

- Approach Lighting
- PAPI
- Illuminated Wind Direction Indicators
- Runway End Lighting
- Runway Edge Lighting
- Taxiway/Apron Edge Lighting
- Backlit Signage

- Airport Beacon
- Apron Floodlighting
- Power Supply
- Field Electrical Centre (FEC)
- Automated Weather Observation Station (AWOS)

18.2.1.6 Airport Maintenance Equipment Requirements

It is assumed that all runway, taxiway, and apron maintenance (including snow/ice clearing), as well as cargo handling, passenger assistance, baggage handling, aircraft de-icing and anti-icing, aircraft ground handling, aircraft fuelling, and building and electrical maintenance will be provided by site personnel and equipment, or by a suitable contractor. Details of how these activities will be safely discharged to ensure the operational integrity of the airport can be included in an Airport Safety Plan (ASP) or a comprehensive set of Standard Operating Procedures. These would be developed prior to the commencement of airport operations.

A grader, dump truck (with snowplow attachment), loader, snow blower, and surface de-icing equipment (liquid and/or granular dispensers) will be needed to keep the surfaces in a useable condition during winter months. A pickup truck with decelerometer (runway friction index) equipment will be required to assist in the assessment of runway operational status. Aircraft de-icing and anti-icing equipment, along with a system to collect, store, and dispose of the glycol overspray will be needed. All equipment accessing the runway and taxiways should be equipped with air radios for ground to air communications, as well as rotating amber beacons.

Aircraft ground handling equipment will include baggage and freight handling equipment, a ground power unit for aircraft engine starts, and a water/wastewater trailer unit. Depending on the parking arrangements on the apron and the size of the aircraft serving the airport, a pushback tractor may also be required (with towbars appropriate to the aircraft type).

A fuel truck to provide fuel for scheduled commercial and chartered aircraft on the apron to improve safety and reduce extra aircraft engine starts. It is assumed an aviation fuel tank and handling facility would be provided at the port and will be sufficient for jet fuel storage for delivery to aircraft on the apron. Aviation fuel will be stored in suitable fuel tanks at Mesters Vig Inlet and will be transported to the Airport by truck when required.

Provision of portable aircraft fire-fighting equipment that could be stored on site depending on the response time to aircraft emergencies that is desired by the airport and aircraft operators.

Security equipment for passenger, baggage, and freight screening will be required if flights are destined to other secure airports. Some destination airports are organized to accept unscreened airline flights but many larger commercial service airports cannot accept unscreened flights. Arrangements for passenger and baggage screening (carry-on and hold bags) should be made if required.

The ASP should include provisions to restrict access to aircraft movement areas of the airport to only those people and vehicles that are authorized by the airport operator. Associated facilities would include appropriate security fencing in designated areas, safety (wildlife control) fencing in other areas, required signage and necessary access points with proper control (road crossing the runway near the threshold of runway 14).

It is assumed that the operational maintenance and repairs of the airport will be performed by the Project site services crews. Trained personnel will be allocated to the airport to provide the following services:

- Airport inspection
- Snow removal and ice control
- Ground to air communication
- Aircraft de-icing and services
- Electrical systems
- Security

18.2.2 Schuchert Airstrip

The mine development schedule requires the construction of the Schuchert Airstrip at the Schuchert Glacier moraine by Year 2. The airstrip is located approx. 11 km south of mine accommodations and administration complex. The purpose of this airstrip is to facilitate a more convenient and direct means of mine personnel transportation to and from the Mine Site from Mestersvig. The Schuchert airstrip design criteria are as follows:

- Design Aircraft is the ATR-42 with the possibility of operations with a Lockheed C-130 Hercules landing loaded and taking-off empty or with light loads. Smaller aircraft such as the Twin Otter are also expected to use this facility
- OLS, including the runway strip, take-off/approach surfaces, and transitional surfaces, are to meet the latest requirements from ICAO Annex 14, 8^{th} Edition for Code C aircraft operating in NI conditions
- The airstrip will have a granular surfaced runway, taxiway, and apron, and will be maintained to operate year-round
- The airstrip will have an airfield lighting system and is intended for 24-hour operations, and
- The design will try to minimize earthworks volumes while mitigating conflicts with the regulatory standards as much as possible.

18.2.2.1 Runway, Taxiway, and Apron Design

The runway length required for an ATR-42 to take-off at the Schuchert Airstrip is approximately 1,199 m (3,934 ft). The selected length should allow maximum take-off weight departures without penalty on most days at the site. This results in a classification as a Code 2C, NI runway.

Minimum allowable width of the runway surface is 30 m. This has been increased to 45 m for this design to allow for difficult winter conditions, crosswinds, granular runway surface operations, and for occasional use by Hercules C-130 aircraft. Maximum allowable longitudinal runway slope is 1.5%. This has been reduced to a project maximum of 1% to ensure take-off and landing distances are not unduly affected by the runway slope. Maximum change between consecutive slopes is 1.5%, where slope changes cannot be avoided. Maximum longitudinal slope rate of change is 0.2% per 30 m. To allow for adequate drainage, maximum transverse slope of the runway surface is 2.5% (recommended for gravel surfaces to facilitate good drainage and reduce standing water). ICAO recommends a maximum of 2%, however Transport Canada standards recommend 2.5% crown to improve drainage and increase longevity of the gravel surface.

Runway strip ends are located a minimum of 60 m out from the runway threshold and are the same elevation as the runway threshold. The strip end extends 40 m either side of the runway centreline and form the start or inner edge of the approach surface of the OLS. The runway strip edges are formed by connecting the outsides of the runway strip ends (inner edge) with an imaginary line. This line is parallel to the runway and located 40 m either side of runway centreline and the same elevation as the adjacent runway centreline (this line is the start of the transitional surface).

ICAO recommends the runway safety standard includes a graded area extending 40 m each side of the runway centreline. This standard is the primary regulation that has not been complied with in this conceptual design. Most northern registered airstrips have reduced graded areas to 30 m either side of runway centreline due to the economic and environmental impacts of the 40 m standard. Subject to direction from GRI, the runway safety areas for the design basis will be to 30 m either side of centreline. Other northern airstrips have been constructed with safety areas of 30 m or less including in northern Canada at Ekati, Diavik, Gahcho Kué, Meadowbank, and Mary River.

ICAO also recommends the RESA standard includes a graded area extending 90 m beyond the 60 m graded strip at the end of the runway resulting in a total safety area of 150 m This standard is the other regulation that has not been complied with in this conceptual design. A 60 m safety area has been included at the runway ends. Transverse slopes in the runway safety area allow for adequate water drainage to prevent pooling and fall within 0 to minus 3% below the horizontal.

Minimum taxiway width required is 15 m; however, we recommend the taxiway at the airstrip be constructed to a width of 23 m to allow easier snow removal in the winter months, provide safer aircraft taxiing without centreline guidance (no paint markings on gravel) and allow taxi with the Hercules C-130. Taxiway clearance from the centreline to an object is 26 m (38 m for the Hercules). Transverse slope of a taxiway is to be sufficient to prevent accumulation of standing water (2.5% minimum). Taxiway safety area (graded area) is a minimum of 5 m from the edge of the taxiway. Taxiway safety area is limited to a maximum transverse slope of plus 2.5% with reference to the transverse slope of the adjacent taxiway surface. The slope below the horizontal plane can be a maximum of 5%.

The apron dimensions will allow for parking and maneuvering of two design aircraft or one Hercules C-130. Apron positioning is flexible along the length of the runway and will be selected to provide the optimal positioning for the site conditions. The apron will include provisions for the containment of de-icing fluids.

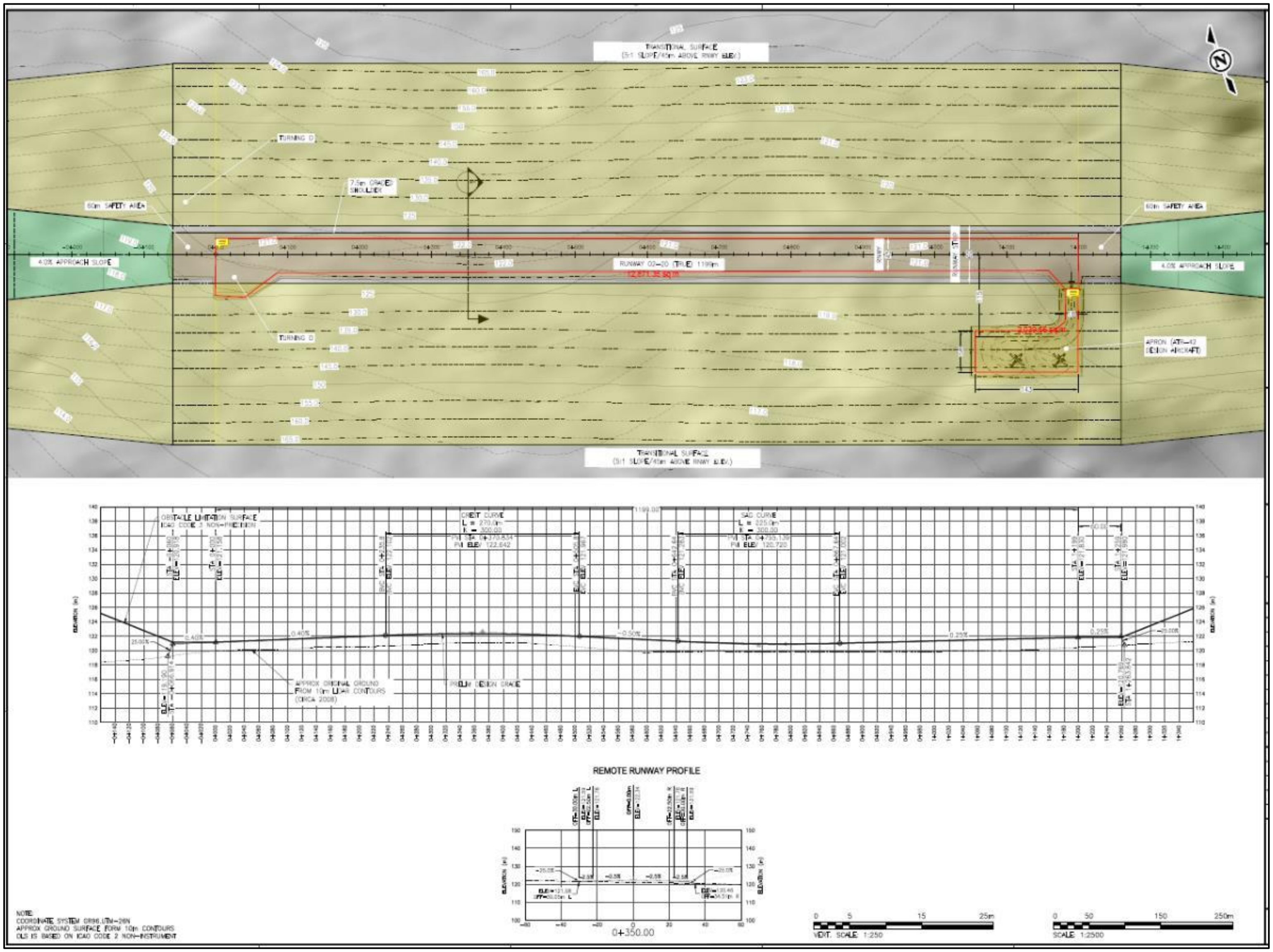


Figure 18-5: Schuchert Airstrip General Arrangement

18.2.2.2 Obstacle Limitation Surface

The OLS defines the areas that must remain obstacle free including moving vehicles, terrain, wind turbines, and any other obstacles in the vicinity of the airstrip. The following requirements are outlined in ICAO Annex 14 - 8th Edition to meet the Code 2 - NI OLS operational level.

The approach surface is an imaginary surface that defines an area that must remain free of obstacles below the aircraft's approach path to both ends of the runway. The approach surface includes:

- An inner edge located 60 m from the runway threshold and extends 40 m either side of the runway centreline.
- The divergence of the sides of the Approach Surface is 10%.
- An outer edge 2,500 m beyond the inner edge and parallel to the inner edge.
- The surface slopes upward from the inner edge for a distance of 2,500 m at a slope of 4%.

The transitional surface is an imaginary surface along either side of the runway and approach surface that must remain free of obstacles. The transitional surface begins at the runway strip (40 m from runway centreline) and extends upwards. The surface begins at the strip or approach surface elevation and extends upwards and away from the runway/approach surface at a grade of 20% to a point 45 m above the Airstrip Reference Point (ARP). The ARP at the Schuchert airstrip will be the centreline elevation at the mid-point of the runway.

18.2.2.3 Instrument Approach Procedures

The selected design aircraft (ATR-42) fits within the Code C – NI category. With a GNSS IAP, we anticipate the airstrip will operate as an NI runway. An NI runway is intended for the operation of aircraft using an IAP to an MDA not lower than 150 m (492 ft) above the runway TDZE.

18.2.3 Additional Airport Requirements

Several additional items are required when developing, operating, and maintaining an airport, as discussed in the below subsections.

18.2.3.1 Instrument Approach Procedures

Tetra Tech recommends engaging an IAP designer to provide an assessment of potential procedures for the airport and provide IAPs for the final airstrip configuration. The airport should be supported by RNAV – GPS (Global Positioning System) IAPs allowing Instrument Flight Rules approaches and departures under suitable meteorological conditions. It is anticipated that IAPs down to NI limits (no lower than 150 m or 492 ft) may be possible. This process should be undertaken as soon as the airport runway threshold locations and elevations have been determined, as the design and approval process can take years to complete.

18.2.3.2 Lighting

The airport will include runway, taxiway, and apron edge lighting. These facilities have been included in the cost estimate. Illuminated signage and windsocks will provide pilots with clear directional cues. Where space, topography, and budgets allow, approach lighting (e.g., Short Simplified Approach

Lighting System) and/or Runway Threshold Identification Lights are recommended (these have not been included in the cost estimate in Appendix B). PAPIs should be installed along the edge for both runway approaches to provide the aircraft with visual vertical guidance.

The lighting controls should be set up to allow pilots to automatically engage the system using Aircraft Radio Control of Aerodrome Lighting as well as direct control by ground personnel.

We recommended the installation of illuminated Runway Distance Remaining signs to provide pilots with better situational awareness on take-off and landing. This is especially important on granular surfaced runways where there are no pavement markings to provide runway distance remaining cues.

18.2.3.3 Building Infrastructure

A prefabricated modular Air Terminal Building (ATB) should be located adjacent to the apron. The building will be sized by GRI to their requirements. The ATB will be equipped with sufficient windows to view the airport and surrounding area. The ATB will contain radio equipment for company and ground to air communication and dual altimeter setting equipment for the ground personnel to relay information to the pilots. An AWOS should be provided to give current conditions and ceilings to the incoming and outgoing pilots. The ATB should be heated and contain washroom facilities. It is expected that all passengers will be loaded from the aircraft directly to a bus and that the ATB will not be sized to contain the passengers.

A prefabricated modular FEC will be located adjacent to the ATB. The FEC will contain all the regulators and controls for the airport lighting option and ATB electrical service. We also recommend a stand-alone emergency power generator in a self contained prefabricated modular station adjacent the FEC.

De-icing equipment, application, and pollution control is normally attributed to the air service provider. A de-icing area underlain by an impervious geotextile draining to a sump would be designed as part of the apron works. This would allow the collection of glycol into a sump that could be collected by a tank truck and hauled to a suitable disposal site.

Due to the short distance to BGMV, it is assumed there will be no aircraft fuelling at the airport.

18.3 Mine Site Ancillary Infrastructure

Ancillary buildings and infrastructure for supporting mine production and ore processing at mine site will consist of a truck shop complex, a primary crusher building, RopeCon conveyor loading station, power plant, accommodation camp, storage facilities, laydown area, helipad, and other support utilities and services, as shown in Figure 16-12.

18.3.1 Truck Shop Complex

The truck shop complex at the mine site will consist of a 60 m long x 40 m wide pre-engineered sprung building designed to accommodate facilities for repair, maintenance, and rebuilding of both open pit mining equipment and light vehicles. The facility will also house storage space for spare parts and administration offices.

The truck shop complex will be located adjacent to mine site accommodation camp. The total usable ground floor area of the building will be approximately 2,400 m^2, including three 300 m^2 service bays, one 300 m^2 wash and tire service bay, 300 m^2 office space, and a 900 m^2 floor space consists of welding bay, workshop, and warehouse. A second floor above the ground floor will provide additional storage and administration office space.

A machine shop will be located inside the workshop area of the truck shop complex. The machine shop will be outfitted with machining tools and equipment.

Ventilation fans and flash shields will be provided in the welding area for personal protection.

Air compressors and receiver tank inside the truck shop complex will provide compressed air for air tools.

A modularized lubricant storage enclosure will house tanks for storing lubricants, coolants, and waste oil for the mining and plant support equipment fleet. The unit will be located about 15 m from the truck shop. The separation distance provides fire safety separation between the storage enclosure and the truck shop complex. The lubricant storage enclosure will also contain air-operated transfer pumps for supplying lubricants to the truck shop dispensing reels in the service bays. A pipe rack will connect the truck shop to the lubricant storage building.

A separate modular exterior storage unit will be provided for waste oil and spent coolants. Waste lubricant recovery systems will pump used oil and coolant to holding tanks located at the lubrication storage facility for recycling or disposal.

The parts warehouse integrated into the truck shop complex will house materials, service parts, and supplies for mine mobile equipment maintenance. The warehouse will be serviced by electric forklifts.

A ready line outside the truck shop complex will provide parking for mine mobile equipment units awaiting service or repairs.

Change facilities complete with lockers, showers, and washroom facilities will be provided for the pit and truck shop crews and will be located in the office and administration area. A lunchroom equipped with fridge, stove, microwave, dishwasher, and cupboards will also be in the office and administration area.

18.3.2 Accommodation Camp

The first camp to be constructed at the mine site will be a 100-person fabric-type camp for use during predevelopment and early site construction activities. A permanent accommodation camp will be built during the construction phase in a single-occupancy configuration to provide 200 single-occupancy rooms. Rooms will be assigned on a check-in check-out basis.

The accommodation camp will be constructed ready for occupancy, with all electrical, communication, lighting, mechanical, sprinklers, plumbing equipment and fixtures, finishes, and furniture and related items, as well as inspected, tested, pre-wired, pre-piped, and pre-assembled as much as possible prior to shipment to site.

The accommodation camp will include dormitories, kitchen and dining facilities, recreation facilities, check-in and check-out areas, administrative offices and first aid, incinerator, and rotating biological contactor (RBC) sewage treatment module.

The dormitory modules will be connected with prefabricated fire-rated egress corridors and will comply with applicable building and fire code requirements.

The central services facility will be designed and prefabricated as a single-storey modularized unit, fully equipped for food preparation/storage, with a kitchen, dining room, incinerator, and recreation areas. All facilities, including the kitchen, will be sized and built for the highest design population.

18.3.3 Power Supply

The power plant is expected to be procured, installed, and operated by a third-party provider (also known as a "over the fence" business arrangement). The mine operator will pay the electricity cost to the power plant provided on a $/kWh basis.

The power plant design, build, and operation will be completed by the power plant provider under the management of GRI's general contracting and operations team during construction and operations.

The spare generator sets will be purchased during the construction stage for construction use and later refurbished for operational usage.

Each generator assembly will be housed in a prefabricated, insulated, and sound attenuated enclosure. Two modules will be included in each enclosure: one for the diesel generator set, and the other for the waste heat recovery equipment. These enclosures will also house the ancillary equipment and associated infrastructure including switchgear, MCCs, low voltage distribution and grounding systems, and control equipment and panels. All of the electrical modules will be designed using "plug and play" technology in order to simplify the installation.

The generator sets will be strategically located adjacent to the truck shop complex, in order to minimize the distance between the truck shop complex and the power plant. This strategic location will also minimize the costs associated with cabling and power transmission losses during operation. The generator sets and all major process equipment will be designed for the same voltage, thus eliminating the need for high voltage to medium voltage transformers or a substation.

The modularized power generator sets will be fabricated and pre-commissioned by the manufacturer prior to shipment to the mite site in order to enhance reliability and reduce labour costs. All enclosures will have a fire detection system and alarm panels with inert gas fire suppression systems.

The power plant control system will be based on pre-programmed individual engine digital controls with an overall master PLC connected to the site control room for constant monitoring 24 hours/day.

The power plant includes all switchgear and control equipment to accommodate the generators. This equipment includes 4,160 V switchgear for the generators and process plant feeders, load-sharing systems, neutral grounding equipment, surge suppression, local and master control systems, and all necessary low voltage distribution equipment for power plant ancillaries.

With the current design, each generator set will have a 6 m-high stainless-steel exhaust stack in order to minimize exhaust concentrations at ground level.

18.3.4 Medical/First Aid

First aid posts will be provided at the accommodations camp and the truck shop complex. A full-time nurse will be in attendance at the first aid station at the camp and roaming first aid attendants/security staff will patrol the property.

An ambulance and a fire truck will be located at the mine site. A sprung structure two-bay garage for the emergency vehicles will be located near the accommodation camp. A helipad will be provided near the first aid post. Patients requiring evacuation will be flown by a medivac helicopter to the nearest hospital.

18.3.5 Cold Storage Building

A cold storage building is required for the short- and long-term storage of consumables requiring protection from the elements, but not heated storage. The building will be insulated and unheated, single-storey, sprung structure, 30 m by 20 m, with a gross floor area of 600 m^2. The building will be supplied with light vehicle truck access doors at each end, as well as accompanying main access doors adjacent to the vehicle doors. The building will be provided with interior and exterior lighting.

18.3.6 Utilities and Services

18.3.6.1 Fuel Farm

Modular diesel fuel tanks (also known as “ISO tanks”) will be transported to mine site from port site by glacier road capable haulage vehicles. These tanks will be laid down in a designated fuel farm area adjacent to the power plant. A modular fuel pumping system and small-bore pipelines will pump fuel from the modular fuel tanks to the power plant. Once depleted, empty modular fuel tanks will be backhauled to the port site for refill. A modular fuel dispensing station will provide a means for fuelling mobile equipment at mine site.

Another fuel farm area will be established by the mine operations for storing and providing fuel for the mining fleet.

There will be at least 24 modular fuel tanks with 21,000 L capacity each to provide adequate fuel storage at mine site in the event of possible glacier access road closure. The envisaged fuel storage requirement at mine site is subject to mine production schedule and varying fuel demand during LOM.

18.3.6.2 Communications

A voice and data communications system will be established at the mine site via a microwave radio link and will consist of microwave antenna and radio equipment mounted on rope conveyor towers. A backup satellite system rated to handle the full communications bandwidth will also be installed.

A communications network will be established among occupied mine site buildings utilizing fibre-optic technology and wireless communication for voice, internet, and intranet traffic. The communications and IT infrastructure will include an internet gateway, telephone private branch exchange (PBX) system, Ethernet local area network (LAN), IT servers, desktop computers, a backup power system, copper and fibre cabling, and site VHF radio system.

Voice communications will be based on Voice Over Internet Protocol (VoIP) technology, using wide area network (WAN) links. A VHF radio system will be installed with provision for handheld units, mobile units, and base stations. A mobile phone cellular service will be included in the system. Local and off-site communications will be through a local wireless/Wi-Fi network whereby employees will utilize their GRI issue cellphones from any location. Video conferencing systems by WAN links will be provided, complete with messenger service flat screens and a projector for use in meeting rooms. A base station and client station will be provided for wireless connection to the network system. The system will include a smart card access system to enable secure logon to the network for desktop and laptop users.

The LAN system will utilize wireless switches to connect to users' computers, and the WAN system will use routers with multi-protocol label switching capabilities to support voice and high bandwidth capabilities.

18.3.6.3 Heating and Ventilation

Heating for buildings and facilities at the mine site will be provided primarily by heat recovery from the power plant. Waste heat from the power plant will be transferred by transfer pumps through a glycol circulating system throughout the accommodation camp and truck shop areas. A diesel fueled boiler adjacent to the truck shop complex will be used as a backup heat source when required.

The accommodation camp and truck shop complex will be equipped with a secondary glycol loop supplied by the primary loop. Secondary loop circulating pumps will provide the method of transfer. Glycol unit heaters will be placed strategically around the perimeter and interior spaces of the buildings as required. Localized controls will provide climatic control for the unit heaters.

Continuous ventilation will be provided for all personnel-occupied and selected unoccupied spaces. Ventilation rates will vary depending on the level of occupancy and the intended use of the space. Ventilation systems will include make-up air units for continuous supply of tempered air, general exhaust fans for contaminant removal, and, where appropriate, localized exhaust fans to remove contaminants directly. Glycol supply to the make-up air units will be the primary heat supply source.

Buildings that are relatively small, such as small warehouses, will be heated with diesel heaters.

18.3.6.4 Fire Water

The clean service / fire water tank located at the mill will have a reserve in the lower portion of the tank that will be drawn from below the primary water nozzles. The fire-fighting reserve in each tank will meet a two-hour demand at 2,000 US gal/min at 100 psi boost. Fire water pump skids complete with diesel-driven fire pump, jockey pump, and controls will be installed. Dedicated fire mains complete with hydrants will be provided at the accommodation camp, truck shop, and the primary crusher. Fire extinguishers will also be provided throughout the facilities. Sprinkler systems will be installed in the warehouse, the main office, and the truck shop complex.

Fire alarm systems at the mine site facilities will report to the emergency response / first aid unit at the mine site which will be monitored 24 h/d.

18.3.6.5 Potable Water

Potable water at the mine site will be supplied from wells. The water will be pumped to the potable water treatment unit (chlorination and ultra-violet disinfection), potable water tank, and potable water pump unit inside the accommodation camp, and then distributed to the various facilities including the accommodation camp and truck shop complex.

18.3.6.6 Sewage

Sewage from the accommodation camp and truck shop complex will be collected and pumped to the RBC sewage treatment module for treatment. Washrooms facilities in remote buildings will be serviced by a vacuum truck.

18.3.6.7 Solid Waste Disposal

Hazardous Wastes

As part of the overall plant design, all hazardous wastes outside of tailings and waste rock will be segregated at the point of generation, placed into appropriate storage containers, and shipped off site to an appropriate recycling or disposal facility. A lined storage facility will be constructed within or near the site fuel storage facilities to store the hazardous waste held in segregation pending periodic off-site shipment. Specific hazardous waste handling protocols are as follows:

- **Waste Oil** – waste oil from heavy equipment and stationary milling equipment will be transferred to a waste oil storage tank to be located within the lubrication storage facility. The waste oil will be filtered and burned in a packaged waste oil burner unit to generate supplemental heating for the truck maintenance shop in the winter months. Any excess waste oil not consumed in this manner will be shipped off site for recycling using a licensed waste oil disposal firm. Every attempt will be made to dispose of waste oil on site as a supplemental heat supply.

- **Waste antifreeze, solvents, and grease** – these wastes will be collected and stored in appropriate drums for regular shipment off site to a licensed recycle or disposal facility.

- **Waste batteries** – waste vehicle batteries will be collected and placed on pallets for regular shipment off site for disposal at a battery recycling facility.

- **Tires** – old tires will be collected and used on site to provide vehicle protection barriers, with excess to be disposed of by burial within an active section of the tailings impoundment.

- **Hydrocarbon Contaminated Soil** – a landfarm will be constructed utilizing bioremediation to treat petroleum-contaminated soil that may accrue during the mine's operational life. The landfarm will be constructed near the proposed non-hazardous waste on-site landfill on a compacted till or other suitable liner. Hydrocarbon-contaminated soil will be transferred into the landfarm, spread out over the surface in thin lifts and treated with fertilizer to promote bioremediation. Soils will be routinely turned over and sampled until it can be demonstrated that the hydrocarbon contamination has been reduced to acceptable standards. Clean soils will be stockpiled for use in progressive reclamation projects. Water collected within the landfarm will be run through an oil-water separator, with the clean water discharged into the tailings impoundment.

Non-Hazardous Wastes

Non-hazardous waste will be segregated into the following two streams:

- **Putrescible kitchen wastes** – organic food wastes from kitchen facilities will be segregated and burned daily in on-site incinerators to help limit wildlife attraction associated with disposal of food wastes.

- **Non-putrescible waste** – all other non-hazardous, inorganic garbage will be collected and disposed of within an on-site landfill to be located in a suitable area that drains by gravity into the tailings impoundment. Non-hazardous garbage placed within this landfill will be periodically buried under a layer of soil or NAG waste rock to prevent loss of garbage through wind action and to control drainage.

Construction, operation, and closure wastes will likely be managed under one waste management permit.

18.3.6.8 Lay Down Area

A lay down area will be developed by the mine operations for storage of supplies and spare parts that can be stored outside.

18.3.7 Primary Crusher Building

The primary crushing structure will be of concrete construction with multiple levels housing the gyratory (primary) crusher, the primary apron feeder, the sacrificial belt conveyor, rock breaker and overhead bridge crane. The apron feeder discharge will be conveyed using a sacrificial belt conveyor to the RopeCon conveyor and the RopeCon conveyor will convey the crushed ore from the mine site to the port site. A level operating surface for the crusher loading station and a ROM stockpile will be constructed above the RopeCon conveyor loading station.

The rock constructed access ramp structure will provide truck access on two sides of the primary crushing building. ROM ore will be discharged into the dump pocket from two sides at the top level. Interior steel platforms and roof will be provided to support equipment for ongoing operation and maintenance need. The control room adjacent to the dump pocket will be a modular prefabricated unit.

18.4 RopeCon Conveyor

Ore transportation from Malmbjerg mine site to the Mesters Vig port concentrator will be performed by a 26 km aerial RopeCon conveyor (Figure 18-6). No input energy is required to operate the conveyor as a result no CO_2 will be generated. The elevation difference from ore conveyor loading and discharge will be approximately 930 m, as a result the conveyor will generate 1.3 MW electrical energy from conveyor braking operations. The electrical energy will be fed into the local mine grid.

The RopeCon conveyor reclamation footprint will be negligible, as the reclamation plan will involve the removal of four towers and the cables and conveyor.

Figure 18-6: RopeCon Conveyor

The RopeCon conveyor will be a vendor-supplied system and will include all structural support frames, cables, drives, etc. to form a completely functional system. The RopeCon conveyor will consist of four sections:

- Section 1 will have a length of 1,726 m and will cover a difference in elevation of 379 m. It will transport crushed ore uphill from the crushing system at the mine site to an intermediate transfer station to Section 2, over the glacier.
- Section 2 will have a length of 5,498 m and will cover a difference in elevation of -500 m. It will transport crushed ore downhill from the first intermediate transfer station (from Section 1) to a second transfer station to Section 3.
- Section 3 will have a length of 2,984 m and will cover a difference in elevation of -598 m. It will transport crushed ore downhill from the second intermediate transfer station (from Section 2) to a third transfer station to Section 4.
- Section 4 will have a length of 11,519 m and will cover a difference in elevation of -184 m. It will transport the crushed ore downhill from the third intermediate transfer station (from Section 3) to the crushed ore stockpile at the port site.

At the mine site loading station, the material will be fed onto the RopeCon conveyor via a chute which is fitted with lateral baffle plates. An impact table with absorbing rubber elements underneath the conveyor belt supports the conveyor belt at the loading point as required. The loading station will also be equipped with a return (drive) pulley, the compact drive unit, support structures and the belt turning device.

The terminal station at the port site will include a discharge chute, a discharge drive pulley, the compact drive unit, the belt tensioning system, support structures and the belt turning device.

18.5 Port Site Ancillary Infrastructure

Ancillary buildings and infrastructure for supporting process and marine operations at port site will consist of a repair shop and warehouse complex, an emergency vehicle garage, a first aid station, loading station, a fuel farm, storage facilities and laydown area, and miscellaneous utilities and services.

Some of the port site ancillary infrastructure, such as power plant and accommodation camp, will be installed on the process barge or accommodation vessel.

18.5.1 Repair Shop and Warehouse Complex

The repair shop and warehouse at the port site will consist of a 40 m long x 20 m wide pre-engineered sprung building designed to accommodate facilities for repair, maintenance, and rebuilding of both port site mobile equipment and light vehicles. The facility will also house office space for clerks and supervisors and storage space for spare parts and consumables.

The repair shop complex will be located adjacent to container storage yard and process barges. The total usable ground floor area of the building will be approximately 800 m^2. The repair shop will be outfitted with machine tool and cutting and welding equipment. Ventilation fans and flash shields will be provided in the welding area for personal protection. Air compressors and receiver tank inside the shop complex will provide compressed air for air tools.

A modularized lubricant storage enclosure will house tanks for storing lubricants, coolants, and waste oil for the port support equipment fleet. The enclosure will be located about 15 m from the repair shop. The separation distance provides fire safety separation between the storage enclosure and the repair shop complex. A separate modular exterior storage unit will be provided for waste oil and spent coolants.

The parts warehouse integrated into the repair shop complex will house materials, service parts and supplies for port site mobile equipment maintenance. The warehouse will be serviced by electric forklifts. Small offices and a lunchroom equipped with fridge, stove, microwave, dishwasher, and cupboards will also be provided in the office and administration area.

18.5.2 Mesters Vig Inlet Accommodation Vessels

The first barge camp to berth at the port site will be a 125-person barge camp for use during early site construction activities and throughout the construction phase. The second 200-person barge camp will arrive at port site in Y-3 to support an increasing construction labour force at port site. One of the barge camps will be retained during early operational years until the permanent camp ship arrives at port site in Year 2. The permanent barge ship will have 200 single-occupancy rooms. Rooms will be assigned on a check-in check-out basis.

In additional to accommodation rooms, the barge camp/barge ship will also consist of kitchen and dining facilities, recreation facilities, check-in and check-out areas, administrative offices and first aid, power generators, incinerator, and domestic sewage treatment modules.

18.5.3 Power Supply

The power plant is expected to be procured and operated by a third-party provider (also known as an "over the fence" business arrangement). The diesel generator sets will be installed on one of the process barges at a designated shipyard in Asia where the process barges are fabricated. The mine operator will pay the electricity cost to the power plant operator on a per kWh basis.

The current port site power plant design is based on eight diesel generator sets each rated at 1,800 rpm, 5 MW continuous, and 5.5 MW prime power, generating at 4,160 V for a total installed generating capacity of 40 MW continuous and 44 MW prime power. The complement of eight diesel generator sets includes two spare sets (n + 2 criteria) to allow one set to be shut down for scheduled maintenance, and another set to be out of service due to unscheduled downtime.

With six generator sets operating, the installed continuous capacity is 30 MW and the installed prime capacity is 33 MW. The "prime" power rating has a 10% overload capability to handle load peaks for a maximum period of 1 hour every 12 hours.

Each generator assembly will consist of two modules: one for the diesel generator set, and the other for the waste heat recovery equipment including the ancillary equipment and associated infrastructure including switchgear, MCCs, low voltage distribution and grounding systems, and control equipment and panels.

The power plant barge will be located adjacent to the grinding and flotation barges to minimize the distance of power distribution cabling and transmission losses during operation. The generator sets and all major process equipment will be designed for the same voltage, thus eliminating the need for high-voltage-medium voltage transformers or a substation.

The modularized power generator sets will be fabricated and pre-commissioned by the manufacturer prior to shipment to the barge fabrication shipyard in order to enhance. The power plant will have a fire detection system and alarm panels with inert gas fire suppression systems.

The power plant control system will be based on pre-programmed individual engine digital controls with an overall master PLC connected to the process plant control room where it will be monitored 24 h/d.

The power plant includes all switchgear and control equipment to accommodate the generators. This equipment includes 4,160 V switchgear for the generators and process plant feeders, load-sharing and load shedding systems, neutral grounding equipment, surge suppression, local and master control systems, and all the necessary low voltage distribution equipment for power plant ancillaries.

With the current design, each generator set will have a 6 m-high stainless-steel exhaust stack in order to limit exhaust concentrations at ground level.

During the construction stage, modular generator sets will be provided by the construction contactors for construction use.

18.5.4 Water Supply

18.5.4.1 Process Water

Process water will be a combination of surface water catchments and tailings reclaim water. Process water will be pumped from the tailings pond and various collection sumps to a settling pond on site, before being pumped to the process water tank. Overflow from the tailings thickener within the process plant will also be pumped to the process water tank. Process water will be pumped from the process water tank pumps and distributed via pipelines to the various areas of the process plant. In addition, fresh water will be added to the system via the clean service/fire water tank and distributed throughout the process plant.

18.5.4.2 Fresh Water

Fresh water will be collected from water wells near port site. The fresh water supply will be pumped and piped to the filtered water tank located near the process barges. From the filtered water tank, most of the water will be pumped to the clean service/fire water tank, located in the same area, and the balance will be used as process water. From the clean service/fire water tank, the fresh/filtered water will be distributed to the process barges for process use, including gland water for pumps.

18.5.4.3 Fire Water

The clean service/fire water tank located at the mill will have a reserve in the lower portion of the process water tank and will be drawn from below the primary water nozzles by the fire water pumps. Fire water pump skids complete with a diesel-driven fire pump, jockey pump and controls will be installed. Dedicated fire mains complete with hydrants will be provided at the major port site buildings. Fire extinguishers will also be provided throughout the facilities. Sprinkler systems will be installed in the warehouse, the main office and the truck shop complex. Fire alarm systems at the port site facilities will report to the emergency response/first aid unit at mine site which will be monitored 24 h/d.

18.5.4.4 Potable Water

Potable water at the port site will be supplied from wells. The water will be pumped to the potable water treatment unit (chlorination and ultra-violet disinfection), potable water tank and potable water pump unit, and then distributed to the various facilities, including the process barges, accommodation barge camp/ship, and repair shop and warehouse complex.

18.5.4.5 Sewage

Sewage from the major port site buildings will be collected and pumped to the RBC sewage treatment unit on the barge camp/ camp ship for treatment. Sewage from remote buildings will be collected by a vacuum truck.

18.5.5 Medical/First Aid

First aid posts will be provided at the accommodations camp and the repair shop near the process plant. A full-time nurse will be in attendance at the first aid stations and roaming first aid attendants/security staff will patrol the property regularly.

A sprung structure two-bay garage for an ambulance and a fire truck will be located near the process plant. Patients requiring evacuation will be transported to BGMV and airlifted to the nearest hospital.

18.5.6 Cold Storage Building

A cold storage building is required for the short- and long-term storage of consumables requiring protection from the elements, but not heated storage. The building will be an insulated and unheated single-storey, sprung structure, 50 m by 40 m, with a gross floor area of 2,000 m^2. The building will be supplied with light vehicle truck access doors at each end, as well as accompanying man access doors adjacent to the vehicle doors. The building will be provided with interior and exterior lighting.

18.5.7 Utilities and Services

18.5.7.1 Fuel Storage and Fuel Farm

The bulk fuel barge (100 ML) will be stored on a floating Aframax tanker berthed at the port and in each of the three process barges (15 ML each) for a total of approximately 145 ML. Piping will connect the tanker to the process barge fuel storage located under the deck of each barge. The barges will be equipped with a double hull and leak detection system. Modular diesel fuel tanks (also known as "ISO tanks") of 21,000 L capacity will be provided and serve as day tanks for the mine site power plant, site mobile equipment and light vehicles. These tanks will be laid down in a designated fuel farm area adjacent to the power plant barge. And distributed to the mine and port site as required. Several of the modular tanks will be equipped with a fuel dispensing station as means for fuelling mobile equipment.

18.5.7.2 Communications

A satellite system will be installed to provide external site communication. Sufficient system redundancy and independent satellite phones will be provided for reliability and redundancy.

A communications network will be established among occupied port site buildings utilizing fibre-optic technology and wireless communication for voice, internet, and intranet traffic. The communications and IT infrastructure will include an internet gateway, telephone PBX system, Ethernet LAN, IT servers, desktop computers, a backup power system, copper and fibre cabling, and site VHF radio system.

Voice communications will be based on VoIP technology, using WAN links. A VHF radio system will be installed with provision for handheld units, mobile units, and base stations. A mobile phone cellular service will be included in the system. A telephone PBX system will be provided for telephone communications using analog wiring. Video conferencing systems by WAN links will be provided, complete with messenger service flat screens and a projector for use in meeting rooms. A base station and client station will be provided for wireless connection to the network system. The system will include a smart card access system to enable secure logon to the network for desktop and laptop users.

The LAN system will utilize switches to connect to users' computers, and the WAN system will use routers with multi-protocol label switching capabilities to support voice and high bandwidth capabilities.

18.5.7.3 Process Barges Heating and Ventilation

Heating for the process barges and buildings within the power plant proximity will be provided primarily by heat recovery from the power plant. Waste heat from the power plant will be transferred by transfer pumps through a glycol circulating system which circulates throughout the process barges and buildings nearby. Diesel fueled boilers at individual major buildings will be used as a backup heat source when required. Buildings that are relatively small, such as small warehouses, will be heated with diesel heaters.

The process barges and buildings nearby will be equipped with secondary glycol loops supplied by the primary loop. Secondary loop circulating pumps will provide the method of transfer. Glycol unit heaters will be placed strategically around the perimeter and interior spaces of the buildings as required. Localized controls will provide climatic control for the unit heaters.

Continuous ventilation will be provided for all personnel-occupied and selected unoccupied spaces. Ventilation rates will vary depending on the level of occupancy and the intended use of the space. Ventilation systems will include make-up air units for continuous supply of tempered air, general exhaust fans for contaminant removal, and, where appropriate, localized exhaust fans to remove contaminants directly. Glycol supply to the make-up air units will be the primary heat supply source.

Facilities at the live ore stockpile and reclaim will have electrical heaters utilizing surplus electricity from the rope conveyor system and diesel heaters for supplemental heating and back up.

Marine vessels will have independent and self-sufficient heating systems on board, fueled by diesel, bunker fuel, and/or waste heat recovered from the power generators on board.

18.5.7.4 Solid Waste Disposal

The solid waste disposal strategy at port site is identical to mine site.

18.5.7.5 Lay Down Area

A lay down area will be developed during construction stage for construction use. The laydown area will be retained during operation stage to store supplies and spare parts that are not subject to outdoor elements.

18.6 Overland Pipelines and Pump Stations

18.6.1 Pipeline Corridor Details

The pipeline infrastructure consists of three pipelines: Tailings, Return water and Fuel. The tailings and the return water pipelines will follow an optimized route from the port facility to the Noret. The route was selected to minimize the pipeline length and to provide a feasible pumping option to deliver the tailings. The pipeline right-of-way (ROW) is designed to accommodate construction. Erecting of the pipeline will not impede oncoming traffic to and from Noret, as shown in Figure 18-7 and Figure 18-8. The road will be graded to a maximum 14% slope to prevent setting of solids in the pipeline during brief shutdowns. Low points and pockets along the pipeline route will be eliminated to provide self-drainage and buildup of material inside the pipeline pockets which might freeze during winter shutdowns. The pipeline grading along with the use of pigs will allow the pipeline to operate without an emergency dump pond.

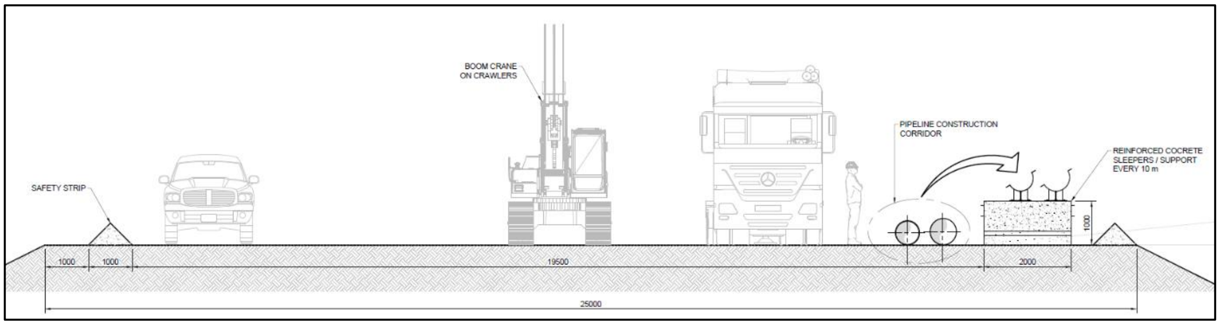


Figure 18-7: Pipeline ROW

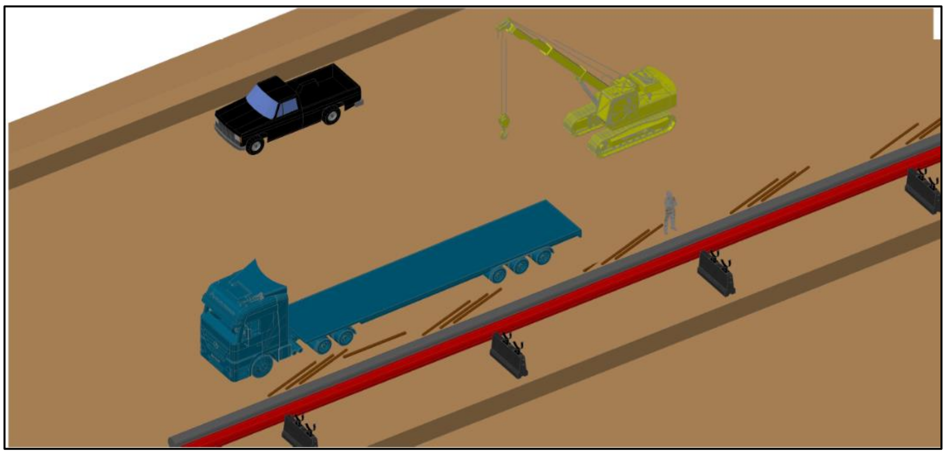


Figure 18-8: Pipeline ROW

18.6.1.1 Pipe Supports

The pipelines will be installed on supports every 10 m. Each support will consist of a reinforced and precast concrete slipper block that will provide a raised platform from which fabricated steel pipe clamps will be mounted. These clamps can be configured to act as an anchor or guide supports. The guides will transfer and direct the pipeline movement to the expansion loops, where most of the pipeline movement will be produced. This raised pipe support configuration will keep the pipeline a minimum of 1 m above grade to help prevent heat transfer between the pipeline and permafrost which could lead to permafrost degradation and ground instabilities.

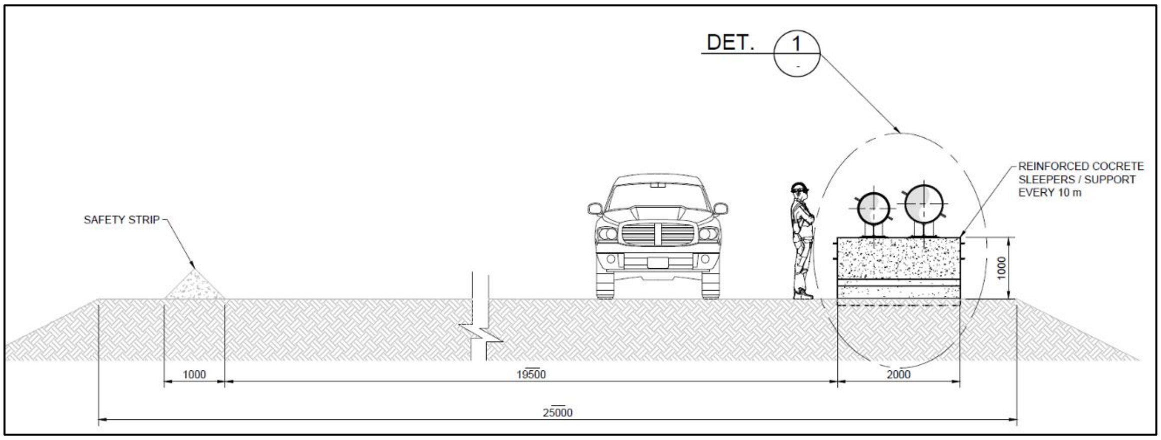


Figure 18-9: Pipeline Sleepers

18.6.1.2 Expansion Loops/Wildlife Crossing

Expansion loops will be incorporated into the pipeline at 1,000 m intervals to accommodate pipeline movement due to thermal expansion and contraction. The width of the pipeline corridor required at the expansion loops is approximately 25 m.

The expansion loops will also double up as locations of wildlife crossings. Wildlife crossings will be included at each expansion loop location to better utilize the extra corridor width required for the piping. The wildlife crossing requirement needs further evaluation during the detail engineering phase to assess the impact of the pipeline on the wildlife and biodiversity in the region.

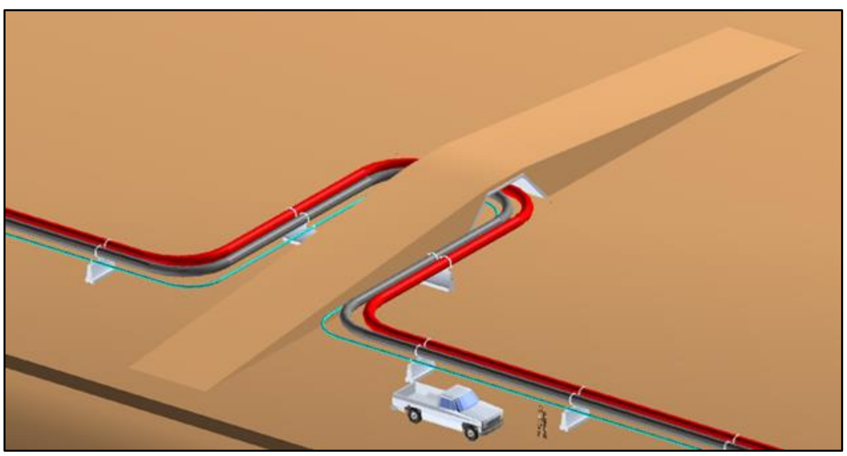


Figure 18-10: Expansion Loop and Wildlife Crossing

18.6.1.3 Pipeline Joints

The steel pipelines will be joined in the field with butt-welds. Flanges will be provided at intervals as required for the installation of the internal HDPE liner.

18.6.1.4 Route Challenges

It is anticipated that the pipeline will follow the main access/service road alignment between Mesters Vig Inlet and Noret TMF.

The primary challenges with this alignment are the multiple drainage crossings across the slope in Mesters Vig Inlet. There are seven crossings which are less than 10 m across and 5 m deep and can likely be managed with culverts. There is one crossing which is considerable (approximately 20 m across and 10 m deep) where a bridge structure will likely be required. Debris flows in these drainages are expected and protection of the pipelines should be considered in the design of the crossings.

The preferred alignment also encounters a very steep section about 2 km from the port which appears to have some instability.

At the Noret TMF, there are several drainage channels that require managing to accommodate the deposition piping around the southern and western side of the facility. These drainages will need to be directed into narrower flow channels for the tailings pipeline to cross. It is likely that seasonal maintenance of these channels will be required as a result of higher flow scour and erosion from the spring/summer melt and/or significant precipitation events.

18.6.2 Tailings Transport System

The tailings pipeline transport system which delivers 1,582.8 t/h from the port facility to the Noret TMF, consists of a 20-inch HDPE lined carbon steel pipeline.

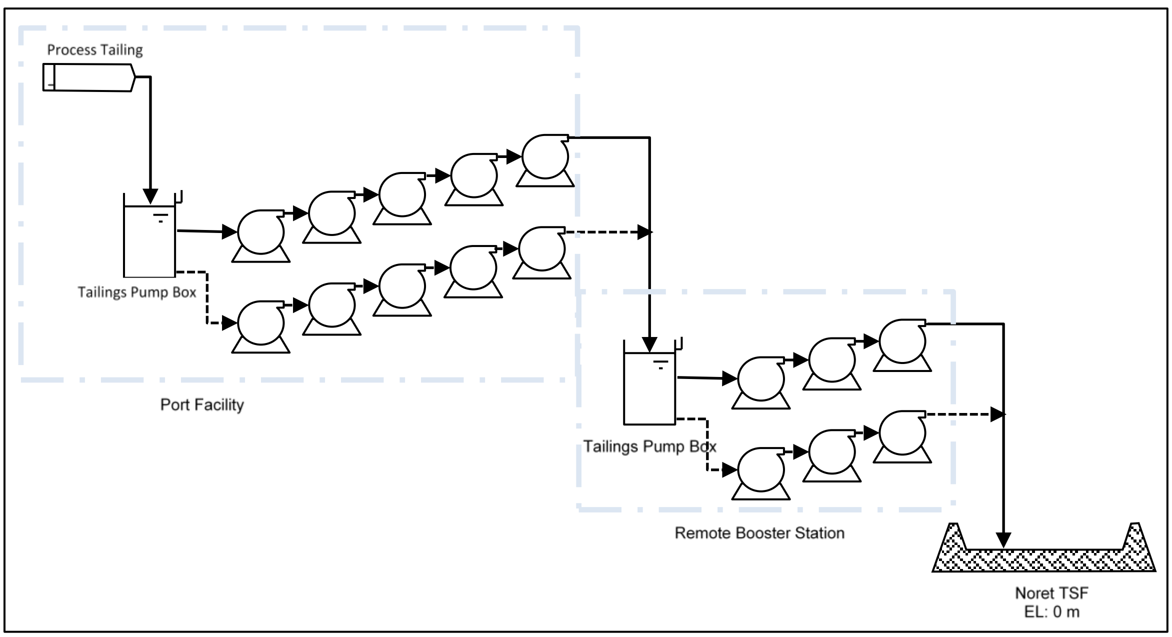


Figure 18-11: Tailings Transport System Process Flow Sketch

The tailings delivery system will originate from the thickener modular barge at the port facility in Mesters Vig Inlet. Thickened tailings from the thickener underflow pumps will report to the tailings pump box. Tailings will be pumped via five stages of heavy-duty centrifugal pumps to a remote booster station approximately 8.5 km from the port facility. The pump station at the port facility will be equipped with two trains of pumps. One train will be utilized as the operating train and the other utilized for standby.

At the booster station, tailings will be received in an agitated tailings pump box. The tailings are then pumped via three stages of heavy-duty centrifugal slurry pumps to the Noret via a 10 km pipeline. The booster station will also be equipped with two trains of pumps. One train will be utilized as the operating train and the other utilized for standby.

The initial pipeline section will be routed across the slope on the north side of Mesters Vig Inlet ascending gradually to the booster station at an elevation of 225 m. This section of the alignment crosses several drainage channels. For the remaining pipeline alignment, from the booster station to the Noret, the pipeline will gradually descend to the Noret over 10 km.

At Noret the main tailings pipeline will be routed around the southern and western shorelines to multiple deposition points to enable even distribution of the tailings into the facility. Single point discharge of the tailings is envisaged. The deposition point will be rotated to utilize the full storage volume of Noret. Spigot pipes will need to be 1 to 2 km long to reach all areas of the facility and to maintain subaqueous discharge of the tailings.

During the winter months the floating pipe will utilize single point discharge into the deepest sections of the Noret. When the ice has thawed, the discharge point will be rotated to provide even distribution of the tailings in the Noret. The deposition area will be managed according to continuous bathometric scans and the deposition location will consider the consolidation of the solids to avoid contaminating the reclaim water system.

The overland pipeline route is shown below in Figure 18-12. The route will be the same for the return water pipeline.

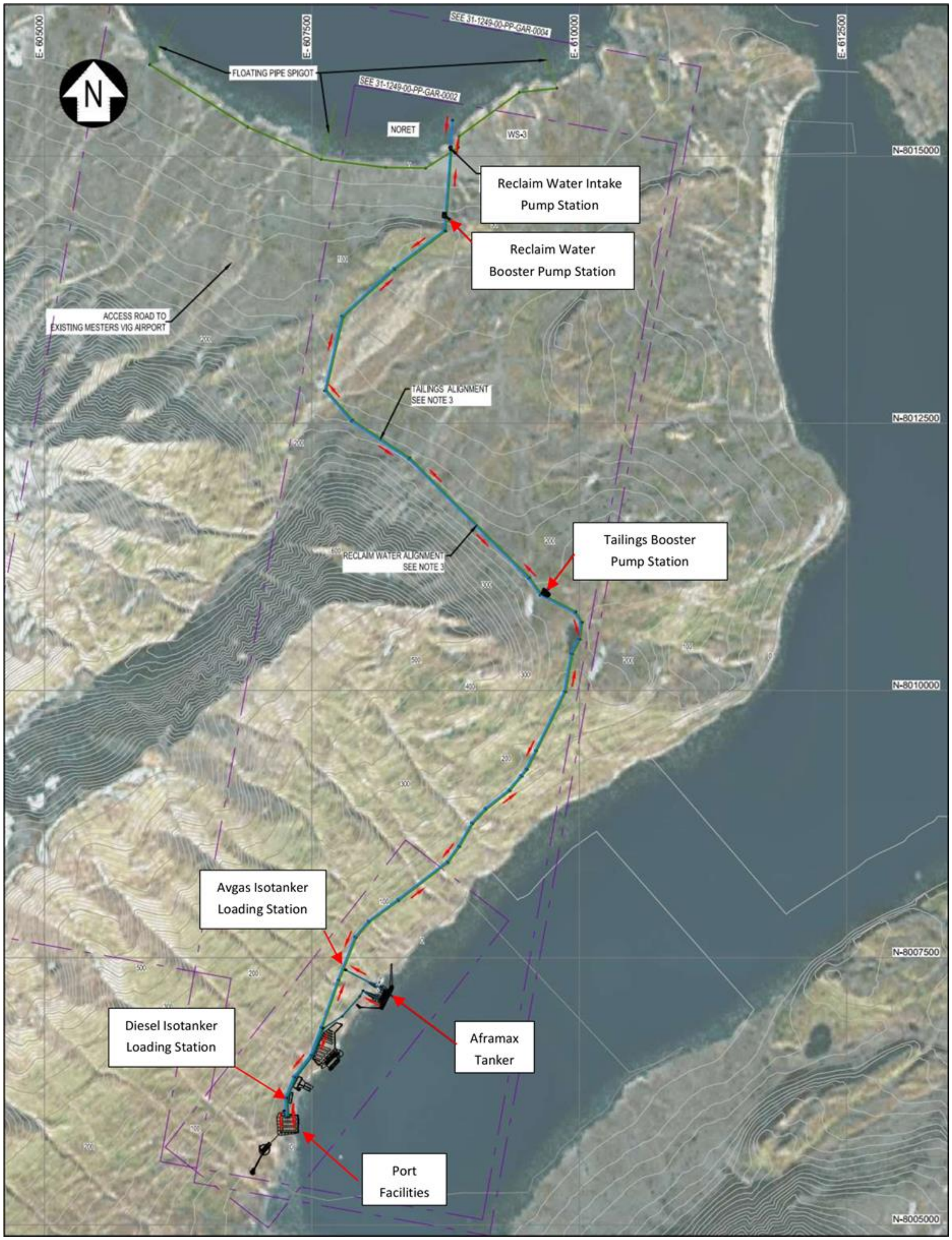


Figure 18-12: Plan View of Tailings and Reclaim Water Pipeline Route

18.6.3 Reclaim Water Transport System

The reclaim water pipeline transport system which delivers 1,219.2 m^3/h of water from the Noret to port facility, consist of a 24-inch HDPE line carbon steel pipeline.

Reclaim water will be drawn from the Noret using an intake structure that is submerged to a depth of 8 m below the water surface. To reach the 8 m water depth a jetty will be created near the embankment of the Noret. The jetty will provide the ability for the pipe to reach to the required depth and to minimize the suction pipe length. It is estimated that during the winter months, the TSF will be covered with ice up to 3 m thick. The suction pipe will be routed under the jetty and protected by a concrete casing to prevent shifting ice from damaging it.

Water will be lifted from the TSF to the skid mounted pump station using self-priming centrifugal pumps. There will be two pump trains, one on standby and the other operating. Each pump train will have a dedicated suction pipe along with recirculation loop to prevent the suction of the non-operating pipe from freezing.

The self-priming pumps will transport the water through a 500 to 1000 m 30-inch HDPE pipeline to a booster pump station. The booster station will have three double suction centrifugal pumps in parallel (two operating and one providing 50% standby). From the booster station, water is pumped through 17.6 km of 24-inch carbon steel to the port facility.

The reclaim water pipeline runs parallel to the tailings pipeline and the overland pipeline route can be seen in Figure 18-13.

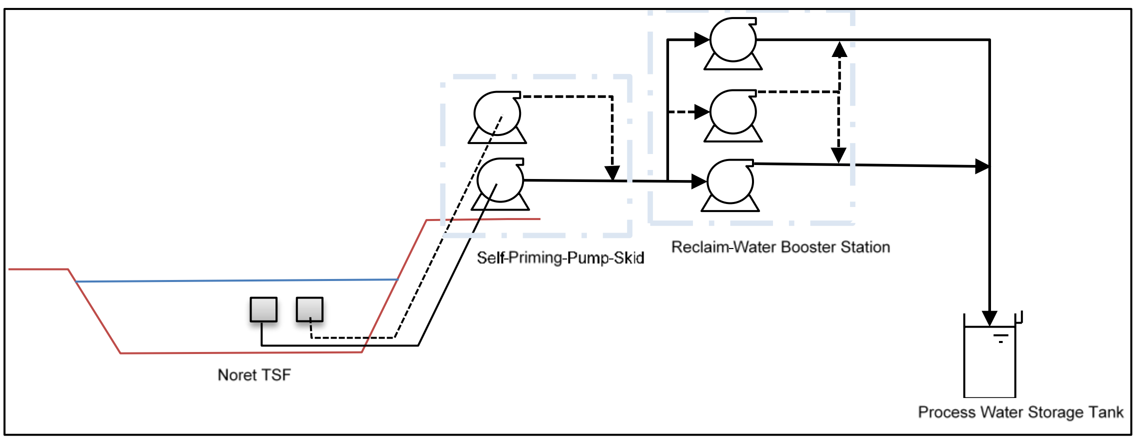


Figure 18-13: Reclaim Water Transport System Process Flow Sketch

18.6.4 Fuel Transport System

Diesel fuel will be pumped from the Aframax tanker to the individual modular barges at the port facility through a 5-inch pre-insulated and heat traced carbon steel pipeline at a flow rate of 9.61 m^3/h. The modular barge ballast compartments will be double lined to provide the required secondary containment and function as storage for fuel at the port facility. The fuel transfer pump that will be located on the tanker will have sufficient pressure to transfer the diesel to the port facility 2.2 km away. An unloading arm will be used to connect to the diesel dispensing bulkheads on the tanker and to provide a flexible joint between the pipeline and the tanker as it moves in the ocean due to the tides and the currents.

At the port facility, the diesel will be transferred to the storage compartments using a header pipe system that runs between all the barges. The piping between the barges will be rubber hose to allow for movement due to settlement and thermal expansion or contraction. There will also be an equalizing pipe between each module barge compartments to maintain an even fluid level in all barges.

Each barge will be fitted with a diesel fuel feed pump that supplies the fuel to the power plant located on the barge. The fuel discharge header pipe will also transfer the fuel to a diesel fuel isotanker loading station. At this station the fuel will be loaded into trucks equipped with portable isotankers. The isotankers will be transported to the Malmbjerg mine site where they will be used as mobile storage. The isotankers will be dropped off at the Malmbjerg mine site and the empty ones picked up and hauled back to the port facility for refuelling.

The diesel fuel pipeline will follow the tanker jetty corridor until it arrives at the tailings and reclaim water right of way. The fuel line will then follow the tailing and reclaim pipeline route towards the port facilities.

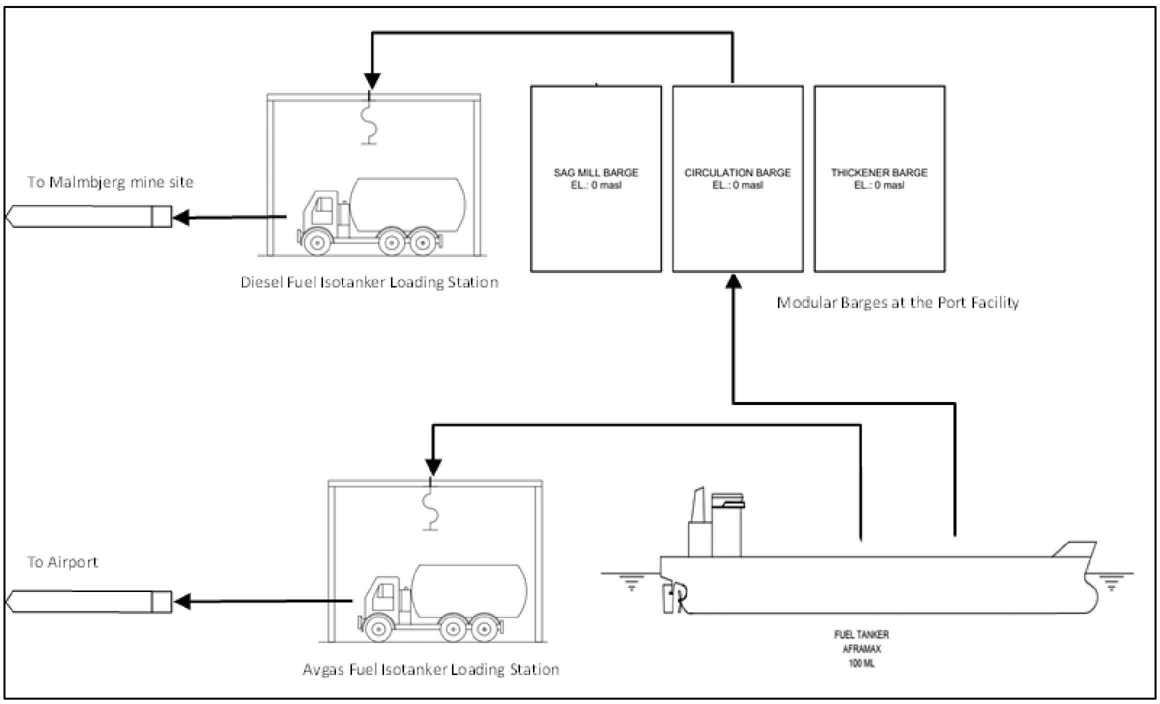


Figure 18-14: Fuel Transport System Block Diagram Sketch

Avgas fuel will be pumped from the Aframax tanker to the nearby avgas isotanker station. The station will be located 200 m from the Aframax tanker. Like the diesel fuel system, the fuel will be pumped using a transfer pump onboard the tanker. There will also be a loading arm that allows for the movement of the vessel. The avgas fuel line will be 5-inch carbon steel and it will run along the jetty corridor until it arrives at the isotanker loading station which will be located just north of the tailings and reclaim water pipeline right of way.

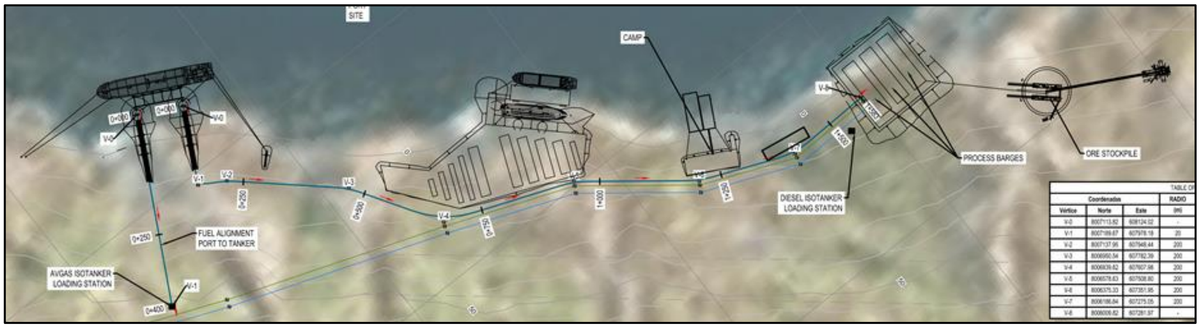


Figure 18-15: Plan View of Fuel Pipeline Route

18.7 Noret Tailings Management Facility

18.7.1 Overview

Tailings generated from the process will be stored by confined discharge into Noret, a large basin located immediately southeast of BGMV, as shown in Figure 18-16. An embankment will be constructed across the narrowest point of the entrance to Noret. The main purpose of the embankment is to prevent the possible migration of fine particulate that may remain in suspension after submarine discharge of tailings into TMF. The embankment will also assist with managing water within TMF, and a spillway will be constructed to release excess water. Two saddle embankments will be constructed to provide dry freeboard in two low areas located at the northwest corner of the basin. The TMF embankments will be constructed prior to the start of operations and will remain throughout the LOM operations.

Tailings produced from the concentrator are deposited underwater during the TMF operating life at a depth of 70 m with a minimum water cover of 3.5 m over the tailings. A rock and filter structure embankment will be constructed at the Noret inlet (Figure 18-16) to prevent water/ice movement from King Oscar Fjord into Noret TMF and prevent tailings migration from Noret TMF into King Oscar Fjord. The TMF design and operating plan includes the construction of an overflow structure at the Noret TMF that will maintain a 3.5 m water depth coverage for in-perpetuity. Industry-accepted guidelines published by the Canadian Dam Association for TMF design and operating will be employed for the TMF, the TMF will operate maintenance free for in-perpetuity after mine closure.

TMF has capacity to store the anticipated total LOM production of tailings solids (i.e., 245 Mt; 175 million m^3 at an assumed in situ dry density of 1.4 t/m^3). The final tailings surface would be maintained approximately 3.5 m below the current water surface in Noret at the end of operations.

The TMF is located in a reservoir that is already contaminated from zinc and lead tailings from the previous operated Blyklippen mine which ceased operations in 1962. Our planned TMF water coverage will assist in mitigating the zinc and lead contamination distribution as the continuation will be contained in the TMF.

Because the ore body has below detection deleterious elements and the main processing component is water, there are no contained deleterious elements in the tailings.

The Noret TMF water storage pond contains salt water from King Oscar Fjord and will be used as the process water source. Surface runoff water will feed into the storage pond from the surrounding area to resupply process water losses due to evaporation and concentrate drying, etc.

Figure 18-16: Noret TMF – General Arrangement Plan

18.7.2 TMF Embankments

The Main Embankment across the entrance to TMF will act as a filter embankment with a sand "core", with sand and gravel and processed rockfill transition zones to ensure internal stability on either side of the core and rockfill shell zones forming the outer portions of the embankment. The embankment crest will be constructed to elevation 5 m. The upstream and downstream slopes will be 1.5H:1V. The maximum water depth along the embankment alignment is approximately 5 m (at mean tide level). The crest of the embankment will be 88 m wide and the maximum embankment height above the seafloor is approximately 10 m. A typical cross-section for the Main Embankment is shown in Figure 18-17.

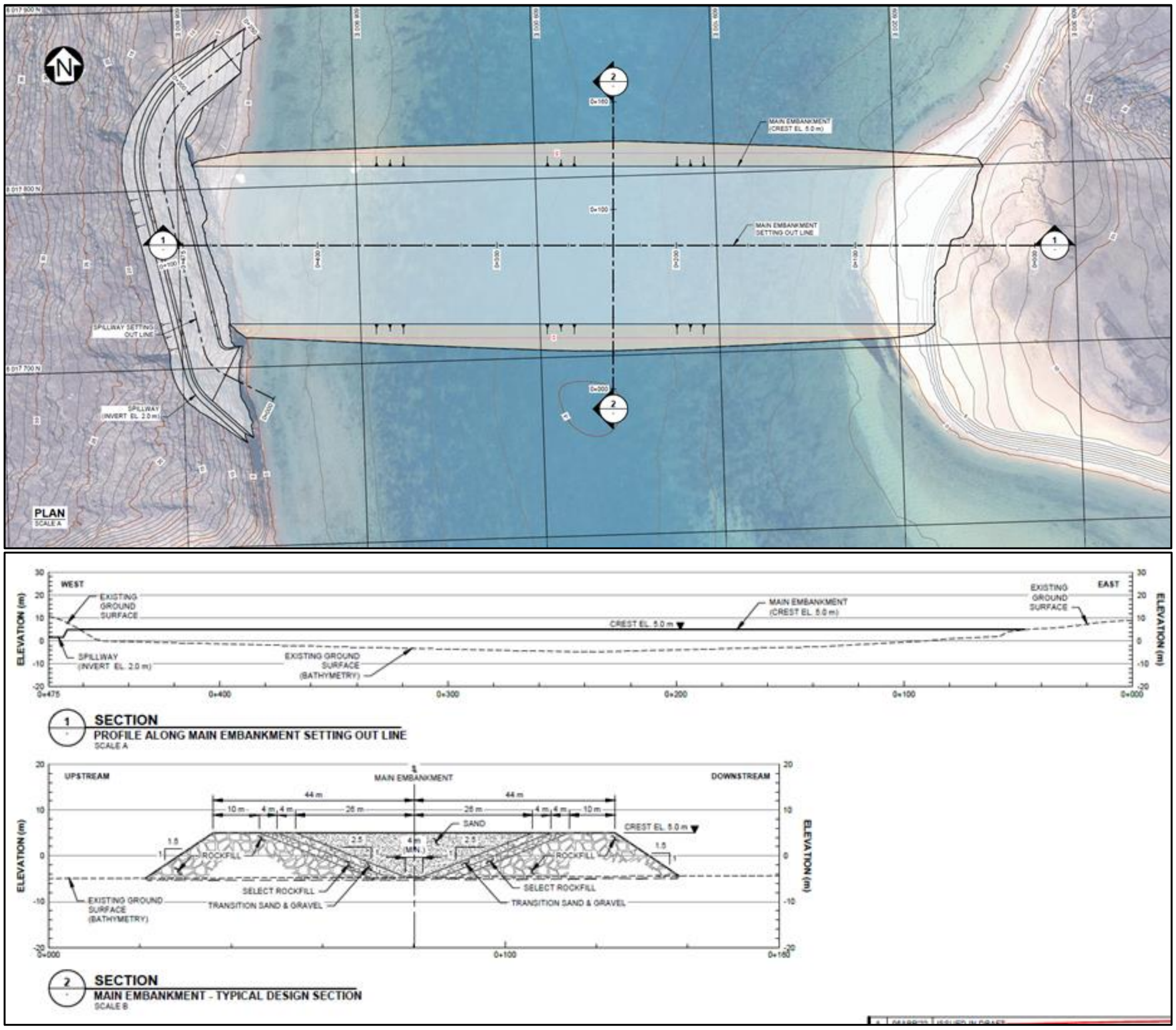


Figure 18-17: TMF – Main Embankment – Plan, Sections and Details

The two smaller saddle embankments, including the West Saddle Embankment and the East Saddle Embankment, will be constructed to provide dry freeboard in two low-lying areas located at the northwest corner of the TMF. The embankments will have a sand “core”, with sand and gravel and processed rockfill transition zones to ensure internal stability on either side of the core and rockfill shell zones forming the outer portions of the embankments. The embankment crest will be constructed to elevation 5 m. The upstream slopes will be 2H:1V with rip-rap erosion protection. The downstream slopes will be 2H:1V. The crest width will be 14 m, and the maximum embankment height above the original ground is less than 3.2 m. A typical cross-section for the saddle embankments is shown in Figure 18-18.

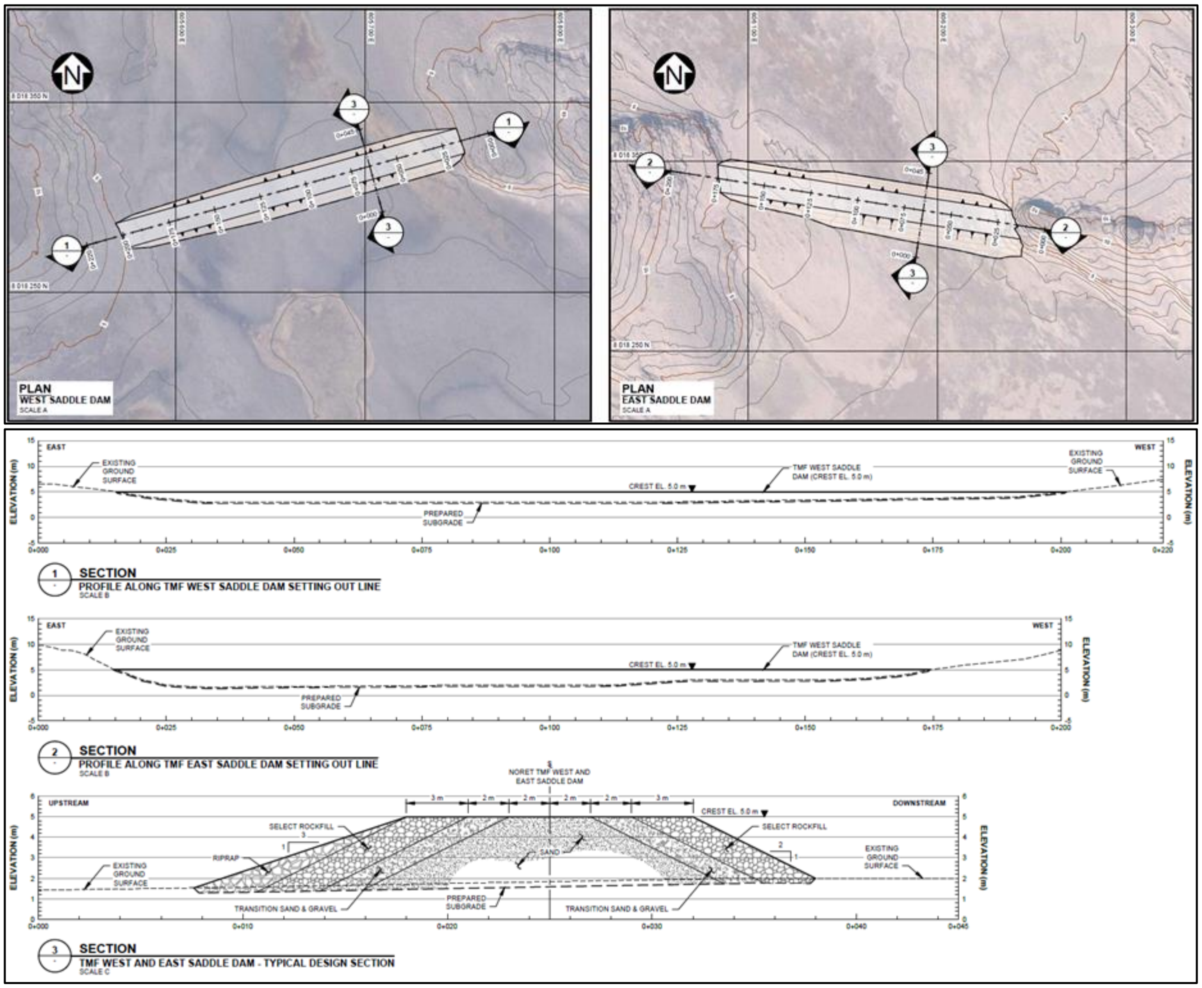


Figure 18-18: TMF – West and East Saddle Dam - Plan, Sections and Details

The fill for the embankments will be obtained from local borrow and quarry sources. The sand and gravel units will be screened from nearby overburden borrows, and the rockfill will be quarried and processed from dolerite outcrops adjacent to the embankments.

The TMF embankments have been classified based on the FS arrangements and industry-accepted guidelines published by the Canadian Dam Association (CDA, 2013 and 2019). The TMF is classified as having a Dam Classification of High. The Earthquake Design Ground Motion (EDGM) and Inflow Design Flood (IDF) thresholds used for the design of the facility were selected based on these classifications.

The TMF embankments are required to be stable under the design loading conditions. The stability of the Main Embankment was evaluated considering loading conditions and minimum target factor of safety (FoS) values recommended for mining dams (CDA, 2019). The FoS targets are met or exceeded for all sections and loading conditions evaluated.

18.7.3 Filling Schedule

The embankment will be constructed to provide sufficient freeboard in the TMF, including safe conveyance of the runoff resulting from the IDF. The design basis and operating criteria are based on the Canadian Dam Association Dam Safety Guidelines (CDA, 2013 and 2019) and site-specific design considerations.

The TMF has the capacity to store the anticipated total LOM production of tailings solids (i.e. 245 million t; 175 million m^3 at an assumed in situ dry density of 1.4 t/m^3). The final tailings surface would be maintained approximately 3.5 m below the water surface in TMF at the end of operations.

18.7.4 Water Management and Freeboard

The primary water management objectives for the TMF are:

- Maximize the recycle of process water and runoff water from the TMF to the Port Site process plant
- Safe conveyance of the IDF from the TMF during operations

Meteoric and supernatant inflows to the TMF basin will be temporarily stored prior to reclaiming to the Port Site process plant by a pump located at the reclaim jetty in the southeast corner of the TMF.

A water/solids balance was completed for the TMF. The water balance was completed for pre-production, operations (Years 1 through 20 [partial]), and closure, using average precipitation conditions. Analyses were also completed for abnormally wet and dry conditions. Based on the water balance, under average conditions, the TMF will operate in a net water surplus, and excess water will be conveyed through the overflow spillway.

The estimated runoff volumes from the IDF were used to estimate the wet freeboard depth required within the TMF to manage the event. The estimated peak flows for the IDF were used to design the emergency overflow spillway (with an invert at elevation 2 m). Approximately 3.8 m of wet freeboard allowance is required during operation to manage the IDF. A dry freeboard allowance of approximately 0.9 m is required to prevent overtopping from wave run-up. Therefore, the total freeboard above the mean sea level is approximately 4.7 m.

18.7.5 Operations, Monitoring and Surveillance

The facilities will be operated in compliance with applicable international and national guidelines and standards. An Operations, Maintenance, and Surveillance Manual and Emergency Response and Preparedness Plan for the TMF will be developed prior to operations. These documents will be used for operator training and support for the management of the TMF.

Monitoring of the TMF and associated infrastructure will be carried out at specified regular intervals to evaluate the performance of the TMF and refine the operating practices. Regular inspections of the TMF and associated infrastructure will be completed as part of the TMF operations to confirm that the TMF is being operated in accordance with the design intent.

18.7.6 Reclamation and Closure

The conceptual TMF closure plan includes leaving the Main Embankment in place to form a shallow lake. The runoff would be discharged to the fjord through the permanent spillway. All infrastructure that is not required after mining will be dismantled and removed offsite. This will include dismantling and removing the tailings and reclaim delivery systems, all pipelines and equipment not required beyond mine closure. All access roads, ponds, ditches, and borrow areas not required beyond mine closure would also be removed. The reclamation and closure plan are a living document that will be updated throughout the Project to reflect changing conditions and input from local regulators.

18.8 Port Facilities, Marine Infrastructure, and Naval Architecture

18.8.1 Marine Structure Alternatives and Descriptions

A trade-off study was conducted to identify and assess alternative marine Arctic structures for the camp and container port, and fuel tanker berth and to select a preferred construction methodology for each structure. The preferred construction methodology for each infrastructure component to the port is described below.

18.8.2 Camp and Container Port

The camp and container port consist of the following (Figure 18-19):

- Floating cargo offloading barge to serve as the container ship berth during the summer shipping months
- Berth and mooring for the camp ship that will be in place year-round during mine operations
- Container storage area for up to 3,400 containers

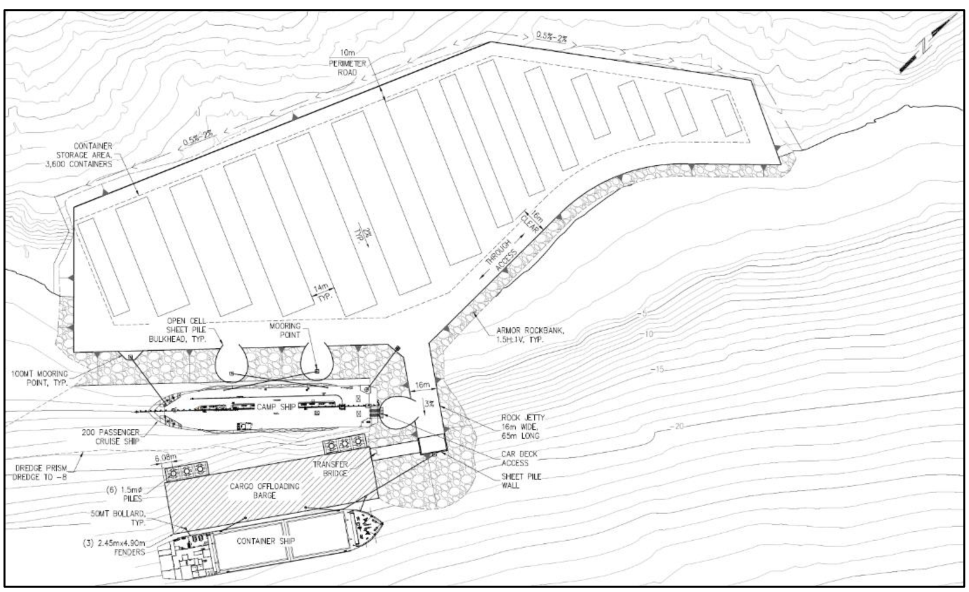


Figure 18-19: Camp and Container Port

Cargo Dock: The cargo off load barge utilizes a reconditioned barge for loading and offloading containers. The reconditioned barge includes modifications for attachment to six, 1,500 mm diameter piles to secure the barge and allow the barge to float with the tides. A transfer bridge between the barge and the causeway provides access for the container forklifts that will move containers from the container storage yard. The container vessels will be equipped with ship cranes to facilitate the loading and unloading of the containers (Figure 18-20). The floating cargo dock will remain attached to the piles during the summer shipping season and serves as a wave barrier to the camp ship. Prior to freeze-up, the barge will be detached from the piles and winched on to the beach to reduce the ice load to the mooring piles. The cargo dock mooring piles are sized to handle the design container ship berthing forces and wind load when moored to the dock. Fenders and four-50 Mt mooring cleats will be installed on the barge.

Figure 18-20: Container Vessel and Cranes

Camp Ship Berth: The floating camp ship will be moored on the leeward side of the cargo dock against two, fender equipped Open Cell Sheet Pile (OCSP) bulkheads (Figure 18-21). Some dredging will be required to provide the required depth for the camp ship and will be performed with a crane and dredge bucked stage from the constructed OCSP bulkheads and the barge. The refurbished ice-class Baltic ferry will be equipped with accommodations above and a car deck below. An additional OCSP bulkhead will be installed at the stern of the vessel to allow access to the vessel car deck (Figure 18-22). The heated car deck will have an access equipped with a man door for crew ingress and egress. An additional insulated overhead door will provide ingress and egress for emergency vehicles and for delivery of resupply containers and for trash removal.

Figure 18-21: Camp Ship Berth

Figure 18-22: Vessel Car Deck

Container Storage Yard: The container storage area is designed to handle approximately 3,400 containers. The storage yard will be a mix of empty containers that will be used for holding bags of concentrate, full containers with mine resupply for distribution to the mine as needed, and full containers of concentrate stored for export during the summer season. The storage area is approximately 4.5 ha and will be constructed with a minimum 1.5-m-thick fill section to insulate the underlying permafrost. The fill will include a top course of crushed rock to provide a running layer for forklift traffic. Grades of a maximum 2% will be established to promote surface water runoff off site. A perimeter ditch, to control surface water run-on from the hills above, will divert water around storage yard into the bay. The rock jetty causeway connects the container storage area to the cargo offload barge and the floating camp car deck access. The width is designed to allow two-way traffic of loaded forklifts. A steel Z-profile sheet pile bulkhead at the end of the causeway will provide a pin connection to support one end of the steel transfer span to the barge. The shoreline exposed to wave action will be constructed with rock armour shore protection to prevent erosion during the open water season.

18.8.3 Fuel Tanker Berth

The fuel tanker berth consists of two OCSP bulkheads and a spacer pipe float sized to provide a permanent deep-water berth for the ice class Aframax tanker (Figure 18-23). The OCSP bulkheads each include a 10 m wide and 120 m long rock causeway to provide access to the tanker and to serve as a staging platform for the crane required to drive the sheet pile. The spacer pipe float will be prefabricated offsite from 1,800 mm diameter pipe and bolted together onsite. It will be equipped with fenders to transfer mooring loads from the ship directly into face of the OCSP bulkheads. Mooring lines will extend from the vessel to four 100-Mt mooring bollards installed in the OCSP bulkhead and four 100-Mt mooring bollards installed onshore. An access gangway will provide man access to the vessel and provide routing for the fuel pipeline from the ship to the shore. The tanker will have approximately 100 ML of fuel storage.

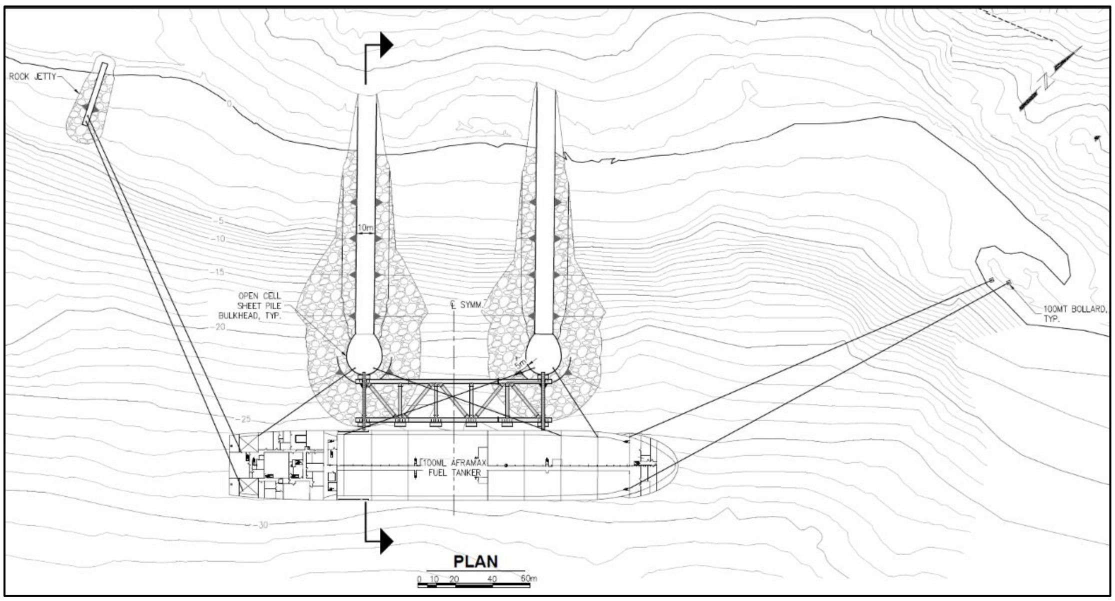


Figure 18-23: Fuel Tanker Berth

18.8.4 Process Barge Site

Three process barges will be fabricated at a shipyard in Asia. The process equipment will be installed, pre-commissioned and prepared for ocean towing to site. The site will be prepared by excavating to -4 m MSL, to allow the barges to be positioned while floating. To take advantage of the winter freezing conditions to control ground water, approximately 1-2 m lifts will be excavated by ripping and/or blasting the frozen soil until the design dept is achieved. A 1-meter-thick blanket of 50-mm minus aggregate will be placed in the winter on the bottom of the excavated slip and compacted into place to provide a level surface for the barge. The following summer, the process barges will be positioned into the prepared slip and ballasted to rest on the bottom. A rock dike and amour rock installed to a top elevation of +5 m, will be constructed across slip opening to protect it against wave action and winter ice conditions. The entire slip will be filled with additional aggregate and finish graded up to approximately +4 m. The outer perimeter of the process barge site will be provided with a water control ditch graded to discharge in the bay (Figure 18-24).

Upon Project closure, the rock barrier around the barges will be removed from each of their docking excavations and together with all three barges will be transported by a tugboat for salvage. Reclamation of the barge locations will be performed by re-sloping the barges areas to the original topography.

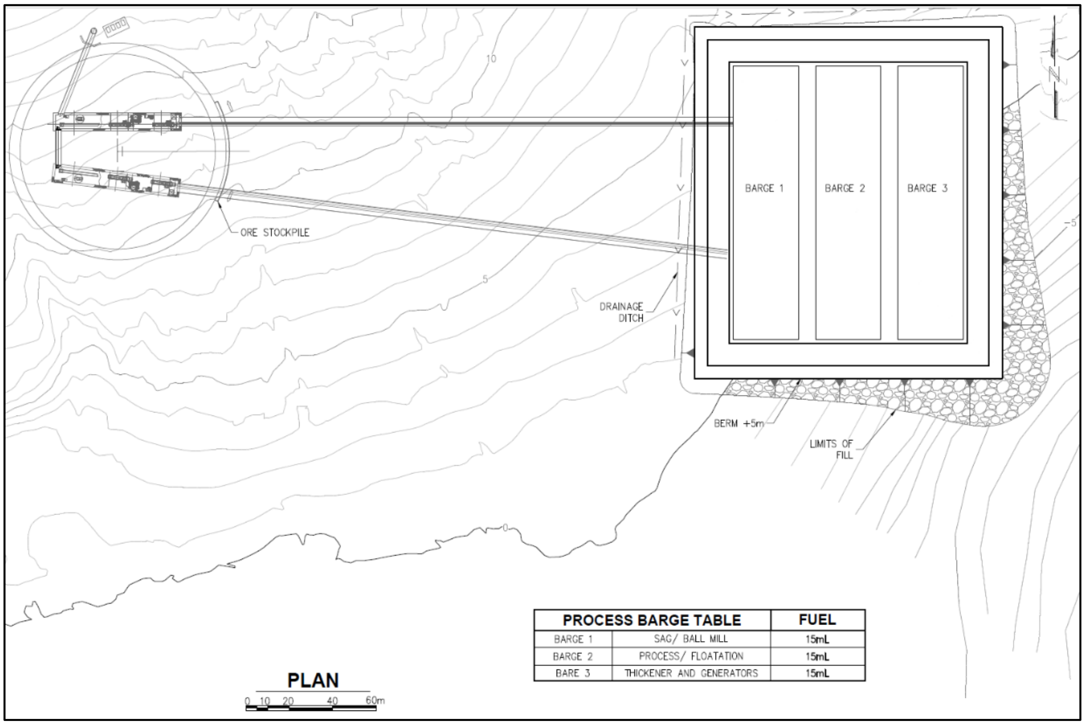


Figure 18-24: Process Barge Site

18.8.5 Temporary Port Site

The temporary port site (Figure 18-25) will be constructed with smaller equipment unloaded from a landing craft directly on the beach during the first sealift. The site work includes the construction of a rock jetty to approximately -2 m depth to allow deeper draft lightering barges from the anchored cargo vessel to unload larger and heavier cargo. A cargo laydown pad will be graded and leveled using the available scree rock to serve as a laydown pad. An additional area will be graded to provide a level pad for an empty, double hull, fuel storage barge that will be winched onto the pad. Buried plate anchors with mooring chains will be installed to secure the floating temporary barge camp. The barge camp will be equipped with additional pile spuds to secure it into place and access floats to provide year-round passenger access to the floating camp (Figure 18-26). The barge camp will be in removed when the permanent floating camp berth is completed, and the additional camp space provided by the temporary camp is no longer required.

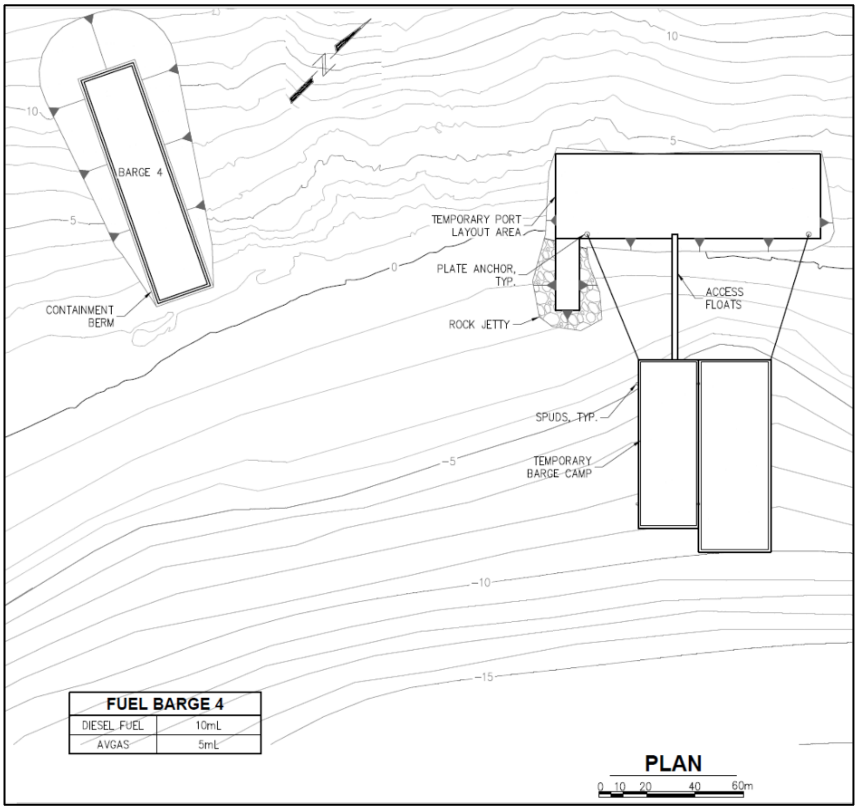


Figure 18-25: Temporary Port Site

Figure 18-26: Passenger Access to Floating Camp

18.8.6 Overall Mine Closure Footprint after Reclamation

The Project has been designed on a low disturbance footprint approach because most of the infrastructure is modularized. Upon reclamation at the Malmbjerg mine-site (Figure 18-1), all structures will be removed and any diverted water courses returned to their original channels. All disturbed land will be regraded and, if possible, local wild grass seeding of suitable areas will be performed. All roadways will be scarified and regraded to return the roadways to their natural topography. All culverts and bridges will be removed. Mesters Vig Inlet process barges will be removed from site by a tugboat. Plant site infrastructure will be removed, regraded, and seeded with local natural grass seed to original topography. The TMF infrastructure (i.e., pumps, pipes) will be removed and reclaimed.

19.0 MARKET STUDIES AND CONTRACTS

19.1 Introduction

Molybdenum is a key alloying element in high-performance iron and steel materials. While molybdenum's metallurgical effects produce high strength and hardness in such alloys in the first place, they additionally also improve toughness as well as the resistance against wear, heat, and corrosion. Furthermore, molybdenum boosts the effect of several other alloying elements by synergetic cross-effects and enhances efficiencies throughout production processes.

The iron and steel grades to which molybdenum alloying applies are crucial for many high value-added products in a wide variety of industrial application segments. These segments include transport, machinery, raw materials exploration and processing, chemical processing, power generation, and many others. These materials are often essential to enhance operational efficiency and lower the operational carbon footprint. Particularly in the segment of renewable energy production, significant future demand for molybdenum alloyed materials is expected.

Major producing markets of molybdenum-containing alloys such as North America and China are practically self-sufficient concerning supply. However, Europe currently consumes around 25% of all primary molybdenum but largely depends on overseas imports. The production and utilization of molybdenum-containing materials at component fabricators and OEMs are strategically important to European industries.

Ultra-high strength steels typically demand high cleanliness and the lowest levels of impurities to avoid embrittlement and unexpected failure during service. Achieving the specified maximum impurity limits not only requires superior steelmaking technology but often relies on a low intake of critical residuals in ferroalloys. Residuals of the most relevant impurity elements such as phosphorus (P), tin (Sn), antimony (Sb) and arsenic (As) are particularly low in bench-scale concentrate tests produced from the Malmbjerg ore. Considering the additional range of molybdenum in steels, the intake of these impurities accordingly remains below industrially relevant levels.

Oxidation roasting of molybdenite concentrate produced at Malmbjerg is required to generate molybdenum trioxide. Roasted molybdenum concentrate can directly be added to liquid steel in the electric arc furnace. Ferromolybdenum (FeMo) alloy, molybdenum metal and other pure molybdenum compounds, such as ammonium paramolybdate, sodium and calcium molybdate, are produced by aluminothermic reduction of technical molybdenum oxides. FeMo can be used in vacuum practices, induction furnaces, or as ladle addition during the production of steel and iron alloys. Facilities for downstream processing of molybdenite concentrate are available in all major markets.

19.2 Supply and Demand

The molybdenum market is following the bullish trend in the prices of industrial metals. Green energy, infrastructure projects, China, and trends in the steel industry act as the long-term catalysts for molybdenum supply and demand. In green energy, the World Bank Group, in its 2020 "Report on Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition", estimates a 119% demand increase for molybdenum from electricity generation technologies through 2050. The International Energy Agency estimates a 290% growth in molybdenum demand from clean energy technologies in 2040 relative to 2020 levels in its May 2021 report "The Role of Critical Minerals in

Clean Energy Transitions”. In infrastructure, the dramatic economic contraction worldwide caused by COVID-19 is forcing governments worldwide to speed up infrastructure investments to spur growth. In the US alone, the American Society of Civil Engineers rated the US C grade infrastructure with a $2.6 trillion gap, which is currently being discussed in the US Congress. China represents close to 28% of global use and production of molybdenum and faces future environmental regulations and responsible sourcing and falling grade challenges. In the steel industry, stronger steels with a lower product weight, less raw material consumption, less waste, and often lower total cost will not only require cleaner superior steelmaking technology but low critical residuals from ferroalloys produced from the Malmbjerg Molybdenum deposit concentrates.

Molybdenum production worldwide was 540 Mlb (244,800 t Mo) in 2020. Figure 19-1 shows the consumer application distribution of molybdenum consumption in 2020.

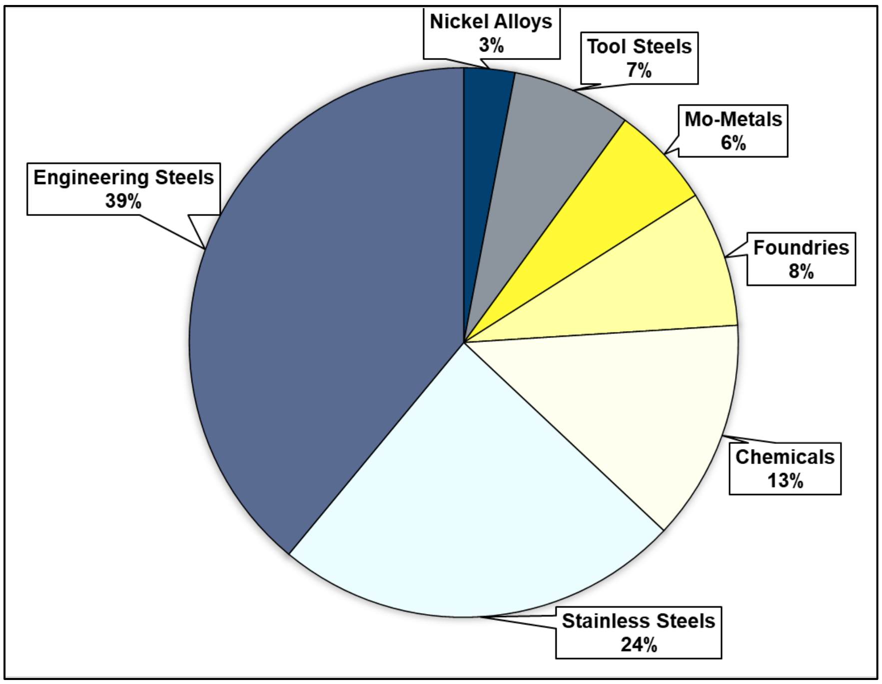


Figure 19-1: Distribution of Molybdenum Consumption (IMOA, 2020)

Figure 19-2 and Figure 19-3 show regional mined production and consumption of molybdenum, respectively, for 2015-2020. These figures show that while Europe consumes close to 25% of the global molybdenum supply, the region has no mined production of its own.

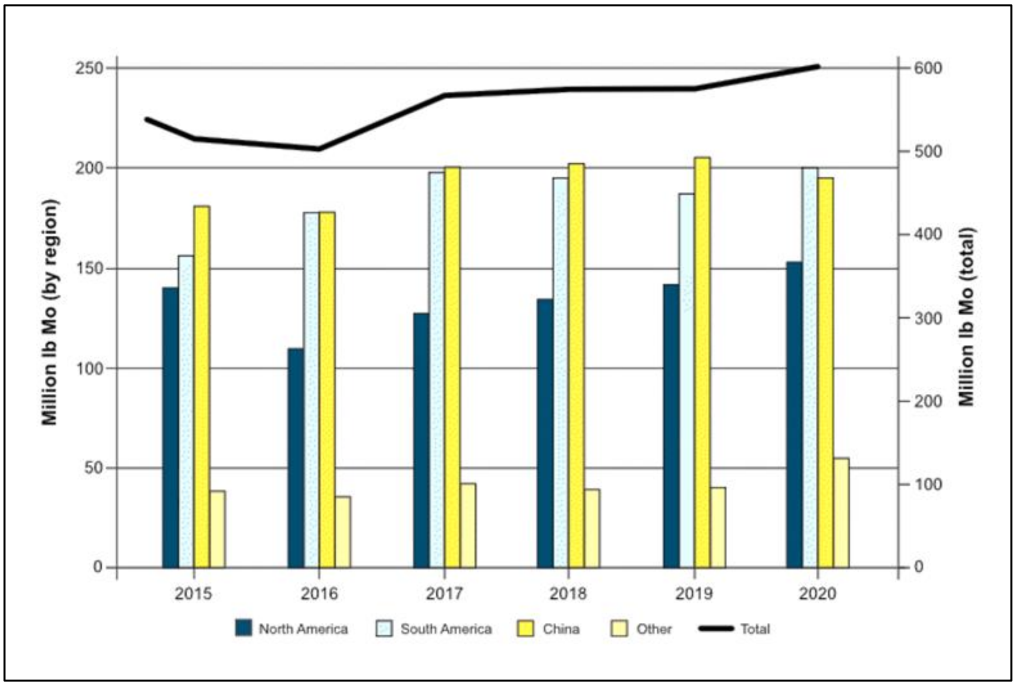


Figure 19-2: Mined Molybdenum Production by Region (IMOA, 2020)

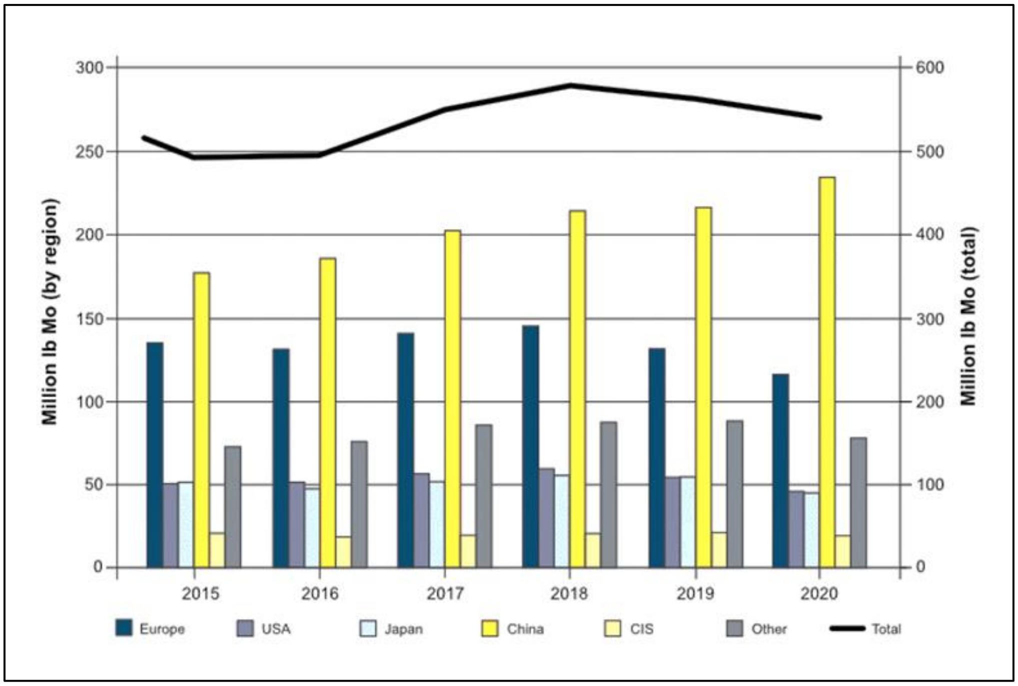


Figure 19-3: Molybdenum Consumption by Region (IMOA, 2020)

The most vulnerable region in terms of sourcing molybdenum in the event of market disruption is Europe because of the lack of domestic mined production; the large need for molybdenum to service the steel industry in the upcoming Green Deal. European countries, specifically Germany, Italy, Sweden, and Finland, which constitute more than 60% of total molybdenum demand, are at higher risk in the event of molybdenum supply disruption. To a greater degree, Europe steel dependent industries like automotive, construction, and engineering, represent around 18% of Europe's $15.5 trillion GDP.

According to estimates presented here, the Malmbjerg Molybdenum Project will be capable of supplying approximately 24.1 Mlb per year in and to Europe for twenty years. Figure 19-4 shows the forecast of worldwide molybdenum demand from 2020 to 2030.

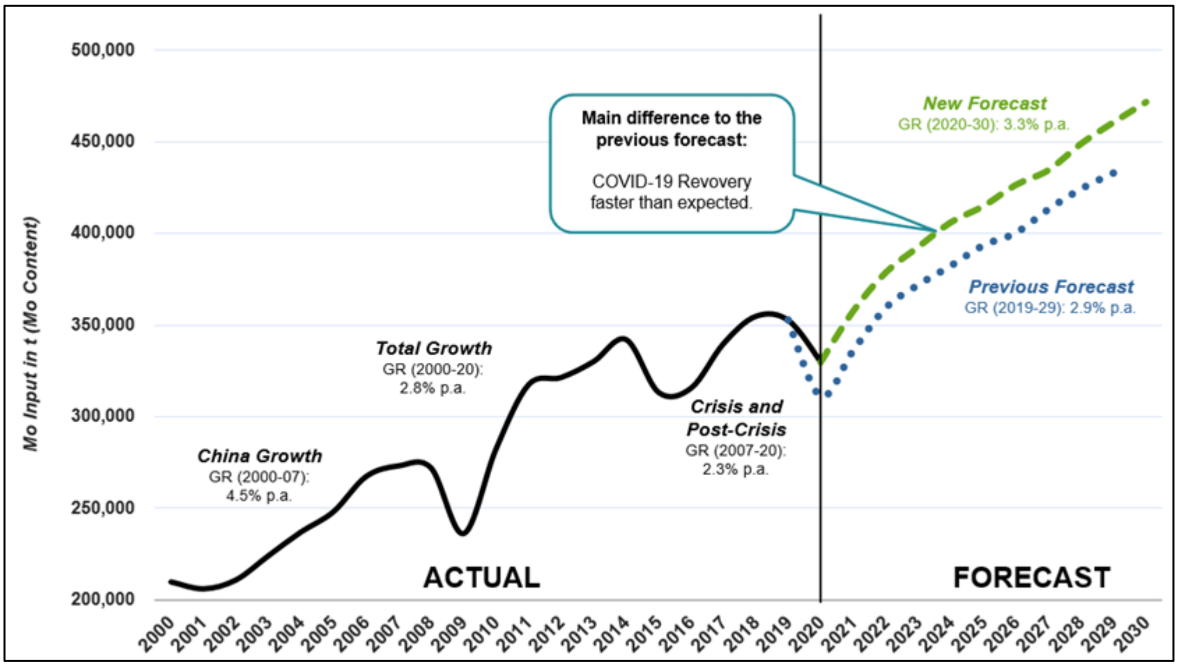


Figure 19-4: Molybdenum Demand (including Mo in Scrap) Forecast (SMR, 2021)

19.3 End Users

There are over 25 molybdenum roasters worldwide, with two in Europe and a conversion facility. Industry estimates that global annual molybdenum roasting capacity is approximately 619 Mlb (~281,000 t), excluding another 40% underutilized capacity in China. This suggests that there is more than sufficient molybdenum roasting capacity to treat future anticipated Malmbjerg molybdenum production.

Europe roasters include the Freeport McMoran Rotterdam Climax facility, where molybdenite concentrate is processed into technical-grade molybdic oxide, ferromolybdenum, pure molybdic oxide, ammonium molybdates and molybdenum disulfide. Sadaci in Ghent, Belgium, now part of Molymet Chile, a leading world molybdenum roaster, also processes molybdenite concentrate to technical-grade molybdic oxide and ferromolybdenum. Ferromolybdenum is produced from molybdenum oxide at the Freeport McMoran Stowmarket, United Kingdom conversion facility.

The steel industry is the largest end-user of molybdenum. Using data from EUROFER, 2021, the European steel industry employs 326 thousand highly skilled people and supports 2.6 million jobs in total. The EU is the second-largest steel producer globally, with 160 Mt of steel produced per year (15% of the world production) at more than 500 steel production sites across 22 EU members states.

Generally, molybdenum sulphide concentrate supply agreements are based on the molybdenum content at the price for technical grade molybdenum oxide, minus a charge for processing fees and contained deleterious elements, if any. The molybdenum oxide price reference is a pricing assessment whereby the price discovery process is established through interviews with sellers and buyers. Figure 19-5 shows the molybdenum oxide price for the past 15 years.

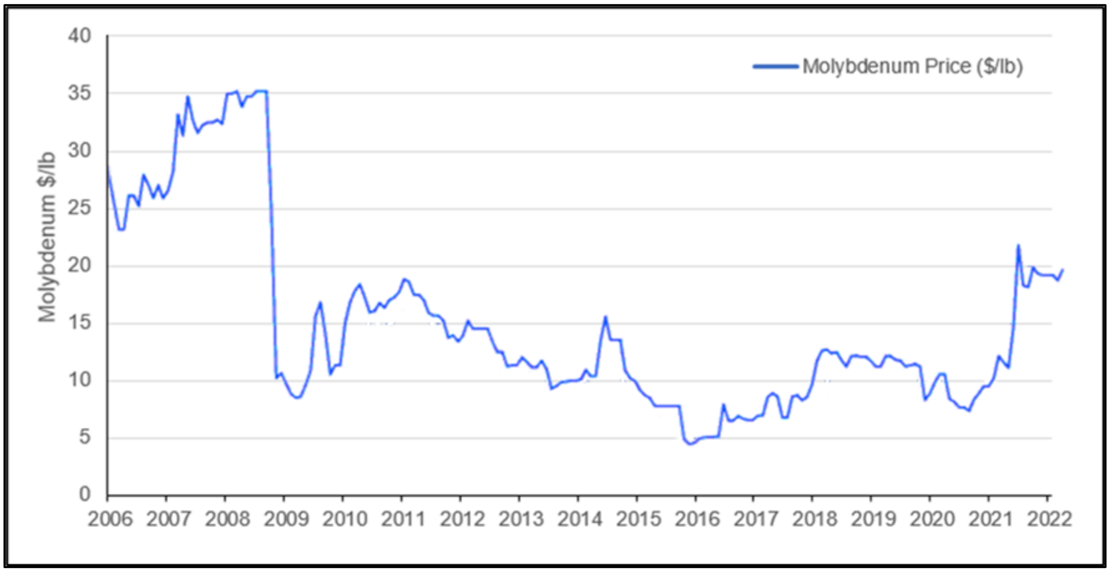


Figure 19-5: Molybdenum price, 2006 – 2022 (World Bank, 2022)

Molybdenum concentrates are typically sold on a Delivered Incoterm such as DAP to the buyer's works or port. A provisional invoice is created at the time of shipment, which reflects the existing market price, concentrate weight, moisture content, and assays. Final settlement occurs once the final assay and QP are known. Hedging in the Mo market is achieved through physical back-to-back hedging. The London Metal Exchange has a molybdenum oxide futures contract. New electronic trading platforms like German Metalshub are now emerging and offer spot market trading for molybdenum oxide and FeMo, among others.

Greenland imposes royalties on minerals production. In the case of molybdenum, there is a 2.5% royalty rate that can be credited against the corporate income tax. Corporate income tax is 25% in Greenland. Revenues for the Project are calculated after deducting 1.25% of the molybdenum metal in concentrate, a treatment charge of 9% of the payable metal value and concentrate transport costs of $50/wmt, including 2% moisture. The resulting net revenue represents approximately 89.6% of the gross metal contained in the molybdenum concentrate.

20.0 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

20.1 Guiding Principles and Criteria

GRI is committed to conducting its business and affairs with honesty, integrity, and in accordance with the highest ethical, legal, and regulatory standards. GRI strives to ensure that its business is conducted in all material respects in accordance with all applicable laws, stock exchange rules, and securities regulations in all jurisdictions that apply to company operations. This includes compliance with all applicable criminal, antitrust/competition, privacy, labour, human rights, environmental, and securities laws in all material respects.

20.2 Permitting process

The permitting process involves the MLSA, a government agency within the Ministry of Mineral Resources and Justice and the EAMRA, a government agency part of the Ministry of Agriculture, Self-Sufficiency, Energy and Environment. The MLSA is the one-door administrative authority for mineral resource activities, licences, etc. The Ministry of Mineral Resources and Justice is responsible for all socio-economic aspects of mineral resources, including SIAs and IBAs, and EAMRA is the administrative authority for environmental matters, including protection of the environment and nature, and Environmental Impact Assessments (EIA). EAMRA also receives input from scientific and independent environmental institutions and therefore works closely with the Greenland Institute of National Resources, Pinngortitaleriffik and the DCE at Aarhus University.

According to the Mineral Resources Act (Greenland Parliament Act no. 7 of 2009 with later amendments), mining companies operating in Greenland must carry out consultation procedures and prepare EIA, SIA, and IBA for approval by the Government of Greenland (Naalakkersuisut) prior to obtaining an exploitation license. In addition, a Navigational Safety Investigation (NSI) must be conducted for the purpose of an evaluation of whether ship voyages to and from mineral exploitation areas can be made in a safe and environmentally reasonable manner. The NSI is approved by The Danish Maritime Authority, who has the authority on safety at sea in Greenland.

The Government of Greenland has the authority to grant exploration and exploitation licenses in Greenland, including in areas of National Parks. The Malmbjerg project had a previous exclusive exploitation license 2008/40 issued in May 2009. The Malmbjerg licence is situated within the Greenland National Park (in Danish: “Nationalparken”). The regulations for the National Park are set out in the Greenland Home rule order no. 7 of 17 June 1992 with later amendments. The regulation sets out that licenses for prospecting, exploration, and exploitation of minerals in the National Park shall be granted pursuant to the Mineral Resources Act in Greenland by the Government of Greenland. A statement is obtained from the National Park Board appointed by the Government of Greenland for the purpose of stipulating relevant special licence conditions.

Regarding the establishment of project infrastructure in Greenland, there is no private ownership of land, as all land belongs to the public. Pursuant to section 1407 of the Greenland Exploration Standard Terms, a licensee is entitled to establish buildings, production plants, installations, tailings, waste disposal sites, etc. within and outside of the licence area, provided they are approved in accordance with articles 10 (now section 19) and 25 subsection 1 (now section 86 subsection 1) of the Mineral Resources Act. (Nuna, 2021).

In May 2009, the Government of Greenland granted the previous owners (Quadra) of the Malmbjerg molybdenum deposit the Exclusive Exploitation License No. 2008/40. Because of the new ownership and new engineering ideas, GRI was requested by the regulators to re-permit the Project. Although the permitting process is subject to regulatory decisions that can positively or negatively influence the timing and outcome of the exploitation license process, the company has been working diligently in each step of the process and used the extensive environmental monitoring data conducted by the Danish Centre for Environment and Energy from 2005-2017 and is therefore aiming to receive an exploitation license in 2023, as per Table 20-1.

Table 20-1: Exploitation License Chronology

Description	2020	2021	Q2-2022	Q4-2022	Q1-2023
ToR EIA and SIA approval*					
ToR Pre-consultation 35 days**					
ToR EIA/SIA White Paper					
Submit NSI					
Submit EIA and SIA					
Public consultation 8 weeks					
IBA negotiations					
Drafting exploitation license					

*First version presented in Danish, Greenlandic, and English on 9 December 2019
**Pre consultation started 9 January 2021, concluded 35 days after

20.3 Baseline Studies

The Schuchert Valley area south of the Malmbjerg deposit has been subject to intense environmental investigations and in connection with the former mining project for Malmbjerg (Quadra). The Schuchert Valley and catchment areas has been subject to substantial environmental studies comprising of collecting lichens, water, sediment, fish, seaweed, mussels, etc., data which are still considered valid for the accessing the Project from the north.

Additional fieldwork has been carried out to supplement the existing data. The focus area of this survey was the area north of Malmbjerg towards Mesters Vig Inlet, as this is the primary area expected to be affected by a potential mining project. The fieldwork was carried out from 1 to 15 August 2021 and included the following surveys and samplings:

- Botanic surveying
- Collection of lichens (baseline for future dust dispersal monitoring)
- Survey of freshwater (rivers/streams) in the area combined with water and sediment sampling in accordance with MLSA/DCE recommendations
- Registration of macro-invertebrates and Arctic char
- Mapping of muskox and polar bears
- Registration of birds in the Delta Valley and Mesters Vig Inlet areas

- Multibeam bathymetric survey of Mesters Vig Inlet including entrance from King Oscars Fjord
- Collection of marine samples (sculpins, common mussels, seaweed and sediments)
- Marine infauna samples (Van Veen Grab)
- ROV/Drop-down camera for mapping marine habitat (same as marine infauna)
- Collection of met-ocean data in Noret Inlet
- Set up two weather stations, one near the Malmbjerg deposit and one near the concentrator facilities at Mesters Vig Inlet

20.3.1 Terrestrial Environment

The Schuchert Valley area south of Malmbjerg deposit has been subject to intense investigations and in connection with the former mining project for Malmbjerg. However, in this Project, access and activities are planned to occur mainly north of the resource through Delta Valley and around Mesters Vig Inlet and Noret Inlet. In this area only the bottom Delta Valley, where a road will be established between the Malmbjerg mine site and the Mesters Vig Inlet, has more widespread vegetation. Additional fieldwork on botanic surveying has been carried out in Delta Valley and around Mesters Vig Inlet and Noret Inlet, and on the mining site to document vegetation types and plant species.

The investigation of birds conducted in connection with the former Malmbjerg mine project has been concentrated on the area of Schuchert Valley (Skov & Hansen, 2007 and 2009). The investigation found that the long-tailed skua (*Stercorarius longicaudus*) was frequently identified throughout the area. In the northernmost part of the Valley, species like dunlin (*Calidris alpine*), turnstone (*Arenaria interpres*), greater sand plover (*Charadrius hiaticula*), and snow sparrow (*Plectrophenax nivalis*) were registered.

With respect to the Delta Valley and Mesters Vig Inlet, there is a known common eider (Somateria mollissima) colony on a small island in the northwest corner of the inlet. The proposed Project is not expected to affect this colony due to the distant location from the proposed mining activities and mitigating measures that will be introduced to not disturb this area. Otherwise, the information on bird presence is scarce in this area, observations of sea and/or shore birds has been included in the additional fieldwork.

The terrestrial mammals found in the project area are the muskoxen (*Ovibos moschatus*), Arctic hares (*Lepus arcticus*), and collared lemmings (*Dicrostonyx groenlandicus*). Arctic wolves (*Canis lupus arctos*) are rare — the north and east Greenland population is estimated to be less than 75 animals (Marquard-Petersen, 1995). Stoats (*Mustela erminea*) are more common and Arctic foxes (*Vulpes lagopus*) are widespread. Polar bears (*Ursus maritimus*) also occur (Boertmann & Mosbech, 2012). Muskoxen and polar bears were observed during the additional fieldwork.

Arctic hare and the collared lemming are found throughout the area of Schuchert Valley and Delta Valley, east of the Mesters Vig Inlet (Aastrup. et al., 2005 and 2006). Human activities are not expected to impact the local stock or the abundance of these species in the National Park.

Arctic fox is common and widespread in the project area. The Arctic fox has a great ability to adapt to changes in the environment, including human activities. Thus, the Arctic fox is frequently observed around settlements in Greenland (Aastrup et al, 2005).

The project area is on the Jameson Land, which is one of the core ranges for muskoxen in northeast Greenland. Areas on both sides of Schuchert Valley are among the most important for the muskox, but the slopes along Delta Valley and Mesters Vig Inlet and the area south of the Mesters Vig Inlet are also preferred areas (Aastrup et al. 2006). Muskoxen in the area were observed during the additional fieldwork. The muskox population in the area is highly variable as they migrate over large ranges of land without territories and the Jameson Land muskox population is not isolated from other muskox populations in northeast Greenland.

Hunters from Ittoqqortoormiit hunt muskox in Jameson Land in accordance with annual quotas. Most hunting takes place along the coasts of Jameson Land and in inner Scoresby Sund Fjord during summer. In winter, hunting takes place using dog sledges along the coast and in the central part of Jameson Land. According to the local hunters in Ittoqqortoormiit, no hunting takes place in King Oscar Fiord and Mestersvig area. The pipeline infrastructure for tailings, return water, and fuel will be established with wildlife crossings to mitigate effects on migrating muskoxen and other wildlifes. Local disturbances affecting minor areas in vicinity of mining activities will be assessed during the EIA.

The polar bear is the top predator of the arctic ecosystem and present along the entire coast of East Greenland. In general, polar bears migrate north along the edge of the ice in early spring and are transported back southward on drifting ice during summer. Polar bears can, in principle, occur everywhere in the project area, especially within the marine regime mainly on drifting ice. During the additional fieldwork, several polar bears were observed in the area of Mesters Vig Inlet.

In recent years, polar bears have, in some areas, adapted to humans, and it is now quite common that polar bears enter settlements in search of food. No studies have been conducted on polar bears' response to disturbances near breeding and winter hibernation areas. Physical installations and motorized traffic within 1 km at the time of "hibernation-break" and soon after will probably affect breeding polar bears. The planned mining activities do not conflict with known hibernation areas for polar bears. The camp and smells from food and garbage may attract polar bears to the mining camp and diverge their normal behaviour. This may lead to a conflict between the staff operating the camp and polar bears. The guidelines “Guidelines for encounters with- /and observation of polar bears” published by the Ministry of Fisheries, Hunting and Agriculture, 2020, will be followed in order to avoid and/or limit any contact with polar bears. The effect of mining activities on polar bears will be assessed during the EIA.

20.3.2 Freshwater Environment

The water quality has been investigated in the Schuchert Valley for the former Malmbjerg project. The area around Malmbjerg and towards the south in the main catchments of the Schuchert Valley is well covered and need limited new monitoring (see Section 20.3.5 on Geochemistry).

The areas north of Malmbjerg are much less studied. Studies north of the Malmbjerg includes hydrological modelling by ASIAQ in four catchment areas in Mestersvig area in 2005-2006 (Helweg et al., 2006). No freshwater was analyzed for metals, nutrients, or alike in these catchment areas – mainly modelling of discharges. North of Malmbjerg, the main area of investigations for freshwater quality has been concentrated on the former Blyklippen mine northwest of Malmbjerg (Aastrup et al., 2004).

Additional baseline studies on freshwater quality have been conducted at a few localities in the Schuchert Valley and in the Delta Valley north of Malmbjerg, and some of the surrounding creeks near the primary crusher and process facilities near the inner part of Mesters Vig Inlet. Only a few stations are necessary in the Schuchert Valley due to data cover in the area from previous baseline studies and localities. The additional studies included sampling of freshwater for chemical analysis as well as identification of fish, including Arctic char (*Salvelinus alpinus*) and freshwater invertebrates. The ecological role of freshwater invertebrates is important as they are the major factor in canalizing energy up the food web, by eating the benthic and planktonic algae and serving them as food for other insects, fish, birds, etc.

Arctic char occurs throughout Greenland and is the only freshwater species that occurs in north and northeast Greenland. However, no data on Arctic char was available from the rivers in Delta Valley, therefore identification of fish has been included in the additional baseline survey. A total of 16 freshwater stations were sampled in Delta Valley and Schuchert Valley. At a few stations, three-spined stickleback (*Gasterosteus aculeatus*) was observed, and a population of Arctic char was found in only one of the sampled locations.

20.3.3 Marine Environment

In 2005, macroalgae were investigated at 29 stations in the north-western part of the project area (DHI, 2005). The investigations showed variations in species composition and relatively little homogeneity. Recordings of rare species with few global finds (*Coelocladia arctica*, *Platysiphon verticillatus, Punctaria glacialis*, *Trachynema groenlandicum*) including the find of a new species for the Greenlandic east coast make the macroalgal flora in the investigated area very interesting. Therefore, based on the macroalgal flora, this area will be accessed as to the need for preservation in the EIA. Due to the high heterogeneity in macroalgae composition and finding of rare species, a supplementary study of the coastal macroalgae community in and southeast of Mesters Vig Inlet has been conducted.

Data on marine invertebrates is very comprehensive and covers a large area including Mesters Vig Inlet. Thus, data on marine infauna in the area is adequate for the EIA. However, data on infauna from the eulittoral zone in Nyhavn and Noret Inlet has not yet investigated, and samples may need to be collected based on information gathered during the EIA process.

The fish community in the shallow waters of Nyhavn and Noret Inlet has never been investigated, but both areas are expected to hold populations of different species of sculpins and snailfish. Capelin (Mallotus villusus) and ice cod are also expected to utilize the areas on a seasonal basis. Capelin may even use the area as spawning area in some years. The mining activities may influence the spawning success of Capelin especially in years where they spawn in Noret Inlet. Thus, placement of tailing in Noret Inlet may overlay eggs with fine sediment and reduce hatching success. This will be assessed during the EIA.

Data on the diversity of marine fishes in the fjords and coastal waters of northeast Greenland were collected on a bottom trawl survey in 2003, north of the project area (Christiansen, 2003). The species composition and the number and biomass for each species were measured. Altogether, 33 species belonging to 13 families were recorded.

The most important marine mammals in Scoresbysund Fjord and surroundings are ringed seal (*Phoca hispida*), harp seal (*Pagophilus groenlandicus*), bearded seal (*Erignathus barbatus*), and narwhal (Monodon monoceros). Other marine species observed frequently in the area are minke whale (*Balaenoptera acutorostrata*), bowhead whale (*Balaena mysticetus*), hooded seal (*Cystophora cristata*), and walrus (*Odobenus rosmarus*). The most likely impact on marine mammals is introduced by increasing vessel activities in the area and underwater noise, especially in and around Mesters Vig

Inlet. The magnitude of impact on the different marine mammals depends on the noise level, the species abundance, and sensitivity to underwater noise. This will be assessed during the EIA.

20.3.4 Chemical Background Concentrations

The Greenland authorities require marine, terrestrial, and freshwater baseline samples collected from the planned mining area and a reference area to determine the chemical background concentrations before mine operations commence. These baseline data provide reference information for future monitoring during mine operation and closure.

Baseline studies were carried out in 2006 and 2007 in connection with the former Malmbjerg project, where all access to the mine should be from south via Schuchert Valley. The sampling included chemical analysis of water, sediments, seaweed, sculpins, and mussels.

As the project has changed to a northern access/activity, the Schuchert Valley is not expected to be disturbed by Project activities. The Schuchert Valley will still be a recipient of water draining the mine area as well as air borne pollution (dust), therefore the existing data is applicable. In order to update baseline for this southern area, water, sediment and lichen sampling has been included in the additional fieldwork.

With respect to the northern entrance route, the Delta Valley and Mesters Vig Inlet have not been characterized. The additional baseline studies include collection of lichens for analysis, in areas of the Delta Valley, at localities north and south of Mesters Vig Inlet and in the area of Mestersvig and Noret.

Sea water, sediment, and biota in the coastal area north of the mine site have a history of contamination from the former Blyklippen lead/zinc mine. Thus, comprehensive knowledge and updated information on the marine environment is essential to establish a solid baseline, and to establish to what extent the Mesters Vig Inlet is contaminated from the former Blyklippen mining activities. The contamination from Blyklippen is primarily restricted to Nyhavn and Noret Inlet, and the tailings deposit at Noret Inlet has been subject to intensive post-closure monitoring, why chemical analyses of sediment, seaweed, sculpins, etc. are available in this area. To get an updated status of the former pollution in this area, several stations have been revisited, sampled (sculpins, common mussels, seaweed and sediments), and analyzed for chemical content during the additional fieldwork.

20.3.5 Geochemistry

The Malmbjerg granitic intrusion comprises five distinct phases and the mineralization, largely comprised of quartz stockworks and veins that host molybdenite with accessory wolframite, scheelite, fluorite, as well as uranium oxides. According to geochemical (metallurgical) testing of samples from Malmbjerg in 2006 by SGS Lakefield Research Ltd. (SGS, 2006a) the concentration of the U_3O_8 grade in bulk samples was less than 20 g/t (0.002%) and considered to be negligible.

20.3.5.1 Waste Rock and Low Grade Ore Stockpiles

Geochemical and water quality predictions on the previous Malmbjerg project waste rock and low-grade ore stockpile study was carried out by SRK Consulting in Cardiff, Wales, UK (SRK, 2007a, b) and Lorax Environmental Services Ltd. in 2008 (Lorax, 2008a, b, c, d). The main drainage from the Malmbjerg waste rock and low-grade ore stockpiles will be through the Schuchert Valley, and the studies includes data and hydrological modelling by Asiaq (2007) and catchment areas defined by DHI (2006, 2009). Baseline hydrological and water quality studies were combined with geochemical/acid rock drainage and metal leach test results from representative samples of expected waste rock in order to quantify the potential environmental impact. Based on these studies some of the waste rock and low grade ore is potentially acid generating (PAG); however, the water quality modelling results indicated that impacts in Schuchert Dal were not anticipated.

DCE (NERI at the time) had questions related to conservative input variables – level of conservativism, "first flush" water quality, water quality during mine operation, and grinding effects of the glacier. Golder Associates (Golder, 2008a, b) completed a third-party review on the water quality predictions and reported to the former Bureau of Minerals and Petroleum (BMP). Golder (2008a, b) concluded that none of the NERI concerns was believed to be a significant issue and that results from previous water quality model by Lorax in 2008 were considered valid.

SRK 2010 provided on updated in the geochemical characterization of waste rock in relation to the three phases of mining and potential management:

- Approximately 59% of waste is predicted to be non-PAG. This material is scheduled to be mined during the initial Phase 1 and 2, which is expected to provide suitable rock for construction.
- Approximately 30% of the waste mined will be PAG but the majority of this (approximately 20% of all waste) would be mined in the final development of the pit – Phase 3. An additional 10% of waste may develop acid rock drainage over time.

Lorax (2008 a, b, c, d) used a conservative assumption that all waste rock and low grade ore would be PAG when completing water quality modelling; therefore, the placement of PAG rock during the latter stages of mining is accounted for in the water quality predictions. GRI will include ongoing geochemical characterization of waste rock and low-grade ore stockpiles during the operational phase to confirm seepage water quality in accordance with environmental management plan. The operational and closure management of waste rock will be reviewed during the EIA.

An assessment of the flooded pit water quality will be completed during the EIA to support closure planning.

20.3.5.2 Tailings

Chemical metallurgy based on samples from Malmbjerg project were previously studied and reported by SGS Lakefield Research Ltd. in 2006 (SGS, 2006a) on behalf of International Molybdenum Plc. The geochemical signature of the metallurgical study does not change over time and is well-described. Based on the geochemistry data the overall tailings were PAG. Previous geochemical characterization of tailings water quality focused on standard test for tailings stored on land and subject to leaching by freshwater. For the current Malmbjerg project tailings will be deposited below water in Noret Inlet. The need for additional geochemical characterization of tailings in a saline water environment and expected TMA water quality will be determined during the EIA.

20.3.6 Glaciation

In February 2020, the Geological Survey of Denmark and Greenland (GEUS) finalized a high-resolution satellite study to forecast glacial ablation and an updated digital elevation model that will show the magnitude and spatial distribution of recent changes in glacier thickness. These glacial modelling studies are useful in relation to the placement and impact on waste rock on the Arcturus Glacier.

The glacier streams will most likely have an influence on the open pit closure, which has yet to be defined, however, the open pit will most likely become part of the glacier water stream flows at closure.

Climate change impacts on glaciation and operation and closure mining activities will be completed during the EIA.

20.3.7 Baseline Studies for the SIA

Baseline studies to support the SIA is conducted as a combination of desktop studies focused on social, economic, and health parameters that are considered to be of greatest relevance for the proposed Malmbjerg Project and stakeholder engagement through public presentations and meetings with identified stakeholders, for stakeholder involvement (Section 20.6.1).

20.4 Process of the EIA and SIA and Impact Benefit Agreement

The EIA/SIA process in Greenland corresponds in most respects to that of the other Nordic countries, the EU, and Canada. Among other things, this implies that public involvement is important, public consultations must be held, and relevant comments and input from citizens incorporated into the EIA document. To obtain an exploitation licence, Terms of References (ToR) for the EIA and for the SIA in English, Danish, and Greenlandic must be submitted. Once the translations and content are acceptable, the draft ToR for the EIA and SIA are published for a 35-day pre-consultation to receive public comments. After this, all comments must be addressed in a White Paper and the ToR for both EIA and SIA must be revised. The pre-consultation for the Malmbjerg project was conducted from mid-January to 22 February 2021. Comments were received and addressed in a White Paper and incorporated in a revised ToR for both EIA and SIA, translated in all three languages and were submitted for approval by the Government of Greenland. In addition, the Company is finalizing the NSI.

After ToR approval, the EIA and SIA are prepared, and the drafts must be published for eight weeks of public consultations and public consultation meetings in towns and villages particularly affected by the activities must be conducted. Following the consultations, a White Paper is prepared that addresses all questions and comments raised during the public consultations. Based on input from the public and the authorities the draft EIA and SIA are revised before submission for approval by the Government of Greenland. Greenland Resources published in February 2022 results of a Feasibility Study that will be the basis for the detailed engineering that will be incorporated in the EIA and SIA. In addition, the Company conducted Environmental Baseline Studies in the summer of 2021 as described in Section 1.4.1, that will be the basis of the environmental information to be included in the EIA/SIA. During 2 to 4 October 2019, the Company conducted a series of community meetings in Ittoqqortoormiit, the only nearby settlement to the Project, located 185 km to the southeast, to provide residents an update on the Malmbjerg Molybdenum Project.

The IBA is an agreement between the licensee, the municipality, and the Government of Greenland. The purpose of the agreement is to handle socio-economic issues and may relate the licensee's compliance with obligations to use Greenlandic manpower and enterprises, including the education or training thereof. The agreement can be considered as a tool for companies to convert the initiatives described in the SIA report into more specific and measurable initiatives. The Benefit and Impact plan in the SIA report therefore forms the basis for negotiation of the IBA. Negotiations concerning the content of the IBA can begin as soon as the eight-week public consultation phase is over.

During the EIA/SIA GRI will also complete a NSI to confirm shipping and mining activities, including tailings placement, can be completed in a safe and environmentally reasonable manner.

20.5 Environmental Impact Assessment

The Greenlandic authorities have prepared a set of guidelines that ensure that EIA reports on mining projects in Greenland follow a fixed, logical template where all potential impacts from the mine are described, discussed and assessed.

Aims of the EIA are:

- To describe the nature and the environment as well as the possible environmental impacts of the proposed project,
- To provide a basis for the consideration of the proposed project for the Government of Greenland,
- To provide a basis for public participation in the decision-making process, and
- To give the authorities all information necessary to determine the conditions of permission and approval of a proposed project.

If it is estimated that an impact will have major negative effects, mitigating effects must be proposed. These guidelines also state that both national rules and guidelines must be met as well as international guidelines and conventions such as IMO Ballast water Convention, IMO MARPOL, etc. Discharges and emissions must comply with Greenlandic standards, and if not available, to either EU standards (EU Directive on Industrial Emissions - IE Directive), US, or Danish standards. This ensures that EIA reports for mining projects in Greenland are to a very high professional level.

The EIA assessments must address two main types of potential impacts on the environment: impacts that could lead to pollution of the environment (including nearby towns and villages) and impacts that could cause disturbance to terrestrial, freshwater aquatic, and marine wildlife and vegetation. In this connection, it is important to note that a large part of the Greenlandic population is very dependent on hunting and fishing, and negative impacts on key species may have major economic and cultural consequences.

To facilitate the understanding and predicting mobilization and leaching of pollutants from mine waste products, the Greenlandic authorities have also published guidelines for the requirements of the mining companies' geochemical test work. This includes the values for discharges/emissions and environmental quality criteria determined by EAMRA that shall be met. Water and air quality criteria are based on existing guidelines from Canada, US, Australia, and international organizations (and aim to be at the same level as these) and include experience from previous projects in Greenland. For elements or substances that are not included in the Greenland lists, quality criteria will be determined by EAMRA on the basis of other existing guidelines from EU/Denmark or elsewhere, if relevant. Emissions from, for example, power plants, incinerations plants, etc. as well as non-road mobile machinery shall comply with EU standards or US standards if EU standards are not available.

20.5.1 Potential impacts on the Environment

Issues to be addressed in the EIA have been identified, based on the project description and the information of existing knowledge of the environment in the area of the Malmbjerg Project and the conducted field studies. The identified issues are summarized in Table 20-2.

Table 20-2: Issues Identified to be Addressed in the EIA and the Associated Risk Assessment

Phases	Elements (Project activity)	Pollution					Disturbance			
		Air pollution/dust	Noise/vibration	Freshwater environment	Marine environment	Terrestrial environment	Physical environment (landscape)	Freshwater environment	Marine environment	Terrestrial environment
Construction	Building of mine facilities on land	X	X	X	X	X	X	X		X
	Building of facilities Mesters Vig Inlet		X		X	X	X	X	X	
	Shipping	X	X		X				X	
Operation	Pit mining (drilling, blasting transport in pit, etc.)	X	X	X		X	X			X
	Concentrator	X	X		X				X	X
	Ore transport		X		X				X	X
	Storage and workshop			X	X	X	X			X
	Shipping	X	X		X				X	
	Tailings Management Facilities	X			X	X	X		X	
	Accommodations and associated activities	X	X		X	X	X			X
	Road transport (fuel, freshwater, etc.)	X	X	X	X					X

table continues…

Phases	Elements (Project activity)	Pollution					Disturbance			
		Air pollution/dust	Noise/vibration	Freshwater environment	Marine environment	Terrestrial environment	Physical environment (landscape)	Freshwater environment	Marine environment	Terrestrial environment
Closure and post-closure	Dismantling and removal of facilities	X	X	X	X	X	X		X	X
	Shipping and other transport	X	X		X		X		X	X
Risk assessment	Shipping				X					
	Accidental oil spill during unloading from ship and refueling the concentrator				X					
	Fuel tank rupture or leak on land or offshore				X	X				

20.5.2 Environmental Management Plan

The EIA must include an environmental monitoring plan in which it is described how all aspects relevant to environmental issues will be monitored, such as discharges/emissions to water and air; use and handling of fuel and chemicals; production and handling of waste rock and tailings; concentrations of, among others, metals, nutrients, chemicals and their effects on the environment; and disturbance of wildlife. The monitoring plan shall cover both the construction phase of the Project and the subsequent exploitation phase and will be developed in cooperation with the Mineral Resource Authority.

A separate plan to monitor the reclamation work will be developed as part of the closure plan.

Preparing an Environmental Management Plan (EMS) as part of the EIA process is mandatory in Greenland. The EMS shall describe how the Project proponent intends to manage the environmental issues identified in the EIA and identify who is responsible for each commitment. The EMS shall assist the mining company to maintain compliance with Greenland's environmental regulations, lower environmental impacts, reduce risks, develop indicators of impact, and improve environmental performance and fulfil the intentions of the international standard for environmental management ISO 14001.

20.5.3 Conceptual Closure Strategy

The closure plan requirements are defined cf. Sec. 43 of the Mineral Resources Act and are subject to the final approved EIA report. The closure plan will include a technical plan describing the removal of equipment and installations, restoration plan of the affected nature and environment and a detailed schedule with closure costs broken down to each item.

The project has been designed on a low disturbance footprint approach because most of the infrastructure is modularized. Due to the structure's modularization of the Malmbjerg project, the proposed closure plan will entail the physical removal of the concentrator infrastructure barges from Mesters Vig Inlet for salvaging at an offshore location. The RopeCon conveyor and all associated and ancillary components will be removed and shipped to an overseas site for salvaging. The mine site infrastructure will be dismantled and transported to Mesters Vig Inlet for shipping to an overseas site for salvaging. Disturbed land areas will be regraded, scarified, and seeded with a wild Greenland tested grass blend. All bridge and culvert structures will be removed, and all drainage channels will be restored to their pre-construction environments. The closure cost associated with these activities is estimated to be approximately $10.3 million which will be financed from cash flow in accordance to an approved MASL closure plan.

20.6 Social Impact Assessment

The SIA must be prepared in accordance with guidelines published by the Greenlandic Mineral Resources Authority. The aim of the SIA is to provide a satisfactory and impartial description for the Greenlandic society in general about what Greenland, the local communities affected, and individuals will gain from the project and to inform and involve relevant and affected individuals and stakeholders early in the process via ongoing dialogue and specific procedures, for example, through information and consultation meetings as well as through relevant media. Towns, settlements, and communities (individuals) that may be directly or indirectly impacted throughout the project must be involved by utilising and respecting local knowledge, experience, culture, and values.

The SIA must also provide a detailed description of the social pre-project baseline situation, which, on the basis of the most recent available data, is to form the basis for planning, mitigation initiatives, and future monitoring and the assessment must identify both positive and negative social impacts at local and national levels, and to optimise positive impacts and mitigate negative impacts throughout the project lifetime and through this ensure sustainable development and a Benefit and Impact Plan must be developed.

20.6.1 Land use and Stakeholder engagement

The nearest formal settlement is Ittoqqortoormiit (Scoresbysund village) with about 310 inhabitants (Statistics Greenland 2019) located about 185 km south-east of the Malmbjerg Project. The Mestersvig Naval Base is located 28 km to the north of the Malmbjerg Project and is generally staffed by two persons during the winter and many more people in the summer from the Sirius patrol and Arctic Command.

Locally in Ittoqqortoormiit stakeholders have preliminary been identified to be consulted in the scoping phase, and a pre-visit to Ittoqqortoormiit was conducted on 2 to 4 October 2019 to ensure early involvement in the SIA process and to provide residents an update on the Project. During the visit, GRI gave a general public presentation on the Project at the local school and met with the Association of Hunters, the Municipality committee members, and the Municipal engineer. The presentation was in Danish supported by a local Greenlandic translator and hard copies were distributed in Greenlandic. GRI believes that the consultation meeting results were very positive and supportive of the Project. GRI agreed to maintain relevant communication through the Ittoqqortoormiit Municipal office and continue with the SIA process.

During these pre-consultation meetings with the inhabitants in Ittoqqortoormiit, GRI was informed that Ittoqqortoormiit inhabitants do not have any fishing or hunting interest in the area near Mesters Vig Inlet.

When the draft SIA is prepared it will be published for public consultation for eight weeks in accordance with the Mineral Resources Act. During the consultation period, public consultation meetings will be organized in towns and villages which will be particularly affected by the activities.

20.6.2 Benefit and Impact Plan

A Benefit and Impact Plan must be included as part of the SIA report and contain specific initiatives on how to limit negative impacts as far as possible while promoting the positive impacts. The Benefit and Impact plan forms the basis for negotiation of the Impact Benefit Agreement.

Monitoring and evaluation requirements for the Benefit and Impact Plan will be included as an element in the subsequent IBA agreement, to identify and assess if any major adjustments in the Benefit and Impact Plan are needed.

20.6.3 Potential Positive and Negative Impacts

In the SIA report direct, indirect and induced impacts of the proposed activities will be assessed, including assessment of potential positive impacts from the Malmbjerg Project and how development opportunities in the Greenlandic society can be maximised and possible negative impacts can be mitigated.

The following potential impacts were listed in the ToR and will be further addressed in the EIA and SIA. Positive Impacts: Business life (local delivery of goods and services); Employment at the Project; Public service and economy (fees, possible port charges and passenger duties in airports etc.); and Infrastructure (ports and airports, etc.). Negative potential impacts: Socio-economic issues (impacts on fishing and hunting); health issues (in a poorly accessible area); use of the area; and recreational values.

21.0 CAPITAL AND OPERATING COSTS

21.1 Capital Cost Estimate

The total estimated initial and sustaining capital cost for the design, construction, installation, and commissioning of the Project is $1,038.1 million. This total includes all direct costs, indirect costs, owner's costs, and contingency. A summary breakdown of the capital cost is provided in Table 21-1.

Table 21-1: Capital Cost Summary

Capital Costs (millions)	Initial Capex		Sustaining Capex		Total Capex	
	$M	€M	$	€	$	€
Mining	88.6	77.2	53.0	46.2	141.6	123.4
Rope Conveyor	194.4	169.4	50.0	43.6	244.4	212.9
Process Plant	112.9	98.4	50.0	43.6	162.9	142.0
Marine Vessels and Naval Architecture	28.3	24.7	10.0	8.7	38.3	33.4
Infrastructure	62.1	54.1	50.0	43.6	112.1	97.7
Tailings Storage and Reclaim Water	47.2	41.1	5.0	4.4	52.2	45.5
Construction Indirects	104.3	90.9	--		--	
Owner's Cost	10.0	8.7	--		--	
Preproduction, Start Up/Commissioning	147.5	128.5	--		--	
Subtotal (before equipment financing)	795.4	693.0	218.0	189.9	1,013.4	882.9
Contingency	83.7	73.0	--		--	
Subtotal (including contingency)	879.1	766	--		--	
Less: Equipment Financing Drawdowns	-88.6	-77.2	--		--	--
Add: Equipment Lease Payment & Fees	29.6	25.8	--		--	
Total Initial Capital (after equipment financing)	820.1	714.6	218.0	189.9	1,038.1	904.5
Closure and Reclamation			TBD			
Total Capital Costs	**820.1**	**714.6**	**218.0**	**189.9**	**1,038.1**	**904.5**

Note:
1. Sums may not add up due to rounding
2. Contingency included at Project sub-category basis and totals approximately 12%
3. Closure capital cost estimate has not been included in the analysis which will be considered as an operating cost as the finalized closure amount has not been negotiated with the Greenland Government authorities.

21.1.1 Class of Estimate

This Class 3 cost estimate has been prepared in accordance with the standards of AACE International. AACE International's recommended practices were considered in the preparation of this estimate. The estimated average accuracy of this cost estimate is +15%/-15%.

21.1.2 Estimate Base Date

Cost estimate base date is Q3 2021 and does not include cost escalation. FS cost quotations were obtained in Q3/Q4 2021.

21.1.3 Estimate Approach

21.1.3.1 Currency and Foreign Exchange

Quotations received from European vendors were converted to United States dollars using a currency exchange rate of €1.0000 to US$1.1477 (Q4 2021).

21.1.3.2 Duties and Taxes

Not included.

21.1.4 Responsibility Matrix

FS capital cost estimate were obtained for the area of responsibility of the following consultants:

- Tetra Tech – processing, ancillary infrastructure, utilities and services, airstrips, all weather access roads, overall capital cost estimate, and overall operating cost estimate
- MMTS – geology, mining, waste management, glacier road, rope conveyor system
- P&C – overland pipeline and pump stations
- KP – TMF, water supply and water management
- PND/Hockema – port infrastructure, marine facilities, naval architecture, and marine vessels.
- Pinnacle – logistics and shipping.
- WSP/COWI – environmental
- GRI – Owner's costs.

Tetra Tech, as the lead consultant, is responsible for the FS.

21.1.5 Elements of Cost

The initial and sustaining capital cost estimate components are direct costs, indirect costs, Owner's costs, and contingency.

21.1.5.1 Direct Costs

Direct costs consist of completing work that is directly attributable to its performance and is necessary for its completion. In construction, it is considered to be the cost of installed equipment, material, labour, and supervision directly or immediately involved in the physical construction of the permanent facility.

Examples of direct costs include mining equipment, process equipment, mills, and permanent buildings.

Total Project direct cost is estimated to be $751.5 million.

21.1.5.2 Indirect Costs

Indirect costs consist of costs not directly attributable to the completion of an activity, which are typically allocated or spread across all activities on a predetermined basis. In construction, (field) indirect costs are costs which do not become a final part of the installation, but which are required for the orderly completion of the installation and may include, but are not limited to, field administration, direct supervision, capital tools, start-up costs, contractor's fees, insurance, taxes, etc.

Total Project indirect cost is estimated to be $251.8 million.

21.1.5.3 Owner's Costs

Owner's costs are costs assumed by the Owner to support and execute the Project.

The Project execution strategy, in particular for construction management, involves the Owner working with an EPCM organization and supervising the general contractor(s). The allowance for Owner's costs was provided by GRI. The Owner's costs include field staffing, field travel, general field expenses, community relations, and Owner's contingency.

Total Project Owner's cost is estimated to be $10.0 million.

21.1.5.4 Contingency

When estimating costs for a project, there is always uncertainty as to the precise content of all items in the estimate, how work will be performed, what work conditions will be encountered during execution, etc. These uncertainties are risks to a project, and these risks are often referred to as "known-unknowns", which means that the estimator is aware of the risks and, based on experience, can estimate the probable costs. The estimated costs of the known unknowns are referred to by cost estimators as "cost contingency". A contingency for each activity or discipline was estimated based on the level of engineering effort, consensus from the consultants, as well as experience on past projects.

Total Project contingency allowance is $83.7 million.

21.1.6 Initial and Sustaining Capital Cost Exclusions

Note that nearly all vendor quotations are budgetary and without validity periods stated in the quotes, which suggest that these quotations are not binding. These quotes may change without notice. In the midst of increasing uncertainty in global economics and trade, fluctuations in global commodity prices and exchange rates could cause a rapid increase in the cost of items presented in this cost estimate, which may be inevitable due to the significant reliance of the Project execution upon imported services and goods. It is not unusual for commodity prices or exchange rates to fluctuate more than 5% within several trading days. The cost estimate presented herein is for information only and is not indicative of the future capital cost estimate produced for the FS or subsequent studies.

The following categories are excluded:

- major scope changes
- schedule recovery or acceleration

- severe climatic conditions
- force majeure
- interest or financing costs
- corporate expenses
- working or deferred capital (included in the financial model)
- taxes and duties
- land acquisition
- any Project sunk costs (studies, exploration programs, etc.)
- closure and reclamation
- vendor price fixing/gouging
- macroeconomic factors
- currency fluctuations
- geopolitical tensions or war
- disruptions of global supply and logistical services
- pandemics or other natural disasters
- other unforeseeable events
- escalation.

21.2 Project Operating Cost Estimate

21.2.1 Summary

Project operating cost estimate consists of mining, ore transportation from mine to concentrator, processing, tailings and reclaim water management, port facilities and G&A costs, are summarized in Table 21-2. The average LOM operating cost is estimated to be $12.42/t ore milled.

Table 21-2: Project Average LOM Operating Cost Summary

Description	Operating cost ($/t ore milled)
Mining (excludes pre-production)	3.94*
Processing + TMF	7.70
Rope Conveyor	0.14
Infrastructure	0.19
G & A	0.46
Total	12.42

*Includes costs related to mining equipment leasing
Numbers may not add due to rounding

Project operating cost accounts estimate includes all recurring costs for payroll, service contractors, camp operations, maintenance parts and supplies, reagents, consumables, supplies, freight, personnel transportation, etc.

Mine operations schedule are as follows:

- two 12-hour shifts per day
- work rotation schedule: 2 weeks on / 2 weeks off

For all operating cost accounts, the costs were developed from the annual production schedule.

21.2.2 Mining Operating Cost

Mine operating costs are developed from first principles. Inputs are derived from vendor quotations and historical data collected by MMTS. This includes quoted cost and consumption rates for inputs such as fuel, lube, explosives, tires, undercarriage, ground engaging tools (GET), drill bits/rods/strings, machine parts, machine major components, operating and maintenance labour ratios. Labour rates for planned hourly and salaried personnel have been supplied by GRI. Summaries of mining operating cost summary and mining operating cost inputs are presented in Table 21-3 and Table 21-4, respectively.

Table 21-3: Mining Operating Cost Summary

Mine Operating Cost Summary	$/t Mined	$/t Milled	Total $ (M)
Drilling	$0.16	$0.28	$68
Blasting	$0.38	$0.66	$162
Loading	$0.21	$0.36	$89
Hauling	$0.58	$1.01	$248
Support	$0.35	$0.61	$149
Unallocated Labour	$0.09	$0.15	$37
Direct cost - Subtotals	$1.75	$3.08	$754
Mine Operations GME	$0.20	$0.35	$86
Mine Maintenance GME	$0.12	$0.22	$54
Mine Engineering GME	$0.13	$0.23	$56
GME Costs - Subtotals	$0.46	$0.80	$196
Total Mining Operating Cost	**$2.21**	**$3.88**	**$950**

Table 21-4: Mining Operating Cost Inputs Summary

Input	Notes
Mine Production Schedule	▪ Annual tonnes (ore/waste/stockpile) are taken from the production schedule. Hours for major equipment are calculated using inputs described in Section 16.0
Production Drilling	▪ Assumes 10% highwall drilling ▪ Annual hours from the production schedule and drilling parameters
Blasting	▪ 0.23 kg/t powder factor for production blasting ▪ 0.12 kg/t powder factor for highwall blasting ▪ Average 20% of holes require emulsion ▪ Emulsion cost - $1.67/kg ▪ ANFO cost - $1.42/kg ▪ Initiation systems - $36/hole (includes det cord, boosters, and detonators) ▪ Delivery, loading, and shooting is included in product costs
Loading and Hauling	▪ Loader productivities outlined in Section 16.0 ▪ Wheel loader rehandles stockpiled ore ▪ 20% of loader hours are assigned to FEL at a ratio of 34/17.6 ▪ 7% of 230 t truck hours applied to 90 t trucks at a ratio of 230/72 (for construction activity and maintenance)
Pit Ancillary Mining Equipment	▪ Based on construction activities and support activities ▪ Annual utilization driven by utilization of primary mining equipment
Equipment Operating Cost	▪ Uses quoted or estimated fuel consumption rates, consumables costs, GET costs, labour ratios, and general parts/maintenance costs ▪ Major repairs are clocked to equipment hours rather than averaging over the equipment life

table continues…

Input	Notes
Hourly Labour	▪ Labour hours are grouped by type (operator, mechanic, electrician, etc.) and are applied with the appropriate cost by type ▪ Hours are rounded off to apply a full person to each crew. Additional hours after rounding are put into Unallocated Labour category
Mine GME	▪ Salaried staff, consumable and rental allowances, software costs, etc. ▪ Fixed yearly costs (except for start-up and wind-down years) ▪ Assumes 14 day on/off rotation
Mine Site Development	▪ Built up using 3D shapes, productivities, and vendor quotations ▪ Includes crushed rock for mine operations

21.2.3 Processing Operating Cost

Annual average processing operating cost is estimated to be $87.3 million per year, or $6.83/t ore milled (excluding TMF and process water management). Included in this cost estimate are:

- Hourly and salaried personnel requirements and costs
- grinding media and liner costs
- maintenance supplies
- reagents
- operation consumables
- electrical power consumption

Processing operating costs are summarized in Table 21-5.

Table 21-5: Summary of Processing Costs (Excluding TMF and Site Water Management)

Description	Labour	Annual Cost ('000 $)	Unit Cost ($/t milled)
Labour	102	15,526	1.22
Consumables			
Liners	--	3,546	0.28
Grinding Media	--	17,707	1.39
Reagent	--	4,001	0.31
Subtotal Consumables	--	25,254	1.98
Supplies			
Maintenance Supplies	--	1,085	0.08
Operating Supplies	--	780	0.06
Power Supply	--	44,671	3.50
Subtotal Supplies	--	46,536	3.64
Total	**102**	**87,316**	**6.83**

Notes:

1. Costs have been rounded to the nearest hundreds of thousands of dollars.

2. Unit costs have been rounded to the nearest hundredth.
3. Totals may not add up due to rounding.

21.2.3.1 Labour Cost

Total process labour costs at the full process rate of 35,000 t/d are estimated to be $ 15.5 million per year, or $1.22/t of ore milled. salary/wage levels based on an industry-focused and location-specific labour survey conducted by GRI, the payments include base salaries/labour rates and various burdens. The processing plant will be staffed with 102 personnel including 8 in general supervisory and technical services, 44 in operational roles, 36 in maintenance roles, and 14 for the metallurgical lab and assay lab.

21.2.3.2 Power Cost

The average annual power consumption, based on the average processing rate of 35,000 t/d of ore milled, is estimated to be 247.7 GWh/a. At an average power unit cost of $0.18/kWh, the annual power cost is estimated to be $44.67 million, or $3.50/t of ore milled.

21.2.3.3 Maintenance and Operating Supplies Costs

Maintenance and operating supplies are estimated to be $0.15/t of ore milled. Maintenance supplies are estimated to cost $1.08 million per year or $0.08/t of ore processed. Operating supplies are estimated to be $0.78 million per year, or $0.06/t of ore milled.

21.2.3.4 Major Processing Consumables Costs

Major consumable costs are estimated to be $25.25 million per year or $1.98/t milled. Major consumable unit prices were quoted from suppliers.

Major processing consumable costs include the following:

- grinding media and liner costs
- reagents
- maintenance supplies

21.2.4 TMF Operating Cost

TMF operating costs include:

- labour cost
- electrical power cost
- maintenance and consumables
- G&A

21.2.5 RopeCon Conveyor Operating Cost

RopeCon conveyor operating cost includes the following;

- maintenance and consumables
- labour cost

21.2.6 Port Infrastructure Operating Cost

Port Infrastructure operating cost includes the following:

- Port operations, maintenance, and consumables
- marine vessel mooring, loading, and offloading
- material and container storage and handling
- accommodation vessels
- electrical power
- labour cost; seasonal and non-seasonal hourly and salaried personnel

21.2.7 General and Administrative Operating Costs

Average LOM G&A operating costs are estimated at $5.8 million per year, or $0.455/t milled. The operating cost distributions are:

- labour
- consumables
- site accommodations
- personnel rotational travel
- socio-economic programs
- communications

21.2.8 Operating Cost Estimate Exclusions

The following items are not included in the operating cost estimate:

- pre-production
- first fills
- closure and reclamation
- escalation

22.0 ECONOMIC ANALYSIS

22.1 Cautionary Statement

The results of the economic analyses discussed in this section represent forward-looking information as defined under Canadian securities law. The results depend on inputs that are subject to a number of known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those presented here.

Information that is forward-looking includes:

- Mineral Resource and Mineral Reserve estimates
- Assumed commodity prices and exchange rates
- The proposed mine production plan
- Projected mining and process recovery rates
- Assumptions as to mining dilution
- Capital and operating cost estimates and working capital requirements
- Assumptions as to closure costs and closure requirements
- Assumptions as to environmental, permitting, and social considerations and risks

Additional risks to the forward-looking information include:

- Changes to costs of production from those estimated in this study
- Unrecognized environmental risks
- Unanticipated reclamation expenses
- Unexpected variations in quantity of mineralized material, grade, or recovery rates
- Geotechnical or hydrogeological considerations differing from what was assumed
- Failure of mining methods to operate as anticipated
- Failure of plant, equipment, or processes to operate as anticipated
- Changes to assumptions as to the availability and cost of electrical power and process reagents
- Ability to maintain the social licence to operate
- Accidents, labour disputes, and other risks of the mining industry
- Changes to interest rates
- Changes to tax rates and availability of allowances for depreciation and amortization

22.2 Basis of Evaluation

The author has prepared his assessment of the Project on the basis of a discounted cash flow model, from which NPV can be determined. Assessments of NPV are generally accepted within the mining industry as representing the economic value of a project after allowing for the cost of capital invested.

The objective of the study was to determine the potential viability of an open pit mine, with transport of ore by RopeCon conveyor to a processing plant located on tidewater to produce a marketable concentrate. In order to do this, the cash flows arising from the development and production plan have been evaluated using a base case that is unlevered (except for leasing of the mining fleet) and an alternative levered case in which 60% of project capital is debt-financed. In each case, a computation is made of the respective IRR, NPV and payback period. The sensitivity of the NPV and IRR results to changes in the assumptions for revenue drivers (molybdenum price, grade, and recovery) capital cost, operating cost, discount rate and leverage are then examined.

22.3 Macro-Economic Assumptions

22.3.1 Exchange Rate and Inflation

All results are expressed in United States dollars ($) except where stated otherwise. Where appropriate, key results and costs are also converted to Euro (€) at an exchange rate of $1.1477 per Euro. Cost estimates and other inputs to the cash flow model for the Project have been prepared using constant, first quarter 2022 USD money terms, i.e., without provision for escalation or inflation.

22.3.2 Weighted Average Cost of Capital

In order to find the NPV of the cash flows forecast for the Project, an appropriate discount factor must be applied, which represents the weighted average cost of capital (WACC) imposed on the Project by the capital markets. The base case cash flow projections have been prepared on an all-equity basis except for the impact of equipment leases for the mining fleet. This being the case, WACC is equal to the market cost of equity. In this case, Micon has selected an annual discount rate of 6% for its base case and has tested the sensitivity of the Project to changes in this rate.

For the levered case, the same WACC of 6% has been assumed the sake of comparability. In this case, it is assumed that debt finance provides 60% of initial capital at a pre-tax cost of 7% p.a. The applicable tax rate is 25%, so the after-tax cost of debt is 5.25%. The implied cost of equity in this case is: (6% - (5.25%*60%))/40%, or 7.125%.

A sensitivity study compares the NPV and IRR results of both cases at discount rates of between 5% and 10%.

22.3.3 Expected Metal Prices

Project revenues will be generated from the sale of molybdenum concentrate to end users and offshore smelters after allowing for concentrate transport and treatment charges and related selling costs.

The Project has been evaluated using a constant molybdenum market price of $18/lb Mo, reflecting the recent upturn in spot price that continues a trend established in mid-2020. Figure 22-1 presents monthly average spot prices for molybdenum over the past 15 years.

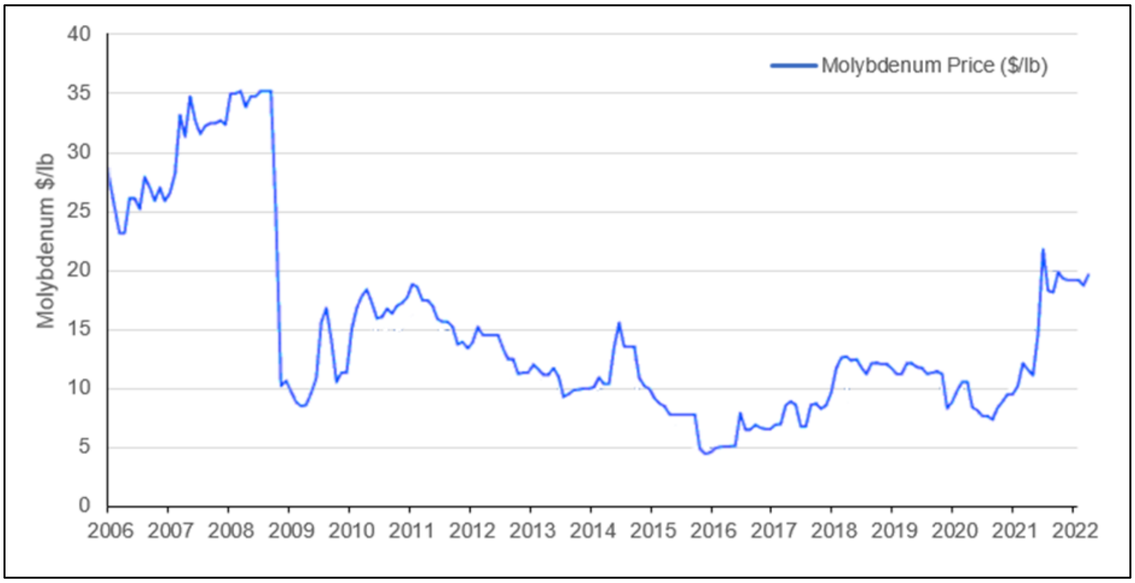


Figure 22-1: Molybdenum Price 2006-2022 (World Bank, 2022)

Project revenue is calculated after deducting 1.25% of metal in concentrate, a treatment charge of 9% of payable metal value and concentrate transport costs of $50/wmt, including 2% moisture. The resulting net revenue represents approximately 89.6% of the gross value of metal in concentrate.

22.3.4 Royalties and Taxation

Greenland imposes a royalty on base metal production at the rate of 2.5% of net revenue.

Corporate taxation in Greenland has been provided for in the cash flow based on a rate of 25% of net income after allowances for depreciation of plant, equipment and capitalized costs of development are taken into account. Royalty payments are credited against income tax payable.

22.3.5 Working Capital

Provision is made in the cash flow for 24 weeks of product inventory, plus 2 weeks of accounts receivable, offset by 2 weeks of accounts payable. An additional $10 million is assumed for inventory of parts and supplies. During the first 10 years of the Project, it has been assumed that up to 90% of the product inventory will be financed through a bank facility bearing interest at an annual rate of 5%. This debt peaks in Year 4 at $261.4 million, with average annual interest costs of $7.9 million over the 10-year period of the facility. In the following 10 years, working capital requirements decline from $220 million (Year 10) to under $100 million (Year 19). Working capital is assumed to be recouped in Year 20 when production ceases.

22.4 Technical Assumptions

The technical parameters, production forecasts and estimates described earlier in this report are reflected in the base case cash flow model. These inputs to the model are summarised below.

22.4.1 Production Schedule

Figure 22-2 shows the annual tonnages of waste mined and material milled, together with the average grade of mill-feed expressed as percentage content of MoS_2. While the tonnage milled remains constant over most of the LOM, average grade trends lower after Year 4, resulting in a steadily reducing volume of concentrate for sale, as shown in Figure 22-3.

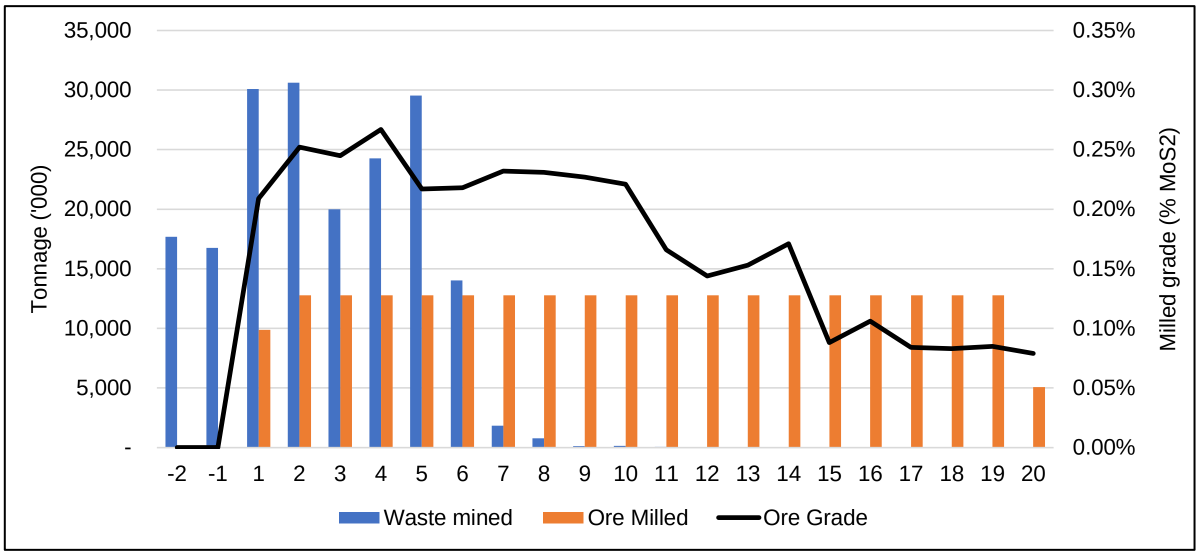


Figure 22-2: LOM Mining Production Schedule

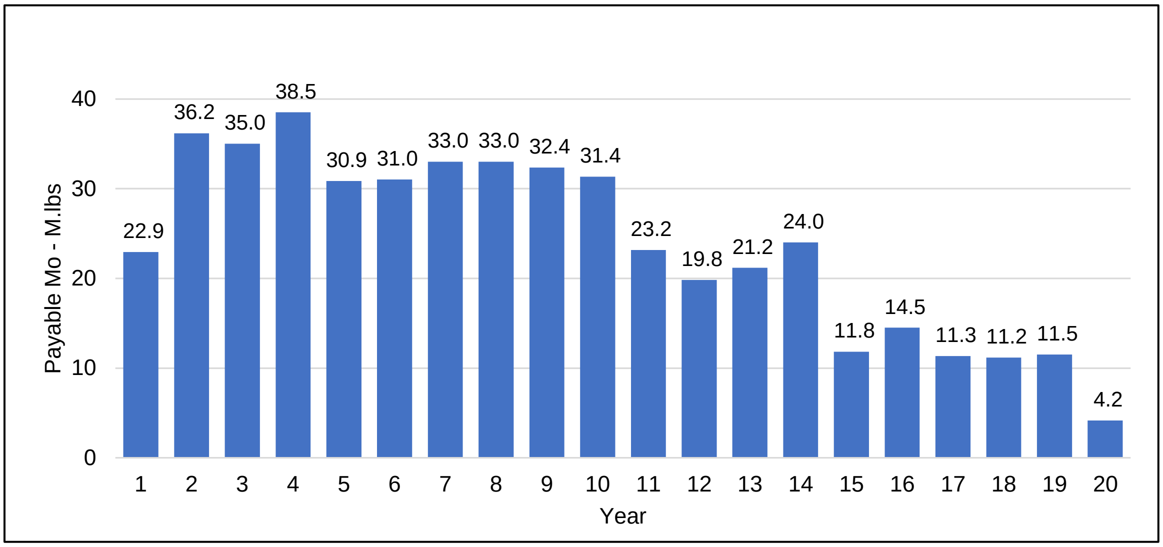


Figure 22-3: LOM Molybdenum Production Schedule

Average annual production in years 1-10 amounts to 32.8 million pounds per year of contained molybdenum metal from ore with an average grade of 0.23% MoS_2. Over the twenty-year open pit mine life, annual LOM production averages 24.1 million pounds molybdenum.

22.4.2 Capital Costs

Initial and sustaining capital costs are described in Section 21.0 and summarized in Table 22-1. Note: Mine closure and rehabilitation costs are excluded.

Table 22-1: Capital Costs

Description	Before Leasing*	Net Lease Adjustments	Capex with Leasing*
	$ M	$ M	$ M
Initial	870.3	(50.2)	**820.1**
Sustaining	218.0	59.0	**277.0**
Total Capital Costs	1,088.3	8.8	**1,097.1**

*Base Case assumes mining equipment is leased; Levered Case excludes leasing.

Base Case capital costs reflect the impact of leasing the fleet of mining equipment, in terms of which each item is assumed to be financed over 5 years at a rate of 5% p.a. with a 20% residual payable on expiry of the lease term.

Lease principal payments are treated as capital expenditure when incurred. Pre-production lease interest of $8.8 million is capitalized while lease interest paid during the operating period is expensed. The impact of equipment leasing is to defer $59 million of capital cost into the operating period, raising sustaining capital expenditure from $218 million (levered case) to $277 million in the base case.

22.4.3 Operating Costs

Project cash operating costs are summarized in Table 22-2.

Table 22-2: Operating Costs

Description	LOM Total Operating Cost	Unit cost per t milled	Unit cost per lb Payable Mo
	$'000	$/t	$/lb
LOM Mining Operating Costs	1,103,305	4.50	2.31
Less Capitalized Preproduction*	(137,538)	(0.56)	(0.29)
Net Mining Operating costs	965,968	3.94	2.02
Ore transport and Processing	1,964,451	8.02	4.12
G&A Operating Costs	111,991	0.46	0.23
Cash Operating Expenses	**3,042,410**	**12.42**	**6.38**
Selling Expenses	793,486	3.24	1.66
Total Operating Costs	**3,835,896**	**15.66**	**8.04**

*Base Case mining operating costs and capitalized operating costs include lease finance charges.

Over the LOM period the average cash cost is $6.38/lb payable Mo. Selling expenses, comprised mainly of concentrate transport and treatment charges, add a further $1.66/lb payable Mo. Figure 22-4 illustrates the breakdown of cash operating costs over the LOM period in comparison to gross revenue, demonstrating that the Project maintains a positive operating margin over the whole mine life.

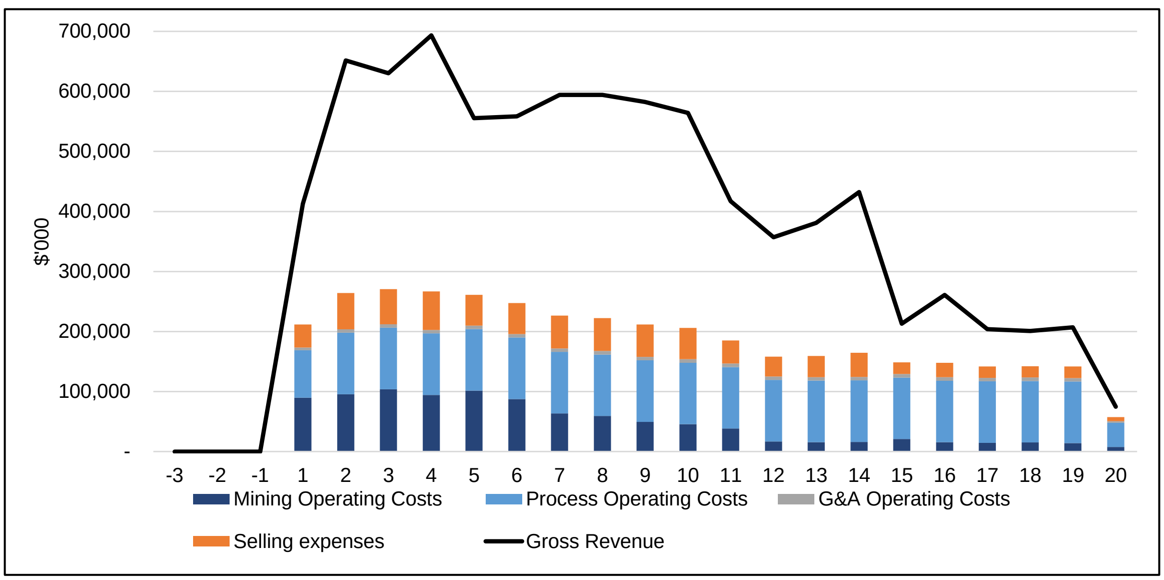


Figure 22-4: LOM Cash Operating Costs

22.5 Project Cash Flow

The LOM base case Project net cash flow after tax is presented in Table 22-3 and summarized in Figure 22-5.

Table 22-3: Base Case LOM Cash Flow Summary

Description	LOM Total Operating Cost	Unit cost per t milled	Unit cost per lb Payable Mo
	$'000	$/t	$/lb
Gross revenue	8,856,572	35.05	18.00
Operating Expenses	3,835,896	15.66	8.04
Net Operating Margin	4,750,676	19.39	9.96
Greenland Royalty	194,827	0.80	0.41
Inventory Finance Costs	79,169	0.32	0.17
Corporate Taxes	706,236	2.88	1.48
Capital Expenditure	1,097,031	4.48	2.30
Net Cash flow after Tax	2,673,414	10.91	5.60

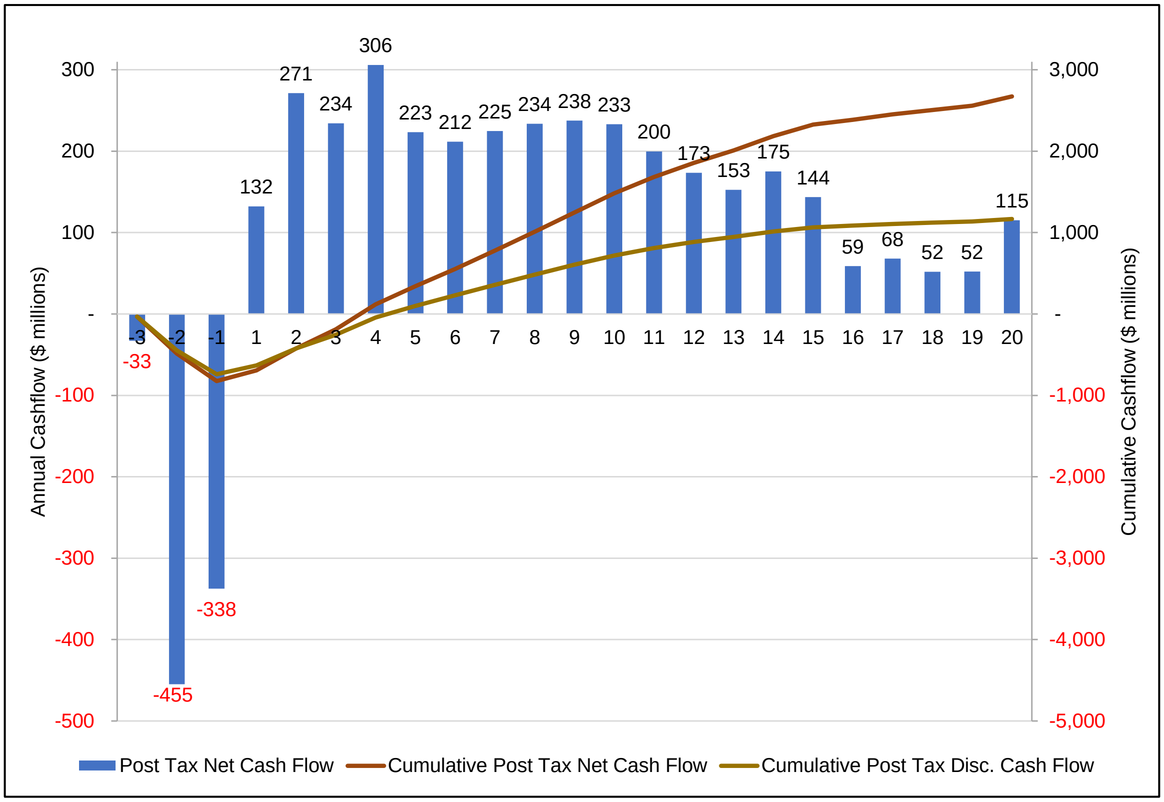


Figure 22-5: LOM Annual After-Tax Net Cash Flows

Annual cash flows are set out in Table 22-4.

Table 22-4: Base Case Annual Cash Flow

	Units	$/t Ore Milled	$/lb Pay Mo	Total/ Average	Year -3	Year -2	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
PRODUCTION																											
Waste Mined	kt			185,892		17,685	16,749	30,081	30,613	19,983	24,262	29,544	14,034	1,832	770	125	152	64	-	-	-	-	-	-	-	-	-
Total Ore Milled	kt			244,987		-	-	9,880	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	12,780	5,067
MoS_2 Grade	%			0.176%		-	-	0.209%	0.252%	0.245%	0.267%	0.217%	0.218%	0.232%	0.231%	0.227%	0.221%	0.166%	0.144%	0.153%	0.171%	0.088%	0.106%	0.084%	0.083%	0.085%	0.079%
Mo Grade	%			0.106%		-	-	0.125%	0.151%	0.147%	0.160%	0.130%	0.131%	0.139%	0.138%	0.136%	0.132%	0.099%	0.086%	0.092%	0.102%	0.053%	0.064%	0.050%	0.050%	0.051%	0.047%
MoS_2 Recovery	%			84.6%		-	-	85.2%	86.1%	85.7%	86.5%	85.3%	85.3%	85.3%	85.7%	85.5%	85.1%	83.7%	82.6%	83.0%	84.2%	80.7%	82.1%	81.0%	80.7%	81.2%	79.7%
MoS_2 Concentrate	dmt			405,772		-	-	19,520	30,781	29,788	32,767	26,242	26,384	28,086	28,086	27,519	26,668	19,717	16,880	18,015	20,426	10,071	12,341	9,646	9,504	9,788	3,543
Concentrate Grade	%Mo			54.0%		-	-	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%	54.0%
Contained Molybdenum	klbs			483,070		-	-	23,238	36,645	35,463	39,009	31,241	31,410	33,436	33,436	32,761	31,748	23,473	20,096	21,447	24,317	11,990	14,692	11,483	11,314	11,652	4,218
REVENUE																											
Mo Payable	klbs			477,032				22,948	36,187	35,020	38,522	30,851	31,017	33,018	33,018	32,351	31,351	23,180	19,844	21,179	24,013	11,840	14,508	11,340	11,173	11,506	4,165
Mo Payments	$/lb Mo			$18.00				$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00
Gross Revenue	**k$**	**$35.05**	**$18.00**	**8,586,572**				**413,058**	**651,365**	**630,353**	**693,388**	**555,311**	**558,313**	**594,333**	**594,333**	**582,326**	**564,316**	**417,234**	**357,200**	**381,214**	**432,242**	**213,119**	**261,146**	**204,114**	**201,113**	**207,116**	**74,978**
Mining Operating Costs	k$	$3.94	$2.02	965,968	-	-	-	89,707	95,505	103,906	94,427	101,504	87,553	63,513	59,264	49,593	45,592	38,367	16,894	15,807	16,206	20,868	15,556	14,630	15,244	14,263	7,568
Process Operating Costs	k$	$8.02	$4.12	1,964,451	-	-	-	79,224	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	102,478	40,631
G&A Operating Costs	k$	$0.46	$0.23	111,991	-	-	-	4,516	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	5,842	2,316
Selling expenses	k$	$3.24	$1.66	793,486	-	-	-	38,171	60,193	58,251	64,076	51,316	51,594	54,922	54,922	53,813	52,148	38,557	33,009	35,228	39,944	19,694	24,133	18,862	18,585	19,140	6,929
Cash Operating Expenses	**k$**	**$15.66**	**$8.04**	**3,835,896**	**-**	**-**	**-**	**211,618**	**264,017**	**270,477**	**266,823**	**261,140**	**247,466**	**226,756**	**222,506**	**211,725**	**206,060**	**185,243**	**158,223**	**159,354**	**164,469**	**148,883**	**148,009**	**141,812**	**142,149**	**141,722**	**57,444**
Net Operating Margin	k$	$19.39	$9.96	4,750,676	-	-	-	201,440	387,348	359,876	426,565	294,171	310,847	367,577	371,827	370,601	358,256	231,990	198,978	221,859	267,773	64,237	113,138	62,302	58,964	65,394	17,534
Greenland Royalty	k$	$0.80	$0.41	194,827	-	-	-	9,372	14,779	14,303	15,733	12,600	12,668	13,485	13,485	13,213	12,804	9,467	8,105	8,650	9,807	4,836	5,925	4,631	4,563	4,699	1,701
Inventory Finance	k$	$0.32	$0.17	79,169	-	-	-	1,168	12,278	11,882	13,070	10,468	9,745	8,299	6,224	4,065	1,970	-	-	-	-	-	-	-	-	-	-
Corporate Taxes	k$	$2.88	$1.48	706,236	-	-	-	10,159	51,953	48,317	65,934	39,793	46,059	61,168	64,029	65,638	64,419	38,202	32,208	37,698	48,119	3,772	14,915	4,064	3,922	5,866	-
Capital Expenditure	k$	$4.48	$2.30	1,097,031	32,801	452,486	335,023	18,481	19,726	53,020	20,665	18,841	14,422	13,676	12,699	12,077	11,942	11,553	11,598	11,866	11,447	11,626	11,493	11,486	103	-	-
Changes in Working Capital	k$	-	-	-	-	2,500	2,500	30,050	17,133	-1,937	5,205	-10,876	16,358	46,190	41,657	38,093	33,893	-27,070	-26,417	10,939	23,141	-99,616	21,999	-25,845	-1,386	2,762	-99,273
Post Tax Net Cash Flow	**k$**	**$10.91**	**$5.60**	**2,673,414**	**-32,801**	**-454,986**	**-337,523**	**132,210**	**271,478**	**234,291**	**305,958**	**223,346**	**211,594**	**224,759**	**233,733**	**237,514**	**233,227**	**199,838**	**173,484**	**152,707**	**175,259**	**143,619**	**58,806**	**67,966**	**51,762**	**52,066**	**115,106**
Cumulative Post Tax Net Cash Flow					-32,801	-487,787	-825,310	-693,100	-421,622	-187,331	118,627	341,974	553,568	778,327	1,012,060	1,249,574	1,482,801	1,682,639	1,856,123	2,008,830	2,184,089	2,327,707	2,386,514	2,454,480	2,506,241	2,558,307	2,673,414
Post Tax Discounted Cash Flow at 6%	k$			1,168,633	-31,859	-416,907	-291,769	107,819	208,862	170,049	209,495	144,273	128,945	129,215	126,768	121,527	112,579	91,002	74,529	61,890	67,009	51,803	20,011	21,819	15,676	14,876	31,025
Cumulative Post Tax Disc. Cash Flow	k$				-31,859	-448,766	-740,535	-632,716	-423,855	-253,806	-44,311	99,962	228,907	358,122	484,889	606,416	718,994	809,996	884,525	946,414	1,013,423	1,065,227	1,085,238	1,107,056	1,122,732	1,137,608	1,168,633

22.5.1 Base Case Economic Evaluation

Applying an annual discount rate of 6%, the Project base case after-tax cash flow evaluates to a NPV_6 of $1,169 million and an IRR of 22.4%. After-tax undiscounted payback is 3.6 years, or 4.3 years when discounted at 6% per year. Further details of the base case results are given in Table 22-5.

Table 22-5: Base Case Economic Results

Item	Units	Base Case	
		$	Euro
Pre-tax Undiscounted Cash Flow	Millions	$3,574	€3,114
Pre-tax NPV@6%	Millions	$1,803	€1,570
Pre-tax IRR	%	27.7	
Pre-tax Payback	years	3.1	
After-tax Undiscounted Cash	Millions	$2,673	€2,329
After-tax NPV @ 6%	Millions	$1,169	€1,018
After-tax IRR	%	22.4	
After-tax Payback	years	3.6	

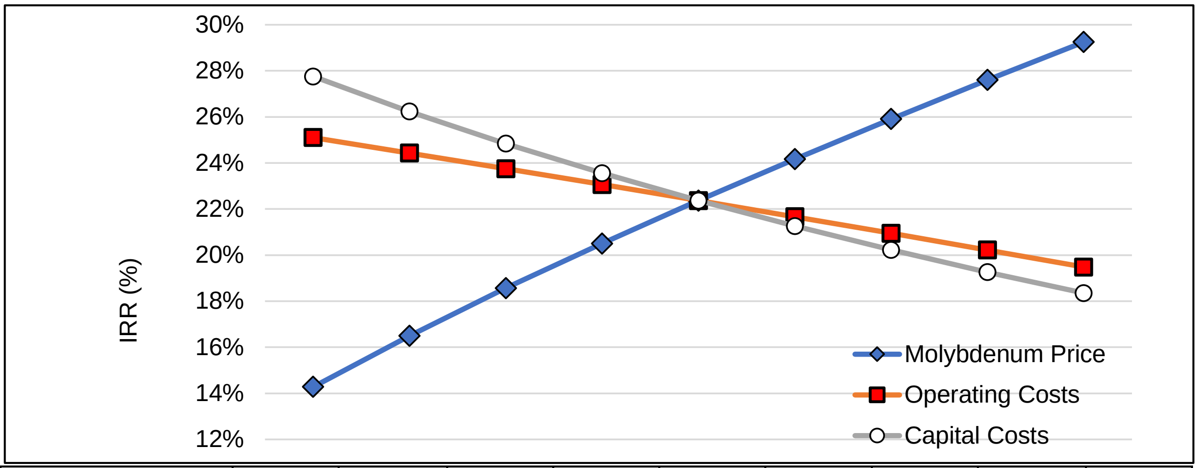
22.6 Sensitivity Analyses

22.6.1 Sensitivity to Price, Capital, and Operating Costs

Figure 22-6 shows the sensitivity of Base Case after tax IRR to changes in Molybdenum Price, Capital, and Operating Costs. In this analysis, molybdenum price may be taken as a proxy both for reserve grade and metallurgical recovery of molybdenum.

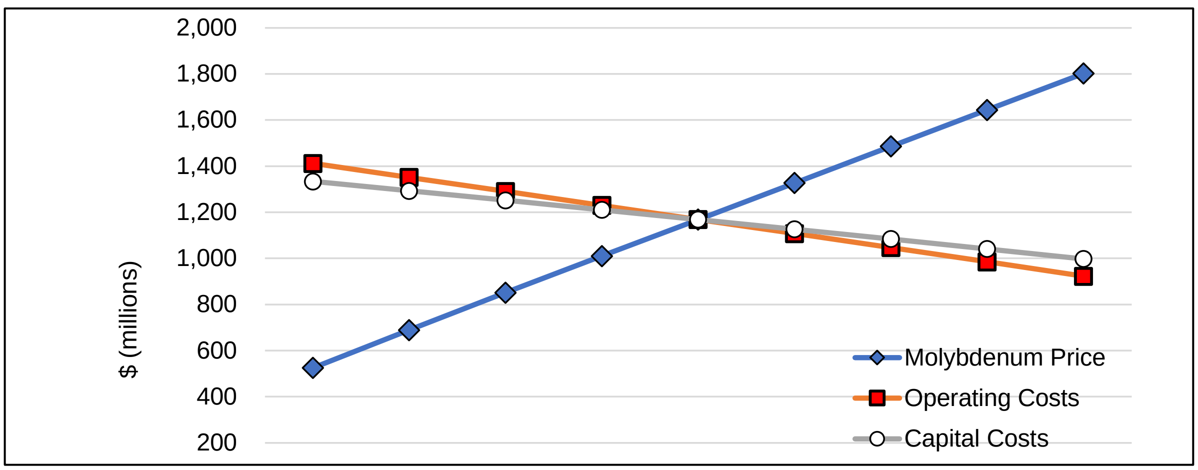
Figure 22-7 shows the sensitivity of Base Case after tax NPV_6 to changes in Molybdenum Price. In this analysis, molybdenum price may be taken as a proxy both for reserve grade and metallurgical recovery of molybdenum.

These charts identify revenue drivers (price, grade, recovery) as the most important factor in determining the viability of the Project. Capital and Operating costs are both less important, though the Project is slightly more sensitive to the latter. Importantly, the results demonstrate that NPV_6 remains positive across the range of sensitivity tested, suggesting the Project can withstand 20% negative variance in any of these three factors.



	-20%	-15%	-10%	-5%	Base	+5%	+10%	+15%	+20%
Molybdenum Price	14.3%	16.5%	18.6%	20.5%	22.4%	24.2%	25.9%	27.6%	29.3%
Operating Costs	25.1%	24.4%	23.8%	23.1%	22.4%	21.7%	20.9%	20.2%	19.5%
Capital Costs	27.8%	26.2%	24.8%	23.6%	22.4%	21.3%	20.2%	19.3%	18.4%

Figure 22-6: IRR Sensitivity to Price, Capital, and Operating Costs



	-20%	-15%	-10%	-5%	Base	+5%	+10%	+15%	+20%
Molybdenum Price	525	689	852	1,010	1,169	1,327	1,486	1,644	1,802
Operating Costs	1,412	1,351	1,290	1,230	1,169	1,108	1,047	985	923
Capital Costs	1,334	1,293	1,252	1,210	1,169	1,126	1,084	1,041	998

Figure 22-7: NPV Sensitivity to Price, Capital, and Operating Costs

22.6.2 Sensitivity to Price (Base Case)

Figure 22-8 shows the sensitivity of the Project after-tax IRR and NPV_6 to changes in molybdenum price, indicating the positive impact of using a spot price of $19.80/lb in place of the base case $18.00/lb. It can also be seen that NPV_6 remains positive with a 25% reduction in price to $13.50/lb. In the Base Case, NPV_6 is reduced to zero at a price of $10.10/lb Mo.

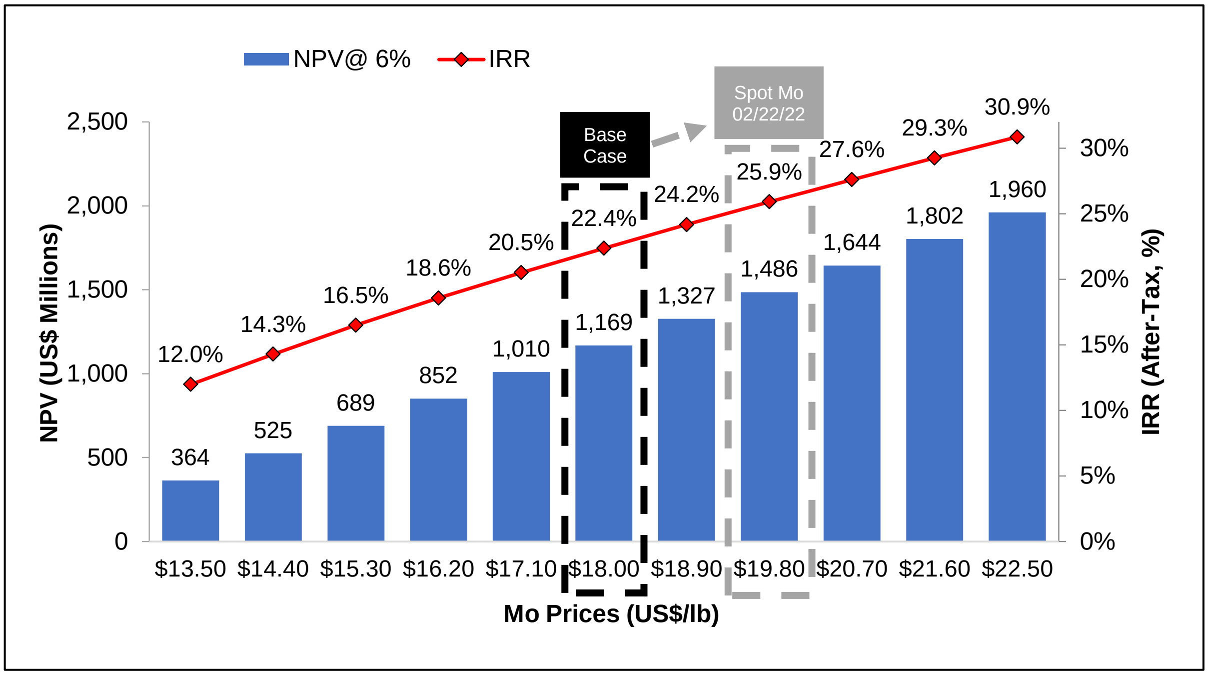


Figure 22-8: Base Case Sensitivity To Molybdenum Price

22.6.3 Evaluation of Levered Case

As an alternative to the base case evaluation, a Levered Case has also been considered. In this scenario, 60% of the initial capital is funded through debt repayable over 15 years bearing an annual interest rate of 7%. Net after-tax annual cash flows for the levered case are given in Figure 22-9.

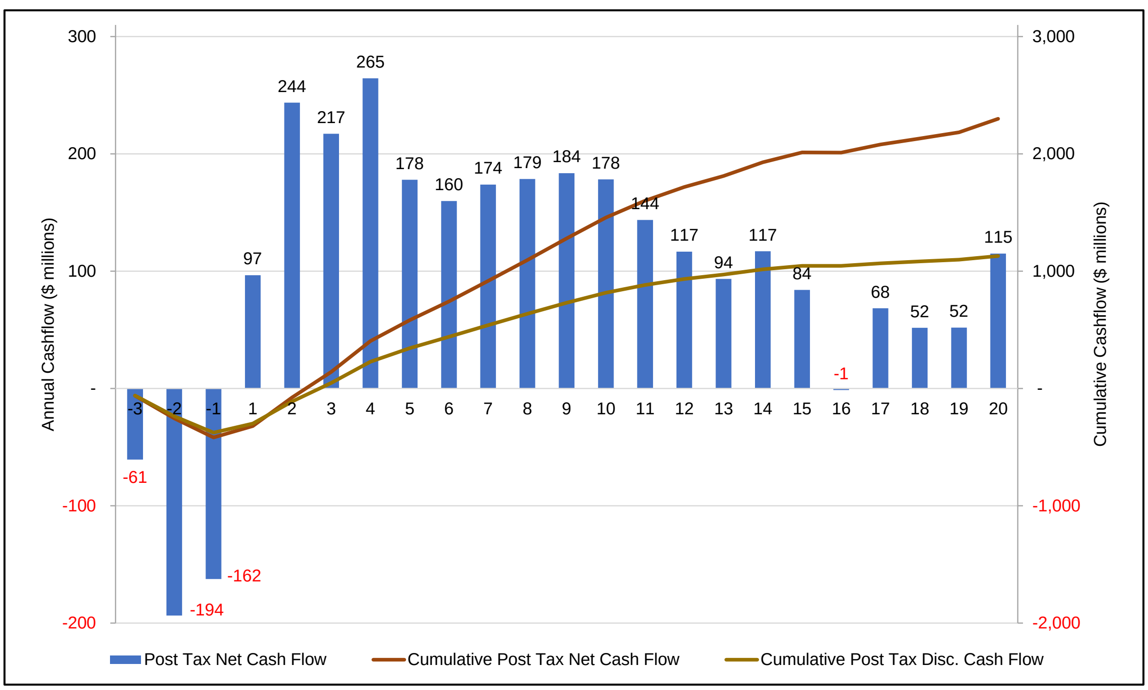


Figure 22-9: Levered Case Lom Annual Cash Flows

In the Levered Case, after-tax undiscounted payback is 2.4 years, or 2.7 years when discounted at 6% per year. Table 22-6 provides more details of the results for the Levered Case.

Table 22-6: Levered Case Economic Results

Item	Units	Levered Case	
		$	Euro
Pre-tax Undiscounted Cash Flow	Millions	$3,101	€2,702
Pre-tax NPV@6%	Millions	$1,730	€1,504
Pre-tax IRR	%	40.4	
Pre-tax Payback	years	2.0	
After-tax Undiscounted Cash	Millions	$2,312	€2,002
After-tax NPV @ 6%	Millions	$1,129	€984
After-tax IRR	%	33.8	
After-tax Payback	years	2.4	

Sensitivity of the Levered Case IRR to the debt:equity ratio was investigated. The results, shown in Figure 22-10, demonstrate the benefit to equity holders of increasing leverage in the Project. Note that the 0:100 (all equity) results do not match the Project base case because this sensitivity analysis excluded mining equipment lease finance.

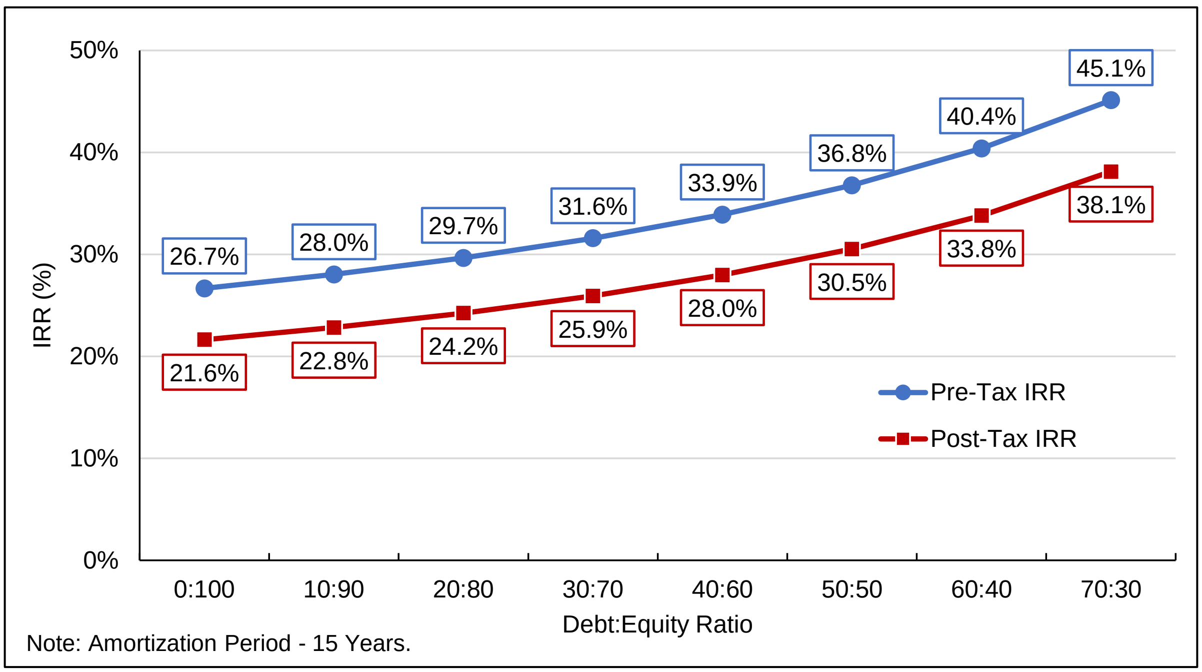
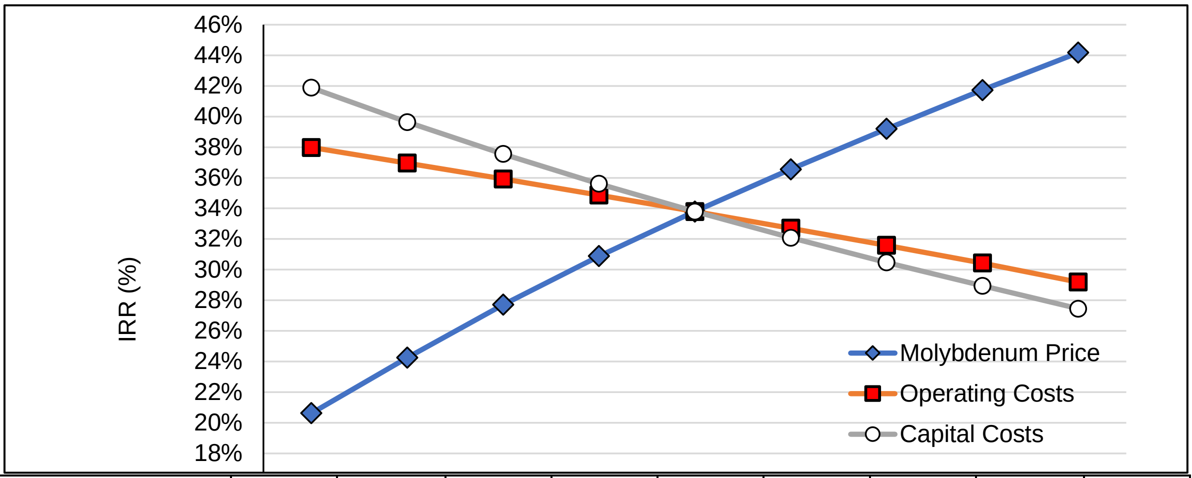


Figure 22-10: IRR Sensitivity to Debt:Equity Ratio (Levered Case)

22.6.4 Sensitivity to Price, Capital, and Operating Costs (Levered Case)

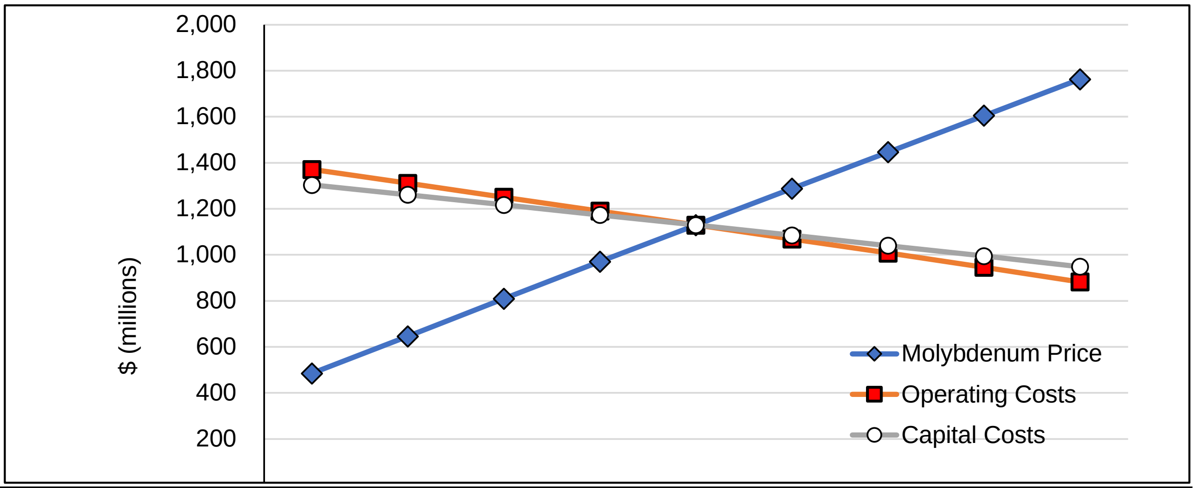
Figure 22-11 shows the after tax sensitivity of the Levered Case IRR to changes in Molybdenum Price, Capital, and Operating Costs. In this analysis, molybdenum price may be taken as a proxy both for reserve grade and metallurgical recovery of molybdenum.



	-20%	-15%	-10%	-5%	Base	+5%	+10%	+15%	+20%
Molybdenum Price	20.6%	24.3%	27.7%	30.9%	33.8%	36.6%	39.2%	41.7%	44.2%
Operating Costs	38.0%	37.0%	35.9%	34.9%	33.8%	32.7%	31.6%	30.4%	29.2%
Capital Costs	41.9%	39.6%	37.6%	35.6%	33.8%	32.1%	30.5%	28.9%	27.5%

Figure 22-11: IRR Sensitivity (Levered Case)

Figure 22-12 shows the after-tax sensitivity of Levered Case NPV_6 to changes in Molybdenum Price, Capital and Operating Costs In this analysis, molybdenum price may be taken as a proxy both for reserve grade and metallurgical recovery of molybdenum.



	-20%	-15%	-10%	-5%	Base	+5%	+10%	+15%	+20%
Molybdenum Price	485	646	809	971	1,129	1,288	1,446	1,605	1,763
Operating Costs	1,371	1,311	1,250	1,190	1,129	1,069	1,008	946	882
Capital Costs	1,304	1,261	1,217	1,173	1,129	1,085	1,040	995	948

Figure 22-12: NPV Sensitivity (Levered Case)

The above charts identify revenue drivers (price, grade, recovery) as the most important factor in determining the viability of the Project. Capital and Operating costs are both less important, though the Project is slightly more sensitive to the latter. Importantly, the results demonstrate that NPV_6 remains positive across the range of sensitivity tested, suggesting the Project can withstand 20% negative variance in any of these three factors.

22.6.5 Sensitivity to Price (Levered Case)

Figure 22-13 shows the sensitivity of the Levered Case after-tax IRR and NPV_6 to changes in molybdenum price, indicating the positive impact of using a spot price of $19.80/lb in place of the base case $18.00/lb. It can also be seen that NPV_6 remains positive with a 25% reduction in price to $13.50/lb. In the Levered Case, NPV_6 is reduced to zero at a price of $11.25/lb.

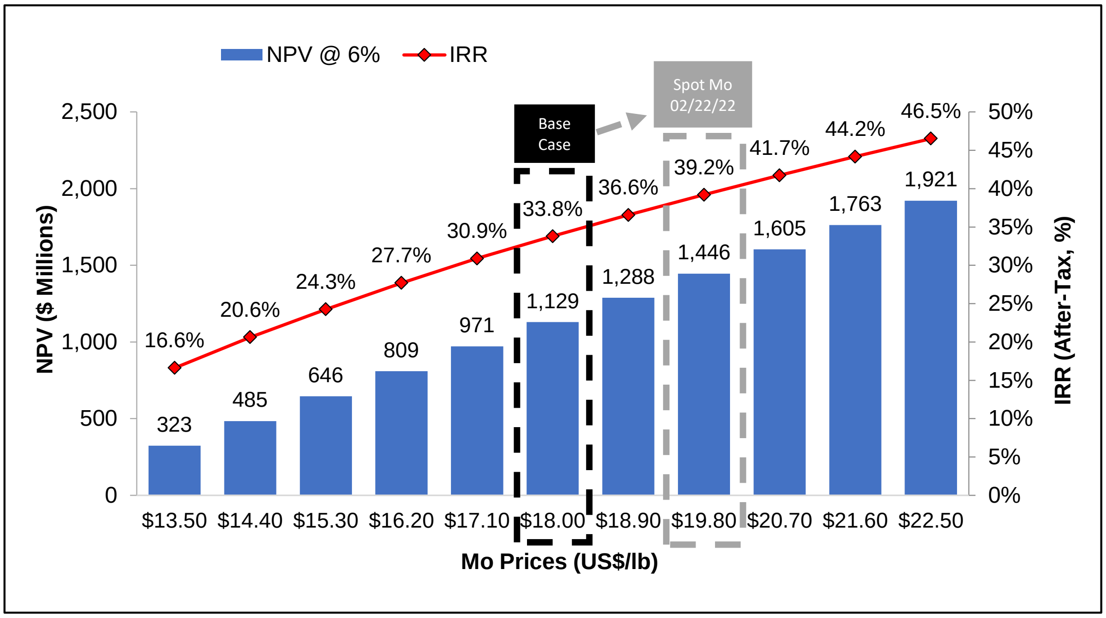


Figure 22-13: Levered Case Sensitivity to Molybdenum Price

22.6.6 Sensitivity to Discount Rate

Table 22-7 shows the sensitivity to discount rate of after-tax NPV in the Base and Levered cases.

Table 22-7: NPV Sensitivity to Discount Rate

Discount Rate	After-tax ($M)	
% p.a.	Base Case	Levered Case
Undiscounted c/flow	2,673	2,299
NPV at 5% disc.	1,342	1,266
NPV at 6% disc.	1,169	1,129
NPV at 8% disc.	882	902
NPV at 10% disc.	659	723

At discount rates of 5% and 6%, NPV is higher in the Base Case but, at discount rates of 8% and 10%, NPV is higher in the Levered Case. This result is consistent with the 7% pre-tax cost of debt assumed in the model.

22.7 Conclusion

This economic analysis of the Malmbjerg Molybdenum Project Base Case demonstrates that the Project is economically viable using the stated price assumptions, cost estimates and technical parameters generated by the FS, and the sensitivity analysis shows that positive returns can be achieved even with 20% adverse variance in price, operating costs, or capital expenditure. The alternative Levered Case demonstrates that returns to equity may be further enhanced when debt funding is applied to 60% of the initial capital costs.

23.0 ADJACENT PROPERTIES

Malmbjerg property is border on all sides by mineral exploration claims held by Longland Resources Limited. The authors of this report have not independently verified the information pertaining to the adjacent claims.

24.0 OTHER RELEVANT DATA AND INFORMATION

24.1 Project Execution Plan

24.1.1 Introduction

The Project Execution Plan (PEP) describes the strategy for executing the Project engineering, procurement, construction, and commissioning phases. This includes the mine, process plant, and TMF. The PEP is based on the following principles:

- Promote safety in design, logistics, construction, and operation for a zero-harm project implementation
- Use the Design, Supply, and Build (DSB) approach for the procurement, construction and commissioning of critical operational systems and equipment
- Expedite factory site and process components, preassembly, modularization, testing to minimize site construction hours and hazards
- Maximize contracting opportunities for major scope components
- Advance planning and scheduling to utilize the ice-free season for ocean shipping

24.1.2 PEP Scope Outline

The Project's Work Breakdown Structure (WBS) is divided as follows:

- Mine site: mine equipment, mine maintenance and primary crusher.
- Ore transport.: RopeCon conveyor
- Port site including process barges, accommodations, concentrate storage, power plant, fuel storage and distribution, tailings and reclaim water pipelines and TMF.
- Shipping and services: consumables receiving and storage, including fuel delivery, concentrate loadout and shipping, and site services.
- Fabrication site (off-site shipyard): concentrator process barges, mill equipment assembly, workshops, and ocean transport to site.

The PEP for each major WBS area is sub-divided into three project phases, from the current FS to full production. The three phases are:

1. Detailed mine, concentrator, port site and TMF engineering
2. Implementation, including Early Works (to mobilize and site preparation), construction, and checkout and commissioning
3. Operations, including operations preparation, ramp-up, and performance testing.

In addition, the Project scope also includes the following activities that are required to support the phases above.

- Logistics planning and implementation.
- Operations preparation – to hire and train the operations team.
- Environmental and regulatory – as required by the Government local authorities
- Community and Stakeholder engagement

24.1.3 Execution Strategy

The primary strategy for the Project is to spend the time and effort in the Engineering phase preparing in as much detail as possible to mitigate risks during the implementation phases. Once the Project is entirely planned and analyzed for completeness and achievability, the Project will be mobilized to the site to complete the implementation phases as rapidly as possible to minimize the costly person-days on-site. This strategy will be realized through the following approaches:

- Prefabricating and assembling concentrator equipment, services, and ancillary components off-site on relocatable floating barges under a DSB contracting arrangement.
- Completion of all the engineering and procurement well in advance before mobilizing to site.
- Maximizing modularization of concentrator and infrastructure site components.
- Maximizing pre-assembly and commissioning of process and infrastructure components.
- Complete concentrator process wet run commissioning of all major mill equipment and process circuits before shipping to site.
- Logistics planning and scheduling all equipment and components required for each phase well before the summer shipping window opens.
- Utilizing floating accommodation blocks for construction and operations housing.

This strategy will minimize the Project's exposure to unfavourable logistics, weather delay conditions and vessel availability risks that will impact productivity on-site and delay the Project.

The procurement strategy for the Project implementation phase is based on a DSB approach for the design, procurement and construction of critical operational systems and equipment. The Project will work towards establishing DSB packages whereby the suppliers complete their scope from Engineering and equipment supply through to installation, start-up, and verification of performance guarantees. This DSB approach will be applied where the suppliers have established expertise with the specific scope of work. In instances where suppliers cannot support a DSB approach for their specific contract, the overall construction plan can be adjusted to an EPC or EPCM contract for those specific contracts only.

The Project also plans to maximize contracting opportunities as part of the procurement strategy. Some major scope components lend themselves to the contracting approach: the power plant, transport services, accommodations catering, and safety/security services. This would help the Project apply its 'risk mitigation' contingency funds to the best-equipped parties to address and mitigate the risks. Accordingly, the costs are minimized with the Project Execution Team primarily fulfilling the contracts management role and the DSB suppliers performing most of the Project detail design and construction logistics themselves.

Finally, the Project will utilize the north access route to the Malmbjerg deposit through the Mesters Vig Inlet for the life of the Project. A permanent Project operations office and accommodation, housed in a modified ocean cruise vessel, will be established at the Mesters Vig Inlet. Mesters Vig will be the permanent staging location for Project construction and operations resupply, staging, and support logistics. The concentrator, power plant, concentrate storage, warehouse facilities and infrastructure installations required for Project construction and operations will also be located at Mesters Vig.

24.1.4 Project Schedule

The Project construction is expected to be approximately 3 years. All the Engineering studies and planning will be completed in advance. The long lead items and detailed logistics planning will also be carried out beforehand. On-site geotechnical drilling and surveying will be completed as required to support the Engineering work before construction.

The major tasks comprising the critical path of the Project schedule include the following:

- Mine and process detailed engineering and design.
- Identification of DSB vendors and development of contracts required for all concentrator, mine, and infrastructure process sections
- Procurement of long lead-time equipment such as crusher, SAG mills and ball mill procurement
- Process barges fabrication and population
- Completion of RopeCon conveyor engineering, design, and procurement
- Logistics planning and execution.

A high-level schedule presented in Figure 24-1 lays out the activities for each of the major scope areas, indicating how the completion of each area is coordinated to achieve the production ramp-up to steady-state operations.

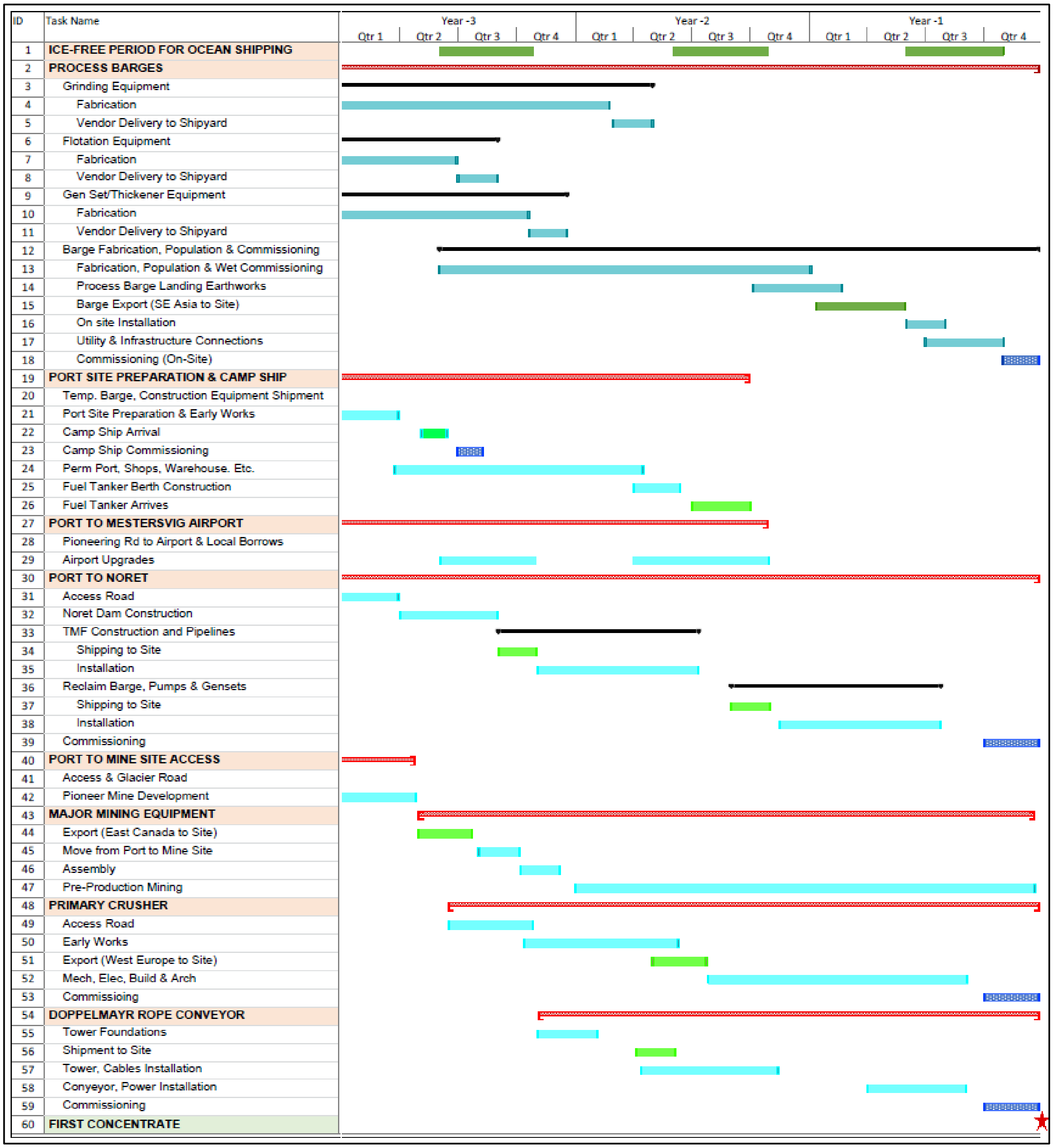


Figure 24-1: Summarized Construction Schedule

24.1.5 Project Management Procedures

The Project Management team will combine the experience of GRI personnel with engineering and construction managers who will be responsible for following the PEP to complete the Project on time and within budget. The Project will be designed and constructed to the highest industry and regulatory body standards, emphasizing environmental and safety considerations. Figure 24-2 shows the management team. GRI will act as the Owner to manage suppliers for the DSB approach.

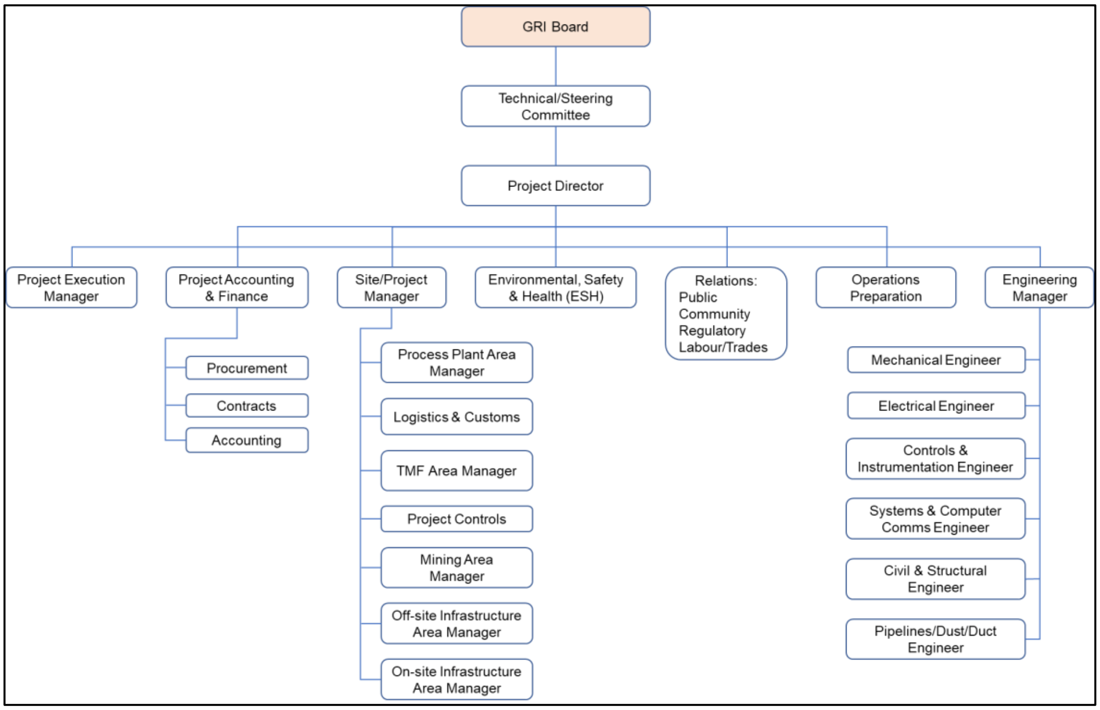


Figure 24-2: Project Management Organization Chart

In conjunction with GRI, the management group will develop comprehensive procedures and standards to establish the Project charter and procedures manual for the execution and administration of the Project. The Project Procedures Manual will outline the following:

- project organization
- communication matrix
- responsibility matrix
- reporting requirements
- data management
- document control
- drawing and specification preparation, including numbering protocols, levels of issue, and transmittal procedures
- equipment and materials procurement procedures
- project scheduling requirements, tools, formats, and issue times
- project accounting methods, including the cost reporting and forecasting systems

- construction contract procedures, including bidding and awarding the work
- site administration procedures, including camp administration rules
- site safety
- field engineering
- safety procedures
- quality assurance expectations
- site and office personnel rules and regulations
- emergency site procedures and contact information
- construction of temporary facilities (power, water, offices, and camp)
- site housekeeping and hazardous waste management
- mechanical completion expectations, including lock-out procedures
- commissioning procedures outline
- project close-out and handover procedures
- other administrative matters and issues specific to the Project

24.1.6 Engineering

24.1.6.1 Engineering Strategy

Primary engineering work will include the following categories:

- water, waste, and tailings design
- open pit mine design
- process barges
- ancillary facilities
- site development and infrastructure
- RopeCon conveyor
- access roads
- airstrips
- diesel fuel storage

Under the DSB approach, the suppliers/contracts are responsible for conducting the detailed engineering design work for specific components, including process barges, process equipment and the RopeCon conveyor.

24.1.6.2 Detailed Layout Engineering

The layout engineering provides detailed drawings and specifications for connecting utilities, including power, instrumentation, water, and pipes between different process plant components. The equipment suppliers will provide the detailed drawings for the major and minor equipment, and the Owner's team will provide the interconnections.

24.1.6.3 Procurement and Contracts

The Owner's Procurement team will provide capital equipment procurement and expediting services. The team will package the technical and commercial documentation and manage the bidding cycle for equipment and materials. Standard procurement terms and conditions approved for the project will be utilized for all equipment and material purchase orders. Suppliers will be selected based on their expertise and experience, location, quality, price, delivery, and support service.

The Procurement team will organize bulk materials purchases, assemble contract tendering documents, establish qualified bid lists, issue tenders, analyze and recommend suitably qualified contractors to GRI, and prepare executed contracts for issue.

A field procurement manager from GRI will manage ongoing construction needs for miscellaneous materials and services and assist with expediting tasks. The field procurement manager will also be responsible for the receipt, storage, and disbursement of purchased materials and equipment at the job site.

24.1.6.4 Project Direction

The Owner's team will establish an off-site project office within easy commuting distance to the site (possibly Dublin). This office will provide the Project direction and house the Owner's team for the engineering and procurement phases. The site office will provide direct day-to-day management of all site activities.

24.1.7 Construction

The Project location is subject to an ice-free shipping season between June to October annually. Consequently, the construction materials and equipment required for the year's site activities must be marshalled, loaded, delivered, and offloaded in this shipping window the year before.

From an operations viewpoint, all consumables and concentrate will be scheduled to be received and shipped respectively during this shipping period. This means that a minimum of one (possibly two) years of consumables, including fuel, spares, and equipment, must be brought to the site during this 5-month shipping window.

24.1.7.1 Construction Management

The site/project manager will manage all on-site and off-site construction and process equipment installation operations. Reporting to the Project Director, the execution manager will plan, organize, and manage construction quality, safety, budget, and schedule objectives. Construction of the Project will be performed by contractors under the direction of the site manager, reporting to the Project Director. The key objectives are to:

- Conduct on-site Health, Safety and Environmental (HSE) policy training and enforcement for all site and contractor staff. Site hazard management tools and programs will achieve the no harm/zero-accident objective.
- Apply on-site and off-site contracting and construction infrastructure strategies to support the Project execution requirements.
- Develop and implement a construction-sensitive and cost-effective master Project schedule.
- Establish a Project cost control system to ensure effective cost reporting, monitoring, and forecasting and schedule reporting and control. A cost trending program will be instigated whereby the contractor will be responsible for evaluating costs on an ongoing basis for comparison to budget and forecasting for the cost report monthly.
- Establish an on-site and off-site contract administration system to effectively manage, control, and coordinate the work performed by DSB contractors.
- Solicit tenders from the contractors and award the construction contracts to successful contractors.
- Apply an effective field constructability program to continue the constructability reviews performed in the design office.
- To develop a detailed field procurement of bulk materials, expediting, logistics, and material control plan to maintain the necessary flow and control of material and equipment to support construction operations.

24.1.7.2 Field Engineering

Surveying

The Owner's team will verify the accuracy of the site-based existing control system before construction begins. The Owner's team will supervise day-to-day field surveying, and the site management team will provide spot checks. The DSB contractor for each installation will verify surveys prior to construction.

Quality Control/Quality Assurance

On-site and off-site DSB contractors will establish and observe their own quality control program in accordance with the DSB contractual technical specifications and applicable codes and standards.

Document Control

All on-site and off-site DSB contractual drawings, specifications, and other documents will be electronically transferred to the field office, logged in, updated in the master stick-file, and distributed to contractors and their supervisors.

Construction Strategy

The DSB construction contracts for the mine and port site facilities, access roads, airport, TMF, process equipment and process barges are expected to be awarded to separate specialized contractors. Early works will be developed in parallel to the construction of the access road. A temporary construction camp will be located at Mesters Vig for Project startup and later replaced with a modified cruise vessel for personnel accommodation and Project administration operations.

Construction Labour Roster

The on-site construction establishment labour schedule is based on two 12-hour shifts. Crews will rotate on a four-weeks-on-site and two-week-off-site basis.

24.1.7.3 Construction Equipment

On-site construction equipment will be the responsibility of each DSB contractor. Contractor equipment safety and operability must comply with the requirements of the Mine Safety Branch. The Owner's safety personnel will perform spot checks to ensure compliance. No mobile equipment will be permitted to operate on-site unless it complies with the applicable Greenland regulations, and no cranes will be permitted to operate unless they have undergone a recent inspection. Equipment modifications must be certified fit for operation, particularly with respect to welding.

24.1.8 Communication

GRI will determine the appropriate on-site construction phase and permanent telecommunications technologies for the Project, with input from the team where needed. Requirements will include voice and data link technologies to support construction and plant operation needs.

24.1.9 Construction Power

On-site construction power will be provided to the DSB contractors as requested. The construction power will be supplied through a number of locally positioned power units for the temporary construction period. The power units will be supplied by low noise, low emission generator sets. In Year -3, a permanent power line will be completed to the mine site, and the power will be used for all mining equipment during the construction phase. After construction, the generator sets will supply emergency power for the duration of the mine life.

24.1.10 Construction Methods/Strategy

24.1.10.1 Early Works

The on-site Early Works Phase will be finished prior to the construction phase and include work to construct the access roads, upgrade BGMV and upgrade the port site for laydown and ancillary facilities. Work for this phase will be completed using small equipment. This work will allow the expedited commencement of future work when the port site to the mine site access road is completed and large equipment can be delivered to the mine site by ground transportation.

24.1.10.2 Mine Pioneering

Personnel, fuel, equipment, explosives, and any other mine items needed for mine development will be delivered to the port site and then transported to the mine along the access road. A pad will be constructed for a temporary camp within the footprint of the Schuchert permanent camp pad. The temporary pad will house personnel, fuel, and other items necessary for the initial construction of the mine. All the major mining equipment will be delivered by Y-3.

The site roads will be developed to the construction level starting from the camp to access all major areas of the mine. The truck shop area, campsite, and laydown areas will be excavated and graded, and the surplus cut material will be used as fill material where needed.

A waste rock storage facility with the capacity of storing all non-ore materials from the Malmbjerg open pit will be established close to the mine. When the ore is mined from the pit, it will either be delivered to the primary crusher or the run-of-mine (ROM) stockpile located next to the crusher (either the high-grade ore stockpile or the low-grade ore stockpile). The pre-strip and stockpiling operations would commence in Y-2.

24.1.10.3 Primary Crusher

The surface for the crusher loading station will be constructed at an elevation above the RopeCon conveyor loading station level. Consolidated rock will be drilled and blasted; dozers and excavators will move and place the blasted rock to form the mine roads. Once the primary crusher foundations are completed, the retaining wall will be constructed concurrently with the structural backfill and the mine truck ramp. The mine truck ramp will be constructed using mine overburden waste trucked to the crusher area by the mine trucks. The early works for the primary crusher would be completed in Y-3.

Once the ramp is in place, the superstructure for the crusher overhead crane will be installed, and the overhead crane will be mounted and energized. Once energized, the 10-t capacity overhead crane will be used to install the crusher shell sections and the pre-assembled main shaft. The DSB approach will be used for the construction and installation of the primary crusher. The crusher installation will be commenced in Y-2 and commissioned in Y-1.

24.1.10.4 RopeCon Conveyor

A pad for the RopeCon conveyor infrastructure will be constructed at the south end of Cirque A. Haul trucks will provide fill material sourced from the pit. Dozers and excavators will smooth the rock to create the pad. The site survey for the RopeCon conveyor tower foundations engineering will be completed in Y-3. The prefabricated towers and cables will be placed in Y-2, and the conveyors will be installed in Y-1.

24.1.10.5 Port Site

The pioneer equipment will be used to level off a laydown pad, construct a rock jetty into the water, secure moorings for the temporary barge camp, construct a level pad for the fuel barge on-shore and build the site access roads. The construction of access roads will start in two headings, the northeast heading (from the Port to Noret) and the southwest heading (from Port to Mine Road). During the Y-3 summer construction season, a cruise ship will be anchored offshore while the permanent berth is constructed. Work crew changes will be accomplished from the shore to the cruise ship with a ferry boat. Upon completion of the permanent cruise ship berth in the fall of Y-3, the ship will be permanently moored into position.

In Y-2, construction will include the uplands container storage area and in-water fuel tanker berth. A total of eight 100 Mt mooring bollards will be installed to secure the fuel ship into position. Starting in the winter of Y-2, when the ground is frozen, the excavation work will be performed for the process barge. Winter excavation will continue in Y-1 for the process barges. At the completion of the excavation to the design elevation, a final level course of aggregate will be installed to provide a flat area for the barges to be grounded. In the summer construction season, the barges will be towed into position and ballasted down to the prepared subgrade. The barges will be backfilled, and armor rock will be installed along the outside edge, protecting it from wave action. The six 1,500 mm piles will also be installed in Y-1 to secure the offloading barge that will be floated into position.

24.1.10.6 Process Barges

Three process barges will be fabricated at an Asian shipyard. The process equipment will be installed, pre-commissioned and prepared for ocean towing to the site. The DSB approach will be used for the construction and installation of process equipment. All three barges (grinding barge, flotation barge and power plant/tailings thickener barge) will be engineered, purchased, and fabricated in parallel. The barge fabrication and population (equipment installation on barges) will commence in Y-3 and be completed in Y-1. The wet commissioning will be completed in Y-1 at the shipyard. Barges will then be towed to the port site, where on-site installation, utility connections, and commissioning will occur.

24.1.10.7 Tailings Management Facility

Tailings generated from the metallurgical process will be stored in the Noret TMF, a large basin located immediately southeast of BGMV. An embankment will be constructed across the narrowest point of the ocean entrance into the TMF. The embankment will be constructed from local borrow and quarry sources in Y-3 and remain active throughout the LOM operations.

24.1.11 Commissioning

In the DSB approach, the vendors/supplier will be responsible for commissioning individual components. The process plant will be wet commissioned at the shipyard before delivery to the site. Once towed to the port site, the Owner's team will take over the custody of the plant and will start commissioning with the assistance of the engineer, the site management team, and the contractors' labour to ensure that the plant is performing as was designed. The Owner's team will be responsible for training the Owner's personnel.

24.2 Logistics

Standard twenty-foot equivalent unit (TEU) containers will be used as the primary shipping module for construction materials and equipment during the construction phase, followed by consumables and molybdenum concentrate during LOM operations. GRI will purchase containers required for the construction and operation period annually based on a rent-to-own approach where the expected inventory of containers required for the Project will reach 3,500 TEUs. On-site containers will be used as outdoor storage for consumables during operations and molybdenum concentrate.

The proposed container Lease/Purchase agreement allocates the containers as an off-balance sheet item entry until the 49th month, and then it becomes an asset valued at approximately $3 million.

Containers will be used to transport consumables from both Quebec and Rotterdam/Antwerp to Malmbjerg, and molybdenum concentrate will be shipped directly to Rotterdam/Antwerp for further treatment. It is anticipated that containers will be stored at these three ports during the non-shipping months and will be reloaded during the shipping windows.

GRI will establish a Logistics and Procurement department to effectively manage and optimize the container logistics in conjunction with the charter vessel operation. The logistics plan will manage charted dedicated vessels in rotation between Greenland, Europe, and Canada to reduce vessel sailing operating costs. The logistics department will manage the short-term rental of the containers orphaned during the off-season at these three ports.

25.0 INTERPRETATION AND CONCLUSIONS

25.1 Geology, Exploration, Drilling, and Analytical Data Collection in Support of Mineral Resource Estimation

MMTS provides the following conclusions:

- The assay QAQC data demonstrates that the assaying for the 2005 and 2007 programs was carried out properly and has yielded valid information appropriate for use in mineral resource estimation.
- Quarter core duplicate samples collected by the QP in 2021 show acceptable results to validate the historic drilling.
- Re-assays of old pulps from pre-2005 sampling programs showed good agreement following a change in assay protocol to a four-acid digestion method.
- The analysis of the twinned hole assay data indicates that the 2005 assays are comparable to the historic data, and that the historic data may be biased slightly lower.
- Confirmation drilling and sampling demonstrates that the assay data collected by pre-2005 operators is valid and appropriate for use in estimation of mineral resources.
- Conversion from the mine grid to the UTM coordinate system may have resulted in errors in location of some pre-2005 drill hole collars of as much as 3 m to 4 m.
- The mineralization at Malmbjerg consists of fracture-filling and disseminated MoS_2 that, in the QP's opinion, is of a style amenable to block modelling with OK.
- Statistical analysis suggests that there are a few outliers to the grade distribution. Outlier restriction of the high-grade composites of between 0.2%MoS_2 and 0.6% MoS_2 was employed during interpolations.
- Post-mineralization dikes are known to be barren and represent sources of internal dilution. The basic dikes are too narrow to segregate from the other rock types and in the QP's opinion, will likely be negligible. The trachyte dikes are much thicker and will impact on local block grades. Wireframe models of known trachyte dikes were constructed to distinguish them from the surrounding rock mass and assigned zero grade to this material.
- Oxidation of the sulphide mineralization has occurred and is particularly intense near surface. Oxide molybdenum will not be recoverable in the mill so, in the QP's opinion, it is appropriate to make an allowance for it in the block model. All blocks within 20 m of surface have been reduced in grade by a factor of 1/3 to account for oxidation.
- Bulk density testing conducted by previous operators indicates that reasonable bulk density values for the principal rock types at Malmbjerg are 2.62 t/m^3 for the intrusive rocks and 2.67 t/m^3 for the sedimentary rocks and trachyte dykes.
- There is a significant tonnage of mineralized material outside of the resource pit shell that might be extractable by underground methods.

- The mineralization appears to be open-ended to the north and at depth. In the QP's opinion, potential additional Mineral Resources warrant further exploration. In addition, there is potential for discovery of other deposits in the area.

25.2 Mineral Resource Estimate

The classification of Measured, Indicated, and Inferred Resources conforms to the Canadian Institute of Mining, Metallurgy, and Petroleum Definition Standards for Mineral Resources and Mineral Reserves dated 15 January 2021 (CIM Definition Standards).

Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. These mineral resource estimates include inferred mineral resources that are considered too speculative geologically to have economic considerations applied that would enable them to be categorized as mineral reserves. It is reasonably expected that most inferred mineral resources could be upgraded to indicated.

The current Mineral Resource estimate represents the resource within the Malmbjerg deposit. There is potential for the discovery of other deposits in the area.

Mr. Michael O'Brien, P.Geo., a senior geologist of Tetra Tech, has completed a third-party review of the Mineral Resource block model. No major discrepancy was found in the block model.

Areas of uncertainty that may materially impact the MRE include commodity price assumptions, metal recovery assumptions, mining, and processing cost assumptions.

There are no other factors or issues known to the QP that materially affect the estimate other than normal risks faced by mining projects in terms of environmental, permitting, taxation, socio-economic, marketing, and political factors.

25.3 Metallurgical Test Work

Metallurgical tests were appropriate to the mineralization type and design of the conceptual flowsheet. Samples from various locations, styles of mineralization and rock types were collected for testing. The samples were selected from various depths and sufficient mass to conduct a detailed test program.

The mineralogy test indicated that molybdenite is the primary mineralized mineral with quartz and feldspar as the dominant species. Pyrite is the major sulphide gangue mineral with trace amounts of sphalerite and galena. Minor quantities of amphiboles, mica/clay minerals and fluoride minerals, fluorite, topaz and gearksutite are also present in the deposit.

The grindability tests indicated that the sample material consisted of a moderately hard sample with respect to SAG milling and a moderately soft sample with respect to ball milling. The abrasion index suggested a relatively abrasive ore.

The flotation test results showed that the samples responded well to the conventional flotation recovery process. The developed flowsheet is similar to other existing molybdenum operations and uses well-proven techniques in flotation. The test using mild steel grinding media in saltwater showed no adverse effect on the flotation performance. The multi-element assay of the final flotation concentrate showed that the impurities in the molybdenum concentrate will not attract smelting penalties as set out by most smelters.

25.4 Mining

The resource model was successfully converted into a mine planning model. The mine planning model utilizes the following considerations to develop the best mining methods:

- best available digital topography
- glacial ablation estimates
- metallurgical recovery projections
- metal price and NSR parameters
- mining metal loss and dilution
- geotechnical

The economic mine life analysis determined the optimum production period of approximately 20 years. The production period comprises of direct mining for a period of 11 years and 9 years production from stockpile. Optimum mine scheduling resulted in a three-phase pit design, providing the best production economics and establishing optimum pit limits. Project production schedule utilizes variable cut-off grades and stockpile strategies to maximize Mo grades and resulting cash flow during the payback period.

25.5 Process Plant

The nominal design throughput of ore into the processing plant is 35,000 t/d which will result a LOM average annual production of approximately 20,290 t of Mo concentrate at an average grade of 54% Mo. The average Mo production head grade during the first 5 years is 0.143% Mo with an anticipated average concentrator recovery of 86%.

A gyratory crusher will be used as the primary crushing unit, and the crushed ore will be conveyed to a stockpile with a RopeCon conveyor. Two parallel lines of two SABC grinding circuits will reduce the particle size to approximately 80% passing 180 µm. A series of rougher/scavenger flotation, two-stage regrinding and three stages of cleaner flotation will be used to produce the final Mo concentrate grading approximately 54% Mo. The plant tailings will be disposed in the TMF.

25.6 Infrastructure

The Project will require the development of a number of infrastructure items. The locations of Project facilities and other infrastructure items take into consideration local topography, environmental, and capital and operating costs. Project infrastructure considerations will include:

- A network of access roads to connect the port site to existing BGMV, port site to the tailings storage facility, port site to the mine site and Schuchert airstrip.
- A tailings storage facility to safely manage the tailings and water associated with mill feed processing, tailings transport and disposition systems and a reclaim water system
- A network of site haul roads

- A new airstrip at Schuchert
- Logistics and warehousing
- Accommodation and administration offices
- Communications
- Fuel storage and fuel farm

25.7 Environmental, Permitting and Social Considerations

The Malmbjerg Project initially received its operating permit in 2008 based on the utilization of the Schuchert Dal southern access and infrastructure installation. The MLSA required GRI to resubmit the EIA and SIA applications in order to receive the operating permit in 2020, since the Project access route was changed from the south (Scoresbysund fjord) to the north (King Oscar fjord).

Most of the collected terrestrial, freshwater, and marine data for the 2008 operating permit are still valid. Additional fieldwork has been carried out in August 2021 to supplement these existing data. The focus area of this survey was the area north of Malmbjerg towards Mesters Vig Inlet, as this area was not studied in detail for the previous project. Baseline hydrological and water quality studies were combined with geochemical (acid rock drainage and metal leaching) characterization of waste rock, ore, and tailings to assess potential environmental impacts for the 2008 project. These studies will be updated to reflect the existing project during the EIA.

The permitting process involves the MLSA, a government agency within the Ministry of Mineral Resources and Justice, and the EAMRA, a government agency part of the Ministry of Agriculture, Self Sufficiency, Energy and Environment. The MLSA is the one-door administrative authority for mineral resource activities, licences, etc. The Ministry of Mineral Resources and Justice is responsible for all socio-economic aspects of mineral resources, including SIA and IBA, and EAMRA is the administrative authority for environmental matters, including the protection of the environment and nature and EIA. EAMRA also receives input from scientific and independent environmental institutions and therefore works closely with the Greenland Institute of National Resources, Pinngortitaleriffik, and the DCE at Aarhus University.

Although the permitting process is subject to regulatory decisions that can influence positively or negatively the timing and outcome of the exploitation license process, the company has been working diligently in each step of the process and used the extensive environmental monitoring data conducted by the Danish Centre for Environment and Energy from 2005-2017 and is therefore aiming to receive an exploitation license in Q1 2023.

25.8 Capital and Operating Costs

The total estimated initial and sustaining capital cost (direct costs, indirect costs, owner's costs, and contingency) is $1,038.1 million (Initial Capex $820.1 million + Sustaining Capex $218.0 million). This cost estimate has been prepared in accordance with the Class 3 standards of AACE International. The estimated average accuracy of this cost estimate is +15%/-15%. The average LOM operating cost is estimated to be $12.42/t ore milled.

25.9 Economics

Economic analysis of the Malmbjerg Molybdenum Project Base Case demonstrates that the Project is economically viable using the stated price assumptions, cost estimates and technical parameters generated by the FS, and the sensitivity analysis shows that positive returns can be achieved even with 20% adverse variance in price, operating costs, or capital expenditure.

The alternative Levered Case demonstrates that returns to equity may be further enhanced when debt funding is applied to 60% of the initial capital costs.

26.0 RECOMMENDATIONS

This section presents the risks, opportunities, and recommendations for the Project. Overall, it is recommended that the Project to be advanced to the next stage.

The QP makes the following recommendations to advance the Project:

26.1 QAQC and Data Validation

- Future drilling programs should employ QAQC sample inclusion rates consistent with current practice to include blanks, field duplicates, coarse duplicates, and CRMs.
- A collar survey should be done to comprise 10% of all collars with equal spatial distribution.
- Additional work on the current location of the edge of the glacier, and the extent of glacial ablation should be undertaken to determine the rate of change of melting.
- Additional sampling of historic core would be beneficial to add to the validation database.

26.2 Geology

- A complete study of the geology, including mineralization, geochemistry, alteration, and host lithologies, be undertaken to fully understand the Project. All geological data should be compiled to produce detailed property-scale maps of the surface and underground geology.
- Continuation of lithologic and alteration data collating so that 3D modelling of the four phases of intrusions is possible to further refine the block model and grade interpolations.

26.3 Exploration

- No further exploration work is planned for the Malmbjerg area at this time. The resource is limited by the extent of the current drilling at depth and is open in each of the valleys. Exploration to extend the resource may occur later.

26.4 Mining

MMTS recommends further engineering studies to evaluate and select the RopeCon conveyor routing, as well as stations, support towers, locations, anchor points, and other operational considerations. The estimated engineering studies cost is $1,000,000.

MMTS also recommends that a detailed ice radar survey to confirm glacial ablation and establish bed rock surfaces in critical infrastructure areas in Cirque A. An updated property Lidar survey. The cost of the ice radar survey would be approximately $300,000 and the Lidar survey would be $200,000.

An updated study is recommended to refine glacial ablation estimates. The cost of this study is estimated at $50,000.

MMTS also recommends a slope stability study to be completed on the West RSF, HGSP and LGSP. The cost of the study is estimated to be $30,000.

Glacial road engineering studies, costing $50,000, including following consideration:

- borrow pit locations
- detailed water controls (culverts)
- geohazard and avalanche controls, geogrid, geotextiles
- hazard meditation and updated topography survey

The Mining risks and mitigation are summarized in Table 26-1.

Table 26-1: Mining Risks and Mitigations

Risks	Mitigations
Adverse weather delays and down days can affect mine operating hours by 2% per week. This delay will have a downstream impact on the target ore production and equipment units.	Ore stockpiles will be placed near the RopeCon conveyor to provide constant ROM material. Equipment availability is decreased to provide extra room for mechanical, operator and weather delays. 10 days of no production has been included in the yearly operating hours calculations.
Differential and/or sudden movement at the toe of the West RSF dump on top of the Schuchert glacier. A stability analysis has not been completed. Current designs have material placed at angle of repose (1:3V:1H) and the toe is on the rock edge between the mountainside and edge of the Schuchert glacier. The rock-glacier edge may be unsupportive for a 400 m high dump, and the lower lifts of the West RSF placed on the glacier that buttress the upper lifts may move and pull the toe of the upper lifts with them.	Elongating the upper lifts in the North direction allows more material to be placed on a known rock foundation. This will increase the truck hours and increase the mining costs by ~5%. Additionally, material placement into the buttressing, lower lifts could be accelerated which would require slightly longer, downhill loaded hauls. The planned mine sequence has the upper lifts completed before the lower lifts are used. Therefore, the upper lifts can be re-sloped after they are filled to decrease the face slope and ultimately increase slope stability.
Differential movement along the interface between the stockpile base and the top of the Arcturus glacier may result in portions of the LGSP becoming unrecoverable	Place lowest grade material on the bottom where possible and defer reclamation of LGSP until the end of the mine life to minimize impact on Project economics if a portion is unrecoverable

26.5 Metallurgy and Process

The QP recommends further metallurgical testing on samples from the Malmbjerg deposit focused on accessing the flotation performance using saltwater at pilot scale which is expected to be used during the operation. The test parameters should be designed to optimize the process conditions and update the metallurgical performance. The test work should include the following:

- The sample for the test program should include the consideration for the expected average LOM head grade and average head grade for the first five-year and ten-year mine plans.
- Bench-scale rougher and cleaner flotation tests should be performed to investigate the effect of process parameters such as reagent dosages and pH in the saltwater conditions matching the water quality expected during operation.

- A pilot plant campaign is recommended using saltwater to verify the bench-scale test results and produce samples for smelting performance assessment and downstream concentrate and tailings dewatering in saltwater conditions.
- Process simulation of the SABC circuit matching the process design throughput and feed and product size (F_{80} and P_{80}) at varying transfer sizes is recommended to optimize/minimize the comminution-specific energy consumption.
- Regrind tests should be conducted to estimate the specific energy consumption in the regrind circuit and provide necessary data for equipment selection for energy-efficient regrinding technologies.
- The cost of the test work is estimated to be approximately $250,000. The costs associated with the drill core sample generation, including drilling and sample shipping, are excluded from the cost estimate. Table 26-2 summarizes the potential risk, opportunities and recommendations for the Project metallurgy and process.

Table 26-2: Metallurgical Risks and Mitigations

Risks	Mitigations
Variation in metallurgical performance, especially in saltwater	Batch, locked cycle, and pilot plant flotation tests are suggested to understand the effect of saltwater on metallurgical performances.
High fluoride mineral-containing zones and molybdenum oxide-containing zones reduce the metallurgical performance. Fluoride minerals in the concentrate can be problematic for the smelter and incur penalties.	Mapping out the high fluoride mineral-containing zones and high molybdenum oxide-containing zones. Ore blending could also be helpful.
Opportunities	**Recommendations**
Reducing comminution energy requirement by reducing ROM ore particle size	Use the Kuz-Ram fragmentation model to predict the particle size after blasting and adjusting blast design and pattern to reduce the powder factor
Reducing the SAG mill size by transferring more power to the ball mill	Perform SMC tests to estimate M_{ia}, M_{ib}, and M_{ic} and predict the total comminution circuit specific energy. Simulating varying transfer sizes to minimize the total energy.
Adapting HPGR-ball mill circuit	Estimate total energy consumption using the HPGR data and conduct additional tests to understand the ore variability to HPGR comminution.
Application of innovative flotation technologies such as Hydro-float and staged flotation reactor (SFR). It will also recover metal at a coarser size and thus reducing the comminution energy consumption.	A new test program is required to assess the viability of these technologies.
Application of energy-efficient regrind technologies to reduce Capex and Opex and improve metallurgical performance.	A new test program is required to access the viability of SMD mill, IsaMill, and HIG mill technologies and their potential downstream benefits.

26.6 Infrastructure

26.6.1 Port Infrastructure

Recommendations for the final design of the port infrastructure require the collection of additional site-specific data, including the following:

- geotechnical investigation of surface port facilities
- geotechnical seafloor seismic work
- detailed bathymetric studies
- weather station operation and data collection
- Mesters Vig Inlet summer and winter met-ocean measurements including ice thickness, waves, water level and current

26.6.2 Pipelines

P&C recommends further test work on the following:

- TMF material rheology studies
- TMF material corrosivity and abrasiveness studies
- geotechnical routing analysis

26.6.3 Tailings Management Facility

- Geotechnical site investigations to confirm the suitable foundations and availability of suitable construction materials for the construction of TMF embankments and spillway
- Concentrator tailings analysis is required to determine tailings deposition characteristics in planned TMF to ensure long term storage stability
- Develop a TMF Operations, Maintenance, and Surveillance Manual
- Develop a TMF closure and reclamation plan suitable for submission to MASL
- Ongoing collection of Project water balance data to continually update TMF water balance operating parameters
- Investigate and remediate as required any potential geohazards that could affect the continuous operation of access roads to Mestersvig and the TMF/process water pipelines.

26.7 Environmental and Permitting

Overall review and update of baseline data, as necessary, and assessment of interactions between the project on the environment and social setting will be completed during the Project permitting (EIA, SIA, IBA, NSI) process. The following tasks should be completed to further support the assessment of environmental impacts:

- Comparison of geochemical characteristics of waste rock in relation to the mine plan to confirm waste rock management requirements and ongoing monitoring will be completed during the operational phase.
- The need for additional geochemical characterization of tailings in a saline water environment and expected TMA water quality will be determined during the EIA.
- Assessment of the flooded pit water quality to support closure planning.
- Assessment of climate change impacts on glaciation and operation and closure mining activities.
- Development of a detailed closure and reclamation plan suitable for submission to MASL after receipt of the Exploitation License.
- Confirmation in the Exploitation License from the Greenland Government that GRI will not be held responsible for historical placement of tailings and associated contamination from the former Blyklippen Mine at Nyhavn and Noret Inlet.

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28.0 QP CERTIFICATES

CERTIFICATE OF QUALIFIED PERSON

Hassan Ghaffari, P.Eng., M.A.Sc.

I, Hassan Ghaffari, P.Eng., M.A.Sc., do hereby certify that:

- I am a Director of Metallurgy with Tetra Tech Canada Inc. with a business address at Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC, Canada, V6C 1N5.
- This Certificate applies to the Technical Report entitled “Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report”, with an effective date of February 23, 2022 (the “Technical Report”).
- I am a graduate of the University of Tehran (M.A.Sc., Mining Engineering, 1990) and the University of British Columbia (M.A.Sc., Mineral Process Engineering, 2004).
- I am a member in good standing of the Engineers and Geoscientists British Columbia (#30408).
- My relevant experience includes over 30 years of experience in mining and mineral processing plant operation, engineering, project studies and management of various types of mineral processing, including hydrometallurgical processing for porphyry mineral deposits.
- I am a “Qualified Person” for the purposes of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) for those sections of the Technical Report that I am responsible for preparing.
- I conducted a personal inspection of the Malmbjerg Property from August 16 to August 23, 2021 and inspected the overall project site.
- I am responsible for Sections 1.13.1 (except glacier road), 1.13.2, 1.13.3, 1.13.4, 1.13.7, 1.15, 1.17, 2.0. 3.0, 18.1 (except 18.1.4), 18.2, 18.4, 18.3, 18.5, 18.8.6, 19.0, 21.0 (except mining, marine and port, tailings and overland pipelines), 24.0, 25.6, 25.8 and 27.0 (only references from sections for which I am responsible).
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

“signed and sealed”

Hassan Ghaffari, P.Eng., M.A.Sc.
Director of Metallurgy
Tetra Tech Canada Inc.

CERTIFICATE OF QUALIFIED PERSON

Sue Bird, P.Eng.

I, Sue Bird, P. Eng., do hereby certify that:

- This Certificate applies to the Technical Report entitled "Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report", with an effective date of February 23, 2022 (the "Technical Report").
- I am currently employed as Vice Principal with Moose Mountain Technical Services (MMTS) with an office address of #210-1510 2nd Street, North Cranbrook, BC V1C 3L2.
- I graduated with a Geological Engineering degree (B.Sc.) from the Queen's University in 1989. I graduated with a M.Sc. in Mining from Queen's University in 1993.
- I have worked as an engineering geologist for over 25 years since my graduation from university. I have worked on precious metals, base metals and coal mining projects, including mine operations and evaluations. Similar resource estimate projects specifically include those done for Desert Fox's Van Dyke Project, Artemis' Blackwater gold project, Ascot's Premier Gold Project, Spanish Mountain Gold, all in BC; O3's Marban and Garrison, gold projects in Quebec and Ontario, respectively, as well as numerous due diligence projects in the southern US done confidentially for various clients.
- I am a member in good standing of Engineers and Geoscientists British Columbia (#25007).
- My recent personal inspection of the Property was from August 16 to August 23, 2021 and conducted a review of the drill cores and a general overview of the topography.
- I am responsible for Sections 1.1 to 1.7, 1.9, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 14.0, 23.0, 25.1, 25.2, 26.1 to 26.3, and 27.0 (only references from sections for which I am responsible).
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date of this Report: February 23, 2022
Effective Date of the Resource Estimate: October 12, 2021
Signing Date: April 11, 2022

"signed and sealed"

Sue Bird, P. Eng.
Vice Principal
Moose Mountain Technical Services

CERTIFICATE OF QUALIFIED PERSON

Marinus (Andre) De Ruijter, P.Eng.

I, Marinus (Andre) De Ruijter, P.Eng., do hereby certify that:

- I am a senior metallurgist with Tetra Tech Canada Inc. with a business address at Suite 1000, 10th Floor, 885 Dunsmuir Street, Vancouver, BC, V6C 1N5.
- This Certificate applies to the Technical Report entitled “Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report”, with an effective date of February 23, 2022 (the “Technical Report”).
- I am a graduate of the University of the Witwatersrand, South Africa, holding M.Sc. and B.Sc. (Metallurgical Engineering), and B.Sc. (Physics, Mathematics) degrees.
- I am a member in good standing of the Engineers and Geoscientists British Columbia (#31031).
- I have practiced my profession for more than 35 years. I have been directly involved in mining and mineral processing plants and projects in Canada, United States of America, Australia, Mexico, Chile, Argentina, Peru, Namibia, Burkina Faso, South Africa, Ethiopia, and Russia.
- I am a “Qualified Person” for the purposes of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) for those sections of the Technical Report that I am responsible for preparing.
- I have not visited the Malmbjerg Property.
- I am responsible for Sections 1.8, 1.12, 13.0, 17.0, 25.3, 25.5, 26.5, and 27.0 (only references from sections for which I am responsible).
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

“signed and sealed”

Marinus (Andre) De Ruijter, P.Eng.
Senior Metallurgist
Tetra Tech Canada Inc.

CERTIFICATE OF QUALIFIED PERSON

Daniel Yi. YANG, P.Eng., M.Eng.

I, Daniel Yi YANG, P.Eng., M.Eng., do hereby certify that:

- I am a Specialist Geotechnical Engineer with Knight Piésold Ltd. with a business address at 1400 – 750 West Pender Street, Vancouver, British Columbia, V6C 2T8, Canada.
- This Certificate applies to the Technical Report entitled "Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report", with an effective date of February 23, 2022 (the "Technical Report").
- I graduated with a Bachelor degree of Civil Engineering from Tongji University in China in 1992 and obtained a Master degree of Geotechnical Engineering from the University of Alberta in Canada in 2002.
- I am a member in good standing of the Engineers and Geoscientists British Columbia (#28936).
- My relevant experience includes 28 years of experience in geotechnical site investigation, slope stability assessment, open pit slope design, and pit dewatering planning for various mining projects.
- I am a "Qualified Person" for the purposes of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) for those sections of the Technical Report that I am responsible for preparing.
- I have not visited the Malmbjerg Property to date.
- I am responsible for Section 16.2.2 and 27.0 (only references from sections for which I am responsible).
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

"signed and sealed"

Daniel Yi YANG, P.Eng., M.Eng.
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CERTIFICATE OF QUALIFIED PERSON

Jesse Aarsen, B.Sc. Mining Engineering, P.Eng.

I, Jesse Aarsen, B.Sc. Mining Engineering, P.Eng., do hereby certify that:

- I am a Principal - Mining with Moose Mountain Technical Services (MMTS), an independent consulting firm, whose address is 1975-1st Avenue South, Cranbrook, BC, Canada, V1C 6Y3.
- This Certificate applies to the Technical Report entitled "Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report", with an effective date of February 23, 2022 (the "Technical Report").
- I am a graduate of the University of Alberta with a B.Sc. in Mining Engineering Co-op Program (2002).
- I am a member in good standing of the Engineers and Geoscientists British Columbia (#38709).
- My relevant experience includes 18 years of experience including time spent in mining operations, engineering, project studies and management of various types of mining studies.
- I am a "Qualified Person" for the purposes of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) for those sections of the Technical Report that I am responsible for preparing.
- I conducted a personal inspection of the Malmbjerg Property from August 16 to August 23, 2021 and reviewed the deposit site, drill cores and the general layout of the camp and topography.
- I am responsible for Sections 1.10, 1.11, 1.13.1 (only glacier road), 15.0, 16.0 (except 16.2.2), 18.1.4, 21.0 (mining and RopeCon conveyor), 25.4, 26.4, and 27.0 (only references from sections for which I am responsible).
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

"signed and sealed"

Jesse Aarsen, B.Sc. Mining Engineering P.Eng.,
Principal - Mining
Moose Mountain Technical Services.

Knight Piésold CONSULTING

CERTIFICATE OF QUALIFIED PERSON

Reagan McIsaac, P. Eng., Ph.D.

I, Reagan McIsaac, P.Eng., Ph.D., do hereby certify:

- I am a Specialist Engineer with Knight Piésold Ltd. with a business address at 200 – 1164 Devonshire Avenue, North Bay, Ontario, P1B 6X7, Canada.
- This Certificate applies to the Technical Report entitled "Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report", with an effective date of February 23, 2022 (the "Technical Report").
- I am a graduate with a Bachelor of Applied Science in Geological Engineering from the University of Waterloo in Canada in 1997 and obtained a Doctor of Philosophy in Engineering Science from the University of Western Ontario in Canada in 2007.
- I am a member in good standing of the Professional Engineers Ontario (#100074049).
- My relevant experience includes 14 years of experience in geotechnical site investigation, planning and design of tailings and water management facilities, geotechnical analysis, construction QA/QC and closure planning and design for various mining projects.
- I am a "Qualified Person" for the purposes of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) for those sections of the Technical Report that I am responsible for preparing.
- I conducted a personal inspection of the Malmbjerg Molybdenum Project from August 16 to August 24, 2021.
- I am responsible for Section 1.13.6, 18.7, 26.6.3, and 27.0 (only references from sections for which I am responsible)
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

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CERTIFICATE OF QUALIFIED PERSON

Stewart Bodtker, P.Eng., B.A., BSc.

I, Stewart Bodtker, P.Eng., B.A., BSc., do hereby certify that:

- I am a Director with Paterson & Cooke Canada Inc. with a business address at 141 Commercial Drive, Unit 7, Calgary, Alberta, T3Z 2A7, Canada.
- This Certificate applies to the Technical Report entitled "Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report", with an effective date of February 23, 2022 (the "Technical Report").
- I am a graduate of The Colorado College (B.A., Mathematics, 1998) and the University of Colorado at Denver (B.Sc., Civil Engineering, 2006).
- I am a member in good standing of the Engineers and Geoscientists British Columbia (#52463).
- My relevant experience includes over 16 years of experience in hydraulic design of water and slurry pipeline systems, selection and specification of water and slurry transport equipment, process engineering, project studies and management of various types of tailings management systems.
- I am a "Qualified Person" for the purposes of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) for those sections of the Technical Report that I am responsible for preparing.
- I conducted a personal inspection of the Malmbjerg Property from August 16 to August 23, 2021 and inspected the overall project site and identified preferred pipeline corridors.
- I am responsible for Sections 1.13.5, 18.6, 21.0 (only overland pipelines), 26.6.2, 27.0 (only references from sections for which I am responsible).
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

"signed and sealed"

Stewart Bodtker, P.Eng., B.Sc.
Director
Paterson & Cooke Canada Inc.

CERTIFICATE OF QUALIFIED PERSON

Gary Watters, P.Eng., P.E.

I, Gary Watters, P.Eng., P.E., do hereby certify that:

- I am the Vice President of PND Engineers, Inc., with a business address at 3240 Eastlake Ave. East, Seattle, WA, 98102.
- This Certificate applies to the Technical Report entitled "Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report", with an effective date of February 23, 2022 (the "Technical Report").
- I am a graduate of the University of Washington (B.S., Civil Engineering, 1990).
- I am a member in good standing of the Engineers and Geoscientists British Columbia (#164727).
- My relevant experience includes over 30 years of experience in port and marine facilities engineering, project studies and management of various types of marine related construction.
- I am a "Qualified Person" for the purposes of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) for those sections of the Technical Report that I am responsible for preparing.
- I have not visited the Malmbjerg Property.
- I am responsible for Section 18.8.3, 18.8.5, 21.0 (port and related infrastructure), 26.6.1 and 27.0 (only references from sections for which I am responsible).
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

"signed and sealed"

Gary Watters, P.Eng., P.E.
Vice President
PND Engineers, Inc.

CERTIFICATE OF QUALIFIED PERSON

Carl McNabb, P.E.

I, Carl McNabb, P.E., do hereby certify that:

- I am a Senior Engineer at PND Engineers, Inc., with a business address at 3240 Eastlake Ave. East, Seattle, WA, 98102.
- This Certificate applies to the Technical Report entitled "Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report", with an effective date of February 23, 2022 (the "Technical Report").
- I am a graduate of Seattle University (B.S., Civil Engineering, 1989).
- I am a registered Professional Engineer in the State of Washington since 1995 (registration number 32193)
- My relevant experience includes over 30 years of experience in port and marine facilities engineering, project studies and management of various types of marine related construction.
- I conducted a personal inspection of the Malmbjerg Property from August 16 to August 23, 2021 and inspected the proposed marine facilities location.
- I am responsible for Section 18.8.1 and 18.8.2.
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

"signed and sealed"

Carl McNabb, P.E.
Senior Engineer
PND Engineers, Inc.

CERTIFICATE OF QUALIFIED PERSON

John Myers, P.E., licensed in the states of Washington and Oregon

I, John Myers, P.E., do hereby certify that:

- I am the President and Managing Principal of Hockema Group, Inc. with a business address at 5306 Ballard Avenue NW, Suite 204 Seattle, WA 98107.
- This Certificate applies to the Technical Report entitled "Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report", with an effective date of February 23, 2022 (the "Technical Report").
- I am a graduate of the Florida Institute of Technology (B.S. Ocean Engineering, 1993).
- I am a member in good standing of the Society of Naval Architects and Marine Engineers (#586240).
- My relevant experience includes over 29 years of experience in naval architecture and marine engineering. Industry focus has been in commercial and government projects in the design, conversion and maintenance engineering of deck cargo barges, tugs, dredges, fishing vessels and other work boat types.
- I am a "Qualified Person" for the purposes of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) for those sections of the Technical Report that I am responsible for preparing.
- I have not visited the Malmbjerg Property.
- I am responsible for Section 18.8.4 and 21.0 (Marine Vessels and Naval Architecture only) of the report.
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

"signed and sealed"

John Myers, P.E.
President and Managing Principal
Hockema Group, Inc.

CERTIFICATE OF QUALIFIED PERSON DAVID BROWN, P.GEO.

I, David Brown, P.Geo., state that:

- I am a Professional Geoscientist (Environmental) at:

  Golder Associates Ltd.
  200 Queen St. West
  Toronto, ON, M5H 3R3

- This certificate applies to the technical report titled Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report with an effective date of: 23 February 2022 (the "Technical Report").
- I am a "qualified person" for the purposes of National Instrument 43-101 ("NI 43-101"). My qualifications as a qualified person are as follows. I am a graduate of the University of Waterloo with a Bachelor of Science in Chemistry and Environmental Resources Studies in 1990 and a Master of Science degree in Earth Science in 1996 and I am a member in good standing with Professional Geoscientists Ontario. My relevant experience after graduation and over 31 years for the purpose of the Technical Report includes baseline investigations, environmental monitoring programs, site rehabilitation and closure plans, and environmental assessment and permitting projects related to proposed, existing, and closed mines.
- The requirement for a site visit is not applicable to me.
- I am responsible for Item(s) 1.14, 20.0, 25.7 and 26.7 of the Technical Report.
- I am independent of the issuer as described in section 1.5 of NI 43-101.
- I have not had prior involvement with the property that is the subject of the Technical Report.
- I have read NI 43-101 and the part of the Technical Report for which I am responsible for has been prepared in compliance with NI 43-101; and
- At the effective date of the Technical Report, to the best of my knowledge, information, and belief, the parts of the Technical Report for which I am responsible, contain(s) all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

"signed and sealed"

David Brown, P.Geo.
Environmental Geoscientist
WSP Golder

CERTIFICATE OF QUALIFIED PERSON

Christopher Jacobs, CEng, MIMMM

I, Christopher Jacobs, CEng, MIMMM, do hereby certify that:

- I am employed as President and Mining Economist by Micon International Limited, 900 – 390 Bay Street, Toronto, Ontario M5H 2Y2. tel. (416) 362-5135, email: cjacobs@micon-international.com.
- This Certificate applies to the Technical Report entitled "Malmbjerg Molybdenum Deposit Feasibility Study, NI 43-101 Technical Report", with an effective date of February 23, 2022 (the "Technical Report").
- I am a graduate of the University of Reading (B.Sc. (Hons) Geochemistry, 1980) and the University of Pretoria (MBA., 2004).
- I am a Chartered Engineer registered with the Engineering Council of the U.K. (registration number 369178) and a professional member in good standing of: The Institute of Materials, Minerals and Mining; and The Canadian Institute of Mining, Metallurgy and Petroleum.
- I have worked in the minerals industry for more than 40 years; my relevant work experience includes 10 years as an exploration and mining geologist on gold, platinum, copper/nickel and chromite deposits; 10 years as a technical/operations manager in both open-pit and underground mines; 3 years as strategic (mine) planning manager and the remainder as an independent consultant when I have focused on the economic evaluation of a variety of deposits including gold and base metals.
- I am a "Qualified Person" for the purposes of National Instrument 43-101 Standards of Disclosure for Mineral Projects (NI 43-101) for those sections of the Technical Report that I am responsible for preparing.
- I have not conducted a personal inspection of the Malmbjerg Property.
- I am responsible for Section 1.16, 22.0, 25.9, and 27.0 (only references from sections for which I am responsible).
- I am independent of Greenland Resources Inc. as Independence is defined by Section 1.5 of NI 43-101.
- I have no prior involvement with the Malmbjerg Property that is the subject of the Technical Report.
- I have read NI 43-101 and the sections of the Technical Report that I am responsible for have been prepared in compliance with NI 43-101.
- As of the date of this certificate, to the best of my knowledge, information and belief, the section of the Technical Report that I am responsible for contain all scientific and technical information that is required to be disclosed to make the technical report not misleading.

Effective Date: February 23, 2022
Signing Date: April 11, 2022

"signed and sealed"

Christopher Jacobs, CEng, MIMMM
President
Micon International Limited